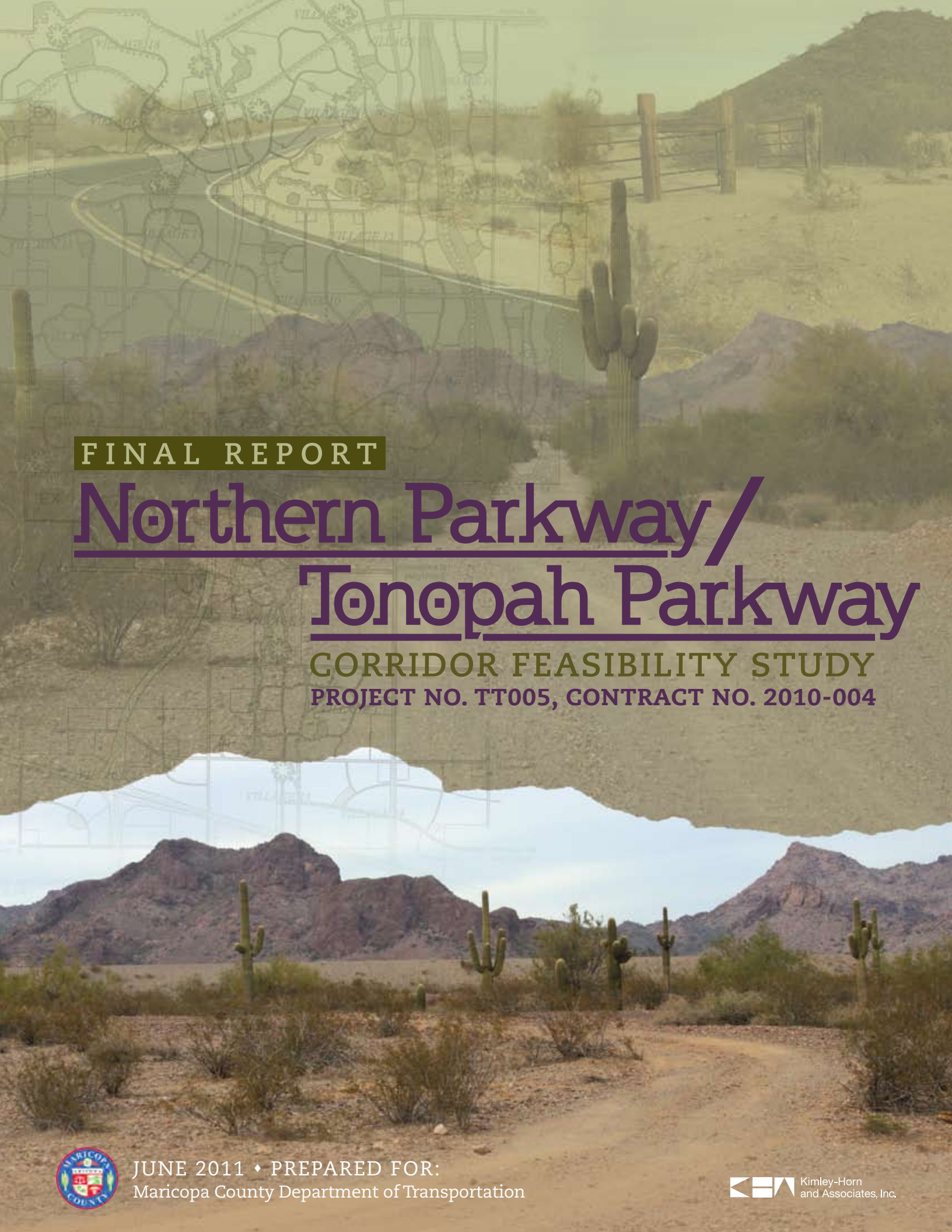


FINAL REPORT

Northern Parkway/ Tonopah Parkway

CORRIDOR FEASIBILITY STUDY

PROJECT NO. TT005, CONTRACT NO. 2010-004

JUNE 2011 ♦ PREPARED FOR:
Maricopa County Department of Transportation

Kimley-Horn and Associates, Inc.

Northern Parkway/ Tonopah Parkway Corridor Feasibility Study

Contract 2010-004
Project TT005

Final Report and Executive Summary

Prepared by:

Kimley-Horn
and Associates, Inc.

June 2011
091337127

TABLE OF CONTENTS

FINAL REPORT AND EXECUTIVE SUMMARY

TABLE OF CONTENTS

FINAL REPORT AND EXECUTIVE SUMMARY

LIST OF FIGURES

LIST OF TABLES

LIST OF APPENDICES IN THIS DOCUMENT

TABLE OF CONTENTS

FINAL REPORT AND EXECUTIVE SUMMARY

LIST OF APPENDICES PUBLISHED AS A SEPARATE DOCUMENT

EXECUTIVE SUMMARY

The *Northern Parkway/Tonopah Parkway Corridor Feasibility Study* is one in a series of long-range transportation planning studies being conducted by the Maricopa County Department of Transportation (MCDOT) to evaluate future parkways identified in the recently completed Maricopa Association of Governments (MAG) framework studies.

The project study area includes the planned Northern Parkway, an east-west corridor centered on the Northern Avenue section line, from the planned Tonopah Parkway (411th Avenue alignment) to the planned Turner Parkway (267th Avenue alignment). The Northern Parkway corridor within the project study area is approximately 18 miles long and two miles wide. This section of Northern Parkway is referred to as the Northern Parkway Hassayampa section to distinguish it from other planned Northern Parkway sections east of the White Tank Mountains.

The project study area also includes the planned Tonopah Parkway, a north-south corridor centered on the 411th Avenue section line, from Interstate 10 (I-10) to the planned Northern Parkway. The Tonopah Parkway corridor within the project study area is approximately 3.75 miles long and two miles wide. The project study area boundaries are shown in **Figure ES-1**.

The technical aspects of the study were guided and reviewed by a Technical Advisory Committee (TAC) and stakeholder group that met four times during the study. Findings and recommendations were presented for public review and input at three public open houses.

Background and Study Need

In July 2008, MAG completed the *Interstate 10/Hassayampa Valley Transportation Framework Study* (known as the *Hassayampa Framework Study*), that recommended a comprehensive roadway network to meet the future traffic demands that result when the area west of the White Tank Mountains is completely developed (hereafter referred to as buildout travel demand). This long-range regional transportation network includes the "Arizona Parkway" as a new facility type to supplement more traditional roadway classifications in meeting projected travel demand.

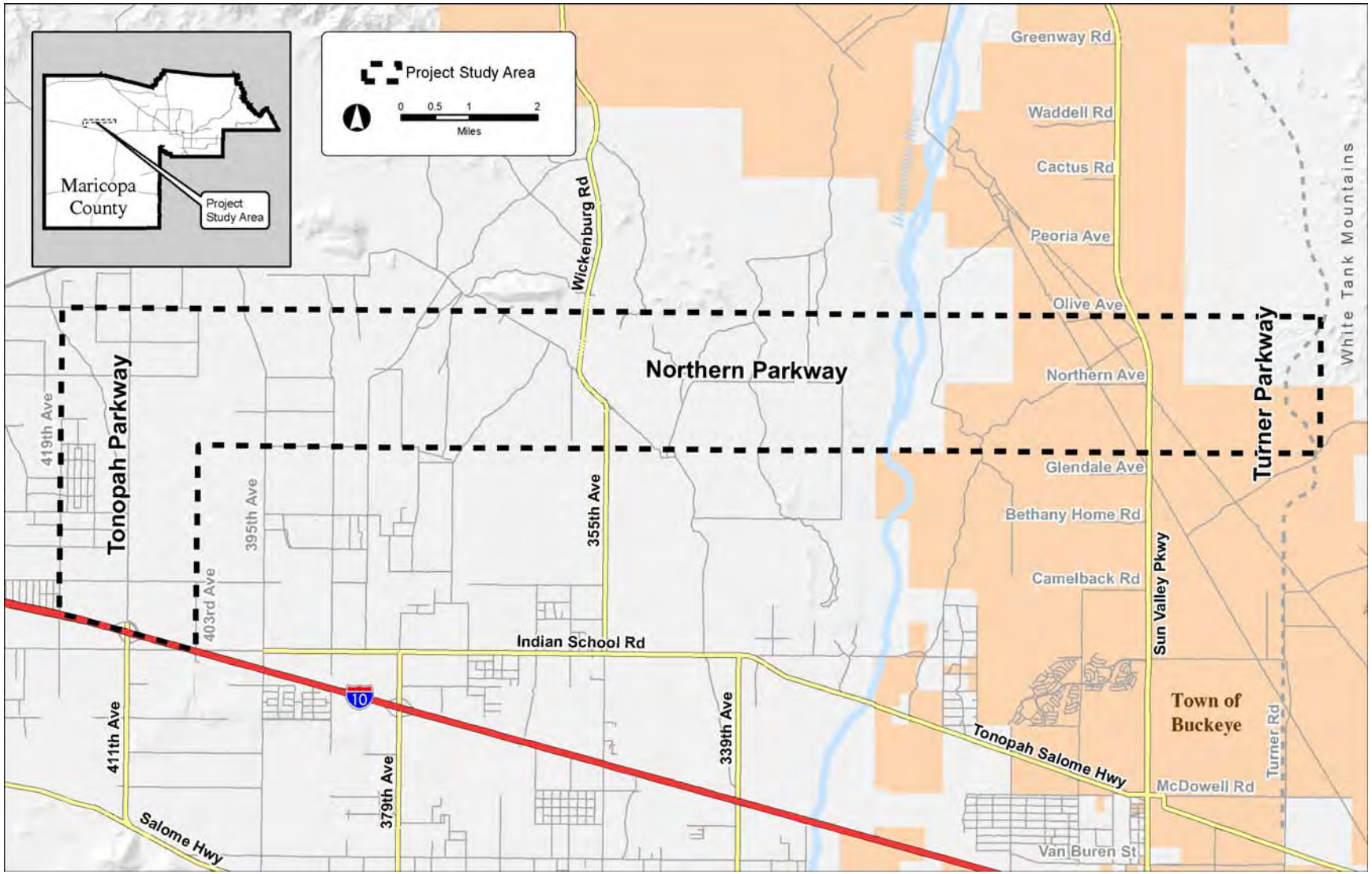
The Arizona Parkway utilizes a distinct intersection treatment that prohibits left turns at major cross-street intersections and controls intersection traffic movements with two-phased traffic signal control. Left-turn movements are made indirectly using directional left-turn crossovers in the median immediately downstream of cross-street intersections. The typical right-of-way width for an Arizona Parkway is 200 feet.

The *Hassayampa Framework Study* demonstrated the need for both Northern Parkway and Tonopah Parkway to meet buildout travel demands and provide a continuous parkway network. This study is the first step in the roadway development process and is meant to aid Maricopa County and the Town of Buckeye in defining and protecting the right-of-way that will be needed for Northern Parkway and Tonopah Parkway.

Study Purpose and Goals

The primary purposes of the *Northern Parkway/Tonopah Parkway Corridor Feasibility Study* are to:

- Define and assess the project study area for potential opportunities and constraints for alternative corridor alignments;



Source: Maricopa County

Figure ES-1 – Project Study Area

- Develop and evaluate conceptual alternative corridor alignments within the study area;
- Recommend a preferred corridor alignment; and
- Define the characteristics of the preferred alignment in sufficient detail for right-of-way preservation.

The study goals for the *Northern Parkway/Tonopah Parkway Corridor Feasibility Study* relate specifically to the proposed Northern Parkway and Tonopah Parkway in the context of the existing and future transportation network in the study area. Specific objectives are listed below for each study goal.

Goal #1: Achieve roadway network continuity and connectivity

- Determine the preferred corridor alignment from a regional transportation corridor perspective;
- Protect and preserve right-of-way for the preferred corridor alignment to maintain its long-term viability;
- Provide future connectivity with primary and regional roadway facilities; and
- Provide crossings of alluvial fans, drainage washes, rivers, and canals.

Goal #2: Enhance traffic flow (capacity) and safety

- Preserve functional integrity of the Arizona Parkway by recommending unique segment-specific solutions to address identified opportunities or constraints;
- Identify areas that may require additional right-of-way or easements, especially at crossings with other parkways, alluvial fans, and utility corridors; and
- Enhance traffic operations while maintaining reasonable access for developments.

Goal #3: Preserve the environment

- Comply with governing environmental regulations for new roadway development;
- Minimize adverse impacts to the study area environment, including wildlife corridors and archeological sites; and
- Enhance important environmental features (e.g., habitat areas).

Goal #4: Develop consensus-driven improvement alternatives

- Work with the TAC and key stakeholders in developing feasible alternatives;
- Develop cost-effective roadway improvement alternatives;
- Conduct public outreach to obtain input on alternatives and build consensus; and
- Ensure consistency between the study's transportation actions and regional/local plans.

Alternatives Development and Evaluation

For alternatives development and evaluation purposes, the study area was divided into two separate segments: the Tonopah Parkway segment and the Northern Parkway segment. The Tonopah Parkway segment alternatives commence at the existing I-10 interchange and proceed north to connect with the Northern Parkway alignment. The Northern Parkway segment alternatives commence at the Tonopah Parkway alignment (411th Avenue) and proceed east to connect with the Turner Parkway alignment.

Through a "brainstorming" process, a wide range of conceptual alternatives were developed and presented to the TAC, stakeholders, and general public for review and input. The conceptual alternatives were then narrowed to the following candidate alternatives to be evaluated in more detail. These alternatives involve the fewest constraints and are most compatible with existing land uses and future development master plans.

Tonopah Parkway segment – three candidate alternatives were identified as follows:

- Alternative A – A 200-foot-wide corridor centered on the 411th Avenue section line;
- Alternative B – A 200-foot-wide corridor with the centerline shifted 35 feet west of the 411th Avenue section line; and
- Alternative C – A 200-foot-wide corridor with the centerline shifted 35 feet east of the 411th Avenue section line.

The Tonopah Parkway candidate alternatives have the least impact on existing subdivided properties, are most compatible with planned developments, and tie directly to the existing I-10 interchange with 411th Avenue.

Northern Parkway segment – two candidate alternatives were identified as follows:

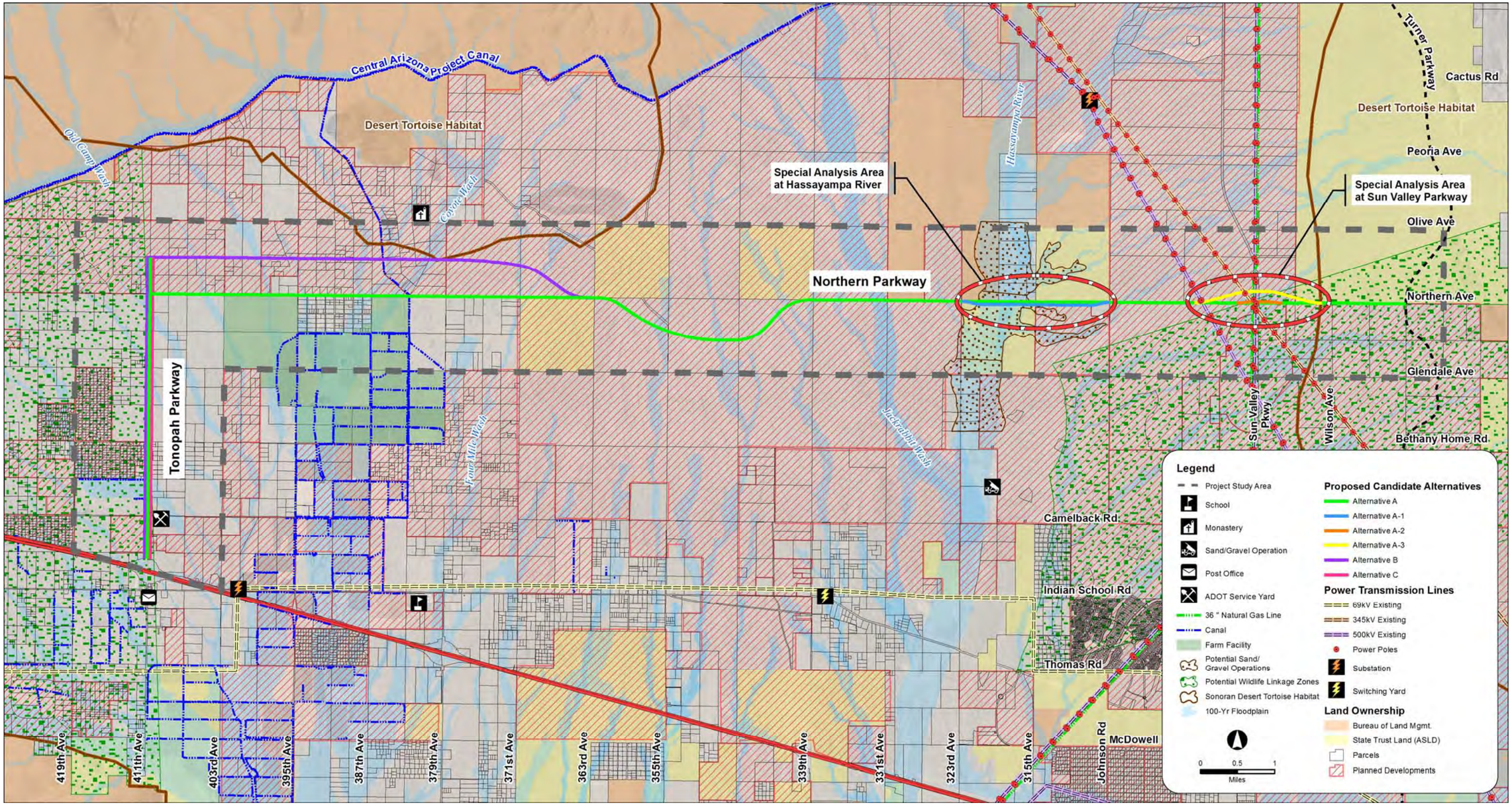
- Alternative A – A 200-foot-wide corridor centered on the Northern Avenue section line, except for a three-mile dip to the south within the Belmont master planned community; and
- Alternative B – A 200-foot-wide corridor with a centerline that shifts one-half mile north of Alternative A from Tonopah Parkway to 371st Avenue, then shifts south to proceed east on the Alternative A alignment from 363rd Avenue to Turner Parkway.

In addition to the candidate alternatives for Northern Parkway, two "Special Analysis" areas were designated along the Northern Parkway segment for more detailed review. The Special Analysis areas are located at the Hassayampa River crossing and in the Sun Valley Parkway interchange area.

As with the Tonopah Parkway candidate alternatives, the Northern Parkway candidate alternatives are generally the most compatible with existing and planned developments. Drawings showing the candidate alternatives are shown in **Figure ES-2**.

The candidate alternatives, along with a "No-Build" alternative, were evaluated using the following evaluation criteria:

- Future development compatibility;
- System continuity and capacity;
- Drainage impacts;
- Irrigation impacts;
- Building/property impacts;
- Wildlife impacts;
- Cultural/archaeological impacts;
- Utility impacts;
- Public acceptability; and
- Cost.



Sources: Maricopa County, MAG, Buckeye, Arizona Public Service (APS), Arizona Game and Fish Dept. (AZGFD), and Arizona State Land Dept. (ASLD)

Figure ES-2 – Candidate Alternatives

The alternatives development and evaluation process, criteria, and results were presented and discussed at four TAC/stakeholder meetings, four one-on-one stakeholder meetings, and three public open house meetings. The meetings were well-attended and there were many favorable comments on the thoroughness of the development and evaluation of alternatives. There was general consensus among the TAC members, stakeholders, and open house participants that the evaluation results are reasonable and valid.

Preferred Alternatives

For both the Tonopah Parkway and Northern Parkway segments, it was determined that the No-Build Alternative does not address the demonstrated long-term need for a high-capacity parkway facility in the study area. In addition, there was more TAC, stakeholder, and public support for Alternative A than for the No-Build Alternative or any other alternatives for both Tonopah Parkway and Northern Parkway. As a result, Alternative A for Tonopah Parkway and Alternative A for Northern Parkway are recommended as the preferred alternatives.

The preferred alternatives are shown in **Figure ES-3**. Also included in this figure are the proposed locations where other freeways and parkways are expected (per the *Hassayampa Framework Study*) to intersect Tonopah Parkway and Northern Parkway. These intersection/interchange locations are preliminary and subject to change.

Planning Level Construction Cost Estimates

Planning-level construction cost estimates were developed for the preferred Tonopah Parkway and Northern Parkway alignments. Because this study does not include preparation of an "engineered" roadway alignment and does not address detailed design issues for various features, the construction cost estimate was based on generalized unit costs.

The estimated construction cost for Tonopah Parkway is $30 million and for Northern Parkway is $175 million, excluding the construction costs of a railroad overpass for the proposed new rail line west of Wintersburg Parkway, and freeway-to-parkway interchanges at I-10 and the planned Hassayampa Freeway, which are subject to further study and design. Right-of-way acquisition and relocation expenses are not included in the construction cost estimate because it is expected that much of the required right-of-way will be dedicated through the land development process.

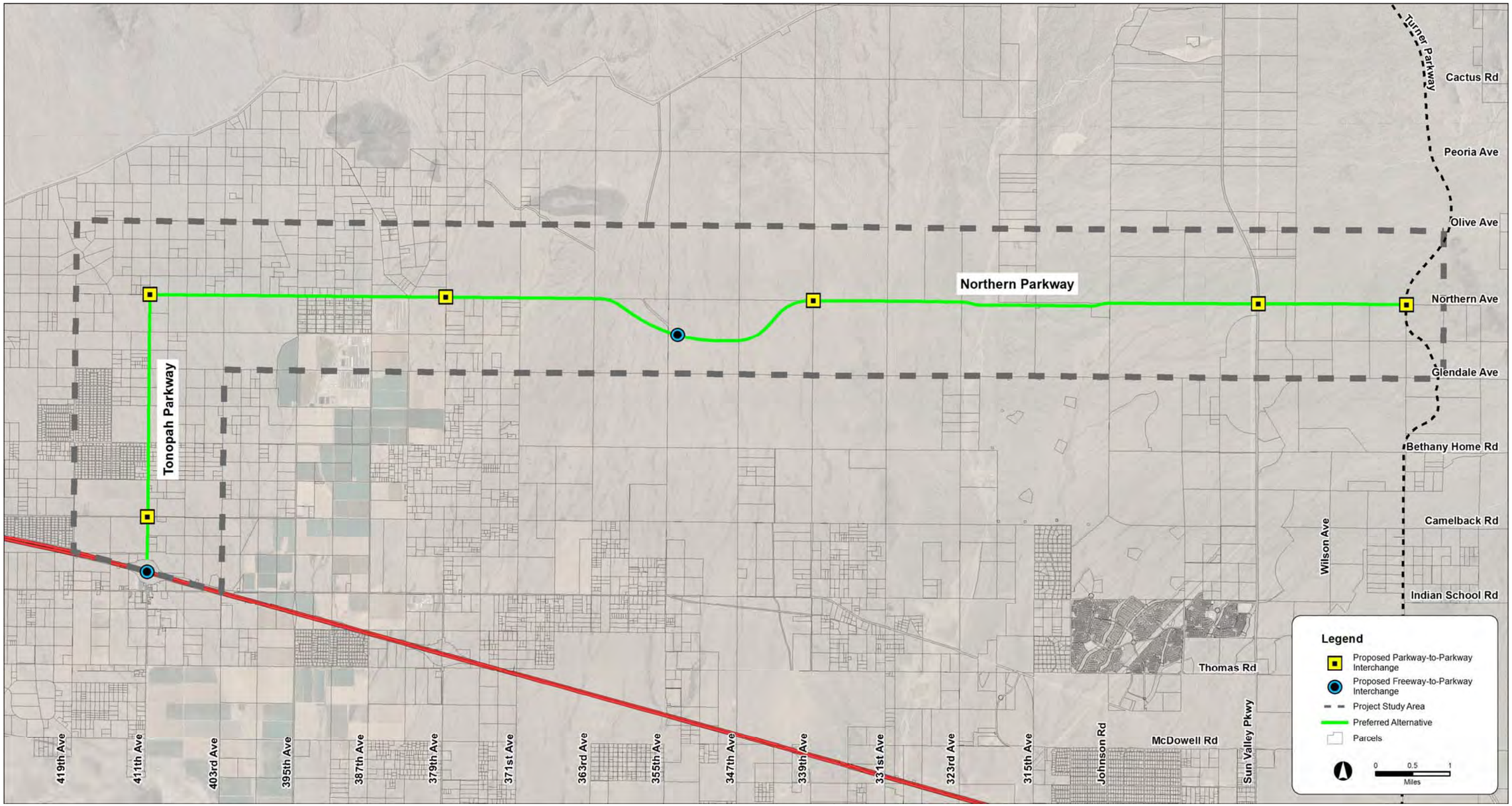
Next Steps

Agencies with primary responsibility for implementing the recommendations of this study are Maricopa County (Transportation, Planning, and Flood Control), Town of Buckeye, and the Arizona Department of Transportation (ADOT). Among the critical long-range planning actions that need to commence are:

- Maricopa County and Town of Buckeye adoption of the Arizona Parkway designation and general preferred alignment for Northern Parkway and Tonopah Parkway;
- Right-of-way preservation in developing areas, as needed, to protect the long-term viability of the parkway facilities;
- Preparation of Design Concept Reports for consideration in project programming;
- Appropriation of funding for design, right-of-way acquisition, and construction, as needed, for joint participation with land developers; and

- Coordination among the jurisdictions and key stakeholders on planning, right-of-way preservation, and design.

While the timing of the implementation of Northern Parkway and Tonopah Parkway will be driven by land development, it is up to the public sector agencies to establish the transportation system planning framework now to be responsive to future land development interests while also protecting the broader long-term public interests.



Sources: Maricopa County and MAG

Figure ES-3 – Preferred Alternatives

1. BACKGROUND INFORMATION

In July 2008, MAG completed the *Interstate 10/Hassayampa Valley Transportation Framework Study* (known as the *Hassayampa Framework Study*), that recommended a comprehensive roadway network to meet the future traffic demands that result when the area west of the White Tank Mountains is completely developed (hereafter referred to as buildout travel demand). This long-range regional transportation network includes the "Arizona Parkway" as a new facility type to supplement more traditional roadway classifications in meeting projected travel demand.

The Arizona Parkway utilizes a distinct intersection treatment that prohibits left turns at major cross-street intersections and controls intersection traffic movements with two-phased traffic signal control. Left-turn movements are made indirectly using directional left-turn crossovers in the median immediately downstream of cross-street intersections. The typical right-of-way width for an Arizona Parkway is 200 feet.

The *Hassayampa Framework Study* demonstrated the need for both Northern Parkway and Tonopah Parkway to meet buildout travel demands and provide a continuous parkway network. Although today's land development and travel demands in the project study area do not warrant major new high capacity roadways in the near-term future, the buildout forecast for future land development and travel demands does warrant major new high capacity roadways in the long-term future. Plans are already underway to convert some of the vacant lands within the project study area to land uses that will generate future traffic.

To preserve sufficient public right-of-way for the future Northern Parkway and Tonopah Parkway, the planning process needs to identify right-of-way requirements for buildout conditions. This study is the first step in the roadway development process and is meant to aid Maricopa County and the Town of Buckeye in defining and protecting the right-of-way that will be needed for Northern Parkway and Tonopah Parkway.

The project scope of work for this study included the tasks necessary to prepare a corridor feasibility report that will provide MCDOT, the Town of Buckeye, area property owners, developers, and other stakeholders with planning guidelines for future growth and development that will lead to the preservation of a 200-foot-wide right-of-way corridor to accommodate the typical Arizona Parkway design. This required significant coordination with various governing bodies, other public agencies, development interests, and the general public.

2. EXISTING AND FUTURE CORRIDOR FEATURES

This section summarizes the information gathered and documented in *Technical Memorandum No. 1 – Existing and Future Corridor Features* (contained in **Appendix 1** of separately published appendices). Key exhibits are provided to graphically display the existing and future corridor features that were considered in identifying and evaluating feasible alignments for Northern Parkway and Tonopah Parkway.

2.1 Relevant Plans, Reports, and Guidelines

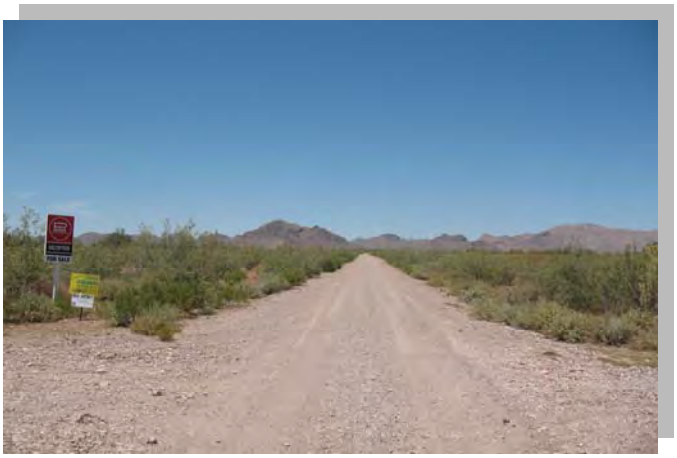
Relevant information on existing and future corridor features was obtained from available studies, reports, and other documents. These documents provided the source information for the figures and tables developed for this study. The following is a listing of the primary documents that were used for this project:

- *ADOT Freeway-to-Parkway Interchange Templates* (October 2010);
- *Anthem Sun Valley Conceptual Land Use Plan* (March 2007);
- *ASLD Draft White Tanks Conceptual Land Use Plan* (February 2007);
- *Balterra Planning Documents* (January 2007);
- *Belmont Planning Documents* (November 2007);
- *MAG Interstate 10/Hassayampa Valley Transportation Framework Study* (July 2008);
- *MAG Regional Transportation Plan* (July 2010);
- *MAG Unofficial Updated Buildout Traffic Projection* (June 2009);
- *Maricopa County Major Streets and Routes Plan: Street Classification Atlas* (revised September 2004);
- *Maricopa County Tonopah/Arlington Area Plan* (September 2000);
- *Maricopa County Transportation System Plan* (February 2007);
- *MCDOT 2010 State of the Systems Report* (Fiscal Year 2010);
- *MCDOT Arizona Parkway Intersection/Interchange Operational Analysis and Design Concepts Study* (August 2009);
- *MCDOT Design Guideline Recommendations for the Arizona Parkway* (August 2008);
- *MCDOT Enhanced Parkway Study* (August 2007);
- *MCDOT Turner Parkway Corridor Feasibility Study* (May 2010);
- *Mirielle Land Use Plan* (October 2007);
- *Montiere Planning Documents* (June 2008);
- *Sun Valley Villages III and IV Planning Documents* (July 2008);
- *Town of Buckeye General Plan* (January 2008); and
- *Town of Buckeye Draft Transportation Master Plan* (December 2009).

2.2 Corridor Characteristics

The project study area includes the planned Northern Parkway, an east-west corridor centered on the Northern Avenue section line, from the planned Tonopah Parkway (411th Avenue alignment) to the planned Turner Parkway (267th Avenue alignment). The Northern Parkway corridor within the project study area is approximately 18 miles long and two miles wide. This section of

Northern Parkway is referred to as the Northern Parkway Hassayampa section to distinguish it from other planned Northern Parkway sections east of the White Tank Mountains.



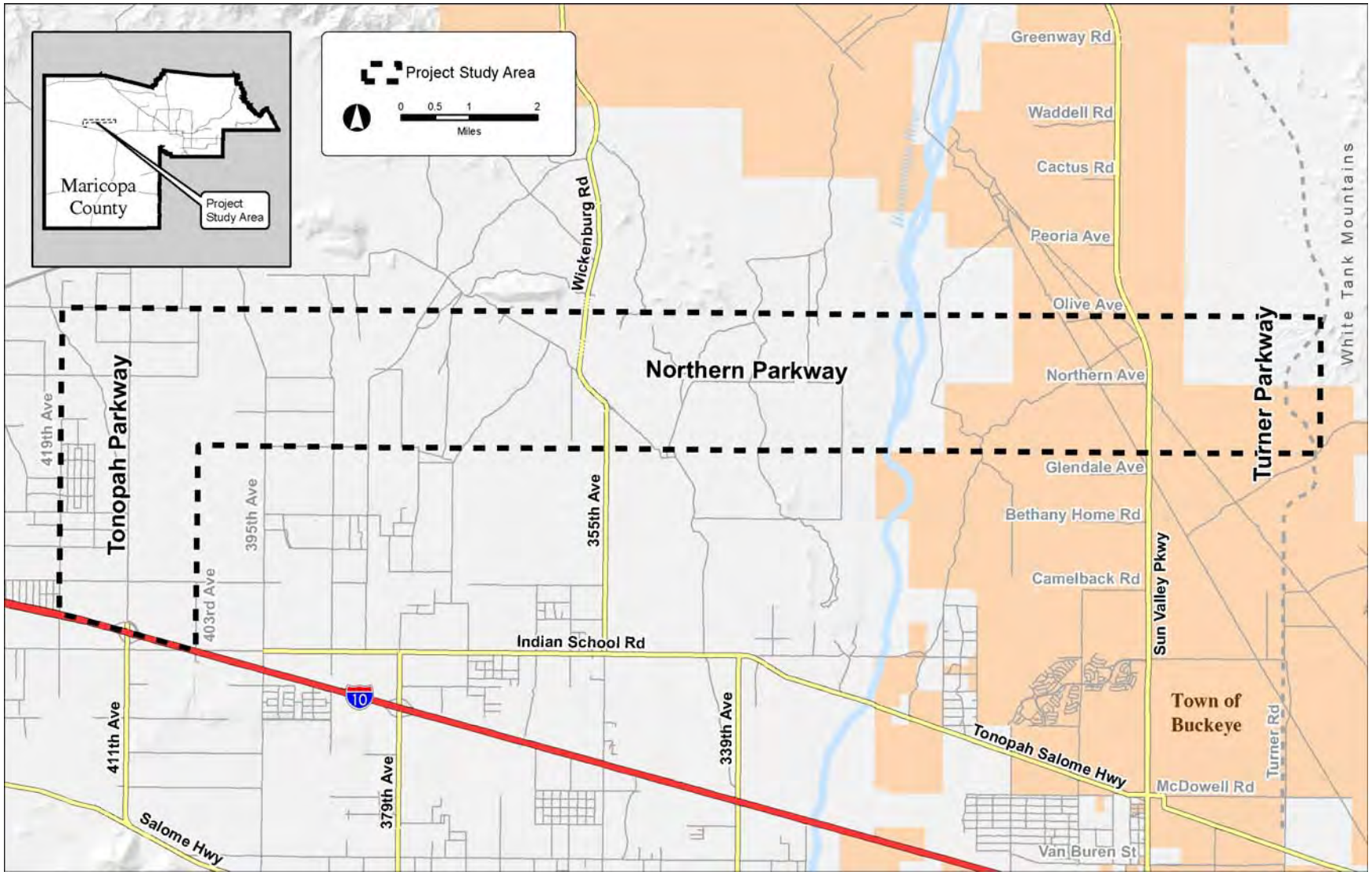
The project study area also includes the planned Tonopah Parkway, a north-south corridor centered on the 411th Avenue section line, from I-10 to the planned Northern Parkway. The Tonopah Parkway corridor within the project study area is approximately 3.75 miles long and two miles wide. The project study area boundaries are shown in **Figure 1**.

The study area consists of low-density residential developments, agricultural properties, and open space. While the vast majority of land within the project study area is currently open desert with unpaved roadways and natural drainage features (see photo above), a large percentage of the parcels have been subdivided or are part of a development master plan with associated entitlements (see photo below). As a result, the study area is positioned for a continued long-term transition to higher density land uses.

Most of the project study area is relatively flat, particularly west of the Hassayampa River. The Hassayampa River, which crosses the project study area roughly between the 315th Avenue and 333rd Avenue alignments, has resulted in significant topographic changes within the project study area immediately west and east of the river. There is an increase in elevation and topographic relief towards the eastern boundary of the project study area.

There is a difference of 643 feet between the low elevation of 1,100 feet in the southwestern portion of the project study area and the high elevation of 1,743 feet in the northeastern portion of the project study area. Most of the project study area has an elevation between 1,100 and 1,400 feet.

There are significant topographical changes (i.e., slopes greater than five percent) just to the east and north of the project study area. To the east of the project study area are the White Tank Mountains, and to the north are the Belmont Mountains and Flatiron Mountain.



Source: Maricopa County

Figure 1 – Project Study Area

2.3 Jurisdictional Responsibilities, Ownership, and Land Use

The Northern Parkway and Tonopah Parkway corridors are located within Maricopa County. Maricopa County has jurisdiction over the majority of the land and roadways within the project study area. The Town of Buckeye has jurisdiction over the land within its town limits adjacent to and within the project study area. Portions of the project study area currently under Maricopa County jurisdiction are also within the Buckeye Municipal Planning Area. Jurisdictional boundaries are illustrated in **Figure 2.**

The project study area contains a mix of both public and private lands. Over 81 percent of the land in the project study area is privately owned. Public land owners in the study area include the Arizona State Land Department (ASLD), which owns 16 percent of the project study area, and the Bureau of Land Management (BLM), which owns two percent of the project study area. Land ownership in the study area is shown in **Figure 3**.

The project study area is primarily zoned for rural agricultural activity and low-density residential uses, with some commercial and higher density residential zoning near I-10. The predominant existing land use within the project study area is vacant land. There are a few clusters of residential and agriculture use located between 379th Avenue and 419th Avenue (see photos below and to the right).

The only public land use is a service yard owned by ADOT. There are a few commercial land uses located directly south and east of the study area near the intersection of I-10 and 411th Avenue. **Figure 4** shows the existing land uses in the study area.

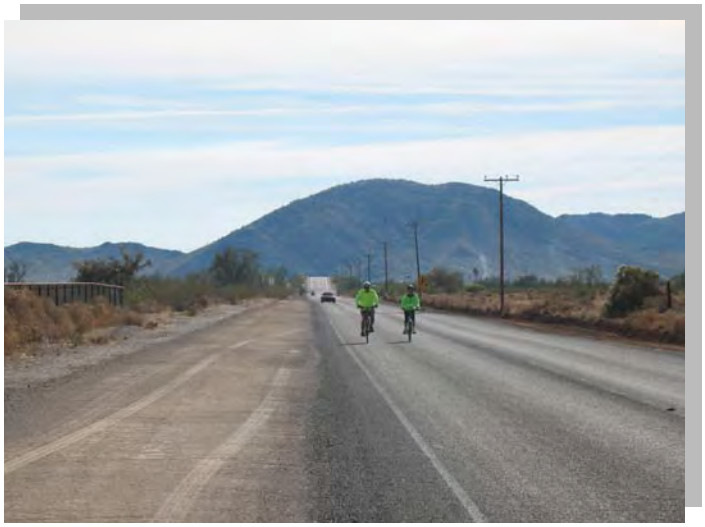
Vacant land within the study area is anticipated to be converted to primarily residential land use at buildout. Most of the study area land west of 371st Avenue is planned to have single-family, low-density residential uses, while the land to the east of 371st Avenue is planned to have higher density residential uses. There are also large patches of planned retail, office, and industrial land uses at major intersections throughout the study area east of 371st Avenue. These future land use patterns follow the land use plans for the large master planned communities in this region. **Figure 5** shows the anticipated future buildout land uses.

2.4 Existing and Planned Developments

A large percentage of the land within and adjacent to the project study area has been subdivided or is part of a development master plan with associated entitlements. **Figure 6** shows the existing and active planned developments around and within the project study area.

2.5 Existing Transportation Network

Within the study area, 411th Avenue is a paved two-lane road between I-10 and Camelback Road that is owned and maintained by Maricopa County (see photo to the right).



Other paved north-south existing roadways in the project study area include Sun Valley Parkway and Wickenburg Road/355th Avenue, along with portions of 387th Avenue.

Northern Avenue exists as an unpaved roadway along the study corridor centerline between 419th Avenue and 387th Avenue. It is neither owned nor maintained by MCDOT.

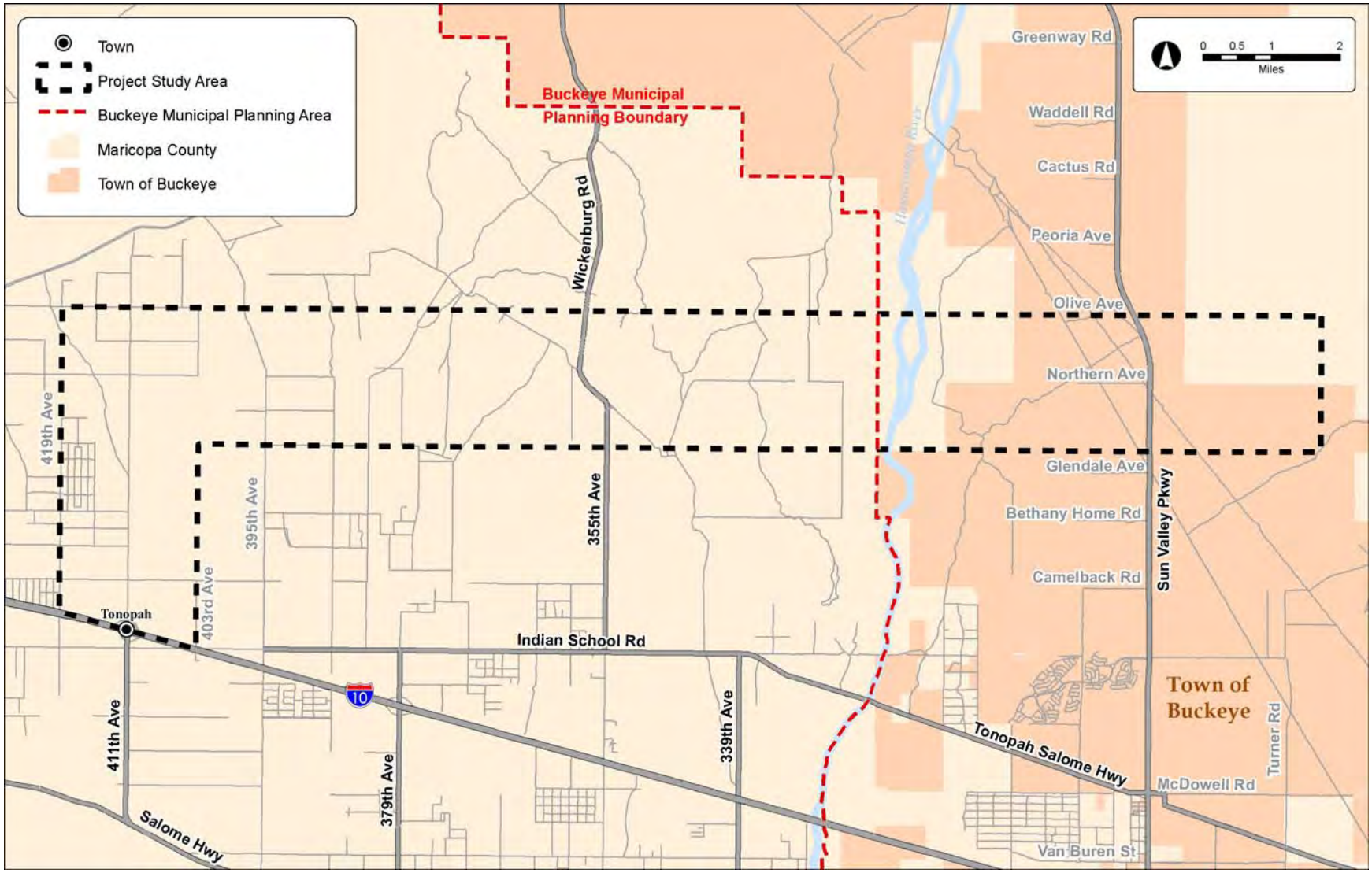
The only paved east-west roadways in the project study area are I-10 and Indian School Road, both of which are in the southwest portion of the project study area. East of 387th Avenue, east-west travel through the corridor is generally an option only for all-terrain vehicles.

The existing transportation network and daily 2008 traffic count volumes are shown in **Figure 7**.

2.6 Future Transportation Network and Travel Demand

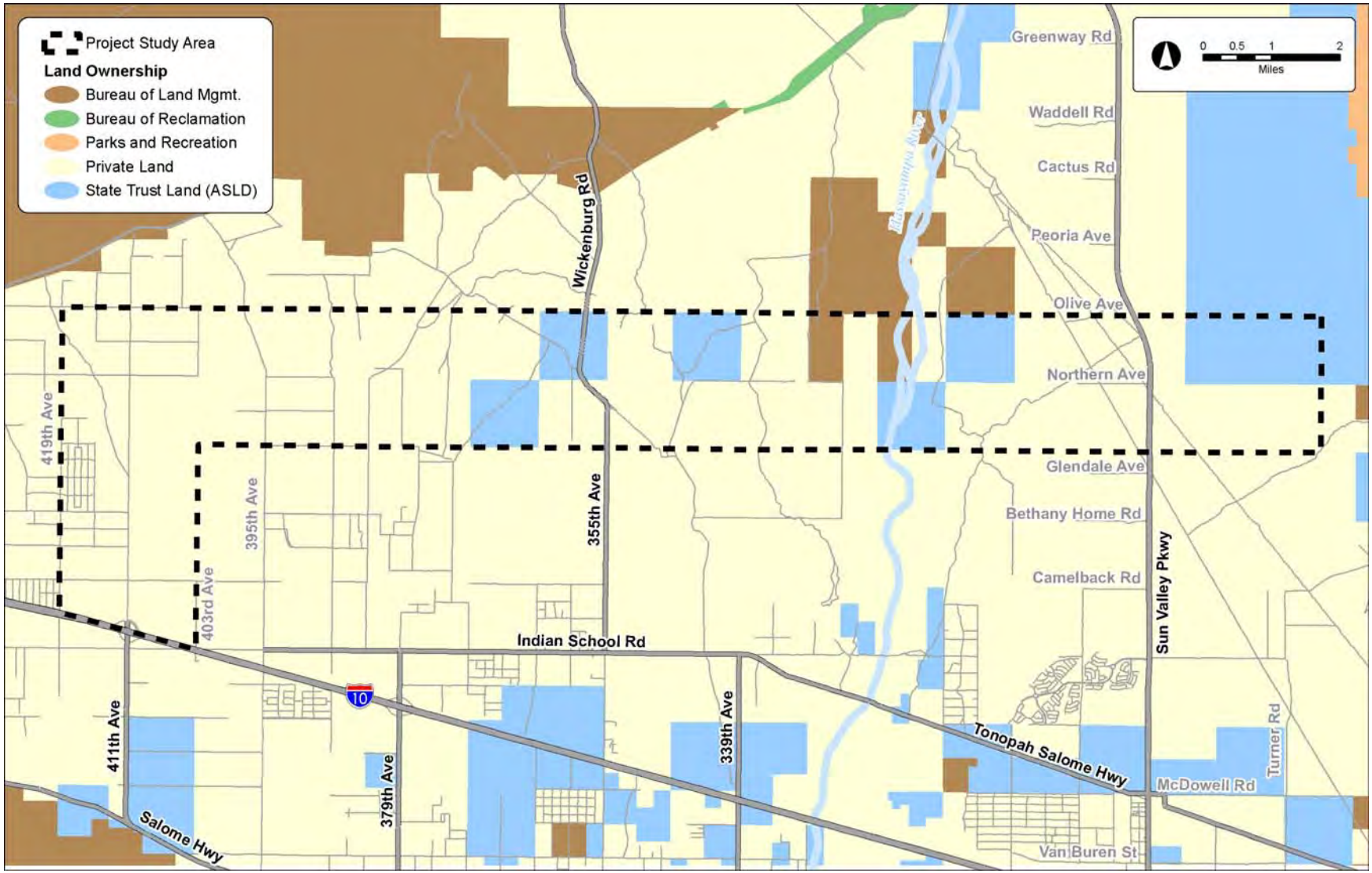
The transportation network in the project study area is anticipated to change dramatically in the future buildout condition. According to the *Hassayampa Framework Study* and the MAG *2010 Update to the Regional Transportation Plan (RTP)*, most existing roadways are expected to change to a higher functional classification and be upgraded to accommodate significantly higher travel demands as the existing transportation network is transformed into an interconnected multimodal network of parkways, freeways, arterials, railroad lines, and transit routes.

Planned transportation features in the project study area include two east-west parkways (all of Northern Parkway and the western edge of Camelback Parkway) and five north-south parkways (Tonopah, Wintersburg, Hidden Waters, Sun Valley, and Turner Parkways) in the buildout condition. A new freeway known as the Hassayampa Freeway is envisioned to traverse the project study area at about the 355th Avenue alignment. Arterial roadways are projected to typically be spaced about one mile apart from other high-capacity roadways (i.e., freeways, parkways, and other arterials), with the spacing being larger in the vicinity of the Hassayampa River and Jackrabbit Wash. The planned build-out transportation network and projected buildout travel demands are shown in **Figure 8**.



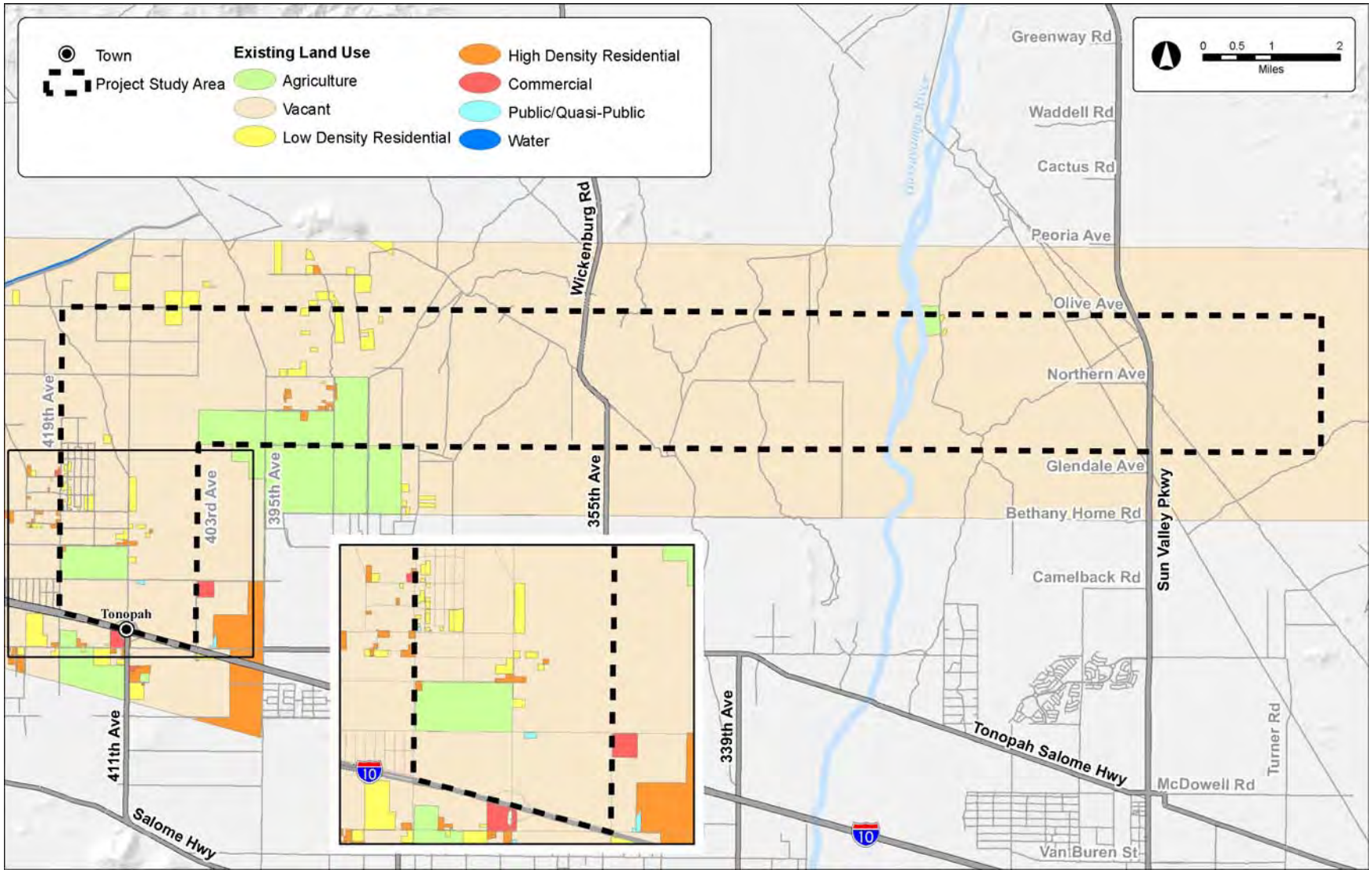
Source: Maricopa County

Figure 2 – Jurisdictional Boundaries



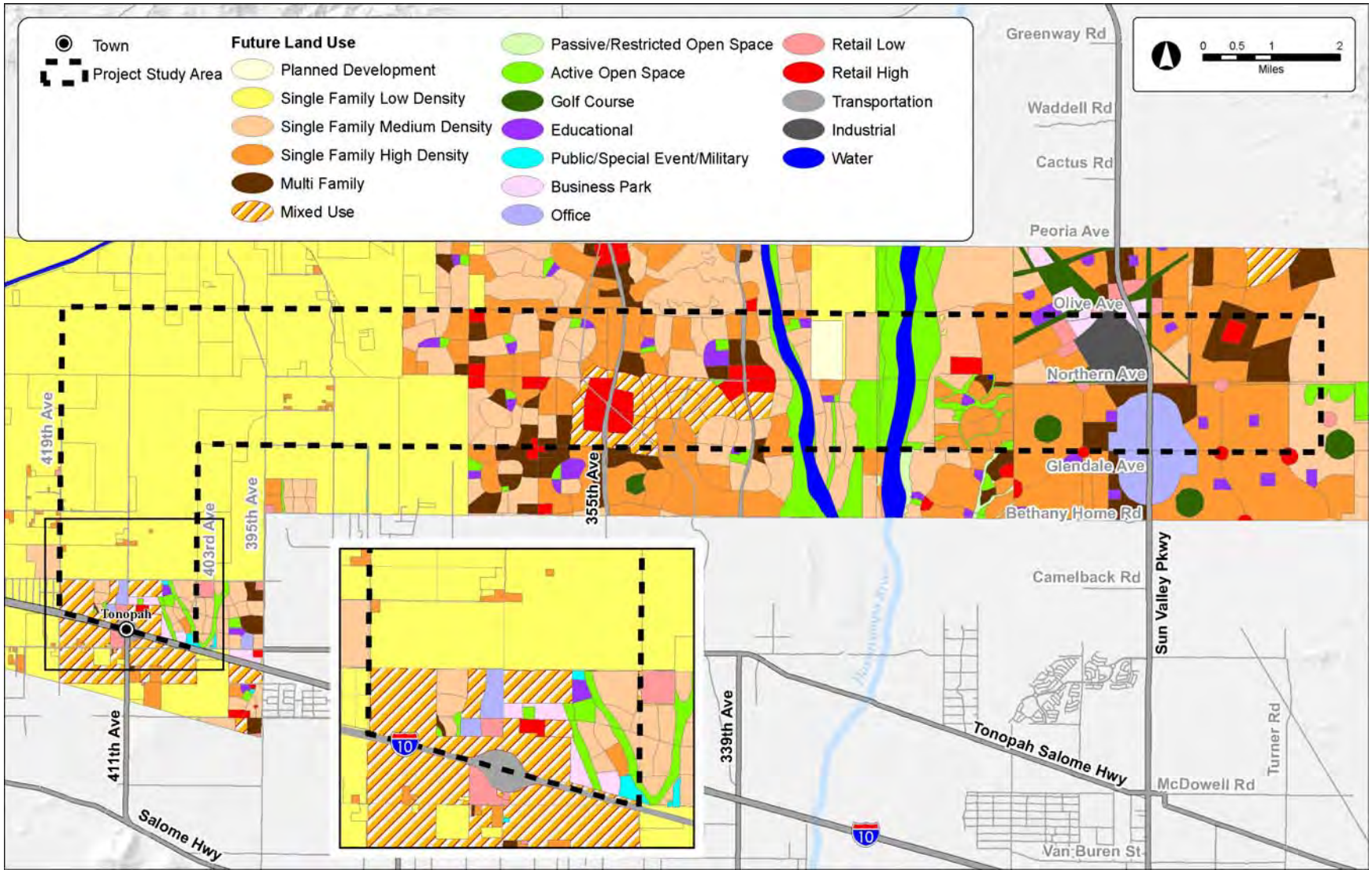
Source: Maricopa County

Figure 3 – Land Ownership



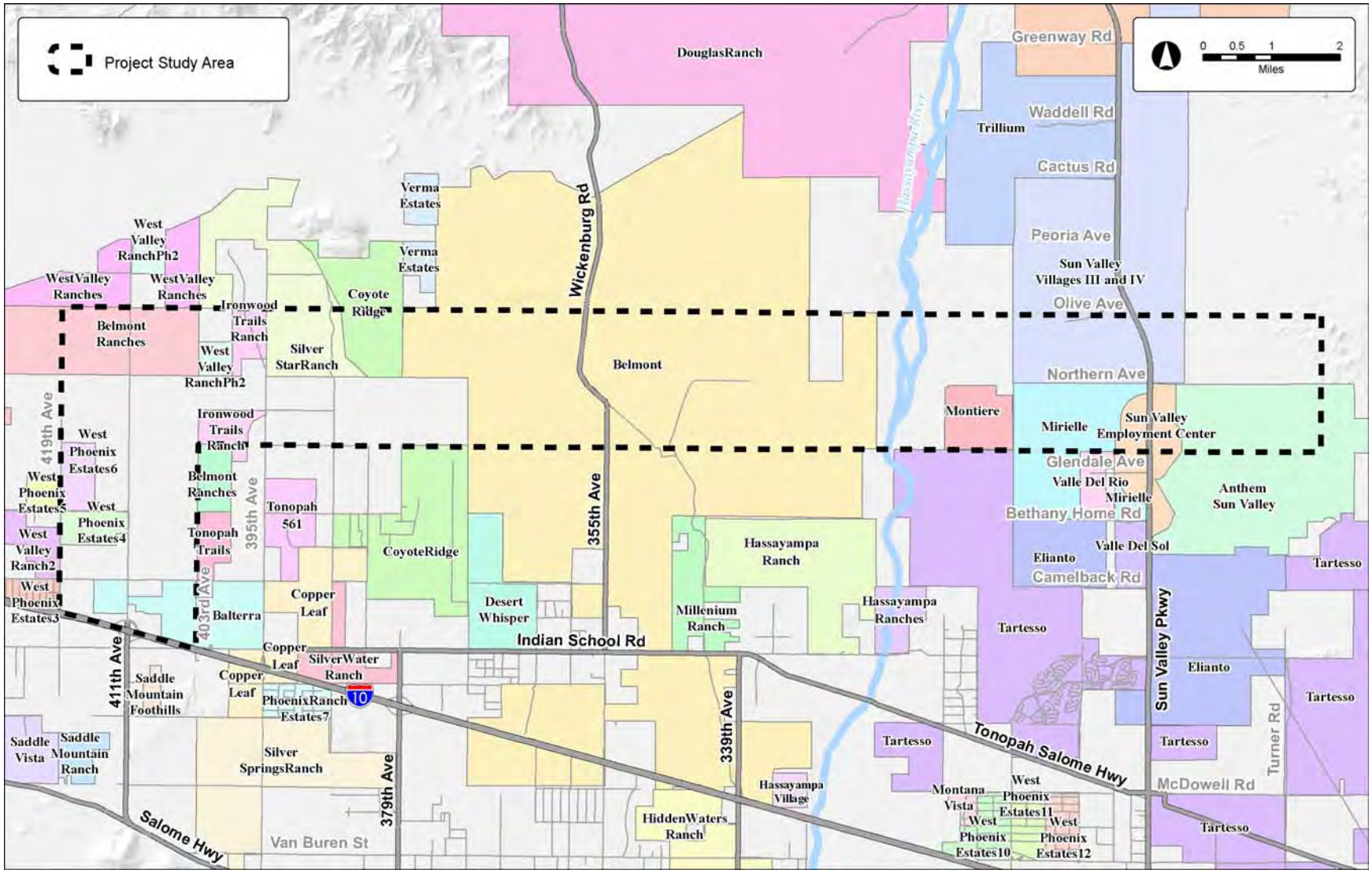
Sources: Maricopa County and MAG

Figure 4 – Existing Land Use



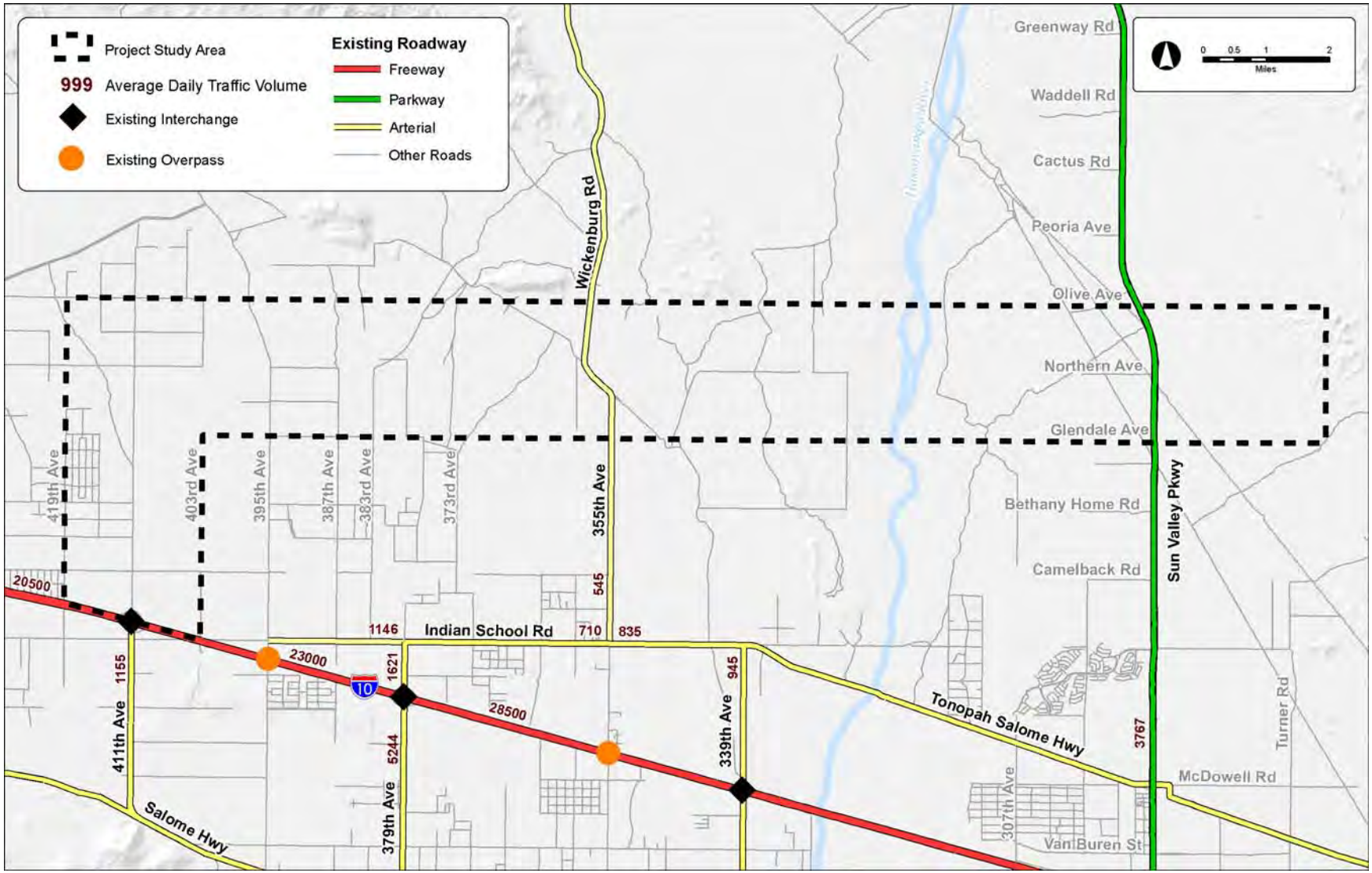
Sources: Maricopa County and MAG

Figure 5 – Future Land Use



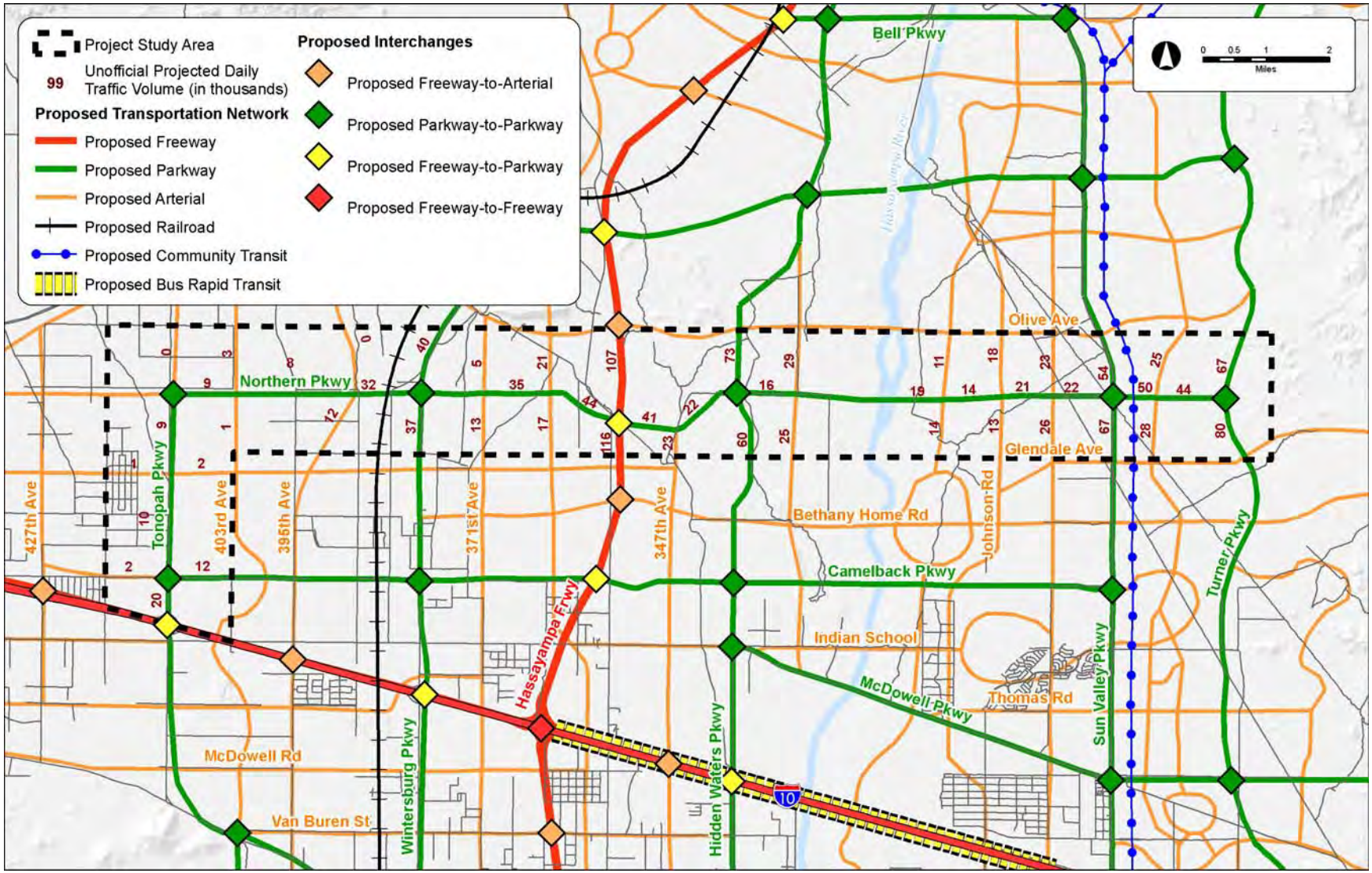
Sources: Maricopa County, Buckeye, and MAG

Figure 6 – Existing and Planned Developments



Source: Maricopa County

Figure 7 – Existing Transportation Network



Source: MAG

Figure 8 – Future Transportation Network

2.7 Utilities and Facilities

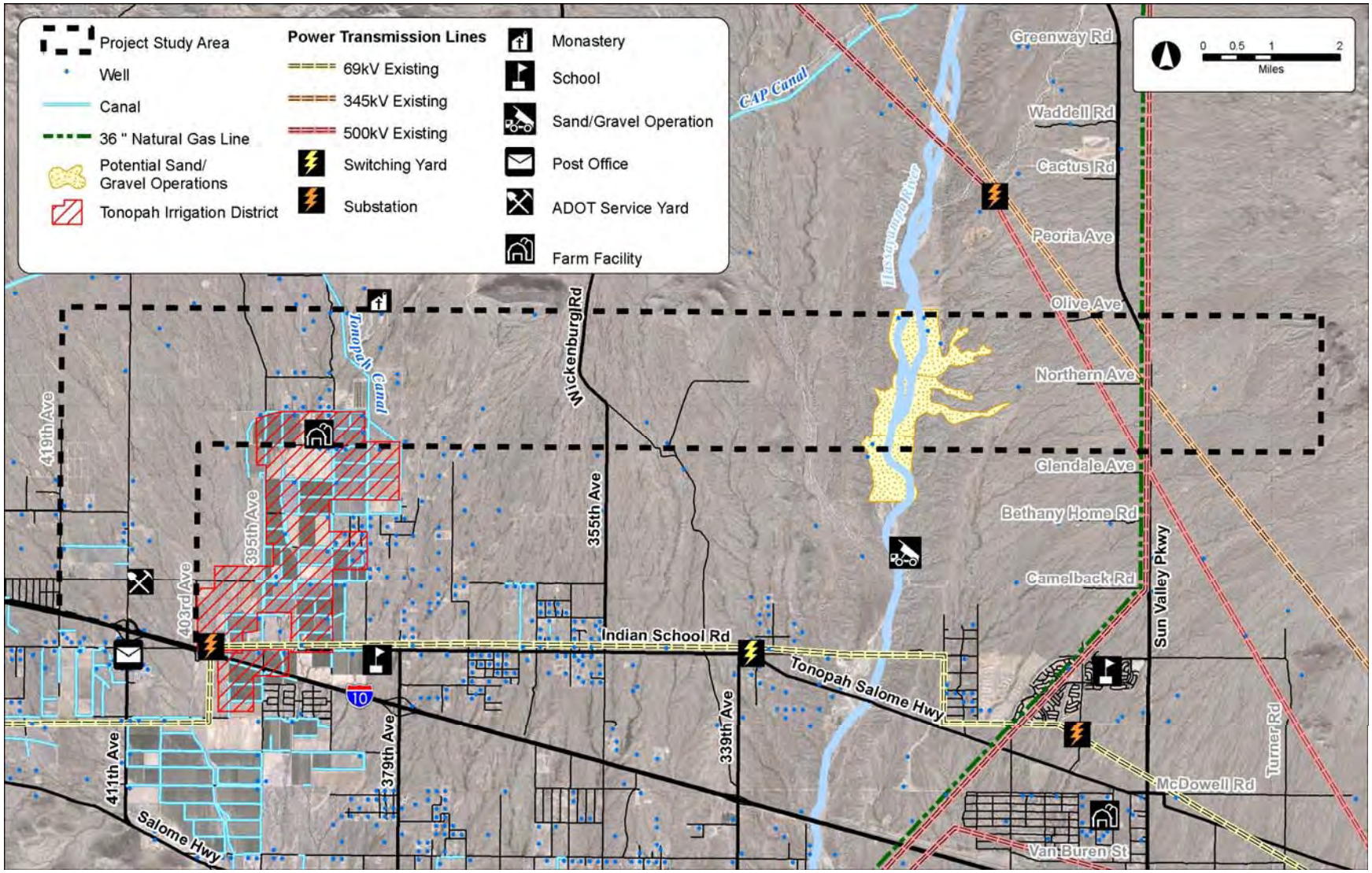
Although much of the project study area is currently undeveloped, it does contain a number of existing utilities and facilities, as shown in **Figure 9.** The most significant utilities and facilities include high voltage power lines, high pressure gas lines, irrigation canals, and private wells.

Several major power transmission corridors run though the project study area (see photo to the right). Three Western Area Power Administration (WAPA) transmission lines – two 500kV and one 345kV – diagonally cross through the project study area directly west of Sun Valley Parkway. Two joint Arizona Public Service (APS)/Salt River Project (SRP) 500kV transmission lines also cross through the project study area along the west side of Sun Valley Parkway. There are no known additional power transmission lines planned by APS/SRP or WAPA within the project study area.

There is an existing 36-inch natural gas pipeline owned by Transwestern that crosses through the project study area parallel and adjacent to the existing APS/SRP 500kV transmission lines that run along Sun Valley Parkway. There are no known additional transmission gas pipelines planned by Transwestern within the project study area.

A branch of the Central Arizona Project (CAP) Canal, named the Tonopah Canal, crosses through the project study area diagonally north of Northern Avenue and along the east side of 383rd Avenue south of Northern Avenue (see photo to the right). This concrete-lined canal is owned by the Bureau of Reclamation and operated by the Tonopah Irrigation District (TID).

Developed properties within the project study area have individual wells to supply water. The western portion of the study area is within the anticipated service area for the Water Utilities of Greater Tonopah, but there are currently no facilities within the study area.



Sources: Maricopa County, APS, and ASLD

Figure 9 – Existing Utilities and Facilities

2.8 Opportunities and Constraints

Based on the existing and future corridor features discussed previously, the following potential opportunities/constraints (generally listed in order from west to east and south to north in the project study area) were identified for consideration in determining feasible alignments for Northern Parkway and Tonopah Parkway:

- Existing I-10/411th Avenue interchange;
- Segments of existing right-of-way and roadway easements along 411th Avenue and Northern Avenue;
- Existing vacancy of land;
- Relatively flat topography west of the Hassayampa River;
- Tonopah Canal;
- Planned rail line west of the proposed Wintersburg Parkway;
- Existing communities, such as West Phoenix Estates 4, West Valley Ranch Phase 2, Ironwood Trails Ranch, Silver Star Ranch, Coyote Ridge;
- ASLD State Trust land;
- Belmont master-planned community;
- Planned freeways, parkways, and arterials through the study area;
- Topography changes near Hassayampa River;
- Hassayampa River;
- Potential sand and gravel operations along the Hassayampa River;
- Montiere master-planned community;
- Mirielle master-planned community;
- Anthem Sun Valley master-planned community;
- Sun Valley Villages III and IV master-planned community;
- Existing Sun Valley Parkway and utility corridor alignment;
- Planned community transit route along Sun Valley Parkway;
- High voltage power corridors running diagonally through the eastern end of study area;
- Recommended Turner Parkway alignment; and
- Topography changes near White Tank Mountains.

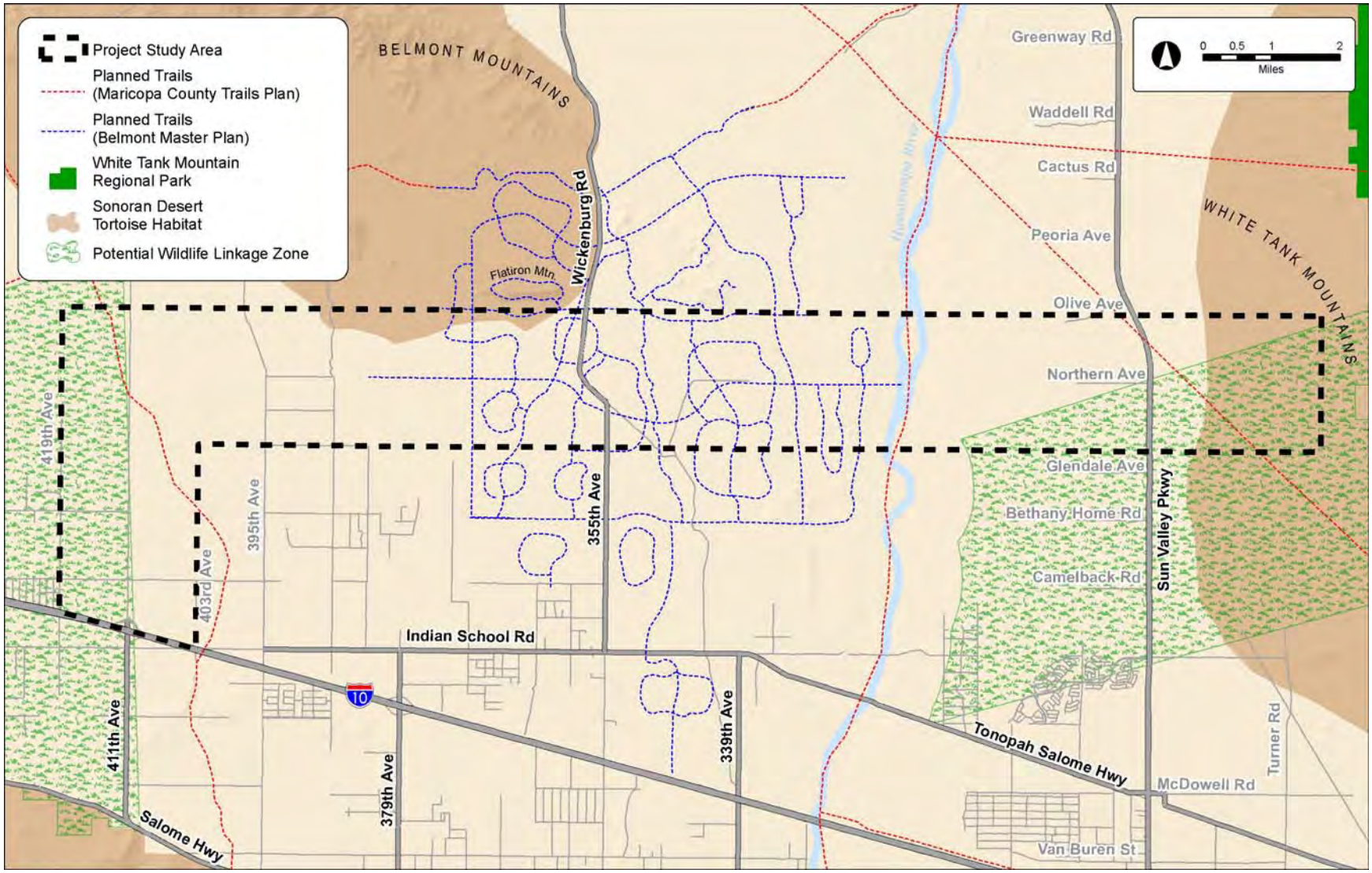
3. ENVIRONMENTAL SUMMARY

Environmental considerations are documented in *Technical Memorandum No. 2 – Environmental Overview* (contained in **Appendix 2** of separately published appendices). The most significant environmental issues affecting the project study area are wildlife habitats and linkage zones, recreational opportunities, and cultural/archaeological resources. The wildlife and recreational areas are shown in **Figure 10**.

With respect to wildlife habitats, there are Sonoran desert tortoise habitats along the northern and eastern edges of the project study area (see photo to the right). In addition, two planned wildlife linkage zones (PLZs) are partially within the project study area: PLZ No. 64 – Bighorn Belmont-Saddle Mountain along the western edge of the project study area; and PLZ No. 65 – White Tanks-Hassayampa River along the eastern edge of the project study area. Wildlife linkage zones and natural drainage channels are critical for the movement and genetic diversity of the various wildlife species found in the project study area vicinity. During final design, the Arizona Game and Fish Department should be consulted to assist in developing wildlife crossings in biologically suitable locations.

Recreational opportunities within or near the project study area include the White Tank Mountain Regional Park (see photo to the left) and numerous planned trails.

To identify potential cultural resources, site files and information maintained at the Arizona State Historic Preservation Office (SHPO) and in the AZSITE cultural resources database, as well as information from the Flood Control District of Maricopa County (FCDMC) and cadastral survey maps/General Land Office Plats available from the BLM, were analyzed. The records review indicated that a total of 30 cultural resource sites have previously been recorded within the project study area. Of these recorded sites, none are listed on the National Register of Historic Places (NRHP) and none have been determined eligible for inclusion on the NRHP by SHPO. It should be noted that approximately 50 percent of the project study area has not been surveyed for cultural resources. It is recommended that appropriate surveys be performed prior to designing or constructing any segment of this project.



Sources: Maricopa County and AZGFD

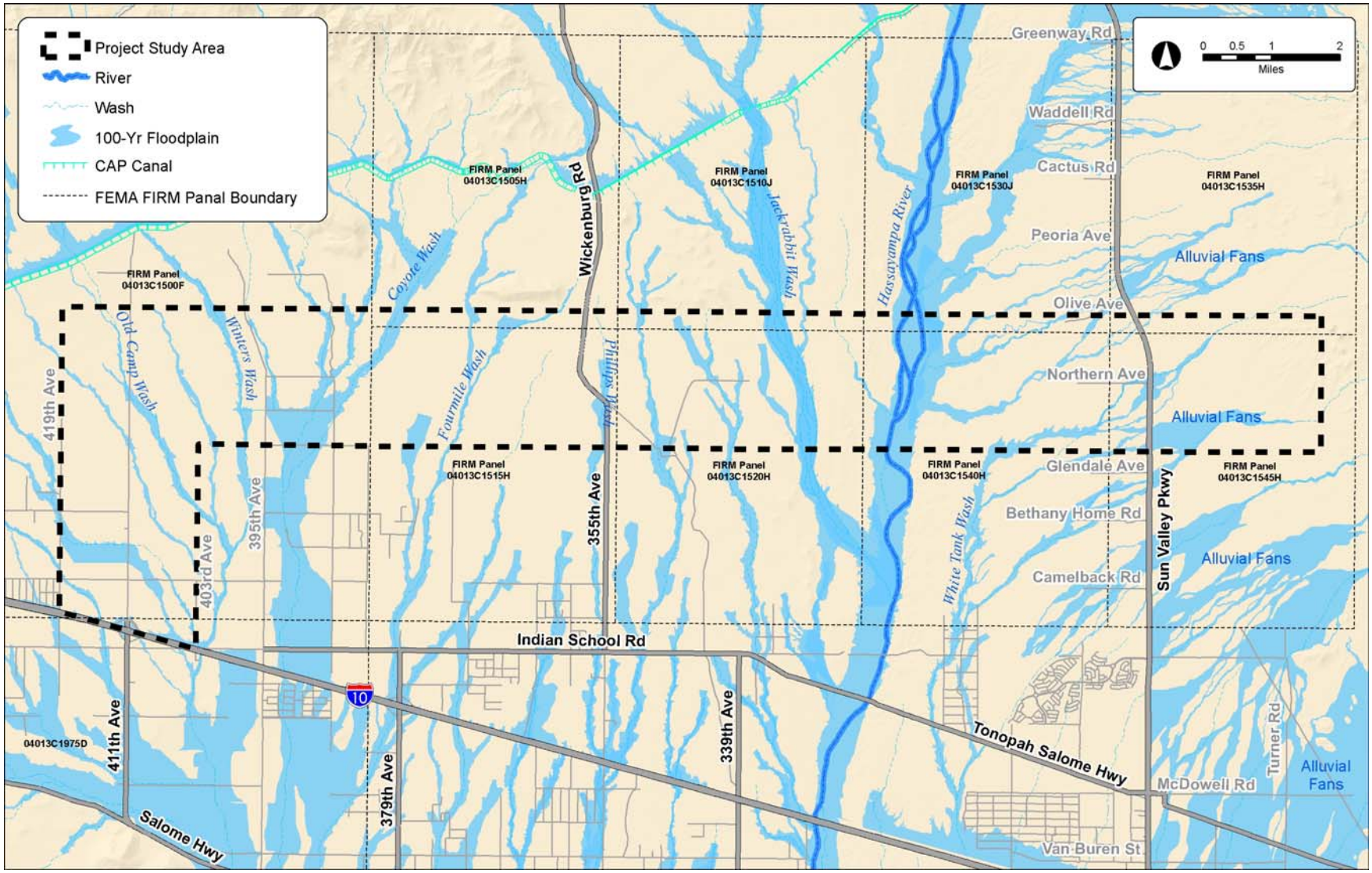
Figure 10 – Wildlife and Recreational Areas

4. DRAINAGE SUMMARY

Technical Memorandum No. 3 – Conceptual Drainage Report identifies and summarizes the existing drainage conditions, features, and hydrologic characteristics within the project study area (contained in **Appendix 3** of separately published appendices). Several drainage studies have been prepared for the project study area vicinity. Most of these studies were completed by FCDMC.

Numerous Federal Emergency Management Agency (FEMA) floodplains drain through the project study area (see photo below). Watercourses in the western half of the project study area drain south to ultimately discharge to the Gila River. Watercourses in the eastern half of the project study area drain west and southwest to the Hassayampa River, which ultimately drains south to the Gila River. **Figure 11** provides a map of the 100-year floodplain areas and also displays the Flood Insurance Rate Map (FIRM) panels containing the effective floodplain mapping. Both FEMA effective and FCDMC (typically pending FEMA approval) floodplain limits are shown on this exhibit.

The most critical drainage issue within the project study area is determining how and where to convey flood flows under the proposed parkways, particularly at the Hassayampa River and Jackrabbit Wash. Other important drainage issues include existing alluvial fan systems east of the Hassayampa River and sedimentation between Jackrabbit Wash and the White Tank Mountains.



Source: Maricopa County

Figure 11 – Floodplains

5. DEVELOPMENT AND EVALUATION OF ALTERNATIVE ALIGNMENTS

Technical Memorandum No. 4 – Candidate Alternative Alignments and Evaluation documents the alternatives development and evaluation process used for this project (contained in **Appendix 4** of separately published appendices). The alternatives development process involved two steps:

The first step was to identify a series of conceptual alternatives that would be subjected to a "fatal flaw" analysis. The conceptual alternatives were developed only to the extent necessary to conduct a meaningful comparative analysis that would produce up to three candidate alternatives that could be defined and evaluated in greater detail.

The second step was to perform a more in-depth evaluation of the candidate alternatives and identify preferred alternatives. The conceptual alternatives, candidate alternatives, and evaluation criteria were all developed in consultation with the TAC and stakeholders and were presented for general public input at public open house meetings.

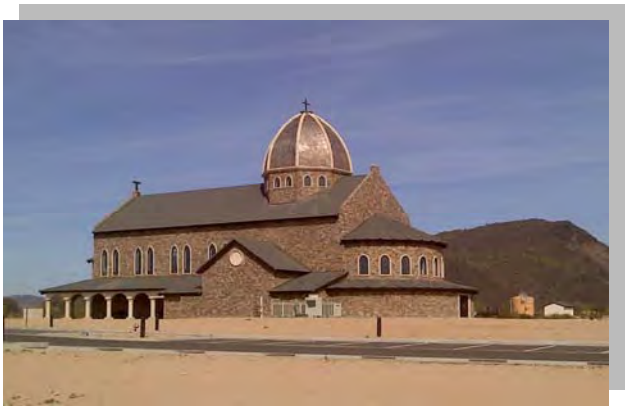
5.1 Conceptual Alternatives

For alternatives development and evaluation purposes, the study area was divided into two separate segments: the Tonopah Parkway segment and the Northern Parkway segment. The Tonopah Parkway segment alternatives commence at the existing I-10 interchange and proceed north to connect with the Northern Parkway alignment. The Northern Parkway segment alternatives commence at the Tonopah Parkway alignment (411th Avenue) and proceed east to connect with the Turner Parkway alignment.

Potential corridor opportunities and constraints were mapped for consideration in developing conceptual alternatives. Opportunities and constraints consist of features that may have some bearing on the location and configuration of conceptual alternatives. Fatal flaws consist of significant constraints that cannot be reasonably mitigated. Many potential constraints are not truly fatal flaws but rather may result in higher project costs if they cannot be avoided, and mitigation measures are required.

Potential opportunities and constraints that were considered in developing the conceptual alternatives include the following:

- *Land ownership:*
  - BLM; and
  - Arizona State Trust land.
- *Land use:*
  - Dairy farm;
  - Wildlife linkage zones;
  - Our Lady of Solitude Monastery (see photo to the right);
  - Agricultural operations;
  - Sonoran desert tortoise habitat;



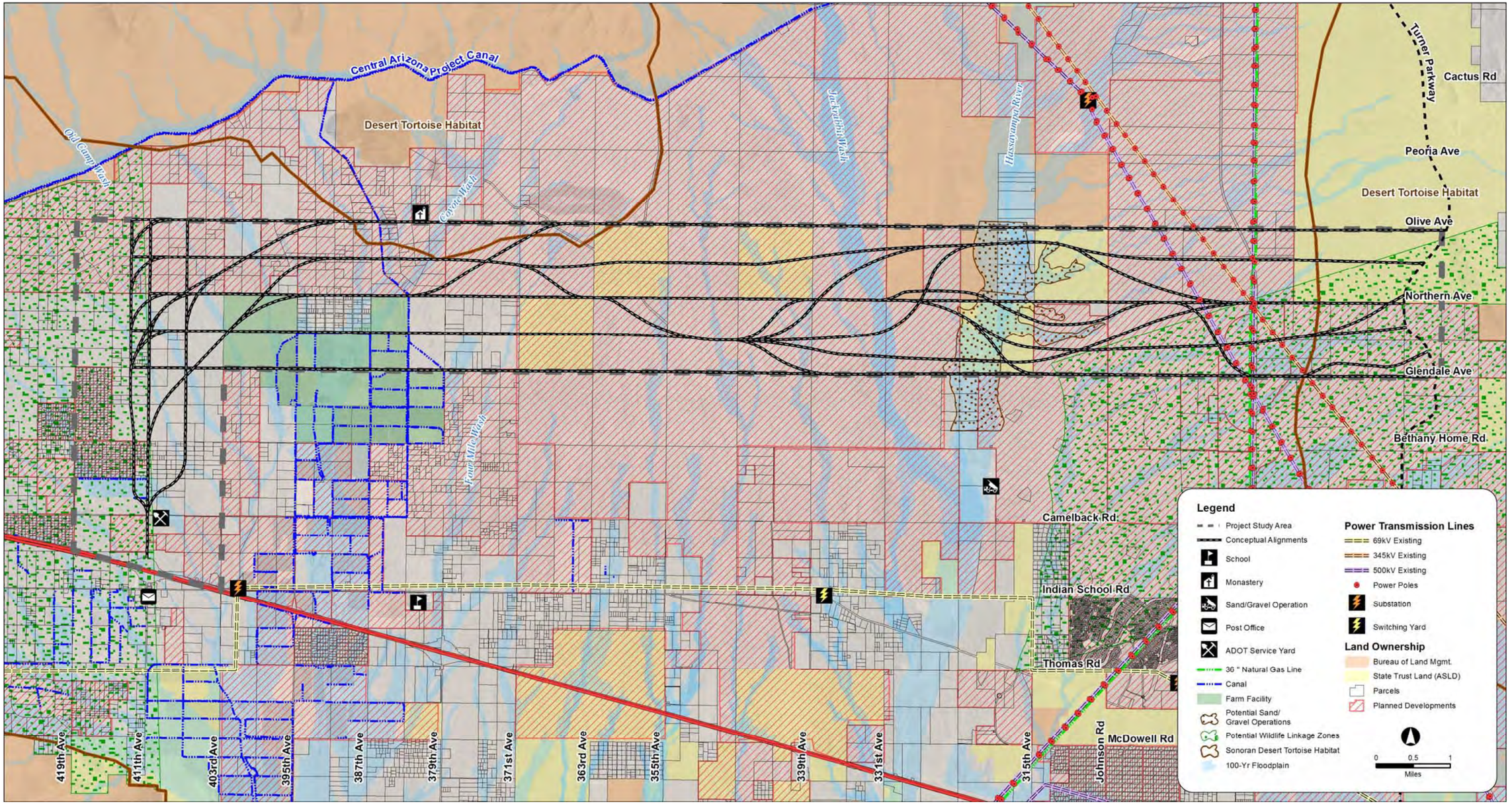
- Potential sand and gravel operations; and
- Existing and planned developments.

- *Transportation:*
  - I-10/411th Avenue interchange;
  - Sun Valley Parkway connection;
  - Future connections with Camelback Parkway, Wintersburg Parkway, Hassayampa Freeway, Hidden Waters Parkway, Sun Valley Parkway, and Turner Parkway; and
  - Planned trail systems.

- *Utilities/facilities:*
  - Irrigation canals – Tonopah Canal (see photo to the left);
  - Gas pipelines and electrical power lines near Sun Valley Parkway; and
  - ADOT Service Yard near I-10 and 411th Avenue.
- *Topography:*
  - Steep slopes near Hassayampa River and Jackrabbit Wash; and
  - Steep slopes near White Tank Mountains.
- *Others:*
  - Potential cultural resources throughout the study area; and
  - Floodplains.

As a starting point in the development of conceptual alternatives, a brainstorming session was conducted with project task leaders and the MCDOT project manager to generate a wide range of 200-foot wide corridor options. The conceptual alignment alternatives along with potential constraints for the Tonopah Parkway segment and Northern Parkway segment are shown in **Figure 12**. As this figure shows, there are opportunities to assemble multiple combinations of alternatives at common intersecting points to produce numerous options for consideration.

In developing conceptual alternatives, constraints considered to be potential fatal flaws were avoided to the extent possible to produce a set of realistic alternatives. The conceptual alternatives were presented to the TAC, stakeholders, and the public for review and input.



Sources: Maricopa County, MAG, Buckeye, APS, AZGFD, and ASLD

Figure 12 – Conceptual Alternatives

5.2 Candidate Alternatives

In order to narrow the range of alternatives to be evaluated in greater detail, a subjective, qualitative assessment was performed on all conceptual alternatives. Preliminary candidate alternatives were selected from the conceptual alignments and presented to the TAC and stakeholders for review and input. The following preliminary candidate alternatives were those that involved the fewest constraints and were most compatible with existing land uses and future development master plans.

Tonopah Parkway segment (I-10 to Northern Parkway) – three preliminary candidate alternatives were proposed as follows:

- Alternative A – A 200-foot-wide corridor centered on the 411th Avenue section line;
- Alternative B – A 200-foot-wide corridor with the centerline shifted 35 feet west of the 411th Avenue section line; and
- Alternative C – A 200-foot-wide corridor with the centerline shifted 35 feet east of the 411th Avenue section line.

The Tonopah Parkway candidate alternatives have the least impact on existing subdivided properties, are most compatible with planned developments, and tie directly to the existing I-10 interchange with 411th Avenue.

Northern Parkway segment (Tonopah Parkway to Turner Parkway) – three preliminary candidate alternatives were proposed as follows:

- Alternative A – A 200-foot-wide corridor centered on the Northern Avenue section line except for a three-mile dip to the south within the Belmont master planned community;
- Alternative B – A 200-foot-wide corridor with a centerline that shifts one-half mile north of Alternative A from Tonopah Parkway to 371st Avenue, then shifts south to proceed east on the Alternative A alignment from 363rd Avenue to Turner Parkway; and
- Alternative C – A 200-foot-wide corridor with a centerline that follows the Alternative A alignment from Tonopah Parkway to one mile west of the Sun Valley Parkway, then shifts south to Glendale Avenue and continues east to Turner Parkway.

As with the Tonopah Parkway preliminary candidate alternatives, the Northern Parkway alternatives are generally the most compatible with existing and planned developments.

After discussing these preliminary candidate alternatives in detail with the TAC and stakeholders, it was decided that the Tonopah Parkway preliminary candidate alternatives would proceed through the more detailed evaluation process. For the Northern Parkway segment, it was decided that only Alternative A and Alternative B would proceed through the more detailed evaluation. It was concluded that Northern Parkway Alternative C would be too disruptive to planned developments and would result in unnecessary out-of-direction travel.

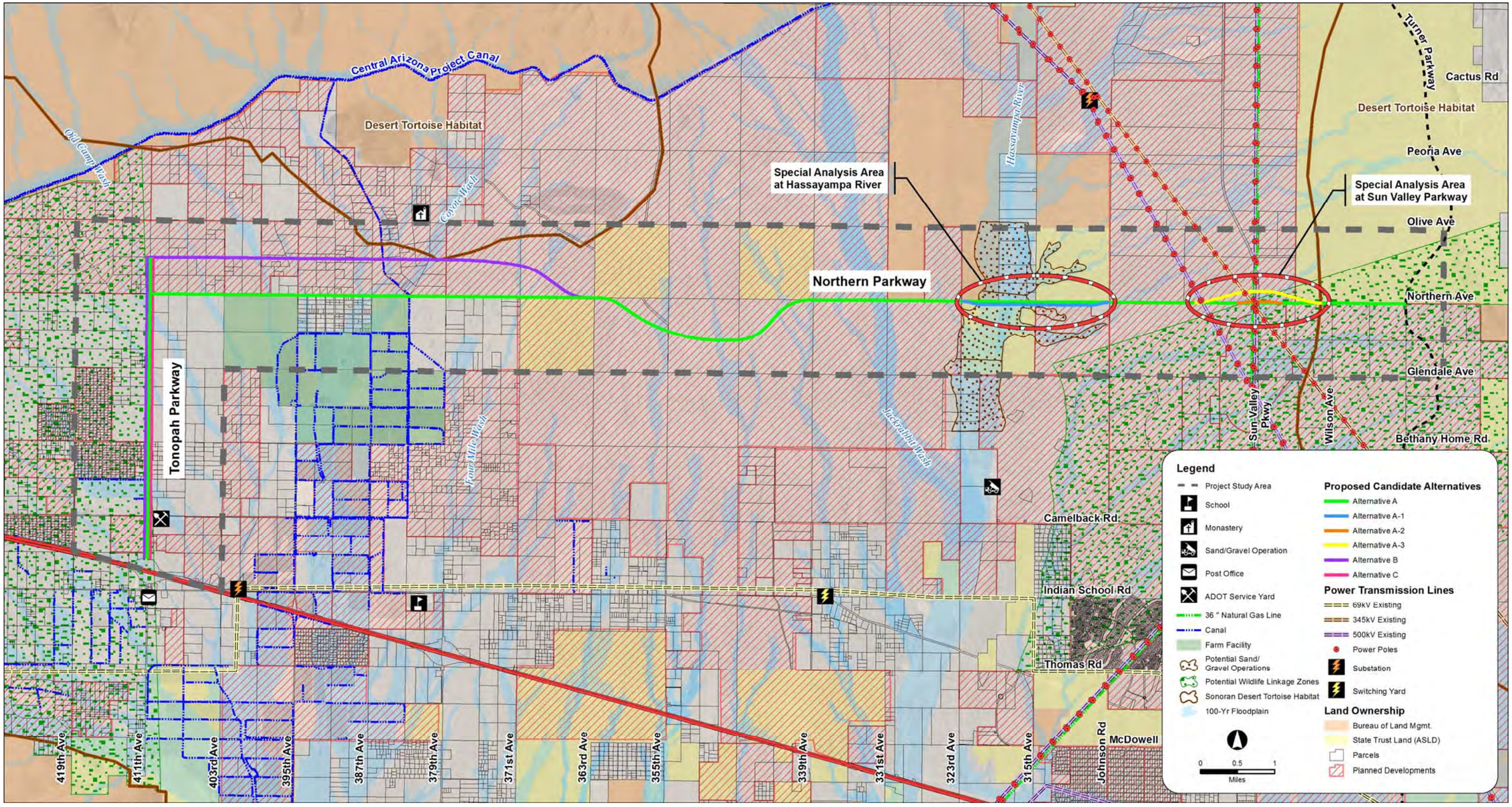
In lieu of developing a third candidate alternative for the Northern Parkway segment, the TAC and stakeholders recommended that variations of Alternative A should be examined at the Hassayampa River crossing and where electrical line towers exist close to the Northern Avenue section line near Sun Valley Parkway. These variations are designated as “Special Analysis Areas”.

Candidate alternatives as recommended by the TAC and stakeholders for Tonopah Parkway and Northern Parkway are shown in **Figure 13**. Schematic drawings showing the candidate alternatives at a scale of 1 inch = 800 feet are included in *Technical Memorandum 4 – Candidate Alternative Alignments and Evaluation* (contained in **Appendix 4** of separately published appendices).

5.3 Alternatives Evaluation Criteria

After identifying the conceptual alternatives and then narrowing the conceptual alternatives to three candidate alternative alignments for the Tonopah Parkway segment and two candidate alternatives for the Northern Parkway segment, the candidate alternatives, along with a "No-Build" alternative, were evaluated using the following evaluation criteria:

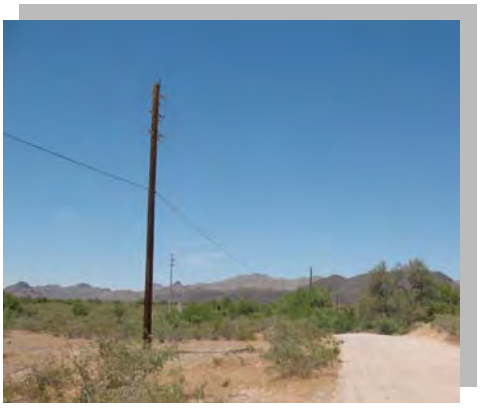
- *Future Development Compatibility* – This criterion addresses the impacts that each alternative had with respect to planned future development and whether or not the alternative was compatible with the planned development. For example, some planned developments in the corridor already show a 200-foot-wide footprint for Northern Parkway along portions of Northern Avenue while other planned developments are based on a no-build or arterial street scenario. This criterion did not address the potential benefits of the parkway to future development, only whether or not the future development plan can accommodate Tonopah Parkway and Northern Parkway;
- *System Continuity and Capacity* – This criterion was a measure of how each alternative contributes to providing a continuous transportation link throughout the length of the corridor with sufficient capacity to serve projected build-out traffic volumes. It also included consideration of the ability to connect with other existing and planned freeways, parkways, and arterial streets;
- *Drainage Impacts* – The Hassayampa River and numerous washes are located in the study area. In most cases, implementing a parkway facility would require new drainage structures, which would typically improve existing drainage patterns;
- *Irrigation Impacts* – With some irrigated farm land in the western portion of the study area, there was some impact on irrigation facilities. In some cases, existing irrigation systems would need to be replaced with new (and more modern) facilities and would derive a benefit from the parkway project. In other cases, irrigation patterns would be negatively impacted, making it more difficult to continue irrigation service;
- *Building/Property Impacts* – There are a number of low-density residential properties and agricultural properties that could be adversely impacted by the parkway project (see photo to the right). Some residential buildings may have to be relocated or vacated and demolished, and some properties may be fully or partially acquired;



Sources: Maricopa County, MAG, Buckeye, APS, AZGFD, and ASLD

Figure 13 – Candidate Alternatives

- *Wildlife Impacts* – There are wildlife habitats and linkage zones within the study area that would experience differing impacts depending on the alternative alignment;
- *Cultural/Archaeological Impacts* – Throughout the study area, there are a combination of known and potential cultural and archaeological sites. Some alternatives would have more adverse impacts than others on these resources. This criterion is limited to known cultural and archaeological sites. Further alignment-specific cultural and archaeological analyses will be needed to identify and mitigate unknown resources;
- *Utility Impacts* – Most existing utilities are located adjacent to existing transportation facilities (see photo to the right), particularly near Sun Valley Parkway. Some combination of utility relocations and parkway alignment shifts would likely be required;



- *Public Acceptability* – Residents and landowners in the study area had differing opinions regarding the need and desirability of constructing new major roadways through the study area. Public input received through the TAC, stakeholder, and open house meetings provided an indication of the general level of support for each alternative; and
- *Cost* – Some alternatives had greater right-of-way, utility, drainage, and construction costs than others and were evaluated on a comparative planning-level cost assessment.

5.4 Alternatives Evaluation Conclusions and Recommendations

Most of the evaluation criteria listed in the previous section do not lend themselves to numerical quantification, so the evaluation was performed on a "qualitative" basis using the following descriptors to describe the relative impacts of each alternative:

- Strong advantage;
- Advantage;
- Neutral;
- Disadvantage; and
- Strong disadvantage.

Table 1 provides a narrative description of the issues that pertain to each of the evaluation criteria for each of the Tonopah Parkway candidate alternatives and evaluation ratings according to the above descriptors. **Table 2** provides a similar narrative description for each of the Northern Parkway candidate alternatives. **Table 3** graphically summarizes the overall evaluation of the candidate alternatives.

Table 1 – Tonopah Parkway Candidate Alternatives Evaluation Matrix

Evaluation Criteria	No-Build Alternative	Alternative A	Alternative B	Alternative C
Future Development Compatibility	Within the Tonopah Parkway portion of the study area, the No-Build Alternative provides an existing two-lane paved roadway along 411th Avenue between the interchange with I-10 and Bethany Home Road and an existing two-lane unpaved roadway along 411th Avenue between Bethany Home Road and the planned Northern Parkway. There are three developments – Balterra, West Phoenix Estates 4, and Belmont Ranches – that make provisions for a major (i.e., rural minor arterial) roadway along 411th Avenue. Balterra plans to dedicate right-of-way for a 65' half-street major roadway on the west side of the section line for 0.5 miles and on the east side of the section line for 0.2 miles. West Phoenix Estates 4 has dedicated right-of-way for a 55' half-street major roadway on the west side of the section line for 0.3 miles. Belmont Ranches has provided an easement for a 55' half-street major roadway on both the west and east sides of the section line for 1.0 mile. While a roadway does exist where development had assumed a roadway would be provided, the No-Build Alternative is not compatible with development in that the roadway surface is unpaved between Bethany Home Road and the planned Northern Parkway and in that the existing two-lane roadway is not the major roadway that was assumed by development. *Net Effect: Disadvantage*	Alternative A provides a 200' (100' half-street) parkway centered on the 411th Avenue section line. Balterra will be required to provide an additional 35' of half-street right-of-way on the west side of the section line for 0.5 miles and an additional 35' of half-street right-of-way on the east side of the section line for 0.2 miles. West Phoenix Estates 4 will be required to provide an additional 45' of half-street right-of-way on the west side of the section line for 0.3 miles. Belmont Ranches will be required to provide an additional 45' of half-street easement on both the west and east sides of the section line for up to 0.5 miles, depending on which Northern Parkway alignment is selected. Alternative A is generally compatible with development in that it results in a major roadway being provided in the general location assumed by development. Additional right-of-way or easements will be needed from development along 411th Avenue for the 200' (100' half-street) parkway because the parkway has a larger right-of-way footprint than was assumed by development. *Net Effect: Neutral*	Alternative B provides a 200' (100' half-street) parkway with a centerline shifted 35' to the west of the Alternative A centerline. Balterra will be required to provide an additional 70' of half-street right-of-way on the west side of the section line for 0.5 miles. West Phoenix Estates 4 will be required to provide an additional 80' of half-street right-of-way on the west side of the section line for 0.3 miles. Belmont Ranches will be required to provide an additional 80' of half-street easement on the west side of the section line and an additional 10' of half-street easement for up to 0.5 miles, depending on which Northern Parkway alignment is selected. Alternative B is generally compatible with development in that it results in a major roadway being provided in the general location assumed by development. Additional right-of-way or easements will be needed from development along 411th Avenue for the 200' (100' half-street) parkway because the parkway has a larger right-of-way footprint than was assumed by development. Alternative B will require more additional right-of-way or easements than Alternative A. *Net Effect: Disadvantage*	Alternative C provides a 200' (100' half-street) parkway with a centerline shifted 35' to the east of the Alternative A centerline. Balterra will be required to provide an additional 70' of half-street right-of-way on the east side of the section line for 0.2 miles. West Phoenix Estates 4 will be required to provide an additional 10' of half-street right-of-way on the west side of the section line for 0.3 miles. Belmont Ranches will be required to provide an additional 10' of half-street easement on the west side of the section line and an additional 80' of half-street easement for up to 0.5 miles, depending on which Northern Parkway alignment is selected. Alternative C is generally compatible with development in that it results in a major roadway being provided in the general location assumed by development. Additional right-of-way or easements will be needed from development along 411th Avenue for the 200' (100' half-street) parkway because the parkway has a larger right-of-way footprint than was assumed by development. Alternative C will require less additional right-of-way or easements than Alternative A. *Net Effect: Advantage*
System Continuity and Capacity	The No-Build Alternative provides an existing two-lane roadway within the Tonopah Parkway portion of the study area along 411th Avenue that is paved south of Bethany Home Road and unpaved north of Bethany Home Road. The MAG Hassayampa Framework Study has shown a long-term need for a parkway, called the Tonopah Parkway, in the general vicinity of 411th Avenue to serve long-term traffic needs. The No-Build Alternative does not conform to the intent of the Hassayampa Framework Study's recommended roadway network connectivity and does not adequately serve long-term traffic needs. *Net Effect: Strong disadvantage*	Alternative A conforms with the intent of the Hassayampa Framework Study's recommended roadway network connectivity by providing a parkway along the general Tonopah Parkway alignment that connects I-10 to Northern Parkway. Alternative A adequately serves projected long-term traffic needs. The centerline of Alternative A aligns with the centerline of the existing I-10/411th Avenue interchange. *Net Effect: Advantage*	Alternative B conforms with the intent of the Hassayampa Framework Study's recommended roadway network connectivity by providing a parkway along the general Tonopah Parkway alignment that connects I-10 to Northern Parkway. Alternative B adequately serves projected long-term traffic needs. The centerline of Alternative B is shifted 35' west of the centerline of the existing I-10/411th Avenue interchange. A transition segment will be needed to connect the two centerlines. *Net Effect: Advantage*	Alternative C conforms with the intent of the Hassayampa Framework Study's recommended roadway network connectivity by providing a parkway along the general Tonopah Parkway alignment that connects I-10 to Northern Parkway. Alternative C adequately serves projected long-term traffic needs. The centerline of Alternative C is shifted 35' east of the centerline of the existing I-10/411th Avenue interchange. A transition segment will be needed to connect the two centerlines. *Net Effect: Advantage*
Drainage Impacts	Old Camp Wash and several other smaller, unnamed washes carry water through the Tonopah Parkway portion of the study area and across 411th Avenue during flood events, causing roadway erosion and sedimentation. The No-Build Alternative does not provide a continuous all-weather roadway, will not correct any of the identified drainage issues, and could result in additional future adverse impacts from drainage issues such as roadway erosion and sedimentation. *Net Effect: Disadvantage*	Alternative A provides a continuous all-weather roadway that will include culverts to convey cross-drainage at smaller washes and structures to convey cross-drainage at larger washes such as Old Camp Wash, improving cross-drainage and better controlling drainage flows. *Net Effect: Advantage*	Alternative B provides a continuous all-weather roadway that will include culverts to convey cross-drainage at smaller washes and structures to convey cross-drainage at larger washes such as Old Camp Wash, improving cross-drainage and better controlling drainage flows. *Net Effect: Advantage*	Alternative C provides a continuous all-weather roadway that will include culverts to convey cross-drainage at smaller washes and structures to convey cross-drainage at larger washes such as Old Camp Wash, improving cross-drainage and better controlling drainage flows. *Net Effect: Advantage*
Irrigation Impacts	The irrigation facilities identified in the Tonopah Parkway portion of the study area include two small east-west irrigation canals that intersect 411th Avenue and seven wells located adjacent to 411th Avenue, most of which are associated with the agricultural land on the west side of 411th Avenue between Camelback Road and Missouri Avenue. The No-Build Alternative does not change the current status and therefore will not have positive or negative impacts on existing irrigation canals or wells. *Net Effect: Neutral*	Alternative A will likely require the relocation or reconfiguration of small sections of the two irrigation canals and the possible relocation of some wells if these facilities still exist when the parkway is implemented. The build-out land use plan assumes the existing agricultural land on the west side of 411th Avenue will ultimately be converted to residential land uses. *Net Effect: Disadvantage*	Alternative B will likely require the relocation or reconfiguration of small sections of the two irrigation canals and the possible relocation of some wells if these facilities still exist when the parkway is implemented. The build-out land use plan assumes the existing agricultural land on the west side of 411th Avenue will ultimately be converted to residential land uses. *Net Effect: Disadvantage*	Alternative C will likely require the relocation or reconfiguration of small sections of the two irrigation canals and the possible relocation of some wells if these facilities still exist when the parkway is implemented. The build-out land use plan assumes the existing agricultural land on the west side of 411th Avenue will ultimately be converted to residential land uses. *Net Effect: Disadvantage*

Source: Kimley-Horn and Associates, Inc.

Table 1 – Tonopah Parkway Candidate Alternatives Evaluation Matrix (continued)

Evaluation Criteria	No-Build Alternative	Alternative A	Alternative B	Alternative C
Building/Property Impacts	Buildings exist in the Tonopah Parkway portion of the study area primarily between Camelback Road and Glendale Avenue. There are 56 parcels adjacent to 411th Avenue. The No-Build Alternative does not change the current status and therefore will not have positive or negative impacts on adjacent buildings or properties. *Net Effect: Neutral*	Alternative A is not anticipated to impact any existing buildings. Alternative A will likely require right-of-way acquisition from all 56 adjacent parcels, including three full parcel acquisitions. *Net Effect: Disadvantage*	Alternative B will likely require the relocation/purchase of one existing residential building. Alternative B will likely require right-of-way acquisition from all 56 adjacent parcels, including nine full property acquisitions. *Net Effect: Strong disadvantage*	Alternative C will likely require the relocation/purchase of one existing residential building. Alternative C will likely require right-of-way acquisition from all 56 adjacent parcels, including five full property acquisitions. *Net Effect: Strong disadvantage*
Wildlife Impacts	The Tonopah Parkway portion of the study area contains the PLZ – 64 Bighorn Belmont-Saddle Mountain potential wildlife linkage zone. 411th Avenue is the eastern limit of this PLZ. 411th Avenue does not currently provide wildlife crossing treatments, but wildlife-vehicle conflicts have not been identified as a common occurrence on 411th Avenue. The No-Build Alternative does not change the current status and therefore will not have positive or negative impacts on wildlife. *Net Effect: Neutral*	Alternative A will result in a wider roadway footprint than currently exists, increasing the crossing distance for wildlife. This increase in crossing distance could be mitigated to some degree by incorporating wildlife crossing treatments, such as overpasses or underpasses, into the new roadway design, particularly at wash crossings like Old Camp Wash. *Net Effect: Disadvantage*	Alternative B will result in a wider roadway footprint than currently exists, increasing the crossing distance for wildlife. This increase in crossing distance could be mitigated to some degree by incorporating wildlife crossing treatments, such as overpasses or underpasses, into the new roadway design, particularly at wash crossings like Old Camp Wash. *Net Effect: Disadvantage*	Alternative C will result in a wider roadway footprint than currently exists, increasing the crossing distance for wildlife. This increase in crossing distance could be mitigated to some degree by incorporating wildlife crossing treatments, such as overpasses or underpasses, into the new roadway design, particularly at wash crossings like Old Camp Wash. *Net Effect: Disadvantage*
Cultural/Archaeological Impacts	There are identified cultural or archaeological resources within the Tonopah Parkway portion of the study area, particularly between Camelback Road and I-10, however none of the identified cultural or archaeological resources are along 411th Avenue. The No-Build Alternative does not change the current status and therefore will not have positive or negative impacts on identified cultural or archaeological resources. It should be noted that approximately 50 percent of the study area has not been surveyed for cultural or archaeological resources. *Net Effect: Neutral*	Alternative A will not have any positive or negative impacts on identified cultural or archaeological resources. Because approximately 50 percent of the study area has not been surveyed for cultural or archaeological resources, it is possible that future surveys conducted as Alternative A is designed could potentially identify additional cultural or archaeological resources that could be impacted by Alternative A. *Net Effect: Disadvantage*	Alternative B will not have any positive or negative impacts on identified cultural or archaeological resources. Because approximately 50 percent of the study area has not been surveyed for cultural or archaeological resources, it is possible that future surveys conducted as Alternative B is designed could potentially identify additional cultural or archaeological resources that could be impacted by Alternative B. *Net Effect: Disadvantage*	Alternative C will not have any positive or negative impacts on identified cultural or archaeological resources. Because approximately 50 percent of the study area has not been surveyed for cultural or archaeological resources, it is possible that future surveys conducted as Alternative C is designed could potentially identify additional cultural or archaeological resources that could be impacted by Alternative C. *Net Effect: Disadvantage*
Utility Impacts	The existing major utilities identified as being located within the Tonopah Parkway portion of the study area include 12kV electrical lines going along the west side of 411th Avenue. The No-Build Alternative does not change the current status and therefore will not have positive or negative impacts on identified utilities. *Net Effect: Neutral*	Alternative A will require relocation of the existing 12kV electrical lines along 411th Avenue. *Net Effect: Disadvantage*	Alternative B will require relocation of the existing 12kV electrical lines along 411th Avenue. *Net Effect: Disadvantage*	Alternative C will require relocation of the existing 12kV electrical lines along 411th Avenue. *Net Effect: Disadvantage*
Public Acceptability	While some residents and property owners have expressed concerns about wildlife impacts, noise impacts, and property tax impacts associated with new/improved roadways, there is more public support for improving roadways in the area to reduce dust pollution, provide all-weather crossings of washes, and to improve property access/and property values. The No-Build Alternative will not provide the general benefits that the public desires. *Net Effect: Disadvantage*	Because Alternative A is centered on the 411th Avenue section line, it will have the most equitable impacts on adjacent properties. In general, there is more public support for Alternative A than any of the other alternatives. *Net Effect: Advantage*	While Alternative B will have more impacts on adjacent properties on the west side of 411th Avenue than any of the other alternatives, no objections were received from any property owners. *Net Effect: Disadvantage*	While Alternative C will have more impacts on adjacent properties on the east side of 411th Avenue than any of the other alternatives, no objections were received from any property owners. *Net Effect: Disadvantage*
Cost	The No-Build Alternative will not require right-of-way or construction costs but it will require continued on-going maintenance costs related to cross-drainage, pavement restoration, and dust control. *Net Effect: Neutral*	Alternative A will require right-of-way, construction, and maintenance costs that are similar to the costs of Alternative B and Alternative C. *Net Effect: Disadvantage*	Alternative B will require right-of-way, construction, and maintenance costs that are similar to the costs of Alternative A and Alternative C. *Net Effect: Disadvantage*	Alternative C will require right-of-way, construction, and maintenance costs that are similar to the costs of Alternative A and Alternative B. *Net Effect: Disadvantage*

Source: Kimley-Horn and Associates, Inc.

Table 2 – Northern Parkway Candidate Alternatives Evaluation Matrix

Evaluation Criteria	No-Build Alternative	Alternative A	Alternative B
Future Development Compatibility	The No-Build Alternative does not provide an existing paved roadway through the Northern Parkway portion of the study area. There are a few existing unpaved sections of two-lane roadway, such as between 411th Avenue and 387th Avenue. There are eleven developments along the Northern Avenue section line that make provisions for a major (i.e., arterial or parkway) roadway along the Northern Avenue section line. In the western section of the study area (i.e., west of 379th Avenue), the five developments have generally provided an easement for a 33' half-street major roadway along the section line. In the middle section (i.e., between 379th Avenue and 323rd Avenue), Belmont plans to dedicate right-of-way (right-of-way) for a 100' half-street major roadway along the section line except for a three-mile segment that dips south of the section line between 363rd Avenue and 339th Avenue where Belmont plans to dedicate right-of-way for a 200' full-street major roadway. In the eastern section (i.e., east of 323rd Avenue), most of the five developments plan to dedicate right-of-way for a 65' or 100' half-street major roadway along the section line. The No-Build Alternative is not compatible with development in that the major roadway that was assumed by development does not exist. *Net Effect: Strong disadvantage*	Alternative A provides a 200' parkway centered on the Northern Avenue section line except for a three-mile dip to the south within the Belmont development. In the western section of the study area, the developments will generally be required to provide an additional 67' of half-street easement. In the middle section, Belmont will not need to dedicate any additional right-of-way as Alternative A matches the roadway alignment and 200' right-of-way width shown in the Belmont community master plan. In the eastern section, the developments will generally be required to dedicate an additional 35' of half-street right-of-way, although Sun Valley Villages III and IV will not need to dedicate any additional right-of-way as Alternative A matches the roadway alignment and 200' right-of-way width shown in the Sun Valley Villages III and IV community master plan. Alternative A is generally compatible with development in that it results in a major roadway being provided in the general location assumed by development. Additional right-of-way or easements will be needed from development along the Northern Avenue section line for the 200' parkway because the parkway has a larger right-of-way footprint than was assumed by development. *Net Effect: Advantage*	Alternative B provides a 200' parkway with a centerline shifted one-half mile to the north of the Alternative A centerline between the planned Tonopah Parkway and 371st Avenue. Alternative B has a curved segment between 371st Avenue and 363rd Avenue that brings the Alternative B alignment down to the Northern Avenue section line just west of 363rd Avenue. From that point east, Alternative B follows the same alignment as Alternative A. In the western section of the study area, only two of the five developments make provisions for a roadway along the Butler Avenue alignment. Those two developments have provided an easement for a 33' half-street roadway and as such would be required to provide an additional 67' of half-street easement for Alternative B. The other three developments in the western section do not make provisions for a roadway along the Butler Avenue alignment and as such would be required to provide 100' of half-street easement for Alternative B. In the middle section, Belmont does not make provisions for a curved roadway from the Butler Avenue alignment to the Northern Avenue alignment between 371st Avenue and 363rd Avenue and as such would be required to provide 100' of half-street right-of-way. For the remainder of the middle section, Belmont will not need to dedicate any additional right-of-way as Alternative B matches the roadway alignment and 200' right-of-way width shown in the Belmont community master plan. In the eastern section, the developments will generally be required to dedicate an additional 35' of half-street right-of-way, although Sun Valley Villages III and IV will not need to dedicate any additional right-of-way as Alternative B matches the roadway alignment and 200' right-of-way width shown in their development master plans. Alternative B, where it differs from Alternative A, is generally not compatible with development in that it results in a major roadway being provided where a roadway had not been assumed by development. Additional right-of-way or easements will be needed along the Butler Avenue alignment and Northern Avenue section line for the 200' parkway because the parkway has a larger right-of-way footprint than was assumed by development. Alternative B will require more additional right-of-way or easements than Alternative A. *Net Effect: Disadvantage*
System Continuity and Capacity	The No-Build Alternative does not provide an existing paved roadway through the Northern Parkway portion of the study area. The Maricopa Association of Governments Hassayampa Framework Study has shown a long-term need for a parkway, called the Northern Parkway, in the general vicinity of the Northern Avenue section line to serve long-term traffic needs. The No-Build Alternative does not conform to the intent of the Hassayampa Framework Study's recommended roadway network connectivity and does not adequately serve long-term traffic needs. *Net Effect: Strong disadvantage*	Alternative A conforms with the intent of the Hassayampa Framework Study's recommended roadway network connectivity by providing a parkway along the general Northern Parkway alignment that connects Tonopah Parkway to Turner Parkway. Interchanges would be accommodated at all proposed intersecting parkways and freeways. Alternative A adequately serves projected long-term traffic needs. *Net Effect: Strong advantage*	Alternative B conforms with the intent of the Hassayampa Framework Study's recommended roadway network connectivity by providing a parkway along the general Northern Parkway alignment that connects Tonopah Parkway to Turner Parkway. Interchanges would be accommodated at all proposed intersecting parkways and freeways. Alternative B adequately serves projected long-term traffic needs. The alignment of the western section of Alternative B is shifted one-half mile north of the Northern Avenue section line, resulting in one mile of out-of-direction travel for those traveling between 411th Avenue and 363rd Avenue. *Net Effect: Advantage*
Drainage Impacts	Winters Wash, Coyote Wash, Fourmile Wash, Phillips Wash, Jackrabbit Wash, the Hassayampa River, White Tank Wash, and several smaller, unnamed washes carry water through the Northern Parkway portion of the study area during flood events. Major existing drainage issues that have been identified include wide floodplains at Jackrabbit Wash and the Hassayampa River, high flood hazard zones near the Hassayampa River and White Tank Wash, alluvial fan flooding, diversion of pending floodplain flows at Coyote Wash, high sediment loads associated with Jackrabbit Wash, the Hassayampa River, and the alluvial fans, and lateral erosion. The No-Build Alternative does not provide a continuous all-weather roadway, will not correct any of the identified drainage issues, and could result in additional future adverse impacts from drainage issues such as lateral erosion. *Net Effect: Strong disadvantage*	Alternative A provides a continuous all-weather roadway that will include culverts to convey cross-drainage at smaller washes and structures to convey cross-drainage at larger washes and at the Hassayampa River, improving cross-drainage and better controlling drainage flows. A bridge over the Hassayampa River could impact potential future sand and gravel operations within the river bed one mile upstream and two miles downstream of the bridge. Alternative A passes through several high flood hazard zones, which could require significant channelization as part of the construction of the roadway to further control drainage flows. *Net Effect: Advantage*	Alternative B provides a continuous all-weather roadway that will include culverts to convey cross-drainage at smaller washes and structures to convey cross-drainage at larger washes and at the Hassayampa River, improving cross-drainage and better controlling drainage flows. A bridge over the Hassayampa River could impact potential future sand and gravel operations within the river bed one mile upstream and two miles downstream of the bridge. Alternative B passes through several high flood hazard zones, which could require significant channelization as part of the construction of the roadway to further control drainage flows. *Net Effect: Advantage*

Source: Kimley-Horn and Associates, Inc.

Table 2 – Northern Parkway Candidate Alternatives Evaluation Matrix (continued)

Evaluation Criteria	No-Build Alternative	Alternative A	Alternative B
Irrigation Impacts	The Tonopah Canal crosses through the Northern Parkway portion of the study area between 387th Avenue and 379th Avenue and provides irrigation to the existing agricultural land on the south side of the Northern Avenue section line. Thirty-five wells were identified as being located within the Northern Parkway portion of the study area. The No-Build Alternative does not change the current status and therefore will not have positive or negative impacts on existing irrigation canals or wells. *Net Effect: Neutral*	Alternative A will likely require a bridge or siphon where the parkway crosses the Tonopah Canal at the Northern Avenue section line. While not anticipated, it is possible that there may be a need to relocate some wells near the Alternative A alignment if these facilities still exist when the parkway is implemented. The build-out land use plan assumes the land adjacent to the Northern Avenue section line will ultimately be converted to residential land uses. *Net Effect: Disadvantage*	Alternative B will likely require a bridge or siphon where the parkway crosses the Tonopah Canal at the Butler Avenue alignment. While not anticipated, it is possible that there may be a need to relocate some wells near the Alternative B alignment if these facilities still exist when the parkway is implemented. The build-out land use plan assumes the land adjacent to the Butler Avenue alignment will ultimately be converted to residential land uses. *Net Effect: Disadvantage*
Building/Property Impacts	Buildings exist in the Northern Parkway portion of the study area between 395th Avenue and 387th Avenue. There are 67 private parcels adjacent to the Northern Avenue section line plus 6 State Land properties and 2 BLM properties. The No-Build Alternative does not change the current status and therefore will not have positive or negative impacts on buildings or properties. *Net Effect: Neutral*	Alternative A will likely require the relocation/purchase of one existing residential building. Alternative A will likely require right-of-way acquisition from all of the 67 adjacent private parcels, the 6 State Land properties, and the 2 BLM properties. Much of the required right-of-way has already been set aside, or is planned to be dedicated. *Net Effect: Disadvantage*	Alternative B is not anticipated to impact any existing buildings. Alternative B will likely require right-of-way acquisition from 54 adjacent private parcels, the 6 State Land properties, and the 2 BLM properties. Most of the required right-of-way for the western section of Alternative B has not already been set aside, or is not planned to be dedicated. Much of the required right-of-way for the other sections of Alternative B has already been set aside, or is planned to be dedicated. *Net Effect: Disadvantage*
Wildlife Impacts	The Northern Parkway portion of the study area contains Sonoran desert tortoise habitat north of Butler Avenue between 387th Avenue and 363rd Avenue and east of 411th Avenue. It also contains the PLZ – 65 White Tanks-Hassayampa River potential wildlife linkage zone. Wildlife-vehicle conflicts have not been identified as a common occurrence in the Northern Parkway portion of the study area. The No-Build Alternative does not change the current status and therefore will not have positive or negative impacts on wildlife. *Net Effect: Neutral*	Alternative A will result in a new roadway along the Northern Avenue section line that creates a barrier to wildlife crossings. Most potential wildlife-vehicle conflicts are anticipated to occur along the segment of Alternative A between Sun Valley Parkway and Turner Parkway. The adverse impacts of the roadway barrier could be mitigated to some degree by incorporating wildlife crossing treatments, such as overpasses or underpasses, into the new roadway design, particularly at drainage crossings like Jackrabbit Wash, the Hassayampa River, and White Tank Wash. *Net Effect: Disadvantage*	Alternative B will result in a new roadway along Butler Avenue and the Northern Avenue section line that creates a barrier to wildlife crossings. Most potential wildlife-vehicle conflicts are anticipated to occur along the segment of Alternative B near 379th Avenue and between Sun Valley Parkway and Turner Parkway. The adverse impacts of the roadway barrier could be mitigated to some degree by incorporating wildlife crossing treatments, such as overpasses or underpasses, into the new roadway design, particularly at drainage crossings like Coyote Wash, Jackrabbit Wash, the Hassayampa River, and White Tank Wash. *Net Effect: Disadvantage*
Cultural/Archaeological Impacts	There are identified cultural or archaeological resources within the Northern Parkway portion of the study area, particularly along 395th Avenue and between 379th Avenue and 363rd Avenue. The No-Build Alternative does not change the current status and therefore will not have positive or negative impacts on identified cultural or archaeological resources. It should be noted that approximately 50 percent of the study area has not been surveyed for cultural or archaeological resources. *Net Effect: Neutral*	Alternative A could potentially impact identified cultural or archaeological resources along the Alternative A alignment near 395th Avenue and near 371st Avenue. Because approximately 50 percent of the study area has not been surveyed for cultural or archaeological resources, it is possible that future surveys conducted as Alternative A is designed could potentially identify additional cultural or archaeological resources that could be impacted by Alternative A. *Net Effect: Disadvantage*	Alternative B could potentially impact identified cultural or archaeological resources along the Alternative B alignment between 379th Avenue and 363rd Avenue. Because approximately 50 percent of the study area has not been surveyed for cultural or archaeological resources, it is possible that future surveys conducted as Alternative B is designed could potentially identify additional cultural or archaeological resources that could be impacted by Alternative B. *Net Effect: Disadvantage*
Utility Impacts	The existing major utilities identified as being located within the Northern Parkway portion of the study area include 12kV electrical lines going along the Northern Avenue section line between 395th Avenue and 387th Avenue, 345kV and 500kV electrical lines going diagonally across the study area and intersecting the Northern Avenue section line at Sun Valley Parkway, and 500kV electrical lines and a 36" natural gas pipeline going along the west side of Sun Valley Parkway. The No-Build Alternative does not change the current status and therefore will not have positive or negative impacts on identified utilities. *Net Effect: Neutral*	Alternative A will require relocation of the existing 12kV electrical lines going along the Northern Avenue section line between 395th Avenue and 387th Avenue. The alignment of Alternative A conflicts with the 500kV electrical line at Sun Valley Parkway, requiring relocation of at least one 500kV electrical line tower or a slight modification to the alignment of Alternative A. A more detailed special analysis is needed to further assess the potential impacts of the alignment of Alternative A on the 500kV electrical line towers at Sun Valley Parkway. *Net Effect: Disadvantage*	Alternative B, like Alternative A, will require relocation of at least one 500kV electrical line tower or a slight modification to the alignment of Alternative B at Sun Valley Parkway. A more detailed special analysis is needed to further assess the potential impacts of the alignment of Alternative B on the 500kV electrical line towers at Sun Valley Parkway. *Net Effect: Disadvantage*
Public Acceptability	While some residents and property owners have expressed concerns about wildlife impacts, noise impacts, and property tax impacts associated with new/improved roadways, there is more public support for improving roadways in the area to reduce dust pollution, provide all-weather crossings of washes, and to improve property access/property values. The No-Build Alternative will not provide the general benefits that the public desires. *Net Effect: Disadvantage*	Alternative A received the most public support because it generally follows the Northern Avenue section line and is the most consistent/compatible with adjacent subdivisions and development master plans. *Net Effect: Advantage*	There was no public support for Alternative B because it is not located on an arterial street section line, will cause additional out-of-direction travel, and is not consistent with adjacent subdivisions and development master plans. *Net Effect: Disadvantage*
Cost	The No-Build Alternative will not require right-of-way, construction, or maintenance costs within the Northern Parkway portion of the study area. *Net Effect: Advantage*	Alternative A will require right-of-way, construction, and maintenance costs that are less than the costs of Alternative B. *Net Effect: Disadvantage*	Alternative B will require right-of-way, construction, and maintenance costs that are more than the costs of Alternative A. *Net Effect: Strong disadvantage*

Source: Kimley-Horn and Associates, Inc.

Table 3 – Candidate Alternatives Evaluation Matrix Summary

Evaluation Criteria	Tonopah Parkway Candidate Alternatives				Northern Parkway Candidate Alternatives		
	No-Build	*Alt. A*	*Alt. B*	*Alt. C*	*No-Build*	*Alt. A*	*Alt. B*
Future Development Compatibility	◒	○	◒	◓	●	◓	◒
System Continuity and Capacity	●	◓	◓	◓	●	◎	◓
Drainage Impacts	◒	◓	◓	◓	●	◓	◓
Irrigation Impacts	○	◒	◒	◒	○	◒	◒
Building/Property Impacts	○	◒	●	●	○	◒	◒
Wildlife Impacts	○	◒	◒	◒	○	◒	◒
Cultural/Archaeological Impacts	○	◒	◒	◒	○	◒	◒
Utility Impacts	○	◒	◒	◒	○	◒	◒
Public Acceptability	◒	◓	◒	◒	◒	◓	◒
Cost	○	◒	◒	◒	◓	◒	●

LEGEND: Strong advantage ◎ Advantage ◓ Neutral ○ Disadvantage ◒ Strong disadvantage ●

Source: Kimley-Horn and Associates, Inc.

A visual inspection of **Table 3** without applying any weighting factors to the criteria indicates that for the Tonopah Parkway segment, the No-Build Alternative and Alternative A have the most positive ratings (i.e., more Strong advantage and Advantage ratings and/or fewer Strong disadvantage and Disadvantage ratings). For the Northern Parkway segment, the No-Build Alternative and Alternative A have the most positive ratings.

The evaluation results were presented to TAC members and stakeholders at the February 23, 2011 TAC/stakeholder meeting for review and discussion. The evaluation results were also presented for review and input at the second open house on February 15, 2011 (see photo below).

For both the Tonopah Parkway and Northern Parkway segments, it was determined that the No-Build Alternative does not address the demonstrated long-term need for a high-capacity parkway facility in the study area (see Strong disadvantage indication for System Continuity and Capacity in the tables). In addition, there was more TAC/Stakeholder and public support for Alternative A than for the No-Build or any other alternatives for both the Tonopah Parkway and Northern Parkway. As a result, Alternative A for the Tonopah Parkway and Alternative A for the Northern Parkway were recommended as the preferred alternatives. The ratings for the two preferred alternative segments are highlighted in **Table 3**.

Factors that supported the selection of the recommended preferred alternatives include the following:

Tonopah Parkway

- The No-Build Alternative will not provide a continuous, all-weather roadway and will not adequately serve projected traffic volumes associated with anticipated build-out land uses. Even though it may be many years before land uses and traffic volumes justify construction of a parkway facility, the transition from agricultural land uses and open desert to higher-intensity land uses is already occurring. Steps need to be taken now to preserve the long-term viability of constructing a parkway in the future by delineating the footprint and preferred location for Tonopah Parkway;
- Alternative A will result in the most equitable right-of-way acquisition by being centered on the 411th Avenue section line;
- Alternative A will not require any alignment shift to connect with the existing I-10 interchange at 411th Avenue;
- Alternative A is not expected to require any residential building demolition or relocation and will result in the fewest full property acquisitions;
- Alternative A has received the most stakeholder and public support because it has the most uniform and equitable impacts on adjacent properties; and
- Alternative A will have the lowest overall project cost because it is the shortest alternative, resulting in less right-of-way acquisition and lower construction costs.

Northern Parkway

- The No-Build Alternative will not provide a continuous, all-weather roadway and will not adequately serve projected traffic volumes associated with anticipated build-out land uses. Even though it may be many years before land uses and traffic volumes justify construction of a parkway facility, the transition from agricultural land uses and open desert to higher-intensity land uses is already occurring. Steps need to be taken now to preserve the long-term viability of constructing a parkway in the future by delineating the footprint and preferred location for Northern Parkway;
- Alternative A generally follows the Northern Avenue section line, making maximum use of existing roadway right-of-way and providing the most direct east-west connection between Tonopah Parkway and Turner Parkway;
- Alternative A will result in the most equitable right-of-way acquisition by generally being centered on the Northern Avenue section line;
- Alternative A is the most compatible with planned developments. The Belmont and Sun Valley Villages III and IV master plans both have provisions for a 200-foot-wide parkway facility;
- Alternative A has received significant stakeholder and public support because it has the most uniform and equitable impacts on adjacent properties and is the most compatible with planned developments along the corridor; and
- Alternative A will have the lowest overall project cost because it is the shortest alternative, resulting in less right-of-way acquisition and lower construction costs.

For the reasons enumerated above, Alternative A for Tonopah Parkway and Alternative A for Northern Parkway were advanced as the preferred alignments.

5.5 Special Analysis Areas

Two "Special Analysis Areas" were identified and analyzed for potentially advantageous options within the Northern Parkway study area:

- The Hassayampa River Special Analysis Area, located where Northern Parkway crosses the Hassayampa River; and
- The Sun Valley Parkway Special Analysis Area, where electrical line towers exist close to the Northern Avenue section line near Sun Valley Parkway.

These Special Analysis Areas are shown in the previously referenced **Figure 13**. Three Special Analysis Area alternatives were developed and analyzed as follows:

Alternative A-1

Alternative A-1 is located in the Hassayampa River Special Analysis Area. Alternative A-1 shifts the parkway's 200-foot-wide corridor 100 feet south of the Northern Avenue section line between 323rd Avenue and Johnson Road.

The advantages of Alternative A-1 include:

- Eliminates the creation of an unusable remnant parcel by fully utilizing the existing 200-foot-wide parcel south of the Northern Avenue section line between 315th Avenue and Johnson Road;

- Impacts fewer property owners; and
- Aligns the parkway immediately adjacent to the Montiere development, eliminating the need for roadway easements across the existing 200-foot-wide parcel south of the Northern Avenue section line for access between Northern Parkway and Montiere.

The disadvantages of Alternative A-1 include:

- Creates curved roadway segments that are more complex to design and drive than straight roadway segments; and
- Requires more property acquisition on the south side of the Northern Avenue section line than on the north side.

Alternative A-2

Alternative A-2 is located in the Sun Valley Parkway Special Analysis Area. Alternative A-2 shifts the 200-foot-wide corridor approximately 100 feet north of the Northern Avenue section line for approximately 1,400 feet either side of Sun Valley Parkway to position the parkway in between two existing electrical line towers.

The advantages of Alternative A-2 include:

- May eliminate the need to relocate one or more existing electrical line towers; and
- Avoids creating unusable remnant parcels.

The disadvantages of Alternative A-2 include:

- Creates curved roadway segments that are more complex to design and drive than straight roadway segments;
- Requires more property acquisition on the north side of the Northern Avenue section line than on the south side; and
- Requires channelization and rerouting of area drainage to prevent the Northern Parkway/Sun Valley Parkway intersection from being within the existing floodplain.

Alternative A-3

Alternative A-3 is located in the Sun Valley Parkway Special Analysis Area. Alternative A-3 shifts the 200-foot wide corridor approximately 800 feet north of the Northern Avenue section line for approximately 4,400 feet either side of Sun Valley Parkway.

The advantages of Alternative A-3 include:

- May eliminate the need to relocate one or more existing electrical line towers; and
- Removes most of the Northern Parkway/Sun Valley Parkway intersection out of the existing floodplain, reducing the amount of required drainage channelization and rerouting.

The disadvantages of Alternative A-3 include:

- Creates curved roadway segments that are more complex to design and drive than straight roadway segments;
- Incompatibility with the approved master plan for Sun Valley Villages III and IV;

- Requires more property acquisition on the north side of the Northern Avenue section line than on the south side; and
- Creates remnant parcels between Northern Parkway and the Northern Avenue section line that may be difficult to develop.

Special Analysis Area Recommendations

Alternative A-1 offers additional benefits beyond those provided by Alternative A for Northern Parkway. Alternative A-1 at the Hassayampa River crossing eliminates the creation of an unusable remnant parcel and improves access between Northern Parkway and the Montiere development. For these reasons, it was recommended that the preferred alignment for Northern Parkway be modified to include the Alternative A-1 100-foot shift to the south in the alignment at the Hassayampa River crossing.

While Alternatives A-2 and A-3 would likely eliminate the need to relocate one or more existing electrical line towers near Sun Valley Parkway, these alternatives involve alignment shifts that will require additional roadway curvature that is not compatible with approved master plans. SRP, the utility company that operates the joint APS/SRP electrical line towers, has advised that it will be feasible to relocate one or more towers as long as they remain on the existing power line alignment. SRP has also provided a preliminary electrical tower relocation cost estimate of $400,000 to $500,000 per tower. While this relocation cost is substantial, it does not outweigh the long-term advantages of keeping Northern Parkway centered on the Northern Avenue section line.

As a result, it was recommended that the preferred alignment for Northern Parkway remain on the Northern Avenue section line (Alternative A) as it intersects Sun Valley Parkway. This alignment will require relocation of one or more electrical line towers to keep Northern Parkway centered on the Northern Avenue section line and avoid introducing additional curvature in the parkway alignment.

6. DETAILED PREFERRED ALIGNMENTS

Technical Memorandum No. 5 – Detailed Preferred Alignment provides detailed information on the proposed alignments and design considerations of the preferred alternatives for Northern Parkway and Tonopah Parkway (contained in **Appendix 5** of separately published appendices).

6.1 Preferred Alternatives

Alternative A is recommended as the preferred alternative for Tonopah Parkway. Alternative A is centered on the 411th Avenue alignment. Alternative A is also recommended as the preferred alternative for Northern Parkway. Alternative A is centered on the Northern Avenue section line alignment except for a half-mile shift to the south between 363rd Avenue and 339th Avenue and a 100-foot shift to the south across the Hassayampa River. These shifts are compatible with the Belmont master planned community and with property lines near the Hassayampa River.

The recommended preferred alternatives have the least impact on existing subdivided properties, are most compatible with planned developments and prior planning studies, and have received the most TAC, stakeholder, and public support.

The recommended Tonopah Parkway preferred alternative is not anticipated to impact any existing buildings or require any residential or commercial relocation. Partial acquisitions are expected on 53 adjacent parcels, and full acquisition will be required on three adjacent vacant parcels. The recommended alternative will likely require relocation or reconfiguration of small sections of two irrigation canals and relocation of several wells.

The recommended Northern Parkway preferred alternative will likely require acquisition and relocation of one existing residential property and partial acquisition of 67 adjacent parcels. Much of the required right-of-way is already in place or will be dedicated though the land development process. A bridge or siphon will be required at the Tonopah Canal and major bridge crossings will be required at the Hassayampa River and at Jackrabbit Wash.

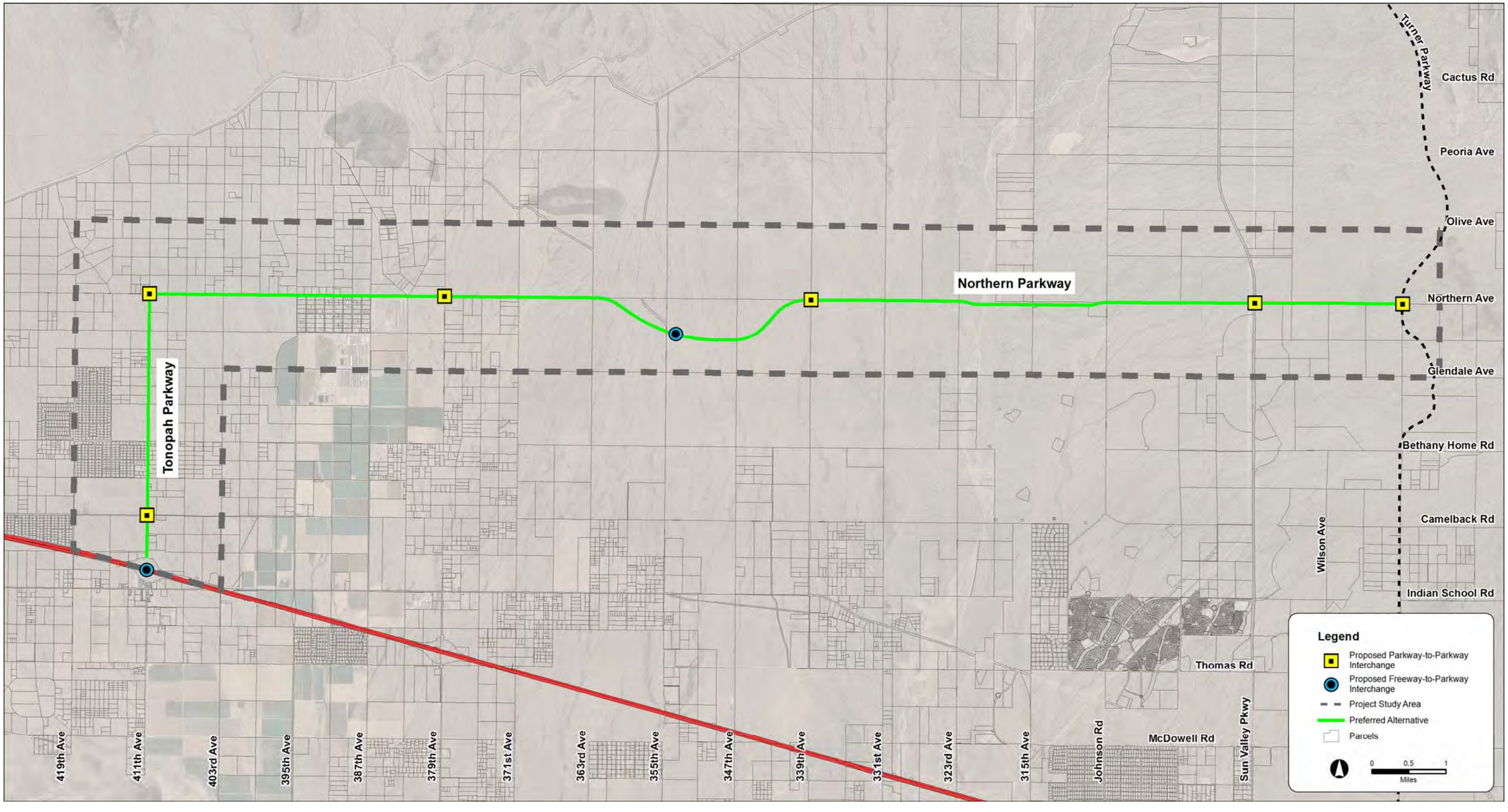
The preferred alternatives for Tonopah Parkway and Northern Parkway are shown in **Figure 14**. Also included in this figure are the proposed interchange locations where other freeways and parkways are expected to intersect Tonopah Parkway and Northern Parkway per the *Hassayampa Framework Study*. These interchange locations are preliminary and will require additional study to identify more precise locations and design features.

6.2 Parkway Design Guidelines and Typical Cross-Sections

Guidelines to be followed for implementation of a parkway such as Northern Parkway or Tonopah Parkway are documented in the MCDOT publications *Enhanced Parkway Study*, *Design Guideline Recommendations for the Arizona Parkway*, and *Arizona Parkway Intersection/Interchange Operational Analysis and Design Concepts Study*.

Design guidelines for the Arizona Parkway are intended to provide a higher level of service than an arterial street but less than a freeway facility. Basic cross-section elements and design guidelines for the typical urban parkway are summarized as follows:

- A 200-foot-wide minimum right-of-way is recommended. Additional right-of-way and/or easements may be needed for intersections, turn lanes, bus bays, drainage structures, drainage facilities, side slopes, utilities, and landscaping;



Sources: Maricopa County and MAG

Figure 14 – Preferred Alternatives

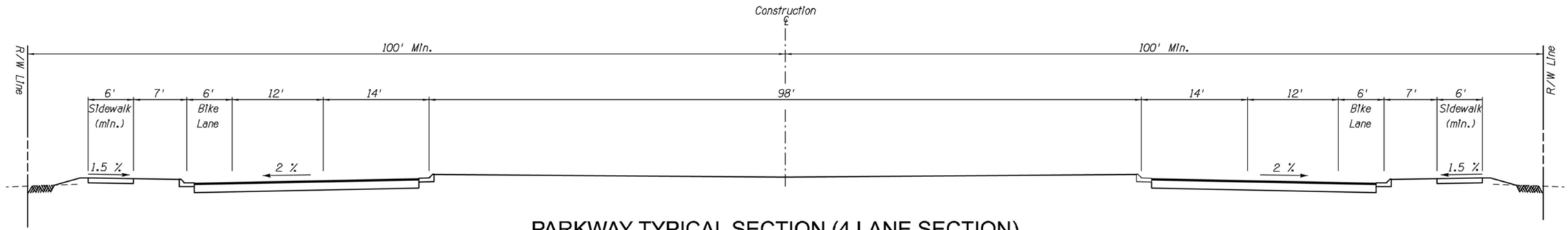
- Twelve-foot-wide lanes are recommended for the outside travel lanes;
- Fourteen-foot-wide lanes are recommended for the inside lanes adjacent to the median;
- A six-foot-wide bicycle lane is recommended adjacent to the outside travel lane;
- Curb, gutter, and a detached six-foot-wide sidewalk are recommended;
- Median width varies based on the number of lanes;
- Minimum design speeds are 50 miles per hour (mph) for rolling terrain and 55 mph for level terrain; and
- WB-50 is the recommended design vehicle.

Parkway typical cross-sections from the *Design Guideline Recommendations for the Arizona Parkway* are shown in **Figure 15**. The basic Northern Parkway and Tonopah Parkway design configuration will be a four-lane parkway, with the segment of Northern Parkway between Sun Valley Parkway and Turner Parkway ultimately becoming a six-lane parkway to accommodate projected traffic volumes.

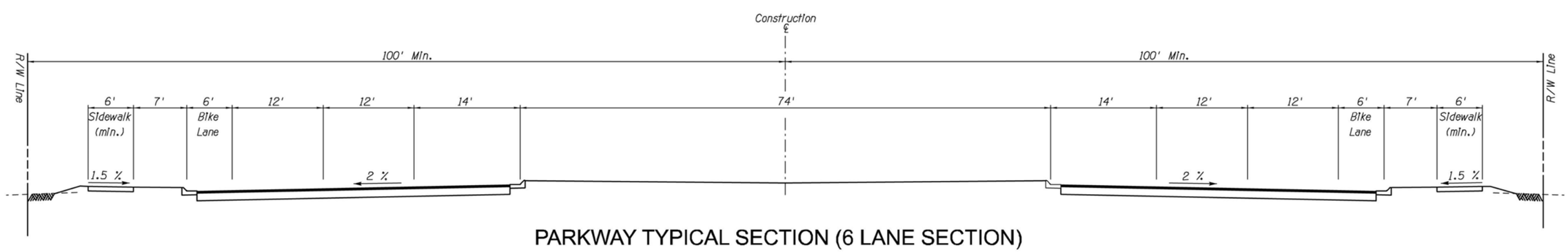
6.3 Crossing Features

There are a number of locations where major roadways, utilities, drainage washes, and other features will cross Northern Parkway and Tonopah Parkway that will require more detailed analyses during design. The following design considerations relate to these crossing features:

- Minimum right-of-way width for at-grade parkway-to-parkway intersections is 225 feet on each approach for a distance of 300 feet to accommodate dual right-turn lanes on both parkways;
- There are six anticipated at-grade parkway-to-parkway intersections within the project study area:
  - Tonopah Parkway/Camelback Parkway;
  - Tonopah Parkway/Northern Parkway;
  - Northern Parkway/Wintersburg Parkway;
  - Northern Parkway/Hidden Waters Parkway;
  - Northern Parkway/Sun Valley Parkway; and
  - Northern Parkway/Turner Parkway.
- There are numerous washes throughout the project study area that will require pipe culverts, box culverts, or bridges, which may result in the need for additional right-of-way (see photo to the right). For purposes of this study, pipe culverts are assumed to be needed where the peak 100-year flood drainage flows are less than 350 cubic feet per second (cfs), box culverts are assumed to be needed for flows between 350 cfs and 1,400 cfs, and bridges are assumed to be needed for flows greater than 1,400 cfs;



PARKWAY TYPICAL SECTION (4 LANE SECTION)



PARKWAY TYPICAL SECTION (6 LANE SECTION)

Source: *MCDOT Design Guideline Recommendations for the Arizona Parkway*

Figure 15 – Parkway Typical Cross-Sections

- The *ADOT Freeway-to-Parkway Interchange Templates* publication contains guidelines and ten potential design templates for grade-separated freeway-to-parkway interchanges. For purposes of this study, the templates that support the Arizona Parkway concept and its two-phase signal cycle are considered appropriate potential solutions for the two anticipated freeway-to-parkway interchanges within the study area at Tonopah Parkway/I-10 (existing freeway) and at Northern Parkway/Hassayampa Freeway (planned freeway);
- A railroad grade separation will be required west of Wintersburg Parkway where Northern Parkway crosses a proposed new rail line; and
- Grade-separated crossings within wildlife linkage zones should be considered to enhance wildlife movement through the area, where feasible.

6.4 Access Management Guidelines

To preserve the operating efficiency of the parkway facilities, a higher level of access management than what is applied to arterial streets is recommended. Because MCDOT will not have operational control over all parkway facilities, it will be up to the agencies with jurisdiction over the roadway to apply and enforce access management policies. The following are recommended as minimum access management guidelines (per the *Design Guideline Recommendations for the Arizona Parkway*) that may be supplemented by the responsible agency with jurisdiction over the roadway:

- Intersections (full median breaks) will preferably be restricted to one-mile spacing, with a minimum spacing of one-half mile, and are only recommended where intersecting with parkway, arterial, or major collector streets;
- Left turns in any direction are prohibited at all intersections;
- Left turns from a side-street or driveway onto the parkway are prohibited;
- Left turns from the parkway to a cross-street or driveway are discouraged due to conflicts between u-turns and right turns;
- U-turn directional crossovers are recommended to be restricted to a maximum of eight per mile; and
- Recommended minimum driveway spacing is 165 feet for low-volume segments and 330 feet for high-volume segments. The typical driveway will be limited to right-in/right-out maneuvers.

6.5 Detailed Preferred Alignment Drawings

Detailed preferred alignment drawings were created that show the parkway centerlines and right-of-way limits at a scale of 1 inch = 200 feet. The detailed preferred alignment drawings are provided in **Appendix A**. The preferred alignment centerlines and right-of-way limits are subject to more detailed design work that may necessitate some adjustments as roadway profiles, drainage requirements, and land development plans are further defined.

In developing the detailed preferred alignment drawings, existing roadway centerlines, section lines, right-of-way lines, and property lines were reviewed to determine the feasibility of following some or all of these lines to the greatest extent possible. At major roadway and drainage wash crossings along the parkways, additional right-of-way will likely be required that will expand the right-of-way limits beyond the basic 200-foot-wide parkway footprint. Areas that may potentially require additional right-of-way are noted in the detailed preferred alignment

drawings as being subject to further study as land development and roadway improvement plans are further defined.

6.6 Planning Level Construction Cost Estimates

Planning-level construction cost estimates were developed for the preferred Northern Parkway and Tonopah Parkway alignments. Because this study does not include preparation of an "engineered" roadway alignment and does not address detailed design issues for various features, the construction cost estimate was based on generalized unit costs. The planning-level unit cost estimates were applied to the Northern Parkway and Tonopah Parkway preferred alignment characteristics and are summarized in **Table 4**.

The estimated construction cost for Tonopah Parkway is $30 million and for Northern Parkway is $175 million, excluding the construction costs of a railroad overpass for the proposed new rail line west of Wintersburg Parkway, and freeway-to-parkway interchanges at I-10 and the planned Hassayampa Freeway, which are subject to further study and design. Right-of-way acquisition and relocation expenses are also not included in the construction cost estimate because it is expected that much of the required right-of-way will be dedicated through the land development process.

Table 4 – Planning-Level Construction Cost Estimates

Facility Characteristic	Tonopah Parkway	Northern Parkway
6-lane Parkway Segment Length (miles)	-	2.0
4-lane Parkway Segment Length (miles)	3.7	15.3
Roadway Construction Cost (in millions)	$30	$135
Major Structural Elements Bridge Construction Cost (in millions)		
Hassayampa River Bridge	-	$25
Jackrabbit Wash Bridge	-	$15
Total Estimated Project Construction Cost (in millions)	**$30**	**$175**

Notes:

1) *The estimated roadway construction unit cost for a 6-lane parkway is $9.6 million per mile and for a 4-lane parkway is $7.4 million per mile. Per the Proposed Laneage for Arizona Parkway Segments exhibit provided by MAG, a 6-lane parkway will ultimately be needed on Northern Parkway between Sun Valley Parkway and Turner Parkway.*
2) *The estimated bridge construction unit cost is $150 per square foot of bridge.*
3) *Major structural elements do not include a railroad overpass for the proposed rail line west of Wintersburg Parkway and freeway-to-parkway interchanges at I-10 and the planned Hassayampa Freeway, which are subject to further study and design.*
4) *Estimated project costs are rounded to the nearest $5 million and are in 2011 dollars.*

Sources: Kimley-Horn and Associates, Inc. and *MCDOT Turner Parkway Corridor Feasibility Study*

A roadway construction unit cost estimate of $9.6 million per mile in 2011 dollars was used for the six-lane segment of Northern Parkway between Sun Valley Parkway and Turner Parkway. The unit cost for a six-lane parkway was developed for the *Turner Parkway Corridor Feasibility*

Study, completed by MCDOT in 2010, and is utilized for this study with no inflation factors applied.

A roadway construction unit cost estimate of $7.4 million per mile in 2011 dollars was used for the four-lane parkway segments in the study area (i.e., Tonopah Parkway and Northern Parkway between Tonopah Parkway and Sun Valley Parkway). The unit cost for a four-lane parkway was developed by calculating the per-lane-mile cost of the six-lane parkway unit cost, multiplying it by the number of lanes in the four-lane parkway, and then applying a 15 percent increase to account for the loss of cost efficiency between a six-lane parkway and a four-lane parkway.

The roadway construction unit cost excludes major structural elements for crossing features but does include 20 percent contingencies for addressing drainage requirements. To give a sense of the amount of required drainage facilities anticipated in the study area, the number of anticipated drainage crossings in the study area, and their relative size and type, were estimated based off aerial photography and required flow capacities, and are summarized in **Table 5**.

The major structural elements in the study area are anticipated to include new all-weather bridges over the Hassayampa River and Jackrabbit Wash along Northern Parkway. Bridge costs were developed by multiplying the anticipated area of each bridge (in square feet) by a bridge construction unit cost estimate of $150 per square foot. The unit cost for bridge construction was derived from typical bridge construction costs on other recently completed projects.

Table 5 – Anticipated Drainage Crossings

Drainage Crossings	Tonopah Parkway	Northern Parkway
Small (pipe culverts)	3	71
Medium (box culverts)	1	7
Large (bridge)	1	10
Total Drainage Crossings	**5**	**88**

Notes:

1) *Pipe culverts are assumed to be needed where the peak 100-year flood drainage flows are less than 350 cubic feet per second (cfs).*
2) *Box culverts are assumed to be needed for flows between 350 cfs and 1,400 cfs.*
3) *Bridges are assumed to be needed for flows greater than 1,400 cfs.*

Source: Kimley-Horn and Associates, Inc

6.7 Implementation Strategies

It is important to recognize that the *Northern Parkway/Tonopah Parkway Corridor Feasibility Study* is a long-range transportation planning study and is therefore the earliest phase of project development. This study is intended to identify the feasibility of constructing parkway facilities at some future date to accommodate traffic demands that will be associated with future land development within and in close proximity to the project study area.

No public funding is currently allocated for design, right-of-way acquisition, or construction of any elements of Northern Parkway and Tonopah Parkway. The recommended centerlines and right-of-way limits will be used to guide future planning efforts and ensure that subsequent land development proposals and transportation system plans are compatible with future construction of Northern Parkway and Tonopah Parkway. Some refinement and negotiation of the parkway centerlines and right-of way requirements may occur in later phases of the project as properties are developed and as transportation improvements are implemented.

The following are key issues captured during this study's stakeholder and public involvement process that should be taken into consideration as the recommendations of this study are carried forward into design and construction:

- *Developer Participation* – It is anticipated that land developers will participate in dedicating right-of-way and participating in project design and construction costs;
- *Funding Strategies* – Long-term funding strategies need to be developed that will assist in positioning the parkway corridors to take advantage of future funding opportunities. When and how much funding is needed will be dependent on when and where development occurs, how much developer participation happens, and what the detailed designs call for;
- *Access Management Strategies* – Access management strategies that are consistent with the Arizona Parkway design guidelines should be implemented to ensure the parkways provide efficient traffic flow, safe operations, and reasonable local land access;
- *Environmental Impacts* – Specific impacts on environmental features, such as natural resources, wildlife habitats, cultural and archaeological resources, noise mitigation, and air quality will require further evaluation during future project development. Wildlife crossing features should be considered in the final project design where appropriate and feasible;
- *New Right-of-Way Requirements* – Final roadway configurations will need to be developed through a more detailed design process to determine exactly how much land will need to be acquired to accommodate the future parkways;
- *Landscaping Plans* – Final project design should specify the type of landscaping to be used;
- *Drainage Structures* – Bridges and culverts along the new roadways should be designed during subsequent design efforts that ensure that the roadways are designed to provide all-weather crossings during major storm events. Opportunities to create drainage structures that also accommodate wildlife movements across the parkways should be considered where appropriate and feasible;
- *Bicycle, Pedestrian, and Transit Access* – Future projects should be designed to accommodate alternative modes of travel and provide access to planned trails and neighborhoods in the area;
- *Coordination with Other Planned Transportation Facilities* – Implementation of the parkways should be coordinated with the implementation of other planned transportation facilities that intersect or impact the parkways (e.g., intersecting freeways, parkways, and arterials);
- *Corridor Traffic Management* – Intelligent Transportation Systems (ITS) should be implemented in conjunction with roadway construction to promote efficient traffic operations and management through the parkway corridors; and

- *Jurisdictional Coordination* – Implementation of corridor improvement, traffic management, and access management concepts should be coordinated among the responsible jurisdictions to ensure safe, seamless, and efficient transportation facilities.

6.8 Next Steps

Agencies with primary responsibility for implementing the recommendations of this study are Maricopa County (Transportation, Planning, and Flood Control), Town of Buckeye, and ADOT. Among the critical long-range planning actions that need to commence are:

- Maricopa County and Town of Buckeye adoption of the Arizona Parkway designation and general preferred alignment for Northern Parkway and Tonopah Parkway;
- Right-of-way preservation in developing areas as needed to protect the long-term viability of the parkway facilities;
- Preparation of Design Concept Reports for consideration in project programming;
- Appropriation of funding for design, right-of-way acquisition, and construction as needed for joint participation with land developers; and
- Coordination among the jurisdictions and key stakeholders on planning, right-of-way preservation, and design.

While implementation timing of Northern Parkway and Tonopah Parkway will be driven by land development, it is up to the public sector agencies to establish the transportation system planning framework now to be responsive to future land development interests while also protecting the broader long-term public interests.

7. PUBLIC INVOLVEMENT OVERVIEW

Technical Memorandum No. 6 – Public and Stakeholder Participation documents the results of the interaction with partnering agencies, stakeholders, and the general public throughout the course of the project (contained in **Appendix 6** of separately published appendices). Engaging partnering agencies, stakeholders, and the public in building consensus has been and will continue to be critical to the success of this study, as well as any future implementation of its recommendations.

7.1 TAC and Stakeholders

A combined TAC and stakeholder group was established by MCDOT to provide technical oversight and guidance throughout the study duration. The TAC and stakeholder group (see photo above) included over 50 individuals representing the following:

- ADOT;
- Arizona Game and Fish Department;
- ASLD;
- Businesses;
- Center for Desert Archaeology;
- CAP;
- Community of Tonopah;
- Developers;
- Federal Highway Administration;
- FCDMC;

- Irrigation and Utility Companies;
- MAG;
- Maricopa County Farm Bureau;
- Maricopa County Planning and Development;
- MCDOT;
- Property Owners;
- Residents; and
- Town of Buckeye.

The role and responsibility of the TAC and stakeholder group was to meet at key decision and milestone points during the study to receive information on study progress, offer advice and guidance on study issues, inform the management of their respective agencies and organizations of the project study progress, and build consensus on study recommendations. The TAC and stakeholders were also requested to review and comment on all draft technical memoranda and the draft final report.

7.2 TAC/Stakeholder Meetings

All individuals in the stakeholder database were invited to participate in four TAC/stakeholder meetings that were scheduled at key milestones throughout the study process as follows:

- *July 14, 2010* – Study Purpose, Data Collection, and Issues Identification;
- *September 22, 2010* – Review Existing and Future Corridor Features, Environmental Overview, Conceptual Drainage Report, Constraints, and Evaluation Criteria;
- *November 15, 2010* – Review Conceptual Alternatives and Develop Candidate Alternatives; and
- *February 23, 2011* – Review Alternatives Evaluation, Discuss Preferred Alignment, and Develop Consensus on Study Recommendations.

Additional one-on-one meetings with stakeholders were conducted where necessary to obtain stakeholder input.

All meetings were well attended with a valuable exchange of questions, answers, and input to the study findings and recommendations.

7.3 Public Open Houses

The MCDOT RightRoads Program, with assistance from the project team, conducted three public open house meetings at critical milestones in the study process as follows:

- *October 18, 2010* – "Project Scoping Phase" public meeting to provide area residents and other impacted stakeholders with an opportunity to inform project team members about the study area issues and local transportation needs. This meeting also provided the study team members with an opportunity to discuss and elicit feedback regarding the study purpose, goals and objectives;
- *February 15, 2011*– "Alternatives Analysis Phase" public meeting to provide the community an opportunity to comment on the roadway alignment alternatives being evaluated for the corridor; and

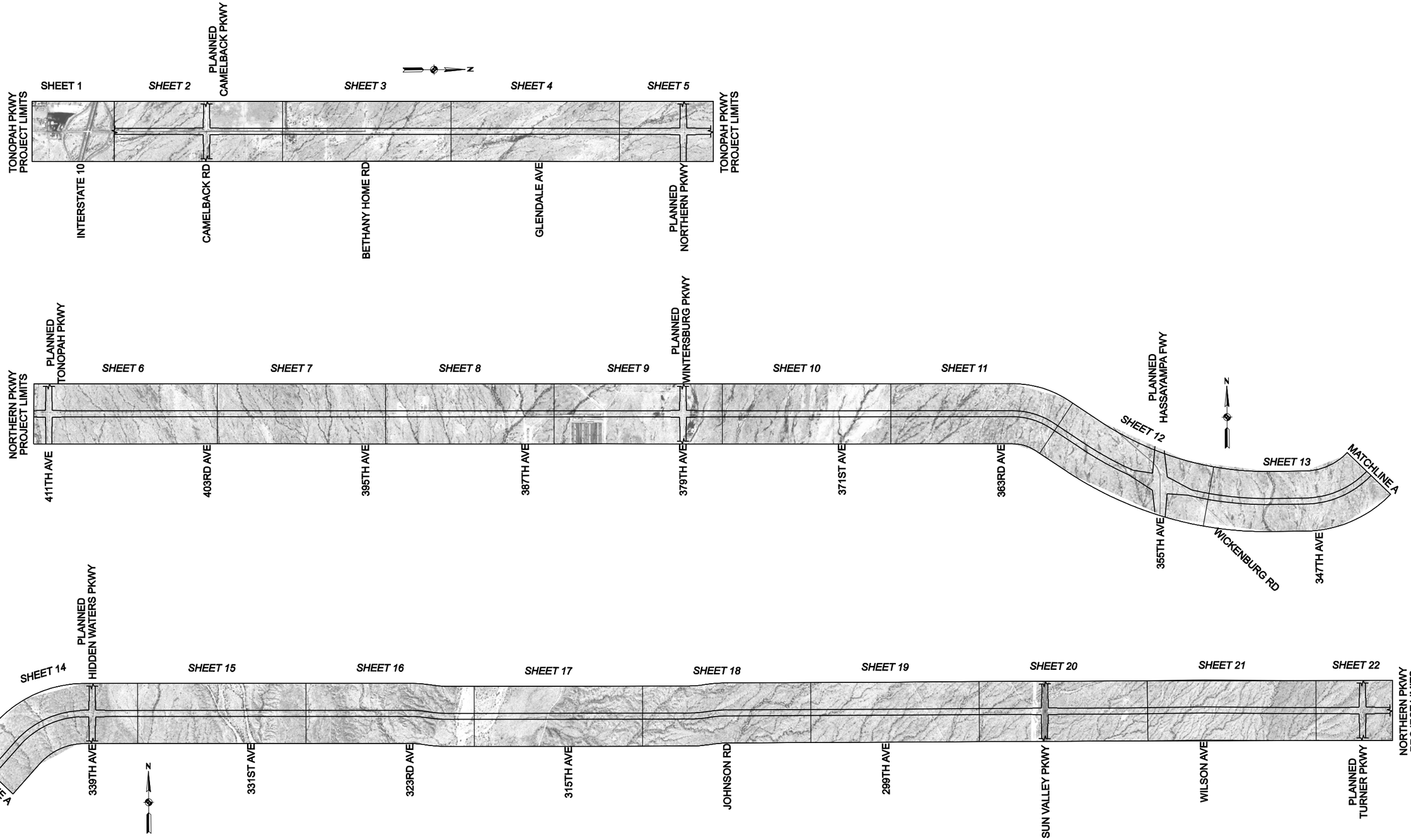
- *March 29, 2011* – "Study Findings and Recommendations Phase" public meeting to present the findings and recommendations of the study, including the preferred parkway alignment, the right-of-way footprint, and preliminary engineering details for the future Northern Parkway and Tonopah Parkway.

The public meetings were conducted in an "open house" format at the Tonopah Valley High School to provide a free, open, and accurate exchange of information between the project team and the public regarding specific issues and questions. Graphics, handouts, aerials, and display board exhibits presented study information. Comment sheets were distributed to all those in attendance so they could provide written comments. Meeting summaries were prepared that summarize the input received from the public.

Kimley-Horn and Associates, Inc.

APPENDIX A

DETAILED PREFERRED ALIGNMENT DRAWINGS



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DEPARTMENT OF TRANSPORTATION

NORTHERN PARKWAY / TONOPAH PARKWAY CORRIDOR FEASIBILITY STUDY

MCDOT PROJECT NO. TT005

RECOMMENDED FUTURE
RIGHT-OF-WAY CORRIDOR

KEY MAP

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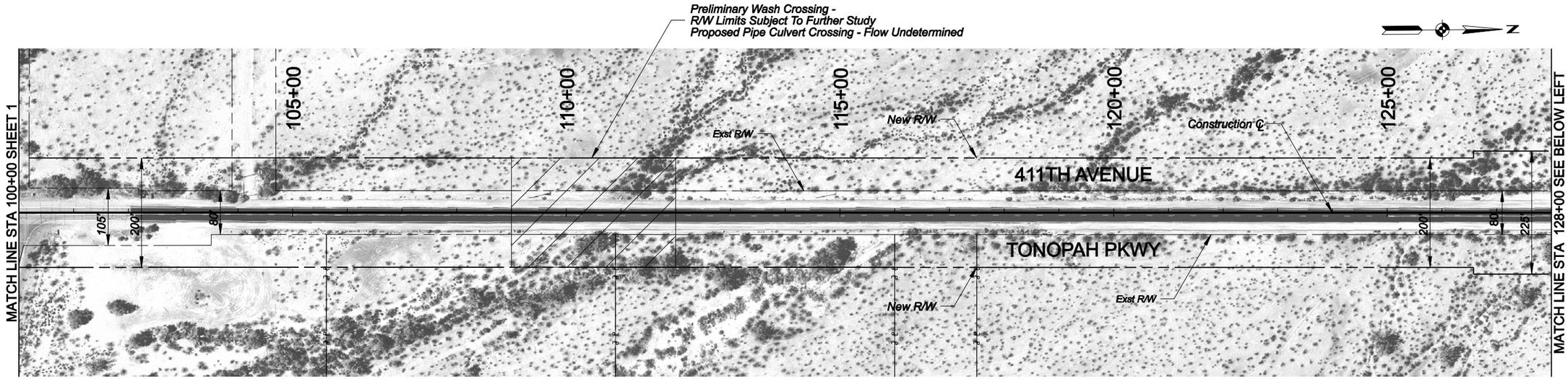

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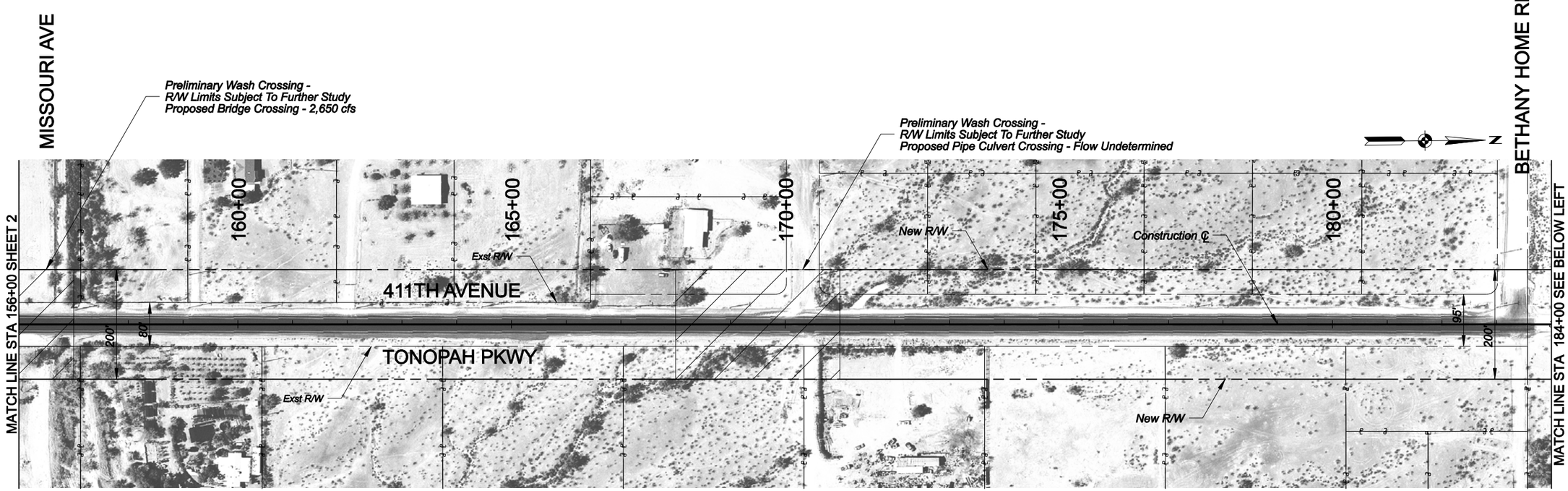

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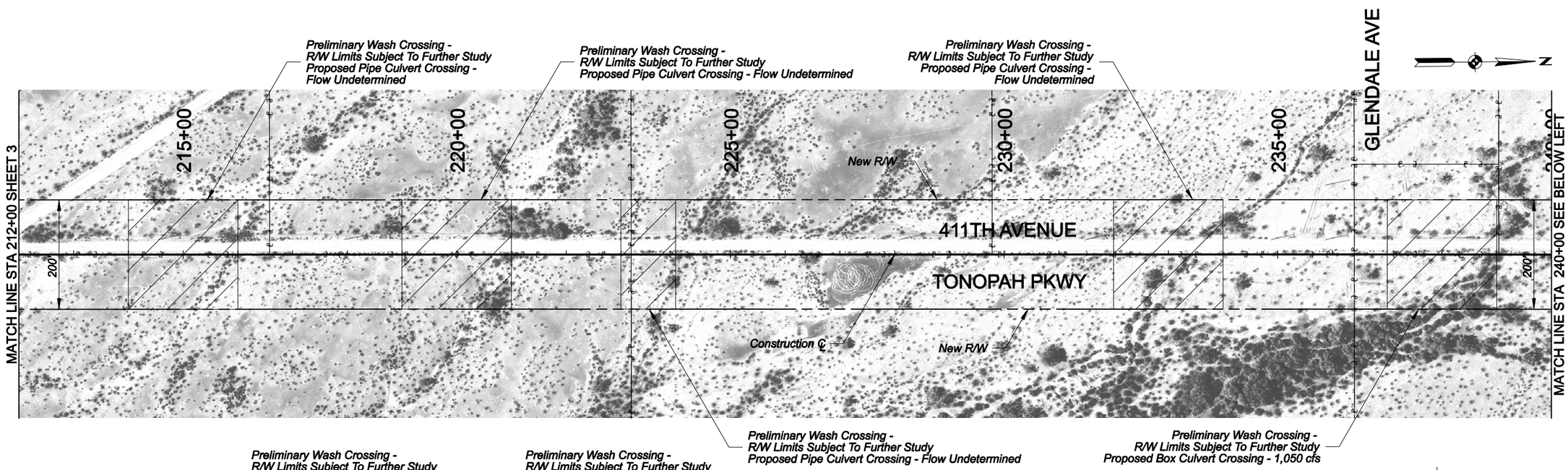

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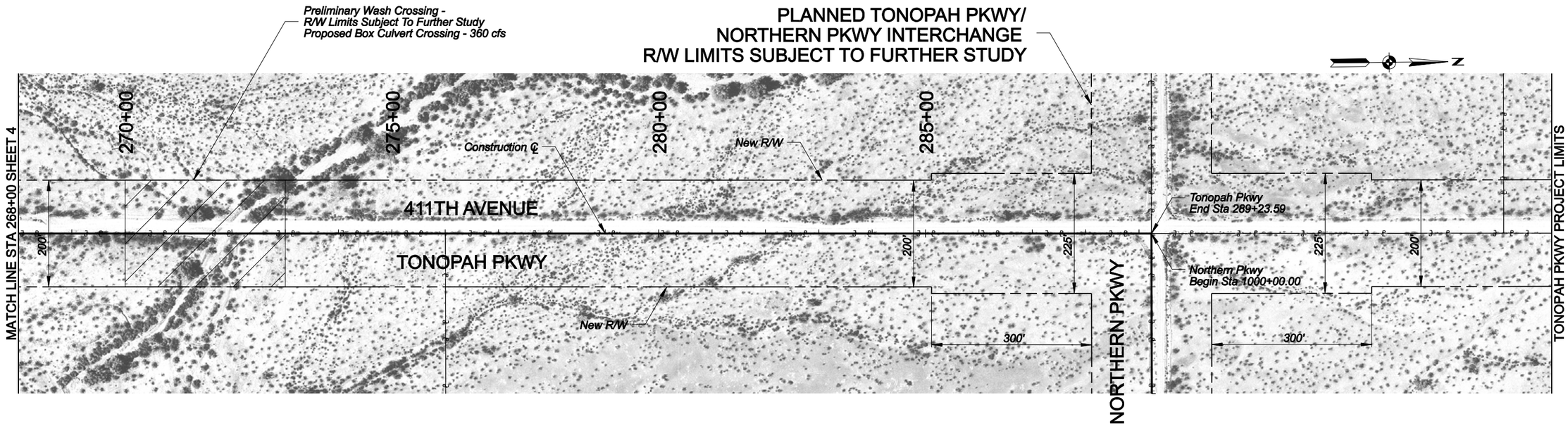

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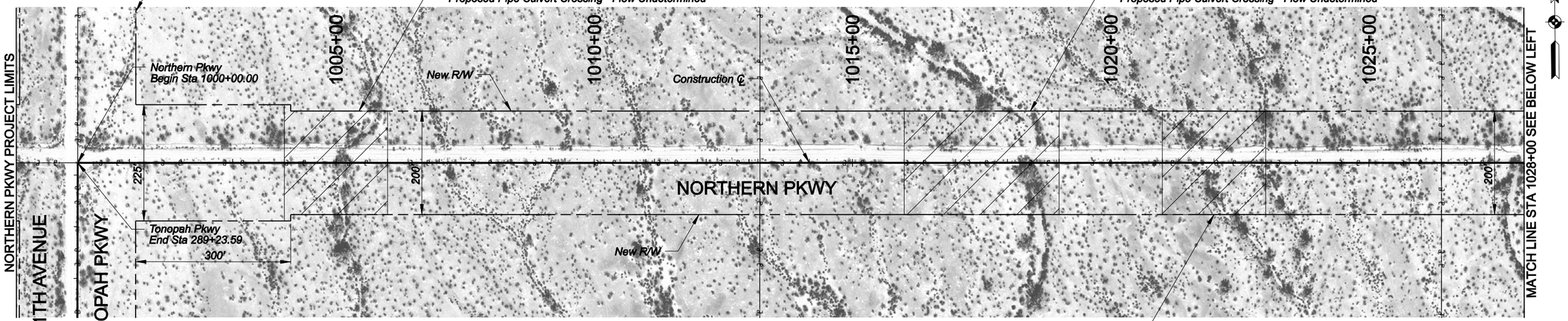

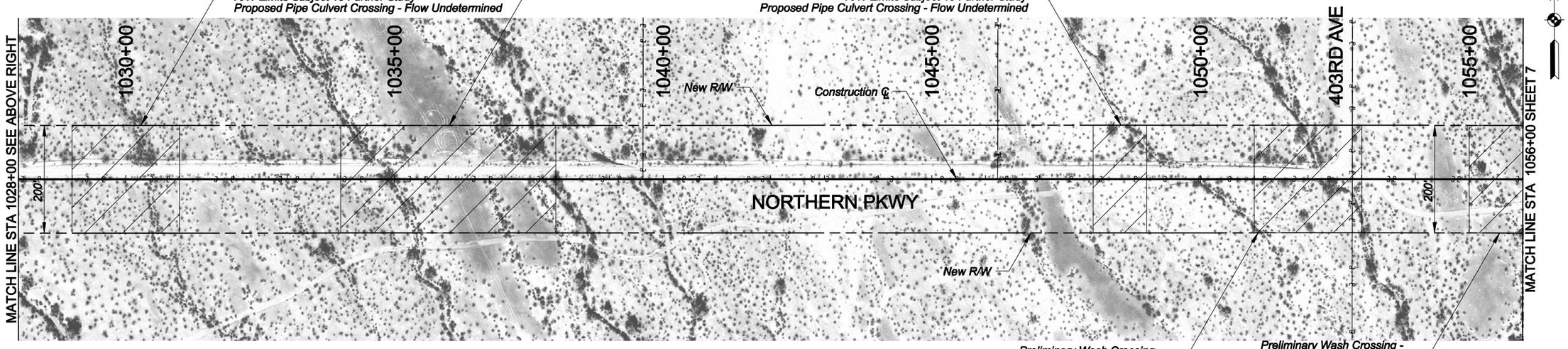

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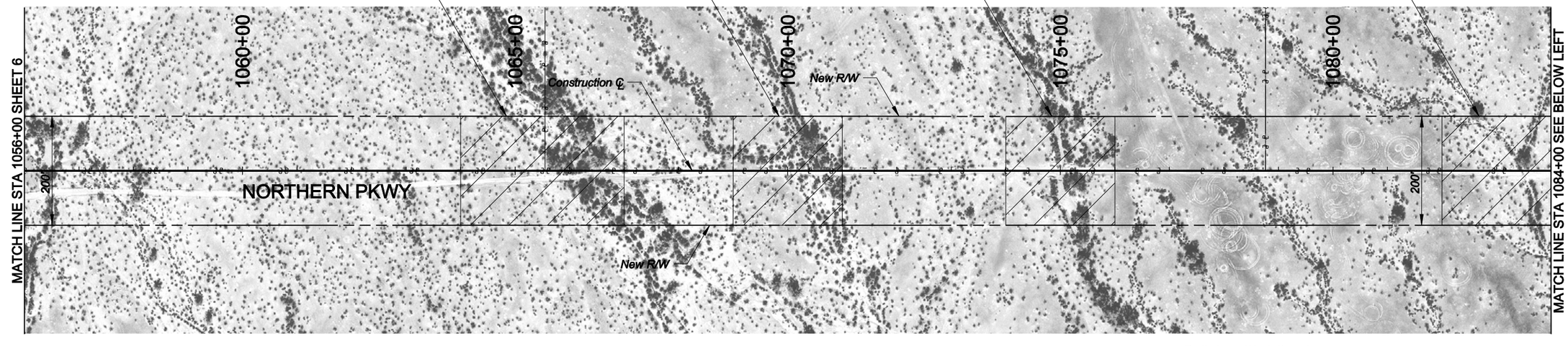

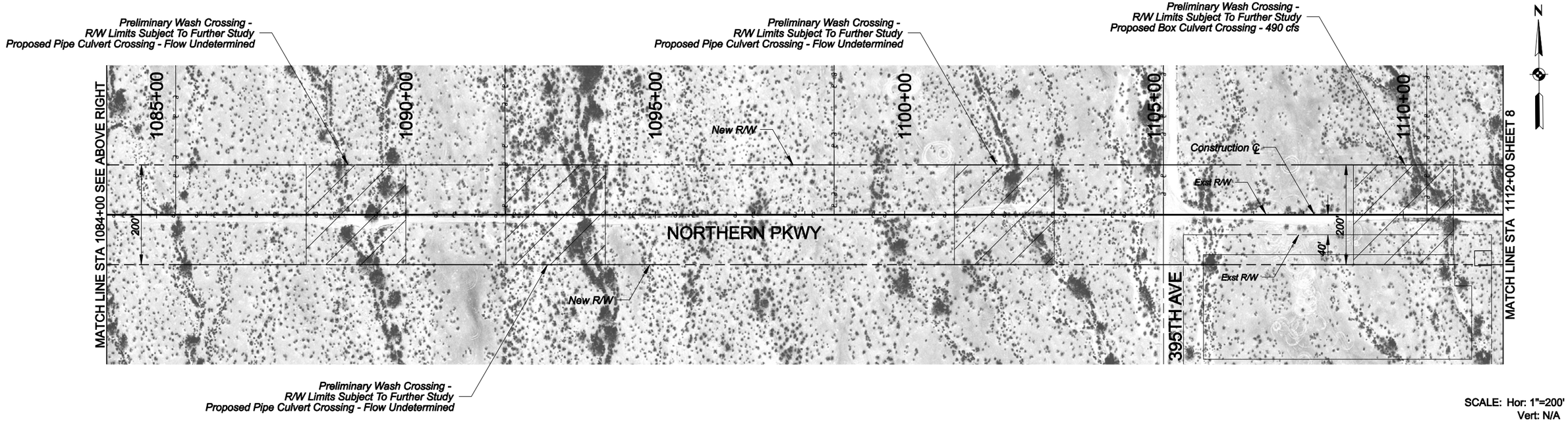

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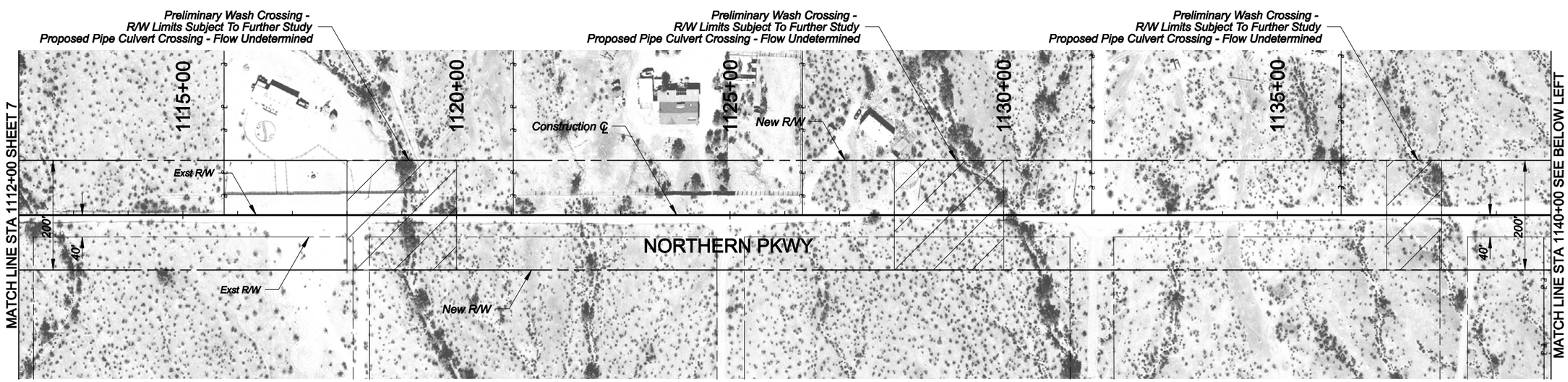

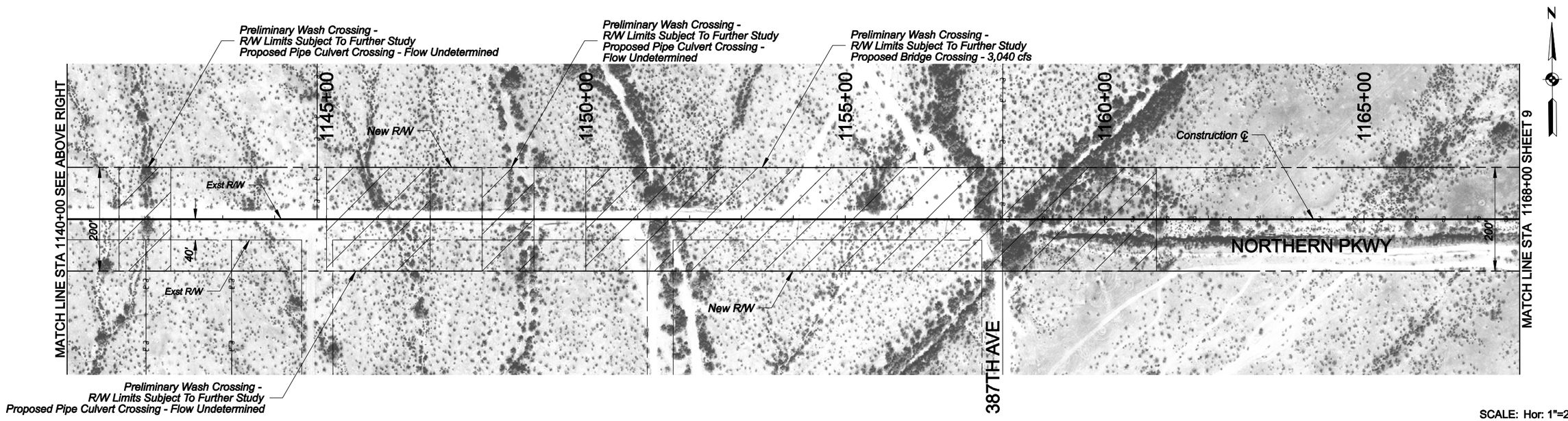

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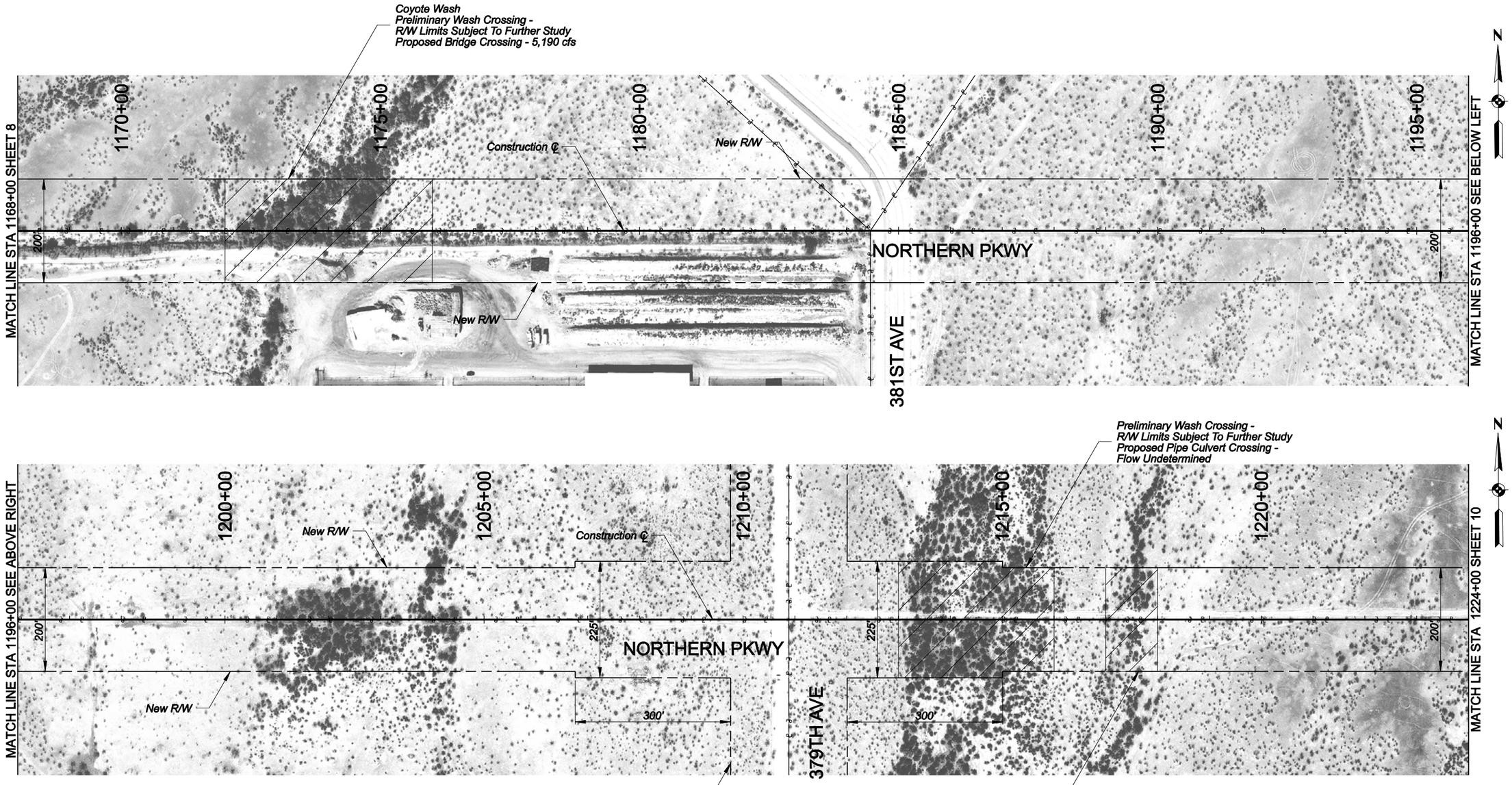

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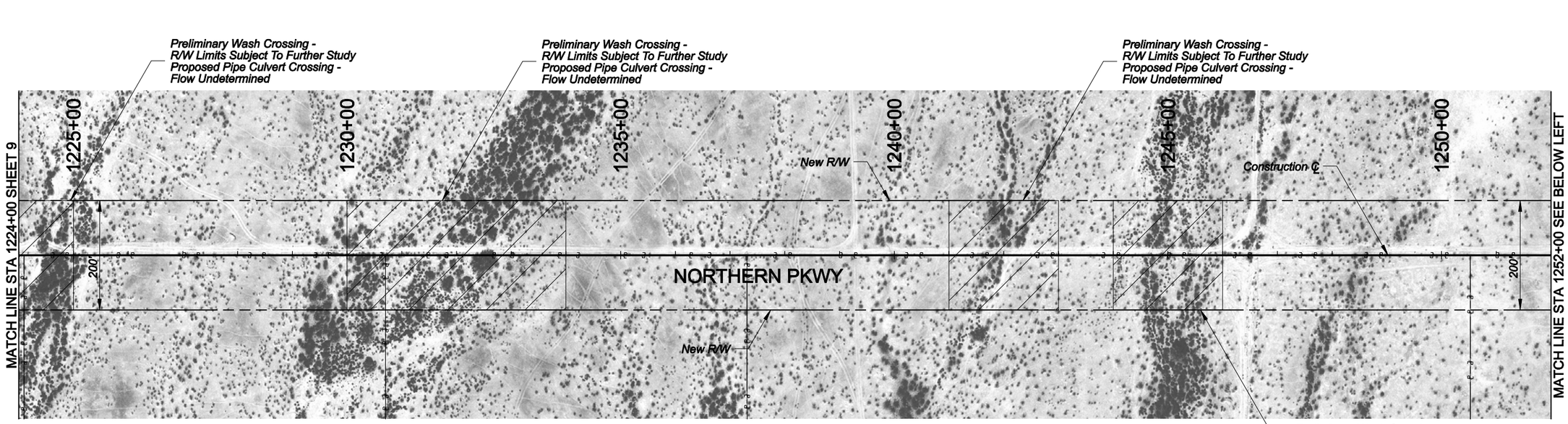

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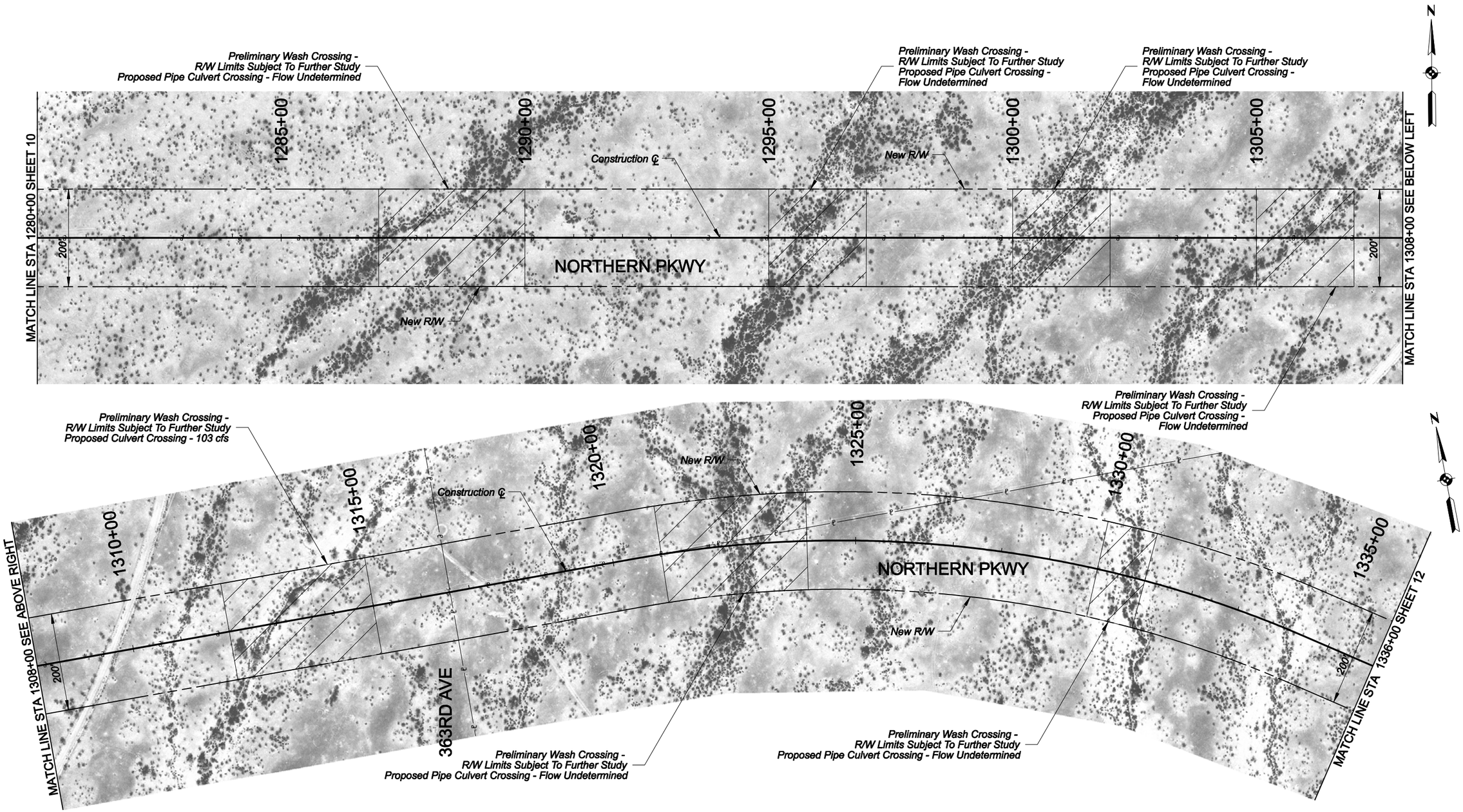

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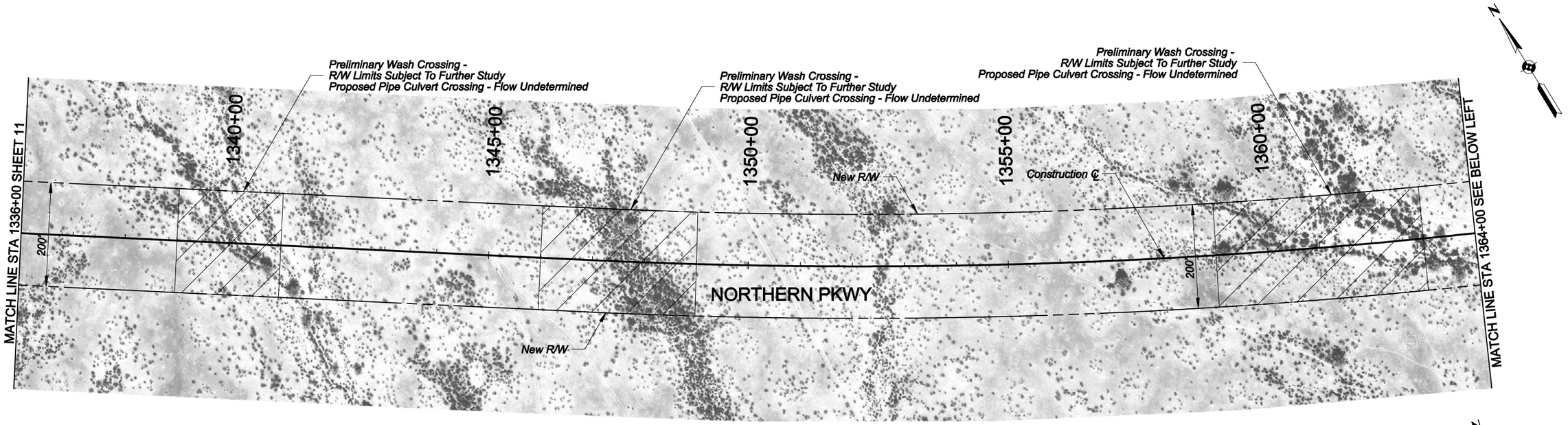

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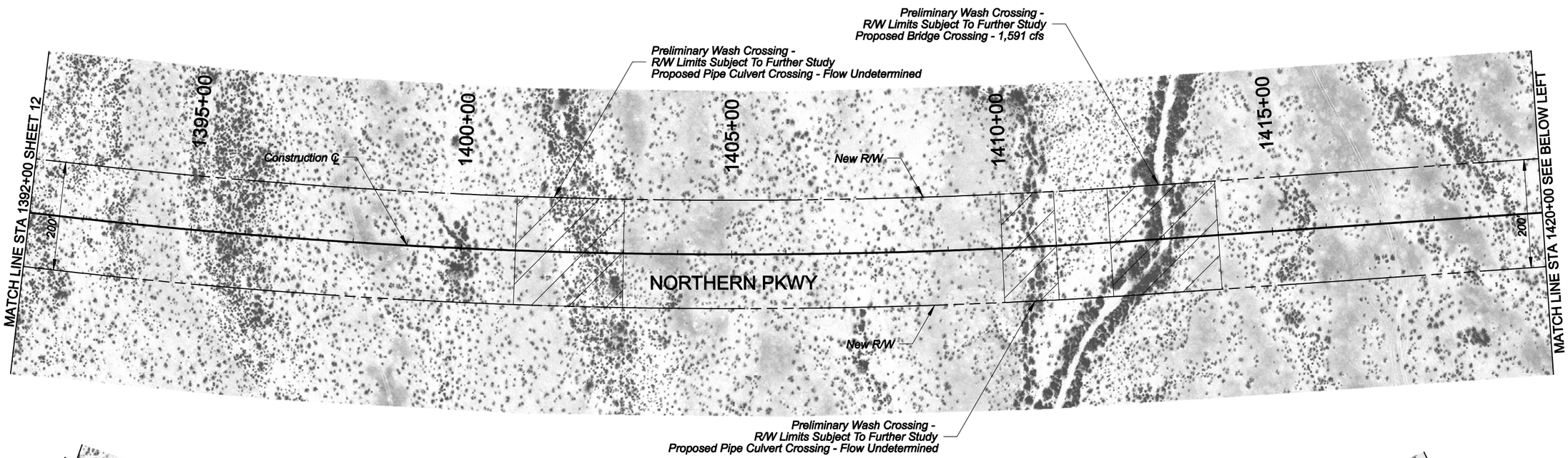

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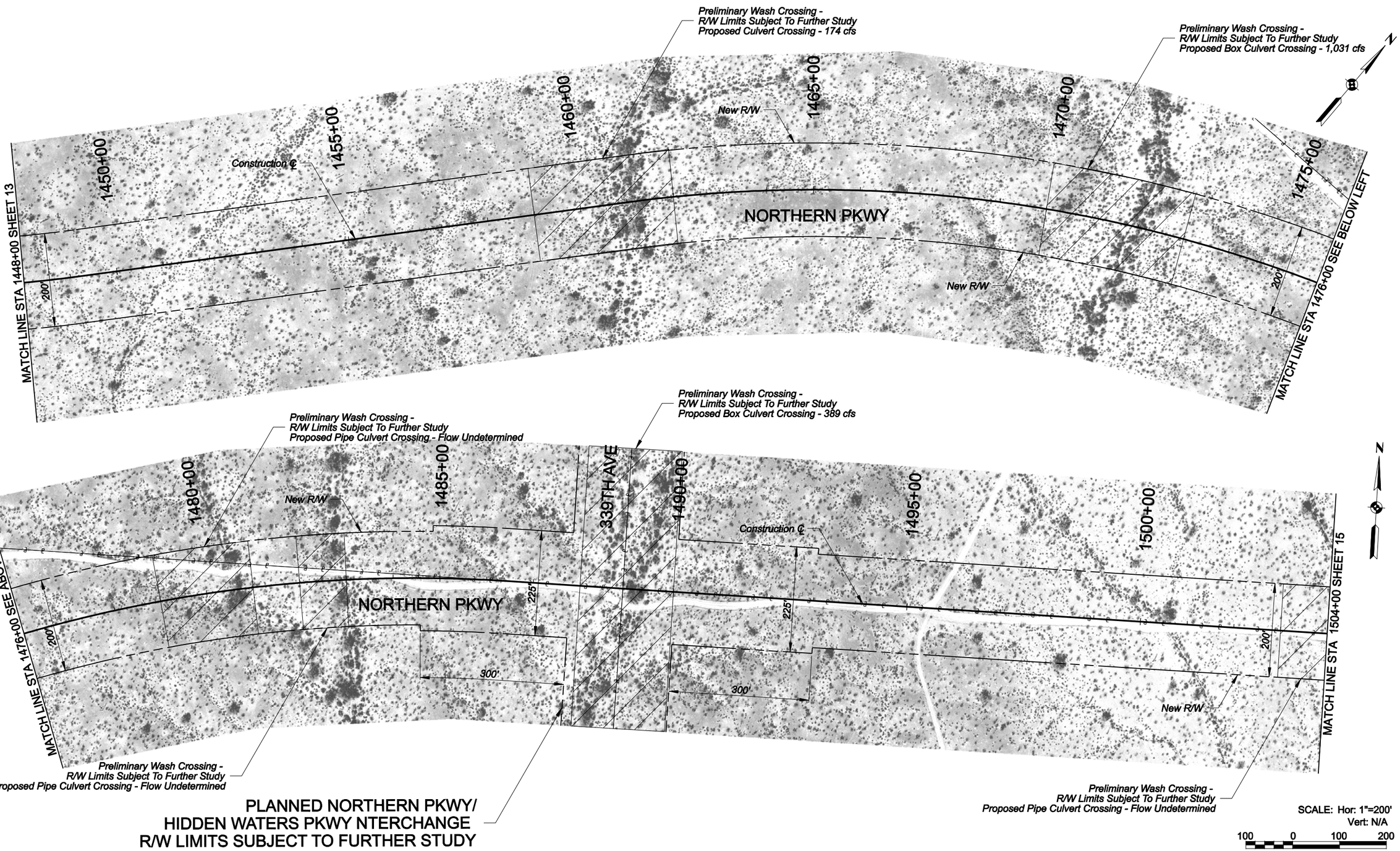

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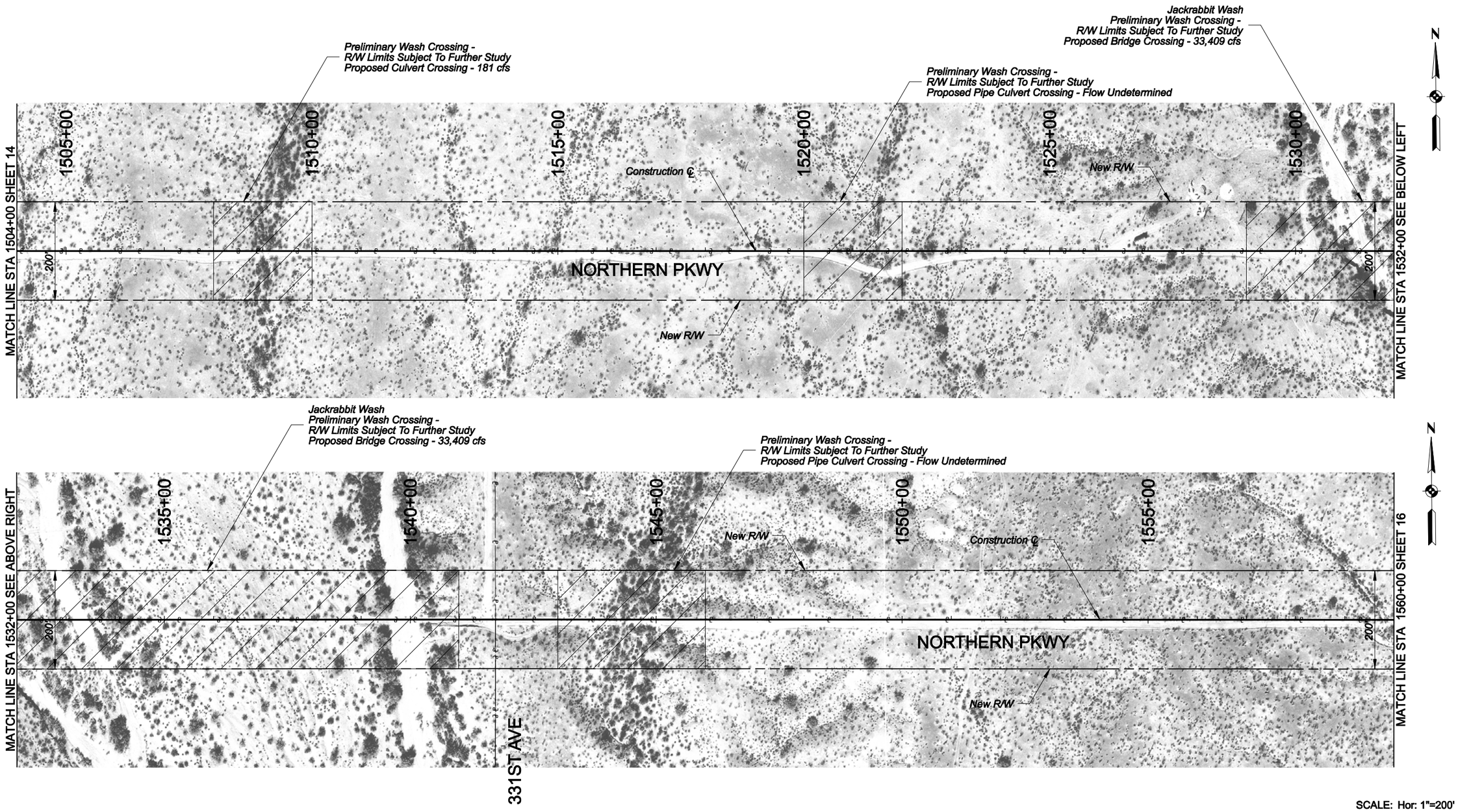

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MARICOPA COUNTY
DEPARTMENT OF TRANSPORTATION

NORTHERN PARKWAY / TONOPAH PARKWAY CORRIDOR FEASIBILITY STUDY

MCDOT PROJECT NO. TT005

RECOMMENDED FUTURE
RIGHT-OF-WAY CORRIDOR

SHEET 15 OF 22

Kimley-Horn and Associates, Inc.

4/11/2011
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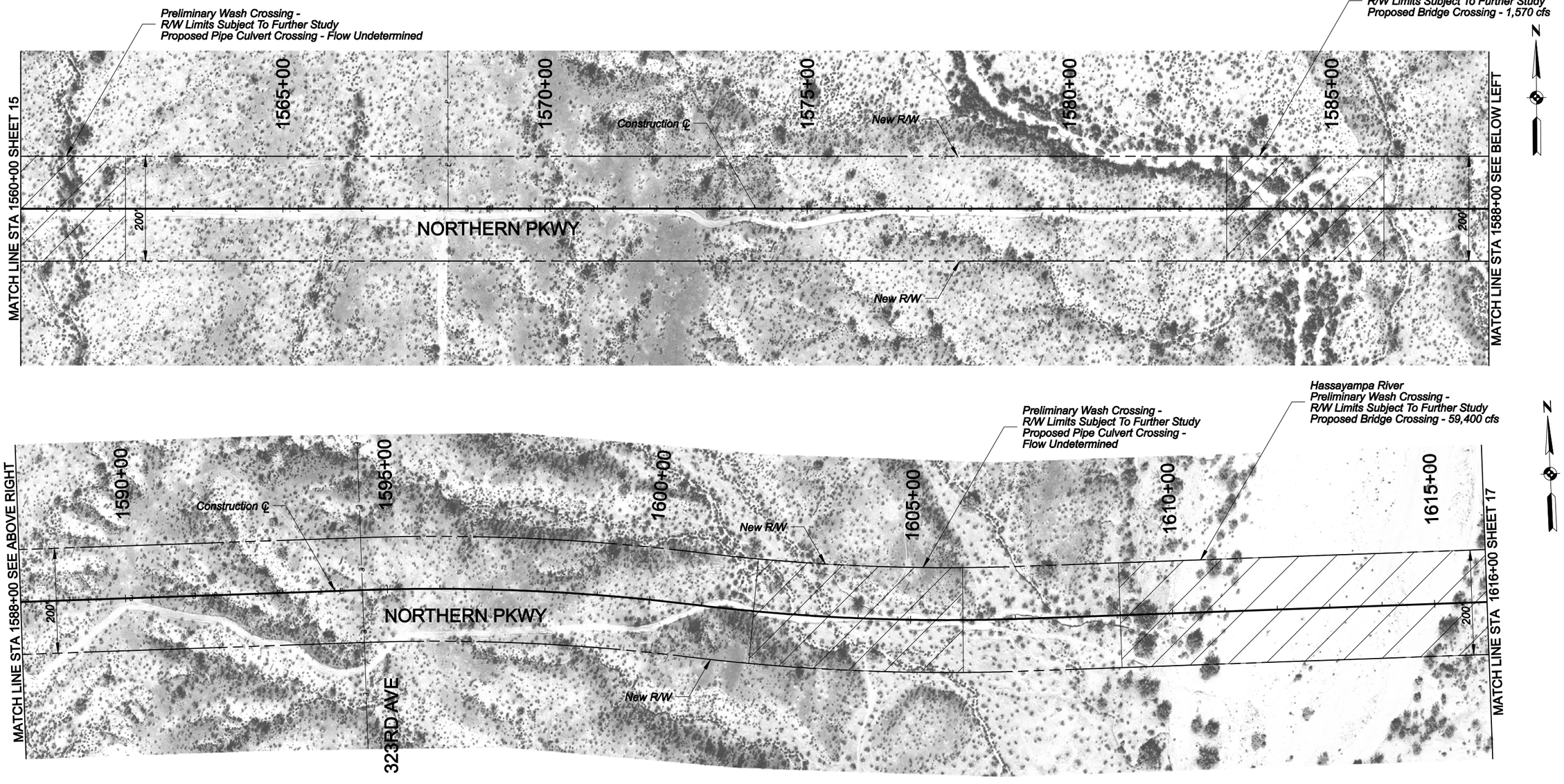

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MARICOPA COUNTY
DEPARTMENT OF TRANSPORTATION

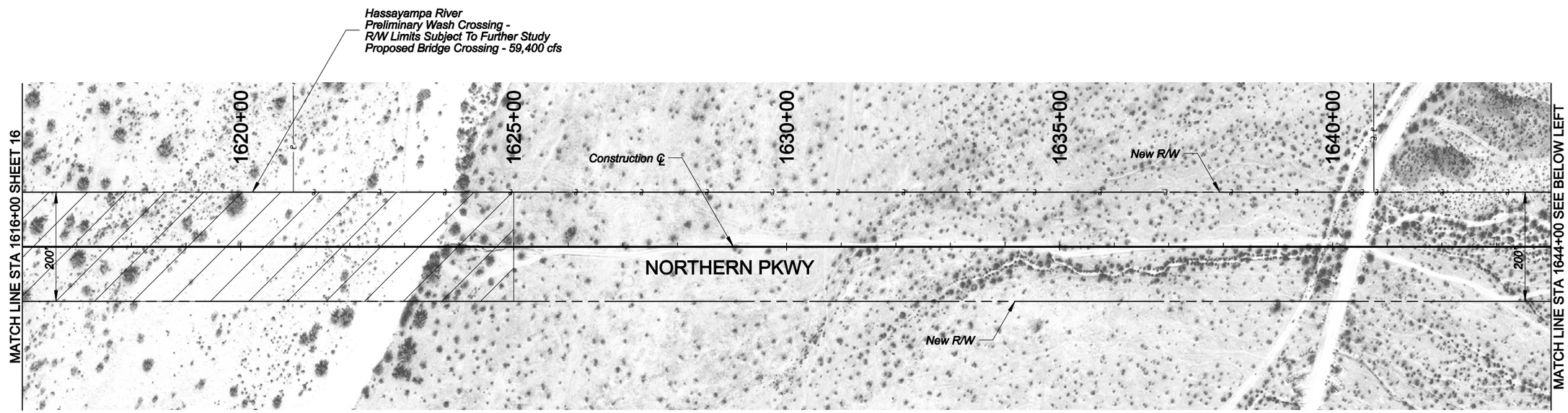
NORTHERN PARKWAY / TONOPAH PARKWAY CORRIDOR FEASIBILITY STUDY

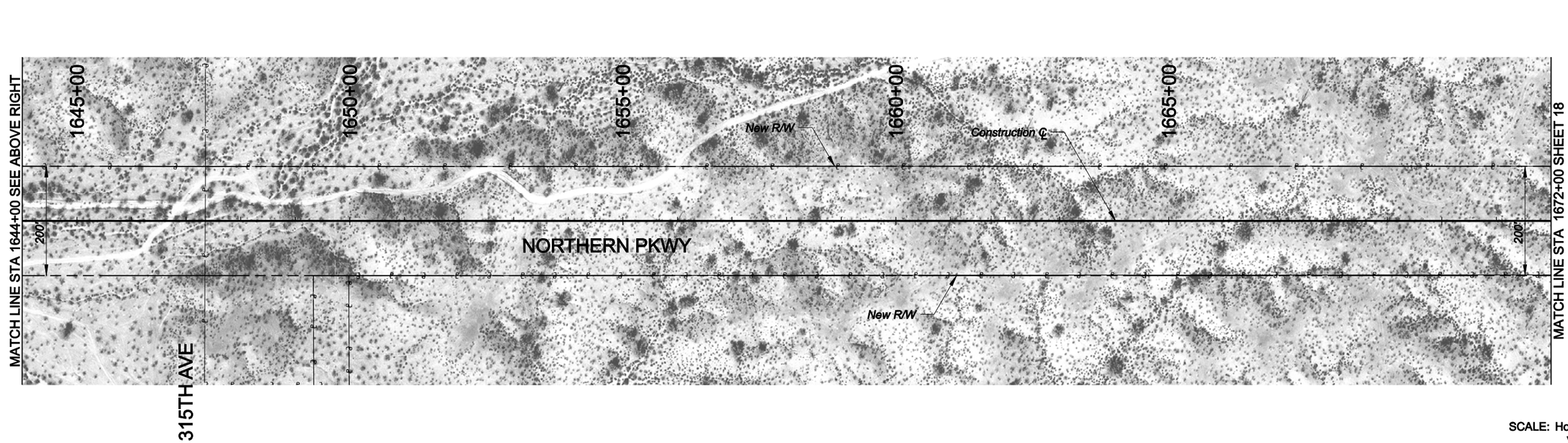
MCDOT PROJECT NO. TT005

RECOMMENDED FUTURE
RIGHT-OF-WAY CORRIDOR

SHEET 16 OF 22

Kimley-Horn and Associates, Inc.





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MARICOPA COUNTY
DEPARTMENT OF TRANSPORTATION

NORTHERN PARKWAY / TONOPAH PARKWAY CORRIDOR FEASIBILITY STUDY

MCDOT PROJECT NO. TT005

RECOMMENDED FUTURE
RIGHT-OF-WAY CORRIDOR

SHEET 17 OF 22

Kimley-Horn and Associates, Inc.

4/11/2011
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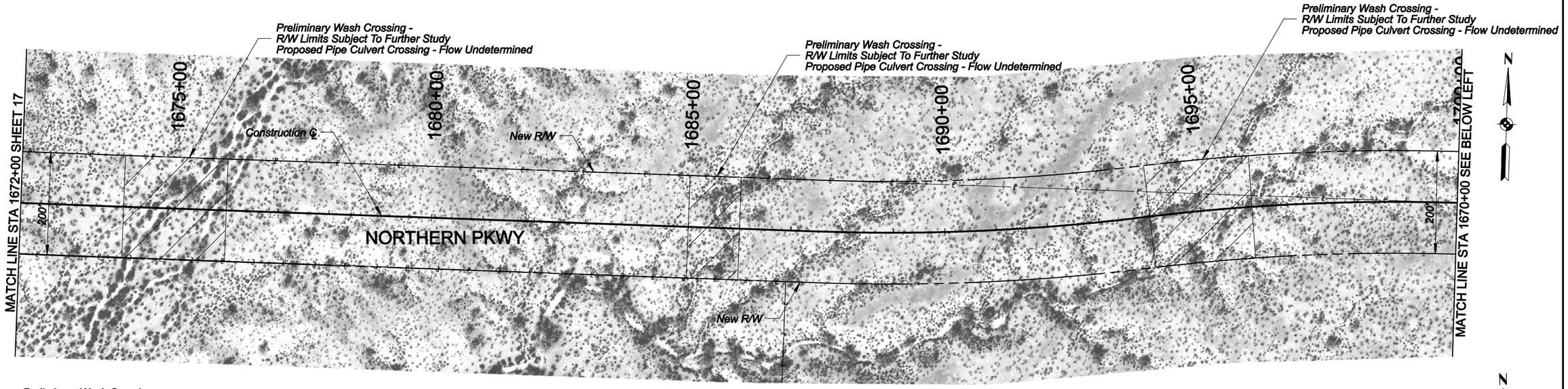

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MARICOPA COUNTY
DEPARTMENT OF TRANSPORTATION

NORTHERN PARKWAY / TONOPAH PARKWAY CORRIDOR FEASIBILITY STUDY

MCDOT PROJECT NO. TT005

RECOMMENDED FUTURE
RIGHT-OF-WAY CORRIDOR

SHEET 18 OF 22

Kimley-Horn and Associates, Inc.

4/11/2011
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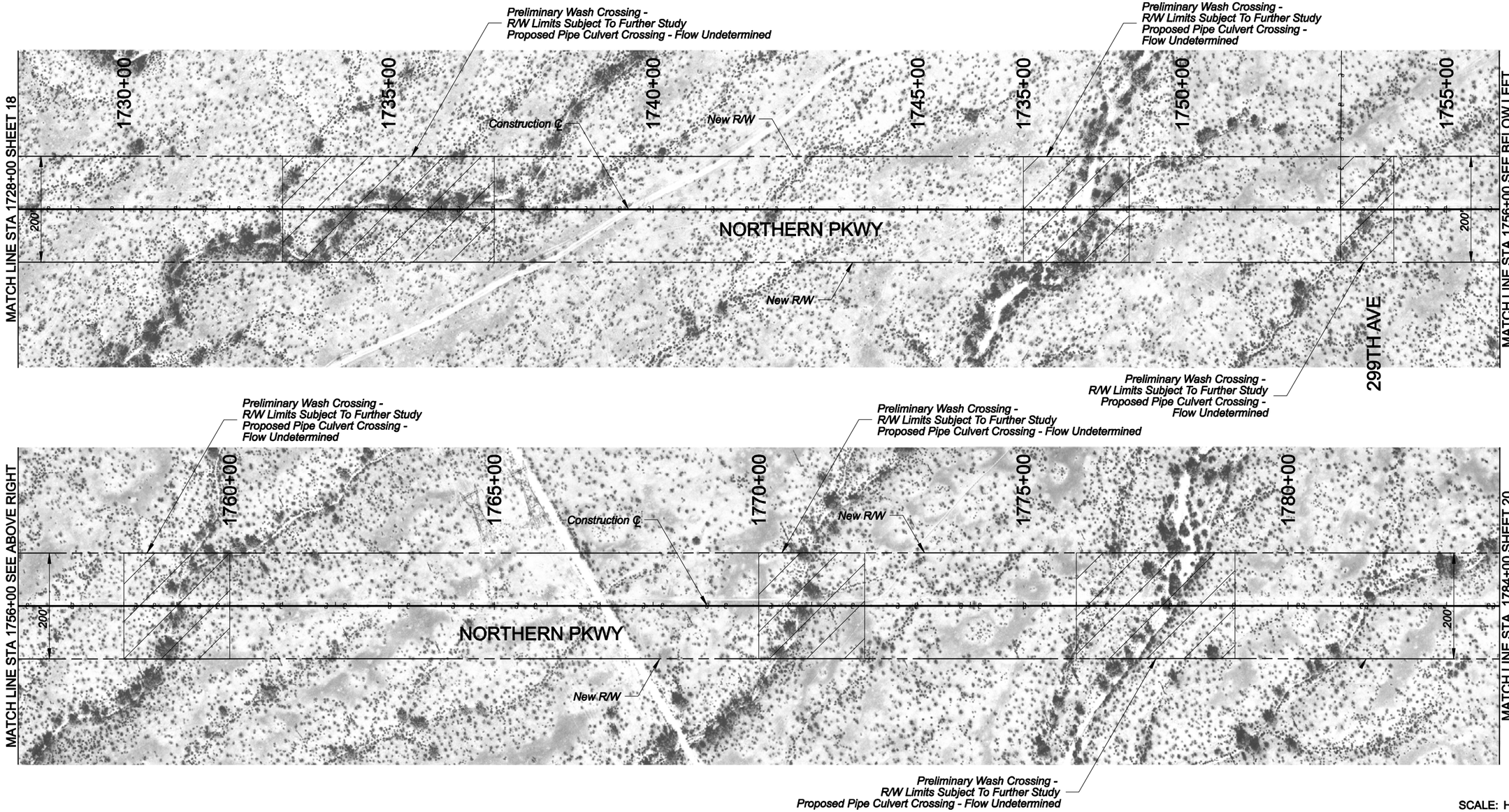

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MARICOPA COUNTY
DEPARTMENT OF TRANSPORTATION

NORTHERN PARKWAY / TONOPAH PARKWAY CORRIDOR FEASIBILITY STUDY

MCDOT PROJECT NO. TT005

RECOMMENDED FUTURE
RIGHT-OF-WAY CORRIDOR

SHEET 19 OF 22

Kimley-Horn and Associates, Inc.

4/11/2011
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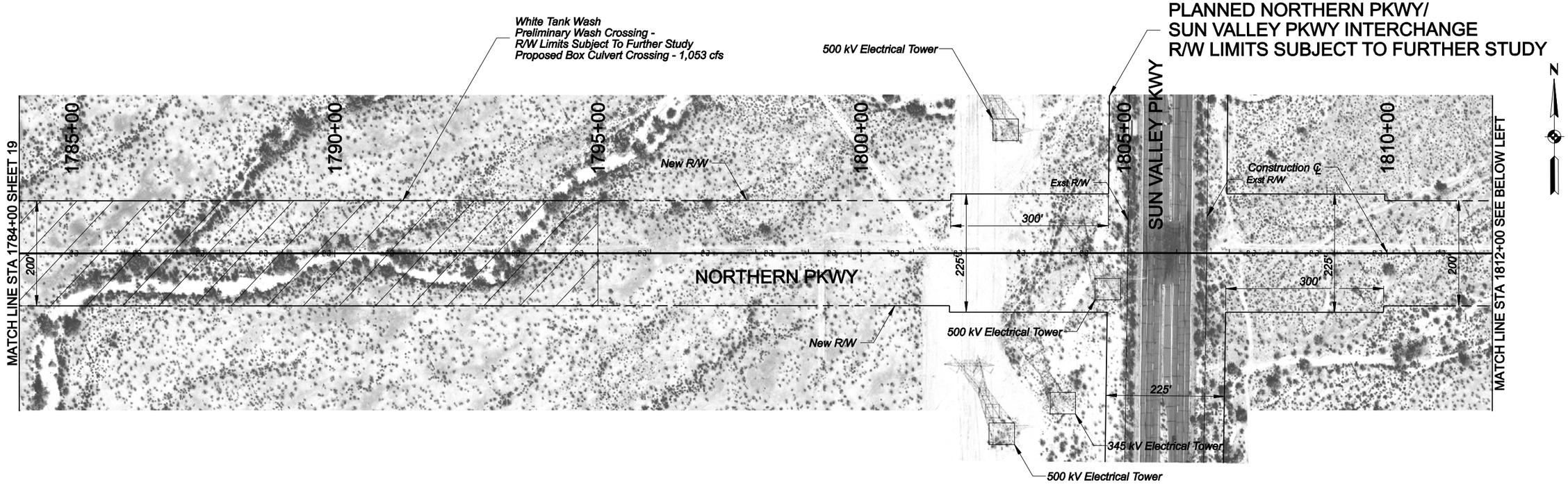

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MARICOPA COUNTY
DEPARTMENT OF TRANSPORTATION

NORTHERN PARKWAY / TONOPAH PARKWAY CORRIDOR FEASIBILITY STUDY

MCDOT PROJECT NO. TT005

RECOMMENDED FUTURE
RIGHT-OF-WAY CORRIDOR

SHEET 20 OF 22

Kimley-Horn and Associates, Inc.

4/11/2011
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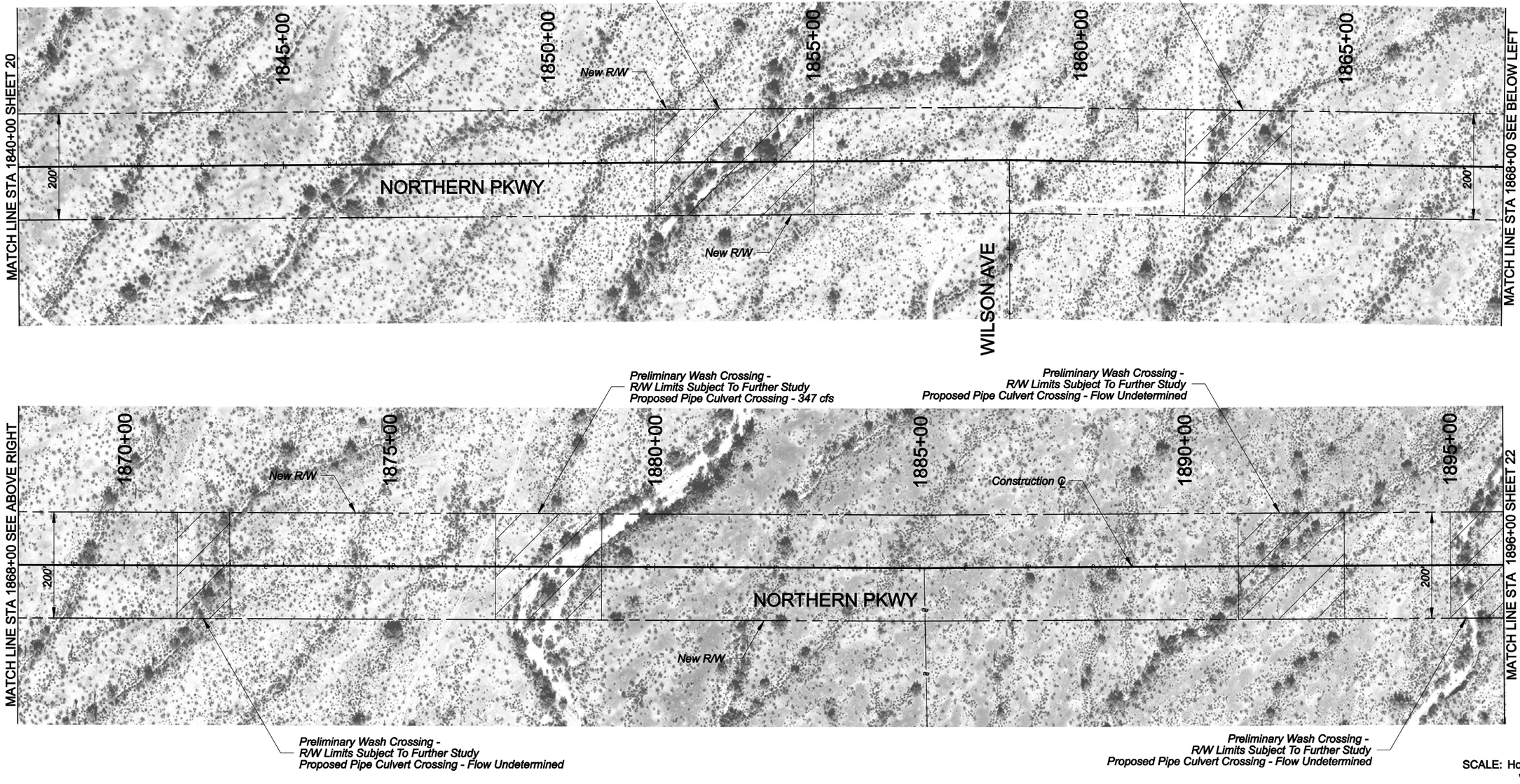

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MARICOPA COUNTY
DEPARTMENT OF TRANSPORTATION

NORTHERN PARKWAY / TONOPAH PARKWAY CORRIDOR FEASIBILITY STUDY

MCDOT PROJECT NO. TT005

RECOMMENDED FUTURE
RIGHT-OF-WAY CORRIDOR

SHEET 21 OF 22

Kimley-Horn and Associates, Inc.

4/11/2011
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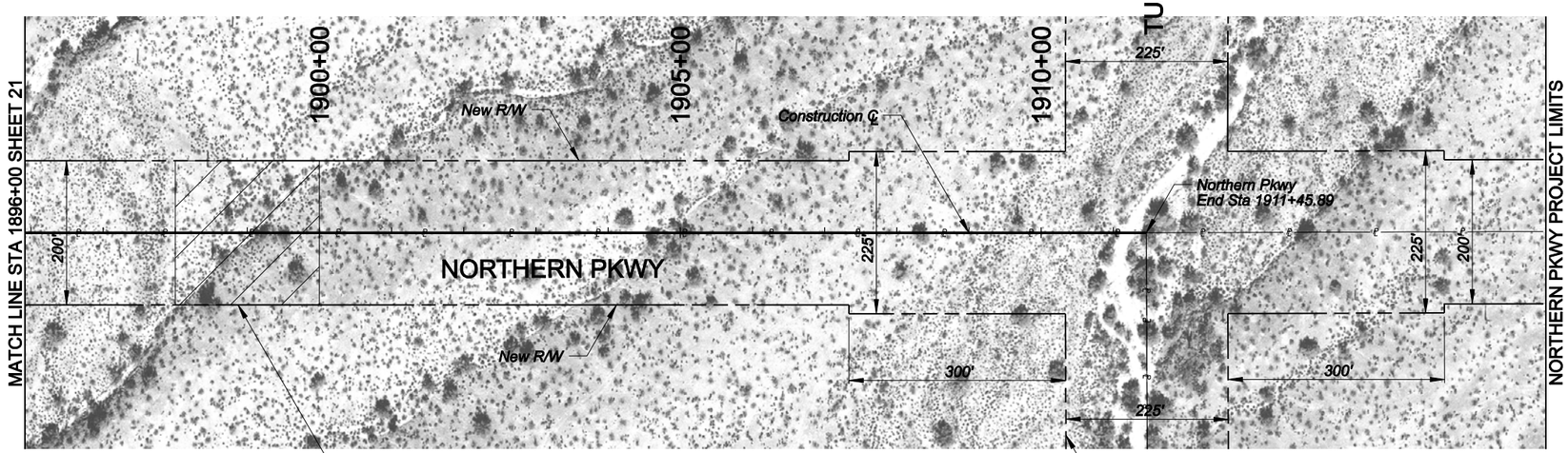

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MARICOPA COUNTY
DEPARTMENT OF TRANSPORTATION

NORTHERN PARKWAY / TONOPAH PARKWAY CORRIDOR FEASIBILITY STUDY

MCDOT PROJECT NO. TT005

RECOMMENDED FUTURE
RIGHT-OF-WAY CORRIDOR

SHEET 22 OF 22

Kimley-Horn and Associates, Inc.

4/11/2011
4:10:09 PM

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