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US-89 Concept Study Report





TABLE OF CONTENTS

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|---|----|
| TABLE OF CONTENTS | 2 |
| 1.0 EXECUTIVE SUMMARY | 3 |
| 1.1 Purpose of the Study | 3 |
| 1.2 Description of US-89 in Davis County | 3 |
| 1.3 Cost Summary | 4 |
| 2.0 ALTERNATIVES ANALYSIS | 5 |
| 2.1 Overview | 5 |
| 2.2 One-Way Frontage Road System – Option 1 | 6 |
| 2.3 Two-Way Frontage Road System – Option 2 (Baseline Design) | 7 |
| 2.4 High Occupancy Vehicle (HOV) Lane – Option 3 | 7 |
| 2.5 Risks and Opportunities | 7 |
| 3.0 TRAFFIC | 9 |
| 3.1 Travel Demand Model | 9 |
| 3.2 US-89 Options Analysis | 10 |
| 3.3 Analysis of U-Turn Movements | 10 |
| 4.0 ENVIRONMENTAL | 16 |
| 4.1 Analysis of Resource Changes | 16 |
| 4.2 Key Issues | 23 |
| 4.3 Environmental Risks | 23 |
| 5.0 CONCEPT COST ESTIMATES | 25 |
| 6.0 FIGURES | 26 |



1.0 EXECUTIVE SUMMARY

1.1 Purpose of the Study

The purpose of the study is to identify potential improvements to the US-89 corridor between Farmington and South Weber. The corridor has been part of a previous environmental study (FEIS Sep 1996) that identified various improvements to the corridor including converting the signalized intersections to grade-separated interchanges. As part of the FEIS, improvements to the local street network were included in the form of intermittent two-way frontage roads on both sides of the highway.

This study aims to examine the potential functionality of a one-way frontage road (OWFR) network along both sides of an improved US-89 to determine the feasibility and make comparisons to the FEIS baseline alternative. The one-way frontage roads would offer an alternative method for local access along the highway while still improving US-89 to a grade-separated highway.

In general, the improvements to US-89 remain as previously studied. The mainline will be improved to a six-lane highway with grade-separated interchanges at key locations. The primary difference in the alternatives considered in this study are related to the frontage road network. The study includes traffic analysis, preliminary layout, and conceptual cost estimates.

1.2 Description of US-89 in Davis County

US-89 in Davis County is a four lane (two in each direction) urban arterial from the I-15 interchange in Farmington to Harrison Boulevard in South Ogden, Weber County. The highway serves as a link between Ogden and Salt Lake City as well as serving the local communities along its route. The study area has experienced rapid growth in population and commercial development, which have brought increased demands on the highway system. The purpose and need for the project identified by the FEIS remains as: Corridor Preservation, Elimination of System Deficiencies, and Safety Improvements.





1.3 Cost Summary

Planning level cost estimates are summarized below for both alternatives. Additional supporting detail is contained in Section 5.0. As a detailed estimate is not feasible at this stage in planning, contingency was incorporated within the construction, right-of-way, and utility portions of the estimates. Similar calculations to support a cost estimate were made for each alternative.

General Assumptions:

- Full reconstruction of US-89 with flexible pavement
- Some soft spot repair anticipated
- Noise wall per FEIS (will change but represented baseline condition)
- Bridges are traditional steel or prestressed concrete girder
- Retaining walls would be needed at bridge locations
- Drainage system to be combination of pipe culvert collection and parallel ditches
- An allowance was provided for earthwork

Right-of-Way

- A total of 39 advance acquisition parcels are included in the total cost
- Residential relocations = \$350,000
- Commercial relocations = \$1,000,000
- Damage allowance included in partial takes
- Administrative costs included
- No allowance for surplus property

Table 1.1 – Planning Level Cost Summary

| | Base Line Option | | OWFR Option | |
|--------------------------------|-----------------------------|------------------------------|-----------------------------|------------------------------|
| | Mainline: | 6-lane Total | Mainline: | 6-lane Total |
| | Local Roads/Frontage Roads: | Two-Way Frontage Road System | Local Roads/Frontage Roads: | One-Way Frontage Road System |
| Construction | \$ | 157,500,000 | \$ | 161,600,000 |
| Program Management (3%) | \$ | 4,800,000 | \$ | 4,900,000 |
| Environmental Study | \$ | 1,000,000 | \$ | 1,000,000 |
| Preliminary Engineering (8%) | \$ | 12,600,000 | \$ | 13,000,000 |
| Construction Engineering (10%) | \$ | 15,800,000 | \$ | 16,200,000 |
| Right-of-Way | \$ | 60,500,000 | \$ | 55,200,000 |
| Utilities | \$ | 10,500,000 | \$ | 10,500,000 |
| Incentives | \$ | 400,000 | \$ | 500,000 |
| Aesthetics | \$ | 1,200,000 | \$ | 1,300,000 |
| Change Order Contingency (10%) | \$ | 16,800,000 | \$ | 17,200,000 |
| | \$ | - | | |
| Total (2015) | \$ | 281,100,000 | \$ | 281,400,000 |
| Total (2019) | \$ | 323,265,000 | \$ | 323,610,000 |



2.0 ALTERNATIVES ANALYSIS

2.1 Overview

US-89 in Davis County is a four lane (two in each direction) urban arterial from the I-15 interchange in Farmington to Harrison Boulevard in South Ogden, Weber County. The highway serves as a primary north-south link between Ogden and Salt Lake City with a connection to I-84 on the north and the I-15/Legacy Parkway interchange on the south. In addition to serving commuters, the route also serves the local communities of Farmington, Fruit Heights, Kaysville, Layton, South Weber, Uintah, and South Ogden. This highway also serves as an alternative to I-15 in this section of Davis County.

This facility was reconstructed to its present alignment and configuration in 1968. Existing at-grade intersections have operated for many years with stop sign controls. Many of the intersections lack desirable geometrics and sight distances. Traffic signals were installed in the early 1990s to improve the safety performance of the highway, but current traffic conditions have outgrown the functionality of a signal-controlled highway.

More recently, existing at-grade signalized intersections have been converted to grade-separated interchanges in accordance with the FEIS. These interchanges have been installed at Shepard Lane, Farmington Main St, SR-193, and South Weber Dr. Additionally, the corresponding frontage roads/local roads in the vicinity of these interchanges have been constructed to accommodate the changes in access and to provide connectivity to the surrounding area.

One of the goals of this study is to provide a high level of mobility along US-89 while providing access to adjacent communities and affected neighborhoods. To address these two issues, this study includes an evaluation of two corridor systems, both having a multi-lane freeway/expressway as the core US-89 improvement.

Option 1 – One-Way Frontage Road System

- Mainline improvements to six lanes (three in each direction)
- Parallel one-way frontage roads (OWFR) adjacent to US-89
- The OWFR begins at the future 400 North interchange and ends at the South Weber Drive interchange
- Interchanges with entrance and exit ramps at existing locations, plus:
 - 400 North
 - Oak Hills Drive
 - Gordon Avenue
 - Antelope Drive
- Grade-separated crossings of US-89 are provided at:
 - Nicholls Road
 - Crestwood Road



Option 2 – Expressway with Two-Way Frontage Road System (Baseline Design)

- Mainline improvements to six lanes (three in each direction)
- Frontage road system similar to the configuration shown in the FEIS and Regional Transportation Plan (RTP)
- Interchanges with entrance and exit ramps at existing locations, plus:
 - 400 North
 - Oak Hills Drive
 - Gordon Avenue
 - Antelope Drive
- Grade-separated crossings of US-89 are provided at:
 - Nicholls Road
 - Crestwood Road

Option 3 – US-89 HOV Lane (Traffic Analysis only)

- Mainline improvements to six lanes (two general purpose lanes plus one express lane in each direction)
- Interchanges/Grade Separations as noted in the other options
- Directional ramps to connect the US-89 express lanes with the I-15 express lanes (I-15 NB to US-89 NB and US-89 SB to I-15 SB only)

2.2 One-Way Frontage Road System – Option 1

The one-way frontage road (OWFR) system begins at the future 400 North (Fruit Heights) interchange. This interchange is currently planned in a tight diamond configuration making this transition fairly straightforward. The northbound OWFR terminates at the South Weber Dr interchange. This has been identified as an ideal terminal location as there is no need for a frontage road between South Weber Dr and I-84. The southbound OWFR on the north end of the corridor is created at the SR-193 interchange. Providing an OWFR southbound between South Weber Dr and SR-193 would create significant impacts to the Weber Basin Water Conservancy District on the northwest corner of the SR-193 interchange.

In general, existing local roads and streets along the entire frontage road route are connected to the one-way system. These intersections will become right-in/right-out access only (See *General Ramp Layout* in Section 6.0). The interchange and grade-separated crossing locations become opportunities for users to change direction, either north to south or south to north.

The area between I-15 and 400 North (Fruit Heights) was also considered for the one-way system. The well-established infrastructure in this area makes the addition of one-way frontage roads more challenging and impactful. For this reason, they are not considered in the alternatives developed for this study.

Other unique elements that should be considered in additional planning of this option include:



- Crestwood Road: The geometry at this location allows for vertical design flexibility including Crestwood Rd aligned over US-89 or with US-89 aligned over Crestwood Rd.
- Each cross-street grade separation provides for the ability to change direction on the frontage road system. An optional enhancement would be the addition of dedicated U-turn or intersection bypass lanes.
- Out-of-direction travel caused by the one-way system and the location of cross-street locations

2.3 Two-Way Frontage Road System – Option 2 (Baseline Design)

The baseline design was established as part of the Final Environmental Impact Study completed in 1996. The core network of interchange locations along US-89 remain the same as the one-way system described above as well as in the FEIS.

The locations of new two-way frontage roads required to complete the system identified in the FEIS include:

- West Side:
 - Lloyd Road extension to Green Road
 - Ward Road to Crestwood Road
 - Mutton Hollow to Oak Hills Drive
 - Oak Hills Drive to Woodridge Drive
 - Gentile Street to Cherry Lane
 - 1650 North to 1925 North
- East Side:
 - Green Road to Peachtree Lane
 - 400 North (Fruit Heights) to Gordon Avenue
 - Valley View Drive to South Weber Drive

2.4 High Occupancy Vehicle (HOV) Lane – Option 3

For the geometric layout, each alternative will accommodate the inclusion of the HOV alternative. The inside general purpose lane is converted to an HOV lane. Some additional space is required to meet current standards. The layouts include the space for an 11-foot HOV lane and a 4 foot buffer area between the HOV and general purpose lanes. The same inside shoulder width is provided. Refer to the traffic analysis section for more information on this alternative.

2.5 Risks and Opportunities

Risks/Challenges

- Utility impacts (petroleum pipeline, Weber Basin aqueduct, fiber optic, overhead power)
- Rising ROW costs
- Public opposition to both one-way frontage roads and two-way frontage roads in existing neighborhoods
- Maintenance of Traffic during construction



Opportunities

- Improved interchange geometry associated with one-way system allowing for narrow spacing of intersections
- Utilizing existing pavements, especially along frontage road routes, to reduce overall cost and ROW footprint
- Partnering with local agencies for drainage outfalls
- Sale of surplus ROW to reimburse corridor preservation funds
- Reduced number of grade separations associated with the one-way option based on out-of-direction travel and demand



3.0 TRAFFIC

3.1 Travel Demand Model

Overview

The Wasatch Front Regional Council (WFRC) and Mountainland Association of Governments (MAG) jointly maintain a travel demand forecasting model for the four-county metropolitan region (Salt Lake, Utah, Weber, and Davis counties). The travel demand model (TDM) predicts future travel demand based on projections of land use, socioeconomic patterns, and transportation system characteristics. The model is run using the TP+/Cube software (currently version 6.4.1). References to “the model” in this report refer to the scripts and data maintained by WFRC and MAG, not to the Cube software. At the time of this study, the WFRC/MAG official version of the TDM is 8.0, which is calibrated to represent 2011 base year travel conditions.

Specific inputs to the model include socioeconomic forecasts and transportation system data. The socioeconomic data includes population, households, employment, and average household income. Household data is further classified by household size, number of workers, and average income. Employment data is classified into twelve categories which include two for public schools. The transportation system data includes both roadway and transit networks. The roadway network includes freeways, arterial routes and collector routes. The transit network includes commuter rail and light-rail lines, bus rapid transit lines, express bus routes, and many local bus routes. New to version 8.0 is a freight component which estimates truck traffic.

The WFRC/MAG model uses the traditional four-step modeling process, consisting of trip generation, trip distribution, mode split, and trip assignment. It includes an auto ownership model to better estimate trip generation and mode split. The model provides a feedback loop during trip distribution, allowing traffic congestion to influence trip distribution patterns. WFRC and MAG have periodically updated the model over the last several years to incorporate new observed data and improved capabilities.

Existing socioeconomic and transportation system data were used to create a base-year (2015) model. Future year forecasts are prepared by running the model using future year socioeconomic and transportation system data. Traffic volume data for the operational analyses were post-processed to obtain balanced inputs for the mainline, ramp, and ramp terminal intersections under study. No seasonal adjustments were applied because weekday peak-hour travel is dominated by commuter traffic.

Modifications to the Travel Demand Model

The version 8.0 TDM from the West Davis Corridor Environmental Impact Statement was used as the base model for the US-89 study. This model has been calibrated for south Weber County and north Davis County more extensively than the default WFRC model and has been peer reviewed with UDOT oversight. Some additional changes were made to the TAZ structure and roadway network for the US-89 area. The original TAZ in the model are well suited for regional traffic forecasts but generally do not provide adequate detail for a smaller-scale study. Smaller TAZ can provide better loading of traffic onto the roadway network. For these reasons, many of the original WFRC TAZ within or near the study area were split into smaller zones. In most



instances, the TAZ are split along barriers such as existing or planned roads, rivers, railroads, and/or major land-use changes. After the splits, the socioeconomic data from the original TAZ were distributed into the new zones. It was assumed that variables such as income and household size for the smaller TAZ were the same as the original TAZ. The roadway network was updated to accommodate the new TAZ structure and to better represent the existing roadway network within the study area.

Traffic Count Data

Existing traffic count data was obtained from various sources including UDOT's Traffic on Utah Highways, previous traffic studies, and manual traffic counts. At the time of the study, Traffic on Utah Highways only contained data through 2013. This data was used to extrapolate and estimate 2015 AWDT which coincides with the existing conditions TDM model year for the study. Peak hour traffic data was collected at the following US-89 intersections: Nicholls Road, 400 North (Fruit Heights), Crestwood Road, Oak Hills Drive, Antelope Drive, and SR-193.

3.2 US-89 Options Analysis

The TDM was used to evaluate the US-89 options under future traffic conditions. Each option was coded into the network and run with 2040 socioeconomic data. The options included: 1) No Build, 2) US-89 with three general purpose lanes each direction and two-way frontage roads, 3) US-89 with three general purpose lanes each direction and single-lane, one-way frontage roads, 4) US-89 with two general purpose lanes each direction and two-lane, one-way frontage roads, and 5) US-89 with two general purpose lanes and one HOV lane each direction. Each option was analyzed using planning level PM volume/capacity (v/c) values from the TDM to determine approximate Level of Service (LOS). Additionally, the option with single-lane, one-way frontage roads was analyzed with 2024 and 2034 data to determine when the third general purpose lane would be needed on US-89. Table 3.1 on the following page contains a summary of the results of the analysis.

3.3 Analysis of U-Turn Movements

One potential feature often included in one-way frontage road systems is dedicated U-turn lanes at the interchanges. These can facilitate traffic circulation and provide an improved user experience when traveling out-of-direction to go northbound or southbound. An analysis was performed to determine the user benefit of U-turns on US-89 from a traffic operations stand point. 2040 traffic volumes were obtained from the TDM and adjusted based on existing count data. The turning movement volumes used for the analysis are presented in the Figures 3.1 to 3.6.



Table 3.1 – US-89 Options Analysis Summary

| No. | From | To | Adjusted AWDT | | | | | | | | | | | | | | | | | | | |
|-----|-----------------|-----------------|----------------------------------|--------|-----|----------------------------------|--------|-----|---------------|-----|--|--------|-----|----------------------------------|--------|-----|----------------------------------|--------|-----|--------------------------------|--------|-----|
| | | | 2024 2-Lane US-89 1-Lane OWFR | | | 2034 3-Lane US-89 1-Lane OWFR | | | 2040 No Build | | 2040 RTP 3-Lane US-89 2-Way Frontage Rd | | | 2040 3-Lane US-89 1-Lane OWFR | | | 2040 2-Lane US-89 2-Lane OWFR | | | 2040 with HOV (2-GP, 1-HOV) | | |
| | | | GP Vol | FR Vol | LOS | GP Vol | FR Vol | LOS | GP Vol | LOS | GP Vol | FR Vol | LOS | GP Vol | FR Vol | LOS | GP Vol | FR Vol | LOS | GP Vol | HOV | LOS |
| 1 | Main St. | Nicholls Rd. | 52,500 | 4,000 | C-D | 63,300 | 3,900 | C-D | 46,200 | E-F | 69,100 | 2,400 | C-D | 68,800 | 4,000 | C-D | 65,200 | 5,200 | E-F | 51,600 | 16,100 | D-E |
| 2 | Nicholls Rd. | 400 North | 51,300 | 3,100 | C-D | 62,100 | 3,100 | C-D | 44,000 | E-F | 67,900 | 2,800 | C-D | 67,600 | 3,200 | C-D | 64,000 | 4,300 | E-F | 49,700 | 16,800 | C-D |
| 3 | 400 North | Oak Hills Dr. | 53,300 | 4,200 | C-D | 64,400 | 4,200 | C-D | 45,200 | E-F | 69,700 | 1,900 | C-D | 70,000 | 4,200 | C-D | 65,700 | 6,100 | E-F | 54,000 | 16,500 | D-E |
| 4 | Oak Hills Dr. | Antelope Dr. | 53,500 | 4,900 | C-D | 64,600 | 4,700 | C-D | 45,500 | E-F | 68,900 | 4,700 | C-D | 69,900 | 4,900 | C-D | 65,500 | 7,000 | E-F | 54,500 | 17,000 | D-E |
| 5 | Antelope Dr. | SR-193 | 52,900 | 3,000 | C-D | 63,900 | 2,900 | C-D | 44,700 | E-F | 68,300 | 2,700 | C-D | 69,200 | 2,900 | C-D | 64,800 | 5,000 | E-F | 50,100 | 18,300 | D-E |
| 6 | SR-193 | South Weber Dr. | 61,300 | 4,800 | D-E | 71,500 | 6,500 | D-E | 57,500 | E-F | 81,700 | - | D-E | 76,100 | 7,200 | D-E | 72,700 | 9,300 | E-F | 62,500 | 18,100 | E-F |
| 7 | South Weber Dr. | I-84 | 70,200 | - | D-E | 81,900 | - | E-F | 63,500 | E-F | 87,100 | - | E-F | 87,200 | - | E-F | 86,000 | - | E-F | 86,000 | - | E-F |

Notes: 1) LOS is obtained directly from the WFRC Travel Demand Model estimates from PMV/C
 2) All Volumes are the daily total of both directions or both frontage roads



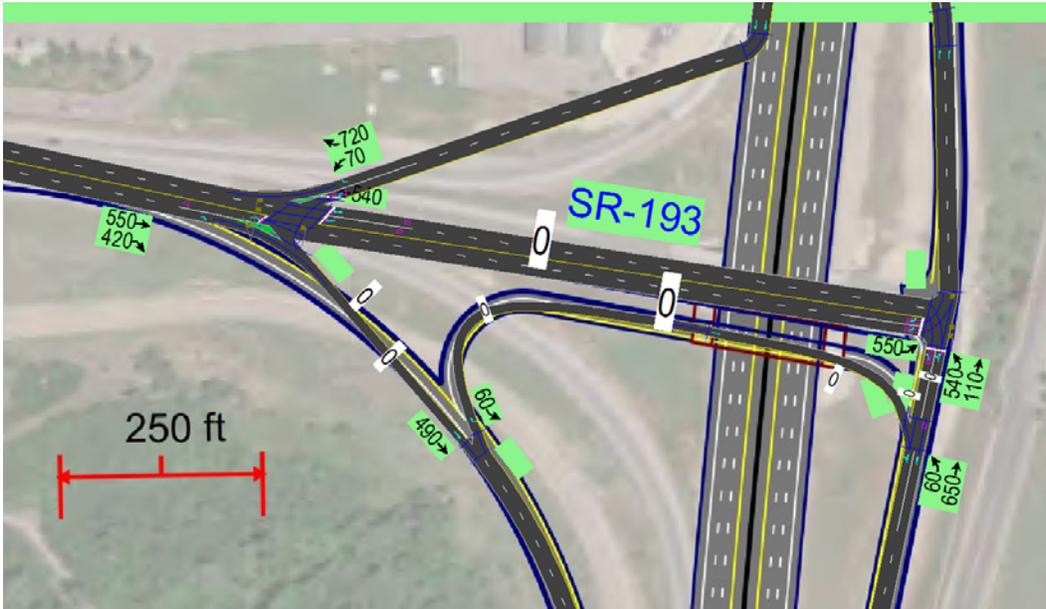


Figure 3.1 – 2040 PM Peak Volumes: SR-193

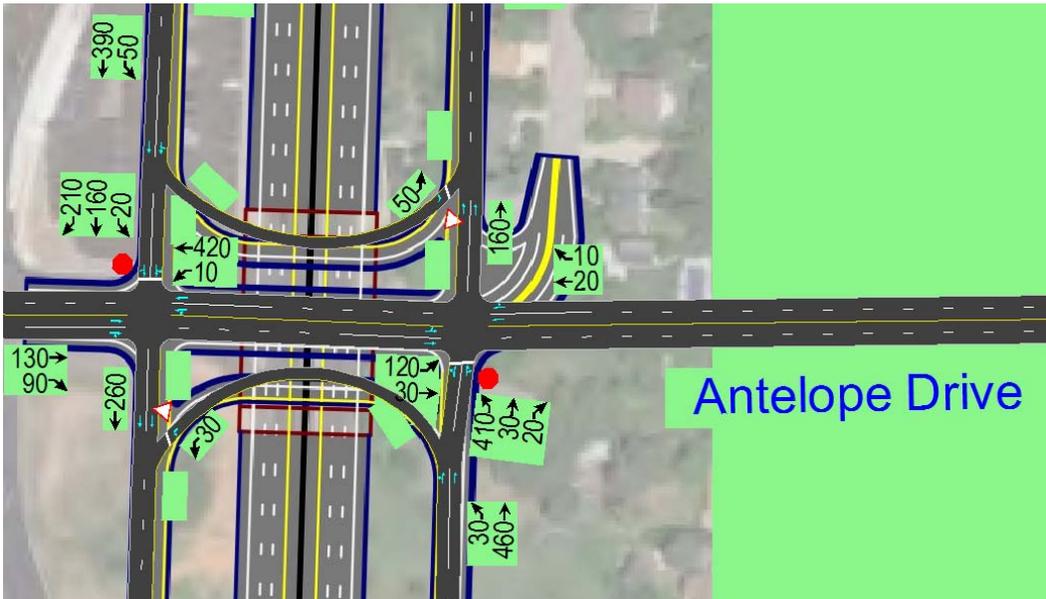


Figure 3.2 – 2040 PM Peak Volumes: Antelope Drive

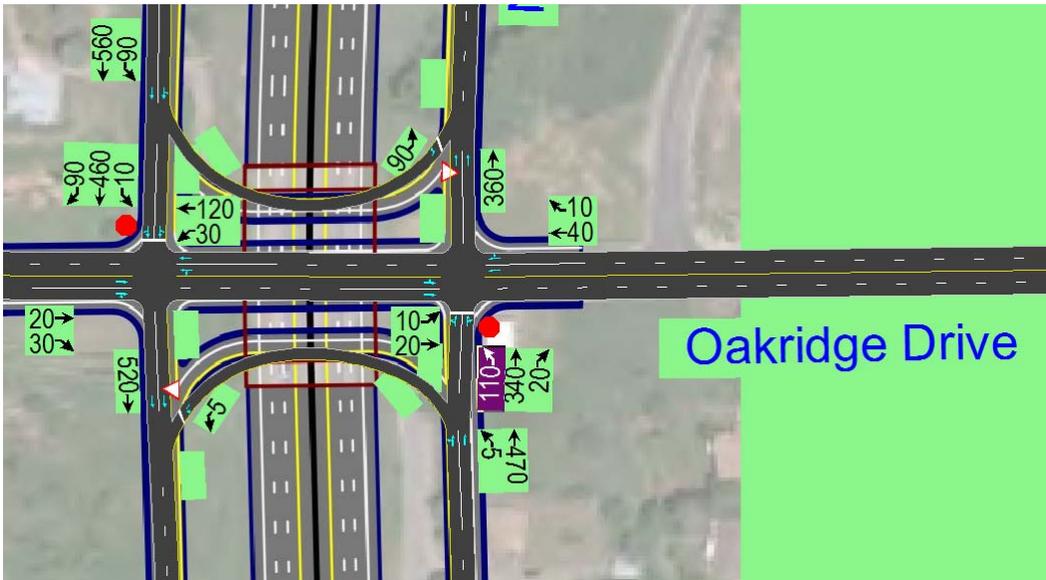


Figure 3.3 – 2040 PM Peak Volumes: Oakridge Drive

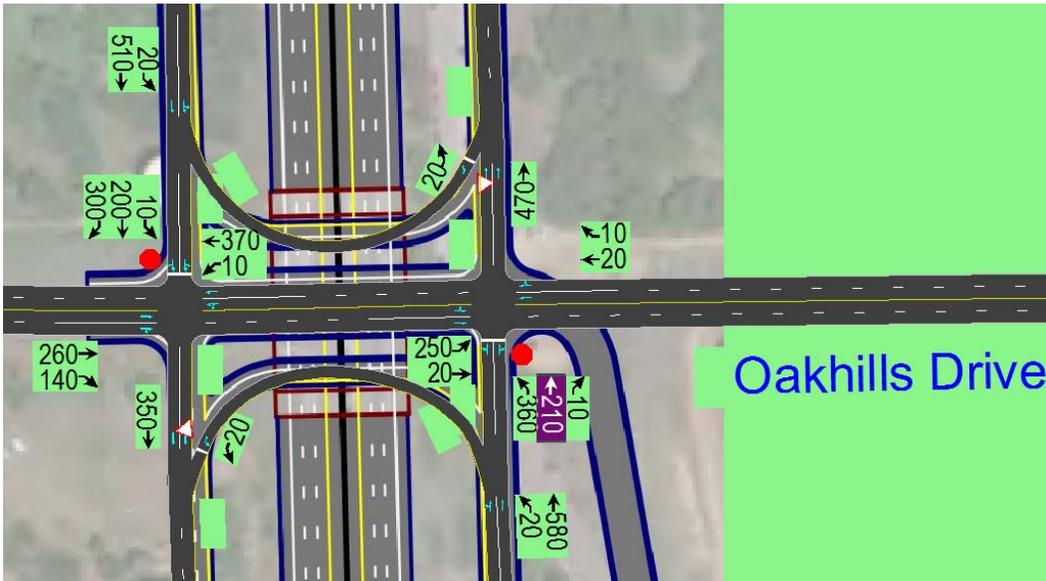


Figure 3.4 – 2040 PM Peak Volumes: Oak Hills Drive



Figure 3.5 – 2040 PM Peak Volumes: Crestwood Drive

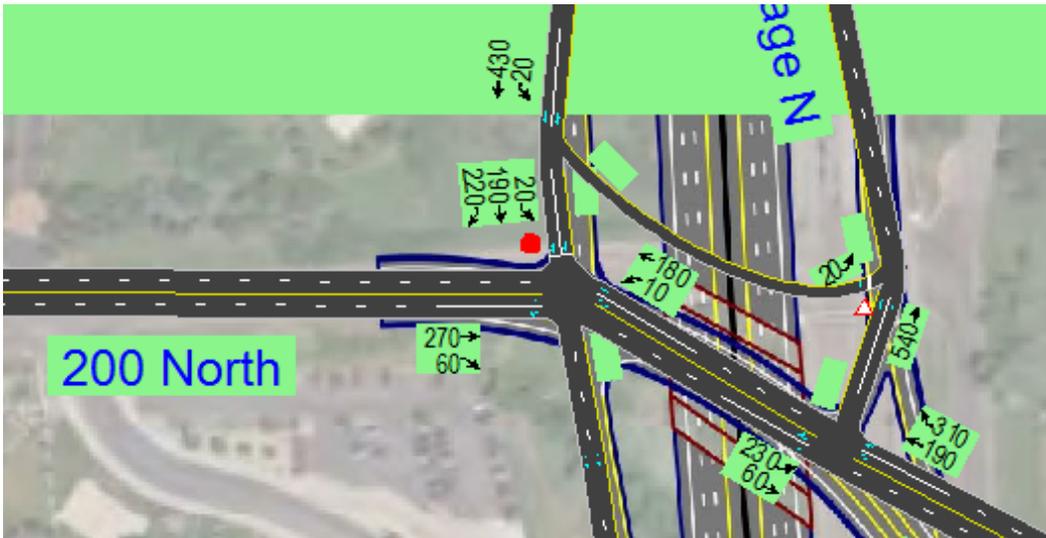


Figure 3.6 – 2040 PM Peak Volumes: 200 North



Using the Synchro and SimTraffic analysis packages, the PM peak hour queue and delay were measured for each of the U-Turn movements. The following table summarizes the results.

Table 3.2 – Queue and Delay Summary for US-89 U-Turns

| Intersection | Delay, NB to SB (sec/veh) | 95 th %-ile Queue NB to SB (ft) | Delay, SB to NB (sec/veh) | 95 th %-ile Queue SB to NB (ft) |
|----------------------------|---------------------------|--|---------------------------|--|
| SR-193 | 2.1 | 0 (free move) | n/a | n/a |
| Antelope Drive | 2.3 | 15 | 1.9 | 25 |
| Oak Ridge Drive (Proposed) | 1.7 | <10 | 2.5 | 41 |
| Oak Hills Drive (SR-109) | 2.8 | 16 | 2.2 | 87 |
| Crestwood Road | 1.5 | <10 | 2.1 | 28 |
| 200 North | n/a | n/a | 2.2 | 17 |

Based on these values, each of the U-Turn movements operate with minimal delays and queues. A comparison of delay with and without the U-turn lanes for the overall interchanges and the intersections is shown in the following table.

Table 3.3 – Interchange Delay Summary – With and Without U-Turns

| Intersection | Total Delay with U-Turn (hr) | Total Delay without U-Turn (hr) | Delay/Veh with U-Turn (sec/veh) | Delay/Veh. Without U-Turn (sec/veh) |
|----------------------------|------------------------------|---------------------------------|---------------------------------|-------------------------------------|
| SR-193 | 11.4 | 12.0 | 16.0 | 16.9 |
| Antelope Drive | 2.5 | 3.2 | 7.3 | 9.5 |
| Oak Ridge Drive (Proposed) | 2.8 | 3.1 | 7.8 | 8.8 |
| Oak Hills Drive (SR-109) | 4.1 | 4.7 | 9.2 | 10.6 |
| Crestwood Road | 0.6 | 0.7 | 4.7 | 5.5 |
| 200 North | 4.0 | 1.9 | 4.0 | 5.2 |

The results of the analysis indicate that the U-turn lanes provide very little operational benefit. The low volumes at the interchanges resulted in minimal delay whether dedicated U-turns were utilized or not.



4.0 ENVIRONMENTAL

A Final Environmental Impact Statement and Section 4(f) Evaluation (FEIS) for the US-89; I-15/Farmington to Harrison Boulevard/South Ogden project was completed in August 1996.

This summary considers changes to the built and natural environment since the time the FEIS was completed, changes to environmental consequences based on conceptual design, potential environmental risks, and key environmental issues to be addressed through the completion of a subsequent State Environmental Study. This evaluation examines only the area between Farmington Main Street and the interchange with I-84, and not the entire corridor evaluated in the FEIS.

In addition, this evaluation discusses potential changes to impacts based on conceptual design prepared for the Study Area. The conceptual design includes both a Baseline Design and a One-Way Frontage Road option. The Baseline Design closely follows the design proposed in the FEIS, while the One-Way Frontage Road option would construct one-way frontage roads the entire length of the study area.

4.1 Analysis of Resource Changes

Table 4.1 summarizes changes to environmental resources in the Study Area (see Chapter 3, Affected Environment, of the FEIS).

Table 4.1 – Changes to Environmental Resources

| FEIS Chapter 3 Section | Resources | Changed? | | Comments |
|------------------------|-------------------|----------|----|---|
| | | Yes | No | |
| 3.1 | Land Use Planning | X | | <p>Growth in the study area has followed the general pattern laid out in the EIS, with the majority of the corridor devoted to housing with some agricultural, recreational, and commercial land.</p> <p>The amount of agricultural land in the study area has decreased. One recreational property, Layton Pioneer Park, has been closed, while two, Harvey Park in Fruit Heights and East Mountain Wilderness Park in Kaysville, have been added.</p> <p>Park-and-ride lots have been added at 400 North, Antelope Drive, and South Weber Drive, while the informal lot at Farmington Main Street is no longer there.</p> |
| 3.2 | Farmland | | X | Most farmland remaining within the study area is within incorporated city limits and not |



| FEIS Chapter 3 Section | Resources | Changed? | | Comments |
|------------------------|--|----------|----|--|
| | | Yes | No | |
| | | | | protected. However, the 25.8-acre parcel of farmland of unique importance opposite Mutton Hollow Road remains unincorporated property and protected under the Farmland Protection Policy Act. |
| 3.3 | Geological and Climatic Conditions and Hazards | | X | Portions of the study area remain at risk for liquefaction, surface-fault rupture, debris flows, and flooding. |
| 3.4 | Socio-Economic Conditions | | X | <p>Populations in Davis, Weber, and Morgan Counties are all larger than projected in the FEIS.</p> <p>Minority populations have risen slightly in Davis (from 9 to 10%) and Weber (from 14 to 15%) Counties.</p> <p>Three churches are located in the study corridor: Mountain Road Evangelical Presbyterian Church on Mountain Road in Fruit Heights, an LDS Chapel on Orchard Road in Fruit Heights, and an LDS Chapel on Valley View Drive in Layton.</p> |
| 3.5 | Pedestrians and Bicyclists | | X | Pedestrian and bicyclist infrastructure on US-89 remains limited to non-existent, except for at signalized intersections where signalized pedestrian crossings are provided. |
| 3.6 | Air Quality | X | | Davis County is currently a nonattainment area for PM 2.5 and a maintenance area for Ozone. |
| 3.7 | Noise | X | | There are a larger number of receptors in the study area, and noise impacts and potential mitigation will need to be reevaluated. |
| 3.8 | Water Resources | | X | <p>There is shallow groundwater (2 to 6 feet) at the southern end of the study area.</p> <p>There are multiple stream crossings in the study area. Haight Creek crosses near Eagle Way, Baer Creek crosses near Green Road, Holmes Creek crosses north of 400 North, the North Fork of Holmes Creek crosses US-89 a few hundred feet north of Oak Hills Drive, Snow Creek crosses near 1200 North in Layton, South Fork and</p> |



| FEIS Chapter 3 Section | Resources | Changed? | | Comments |
|------------------------|----------------------------------|----------|----|---|
| | | Yes | No | |
| | | | | <p>Middle Fork, both near Fernwood Drive, North Fork near Hill Field Road, Corbett Creek near Deer Run Drive, and the Weber River near I-84.</p> <p>The Davis-Weber Canal crosses the highway near 7800 South in South Weber.</p> <p>The Weber Aqueduct, owned by the Bureau of Reclamation, is located primarily east of the study area. It comes close to US-89, possibly entering the right-of-way, just north of Oak Hills Drive, and crosses the highway twice between Fernwood Drive and Hill Field Road.</p> |
| 3.9 | Wetlands | X | | <p>The FEIS recorded wetlands near Shepard Lane, which appear to be gone. A seasonal irrigation pond was also recorded near the northeast corner of Farmington Main Street, which now appears to be residential development. Wetlands recorded around Hobbs Creek near 2700 North in Layton may or may not still exist.</p> |
| 3.10 | Vegetation | | X | No Change |
| 3.11 | Wildlife | | X | <p>Several sections of the study area were identified as wildlife-vehicle collision hotspots in a 2008 UDOT report with 10 or more accidents per mile. Figures from the FEIS show between 8.88 and 42.64 deer killed per mile between 1988 and 1993.</p> |
| 3.12 | Fisheries | | X | <p>The Weber River contains an active fishery. None of the other streams in the study area carry enough water to support fish habitat.</p> <p>Holmes Creek Reservoir and Hobbs Reservoir contain active fisheries.</p> |
| 3.13 | Threatened or Endangered Species | X | | <p>The Yellow-Billed Cuckoo is a newly identified potential Threatened Species. However, designated critical habitat for the cuckoo does not exist in the project area, and riparian forest patches of the size required for nesting are not</p> |



| FEIS Chapter 3 Section | Resources | Changed? | | Comments |
|------------------------|---|----------|----|---|
| | | Yes | No | |
| | | | | present. A number of migratory birds could also be of concern. |
| 3.14 | Historical, Archaeological, and Paleontological Resources | X | | <p>The following Eligible Properties recorded in the FEIS appear to be still standing in the study area:</p> <ul style="list-style-type: none"> • 1787 North Main St, Farmington (E18) • 1817 North Main St, Farmington (E20) • 530 North 1300 East, Fruit Heights (E2) • 42DV47, Layton (Flood Control Walls) (E4) • 2550 North Highway 89, Layton (E6) • 2778 North Highway 89, Layton (E17) • 8336 South Highway 89, South Weber (E9) • 8102 South Highway 89, South Weber (E10) <p>Some properties on the following roads/addresses are old enough to be considered historic, and may be eligible:</p> <ul style="list-style-type: none"> • Golden Circle Drive (northeast corner of Nicholls Road and US-89) • Green Road, 1250 East (northwest corner of Green Road and US-89) • Various Properties on US-89 • Mountain Road • Ward Road • 700 North • Mutton Hollow Road • Cherry Lane • Valley View Drive • 2850 East • SR-193 |
| 3.15 | Hazardous Material and Waste Sites | | X | No change. |
| 3.16 | Visual Resources | | X | No change |



Table 4.2 summarizes changes to potential environmental consequences in the Study Area (see Chapter 4 Environmental Consequences, of the FEIS).

Table 4.2 – Changes to Environmental Consequences

| FEIS Chapter 4 Section | Resources | Changed? | | Comments |
|------------------------|--------------------|----------|----|--|
| | | Yes | No | |
| 4.1 | Land Use Impacts | X | | <p>There would be no impact to land use planning, as the corridor has been planned for decades.</p> <p>Current conceptual design shows impacts to Nicholls Park and East Mountain Wilderness Park. Layton Pioneer Park has already been closed.</p> <p>The park-and-ride lot at Antelope drive would be impacted under either design and would need to be redesigned or relocated.</p> |
| 4.2 | Farmland Impacts | | X | The unique farmland near Mutton Hollow Road would be impacted by construction of a frontage road. |
| 4.3 | Geology | | X | No change. Hazards will be carefully considered before construction. |
| 4.4 | Social Impacts | | X | No change. Neighborhoods are not expected to be divided. Some social properties (churches, parks, schools) may be slightly impacted by partial property acquisitions, but no full acquisitions of these properties are anticipated. |
| 4.5 | Relocation Impacts | X | | <p>The FEIS anticipated the full acquisition of 147 existing homes and businesses in the study corridor.</p> <p>UDOT has previously acquired dozens of properties in the Study Area. The Baseline Design would require an additional 31 residential and 1 business acquisitions, while the One-Way Frontage Road Design would require an additional 39 residential and 1 business acquisitions. Each design would also require the acquisition of 2 parcels of undeveloped land.</p> |



| FEIS Chapter 4 Section | Resources | Changed? | | Comments |
|------------------------|--|----------|----|---|
| | | Yes | No | |
| 4.6 | Economic Impacts | | X | No change. The amount of taxable land will be slightly reduced. Some businesses may be affected by changes in access related to the frontage road system, and one business will be purchased. |
| 4.7 | Joint Development | X | | Inclusion of bicycle facilities, landscaping, and park and ride lots will follow current UDOT guidelines. |
| 4.8 | Pedestrians and Bicyclists | X | | The pedestrian overpass at the south end of Old Mountain Road has been constructed. The previously considered pedestrian overpass at Nicholls Road is not included in the conceptual design. |
| 4.9 | Air Quality Impacts | | X | Air quality impacts will be reevaluated during the completion of a State Environment Study. |
| 4.10 | Noise Impacts | X | | Approximately 308 receptors were impacted under the FEIS noise study. Given the larger number of residences in the study area, a larger number of receptors are expected to be impacted under either conceptual design. |
| 4.11 | Water Quality Impacts | | X | No change. Water quality impacts are expected to be minimal. |
| 4.12 | Permits | | X | No change. A wetland and/or stream alteration permit may be required. |
| 4.13 | Wetlands Impacts | X | | Residential development in the study area has likely reduced the number and size of wetlands potentially impacted by the project. |
| 4.14 | Water Body Modification and Wildlife Impacts | | X | No change. Waterway crossings will be extended to accommodate a wider road. Wildlife-vehicle impacts will continue to be a concern. |
| 4.15 | Floodplains | | X | No change. There will be minor impacts to floodplains in the study area. |
| 4.16 | Wild and Scenic Rivers | | X | No change. This resource is not located in the study area. |
| 4.17 | Coastal Barriers | | X | No change. This resource is not located in the study area. |
| 4.18 | Threatened and Endangered Species | X | | Potential impacts to Yellow-Billed Cuckoo habitat will need to be considered. |



| FEIS Chapter 4 Section | Resources | Changed? | | Comments |
|------------------------|---|----------|----|--|
| | | Yes | No | |
| 4.19 | Historic, Archaeological, and Paleontological Resources | X | | <p>There are potentially more than 50 additional historic structures present in the study area. Additional study of these properties will be required.</p> <p>The FEIS anticipated Adverse Effects to nine historic properties in the study area. Three of these properties have since been demolished.</p> <p>The FEIS committed to ILS documentation of adversely affected properties.</p> |
| 4.20 | Hazardous Waste Impacts | | X | No change. Property may need to be acquired from potential hazardous waste properties. |
| 4.21 | Visual Impacts | | X | No change. There will be visual impacts from elevated interchange structures and potential noise walls. |
| 4.22 | Energy | | X | No change. A certain amount of energy will be expended during construction of the project. |
| 4.23 | Construction Impacts | | X | No change. Typical construction impacts due to traffic flow modifications, noise, vibration, and air quality are expected. |
| 4.24 | Short-Term Uses vs Long-Term Productivity | | X | No change. The project will provide a good use of resources consistent with long term productivity of the region. |
| 4.25 | Irreversible and Irretrievable Commitments | | X | The resources irretrievably committed to the project would not be better used elsewhere, based on the benefit to the region and the relative abundance of those resources. |

4.2 Key Issues

The following should be considered as key issues in a subsequent NEPA or state environmental study for the proposed project:

Relocations

UDOT's involvement in property acquisition in the study corridor has been extensive and ongoing. However, even though many of the required properties have already been purchased, additional properties will still be required for the project. Early stakeholder and public involvement will be key in mitigating the effects of these relocations.

Pedestrian and Bicyclists

The FEIS proposed the construction of a pedestrian overpass at Nicholls Road. This overpass is not included in the current design. Although the proposed interchange may provide sufficient pedestrian facilities, the change in design may need to be explained to the public.

Air Quality

The addition of through travel lanes raises air quality concerns. In addition, air quality requirements and plans have changed since the completion of the FEIS. A new air quality study will be required.

Noise

There are a large number of residential properties in close proximity to US-89. The noise impacts of widening and converting the highway to a limited-access expressway will be substantial. Noise walls will likely be considered reasonable and feasible for substantial stretches of the highway. However, noise walls will also impact visual resources, including views of the Wasatch Mountains to the east.

Historic, Archaeological, and Paleontological Resources

A larger number of properties are now likely to be eligible for the National Register of Historic Places (NRHP), although some recorded in the FEIS have since been demolished. Consultation with the State Historic Preservation Office (SHPO) and other interested stakeholders will need to be undertaken again, and additional mitigation may need to be considered.

4.3 Environmental Risks

The following are believed to pose the greatest risks to completion of the project:

Public Controversy

Any project with many residential and business relocations will be subject to scrutiny from the public and affected property owners. This scrutiny has the potential to become controversial if the reasons for the project are not found to be acceptable. The long lead-in time for this project, and the drawn-out acquisition process may make this aspect of the project easier for the public as they have anticipated construction for some time. Noise impacts and noise walls are also likely to create a certain level of public controversy.

Cultural Resources

Impacts to historic resources will require discussions with stakeholders, particularly the SHPO, regarding the Area of Potential Effects, survey methodologies, effects to historic properties, and suitable mitigation. This process poses a schedule risk for any environmental study.

Davis Aqueduct

The Davis Aqueduct is a 48-inch, Bureau of Reclamation-owned, concrete waterline carrying water from the Weber River through eastern Davis County. The Aqueduct passes under the highway twice between Fernwood Drive and Hill Field Road, and near it a third time, near Oak Hills Drive. The Bureau of Reclamation generally has a long review time for projects that may impact their properties. In addition, the Aqueduct is operated by the Weber Basin Water Conservancy District, which adds another layer of review. Any proposed impacts to the pipeline will add to the schedule length of the project.

5.0 CONCEPT COST ESTIMATES

5.1 BASELINE OPTION

- Construction Cost Detail
- Utility Cost
- Right-of-Way Cost

5.2 ONE-WAY FRONTAGE ROAD OPTION

- Construction Cost Detail
- Utility Cost
- Right-of-Way Cost

Utah Department of Transportation

Print Date:
6/8/2016Project No.: S-R199(198), PIN 13480
Project Name: US-89 Corridor Study
Desc. Of Construction: Base Line Design: 6-lane US-89 w/Two-Way Frontage Road System
County: Davis

| No. | Description | Qty | Unit | Unit Price | Amount | Comments/Assumptions |
|-----------------------------------|---|-------|------|----------------|-----------------|----------------------|
| 90 - UTILITIES (UDOT 100%) | | | | | | |
| | Culinary Water Relocation | 12000 | ft | \$105.00 | \$ 1,260,000.00 | |
| | Sanitary Sewer Relocation | 2000 | ft | \$100.00 | \$ 200,000.00 | |
| | Water Transmission (WBWCD) | 1000 | ft | \$140.00 | \$ 140,000.00 | |
| | Private Water System/Irrigation | 6000 | ft | \$80.00 | \$ 480,000.00 | |
| | Other | 1 | lump | \$2,000,000.00 | \$ 2,000,000.00 | |
| | | | | Subtotal | \$ 4,080,000.00 | |
| | Contingency (30%) | 30% | | | \$ 1,224,000.00 | |
| | Third-Party Design and Project Administration (15%) | 15% | | | \$ 612,000.00 | |
| | | | | | \$ 5,916,000.00 | |

| | | | | | | |
|----------------------------------|---|-------|------|----------------|-----------------|--|
| 91 - UTILITIES (UDOT 50%) | | | | | | |
| | Relocate Telecomm - buried | 35000 | ft | \$30.00 | \$ 1,050,000.00 | |
| | Relocate Telecomm - overhead | 12000 | ft | \$15.00 | \$ 180,000.00 | |
| | Relocate Power | 18000 | ft | \$40.00 | \$ 720,000.00 | |
| | Relocate Power - Transmission | 1000 | ft | \$150.00 | \$ 150,000.00 | |
| | Relocate Petroleum Pipeline | 10000 | ft | \$120.00 | \$ 1,200,000.00 | |
| | Relocate Natural Gas | 30000 | ft | \$30.00 | \$ 900,000.00 | |
| | Other | 1 | lump | \$2,000,000.00 | \$ 2,000,000.00 | |
| | | | | Subtotal | \$ 6,200,000.00 | |
| | Contingency (30%) | 30% | | | \$ 1,860,000.00 | |
| | Third-Party Design and Project Administration (15%) | 15% | | | \$ 930,000.00 | |

Subtotal: \$ 8,990,000.00
Subtotal UDOT 50% Share: \$ 4,495,000.00

SUBTOTAL UTILITIES: \$ 10,411,000.00

Utah Department of Transportation

Print Date:
6/8/2016Project No.: S-R199(198), PIN 13480
Project Name: US-89 Corridor Study
Desc. Of Construction: OWFR: 6-lane US-89 w/One-Way Frontage Road System
County: Davis

| No. | Description | Qty | Unit | Unit Price | Amount | Comments/Assumptions |
|-----------------------------------|---|-------|------|----------------|-----------------|----------------------|
| 90 - UTILITIES (UDOT 100%) | | | | | | |
| | Culinary Water Relocation | 12000 | ft | \$105.00 | \$ 1,260,000.00 | |
| | Sanitary Sewer Relocation | 2000 | ft | \$100.00 | \$ 200,000.00 | |
| | Water Transmission (WBWCD) | 1000 | ft | \$140.00 | \$ 140,000.00 | |
| | Private Water System/Irrigation | 6000 | ft | \$80.00 | \$ 480,000.00 | |
| | Other | 1 | lump | \$2,000,000.00 | \$ 2,000,000.00 | |
| | | | | Subtotal | \$ 4,080,000.00 | |
| | Contingency (30%) | 30% | | | \$ 1,224,000.00 | |
| | Third-Party Design and Project Administration (15%) | 15% | | | \$ 612,000.00 | |
| | | | | | \$ 5,916,000.00 | |

| | | | | | | |
|----------------------------------|---|-------|------|----------------|-----------------|--|
| 91 - UTILITIES (UDOT 50%) | | | | | | |
| | Relocate Telecomm - buried | 35000 | ft | \$30.00 | \$ 1,050,000.00 | |
| | Relocate Telecomm - overhead | 12000 | ft | \$15.00 | \$ 180,000.00 | |
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| | Relocate Petroleum Pipeline | 10000 | ft | \$120.00 | \$ 1,200,000.00 | |
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| | Other | 1 | lump | \$2,000,000.00 | \$ 2,000,000.00 | |
| | | | | Subtotal | \$ 6,200,000.00 | |
| | Contingency (30%) | 30% | | | \$ 1,860,000.00 | |
| | Third-Party Design and Project Administration (15%) | 15% | | | \$ 930,000.00 | |

Subtotal: \$ 8,990,000.00
Subtotal UDOT 50% Share: \$ 4,495,000.00

SUBTOTAL UTILITIES: \$ 10,411,000.00

6.0 FIGURES

6.1 CONCEPT LAYOUT PLANS

Baseline Design

One-Way Frontage Road

6.2 ENVIRONMENTAL RESOURCE MAPS



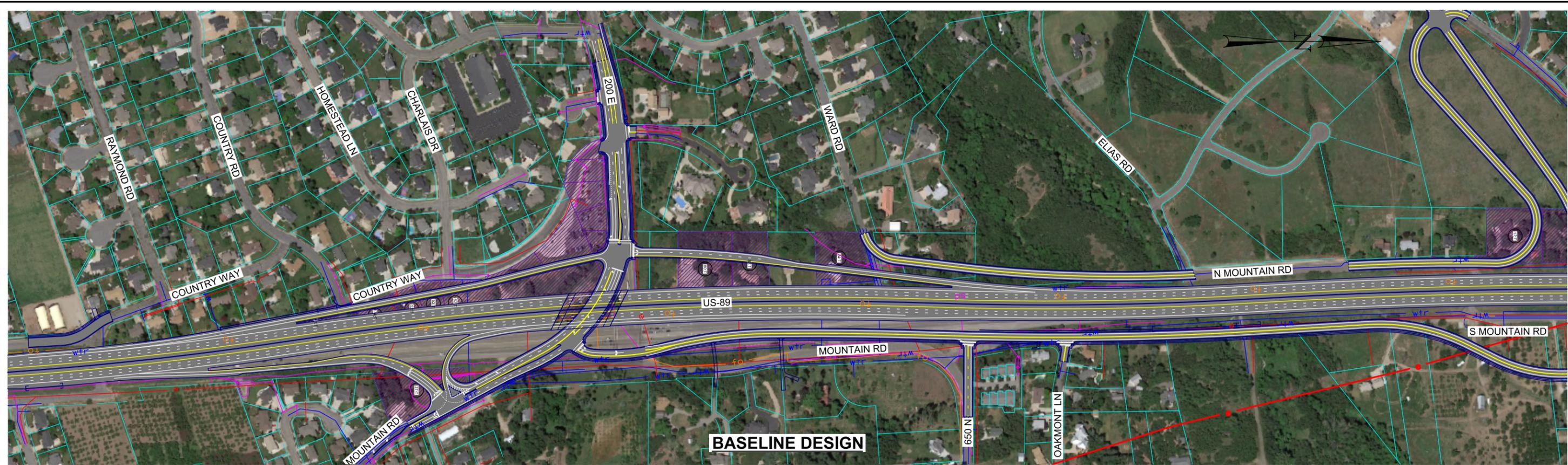
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|  | ADVANCE ACQUISITION PARCELS |
|  | POTENTIAL RELOCATIONS |

US-89
FIGURE 2

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| DATE: | 5/13/2016 |



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|  | ADVANCE ACQUISITION PARCELS |
|  | POTENTIAL RELOCATIONS |

US-89
FIGURE 3

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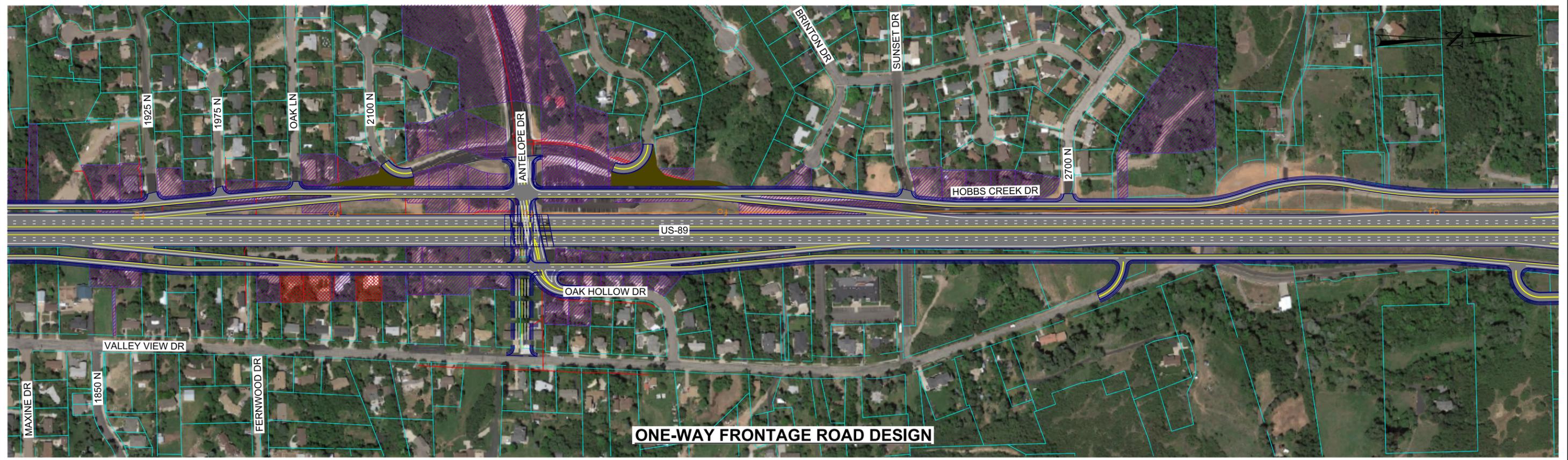
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|  | ADVANCE ACQUISITION PARCELS |
|  | POTENTIAL RELOCATIONS |

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FIGURE 4

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|  | POTENTIAL RELOCATIONS |



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-  ADVANCE ACQUISITION PARCELS
-  POTENTIAL RELOCATIONS

US-89
FIGURE 8

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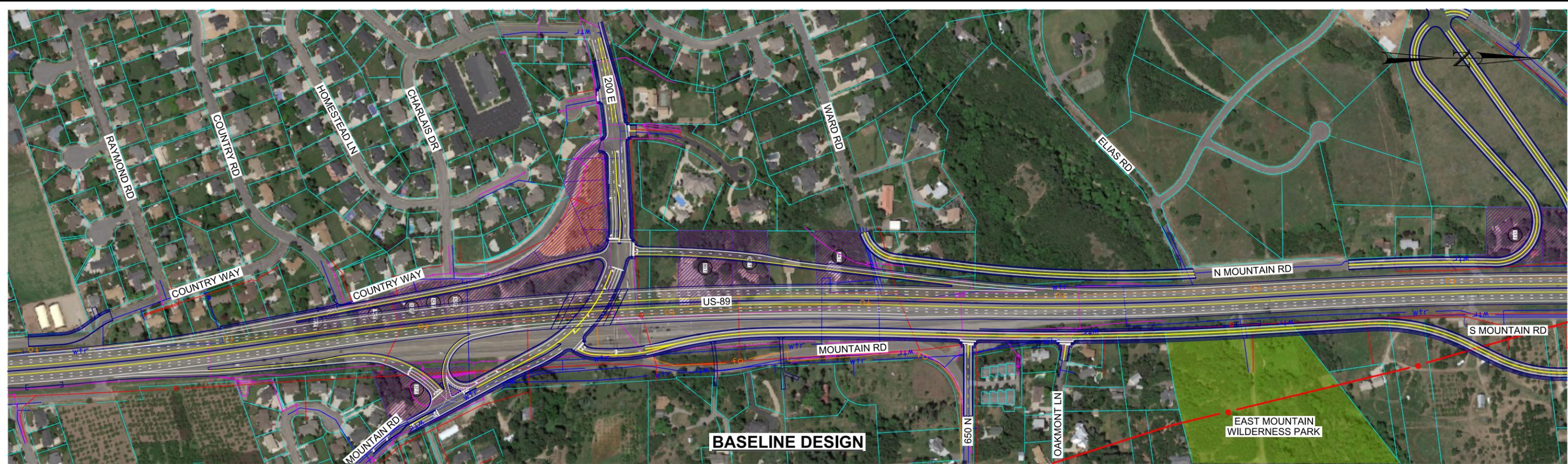
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| | ADVANCE ACQUISITION PARCELS | | PARKS |
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| | CHURCHES | | PARK AND RIDES |
| | STREAMS, CREEKS, BODIES OF WATER | | |

US-89
FIGURE 1

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 5/12/2016



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| | STREAMS, CREEKS, BODIES OF WATER | | |

**US-89
FIGURE 3**

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**US-89
FIGURE 4**

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ONE-WAY FRONTAGE ROAD DESIGN



ONE-WAY FRONTAGE ROAD DESIGN

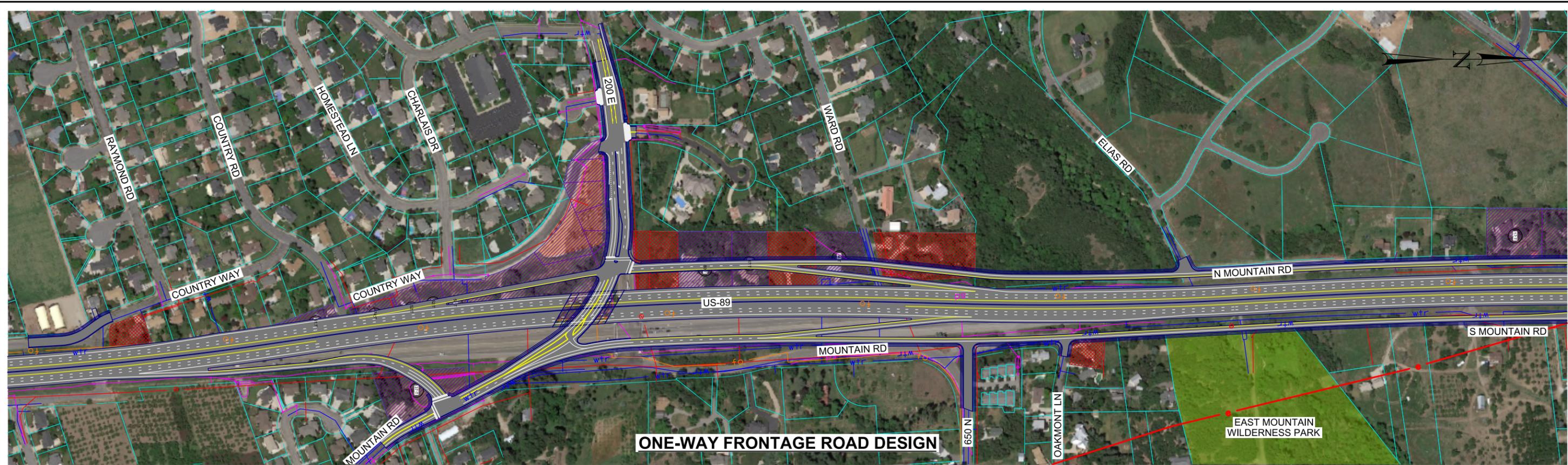
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|  | POTENTIAL RELOCATIONS |  | FORMER PARKS |  | PARK AND RIDES | | |

**US-89
FIGURE 1**

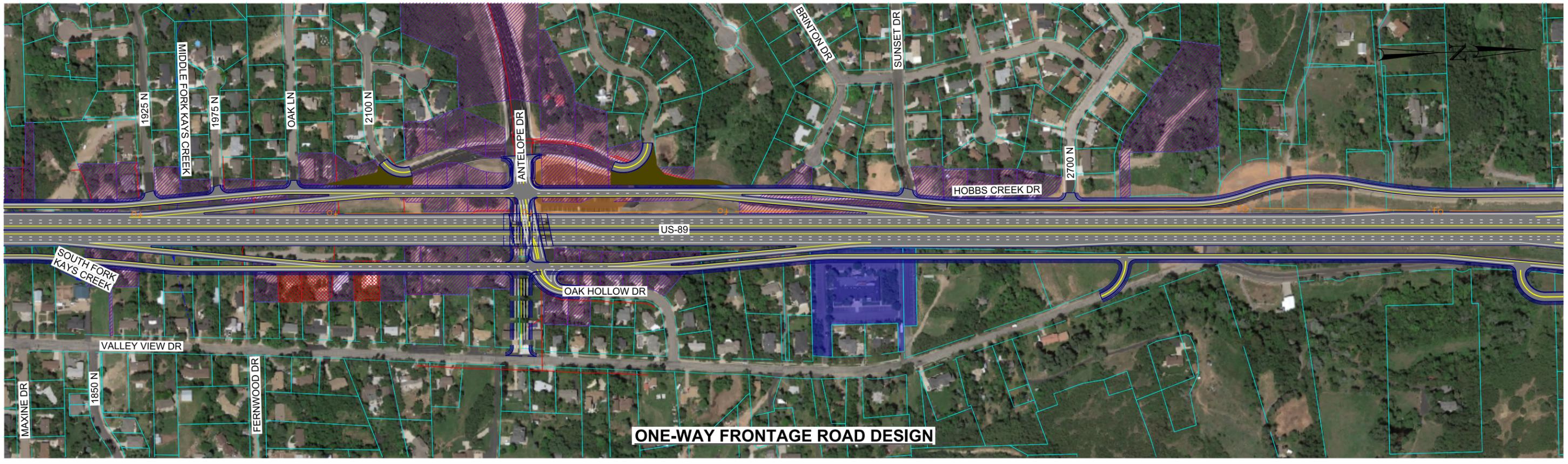
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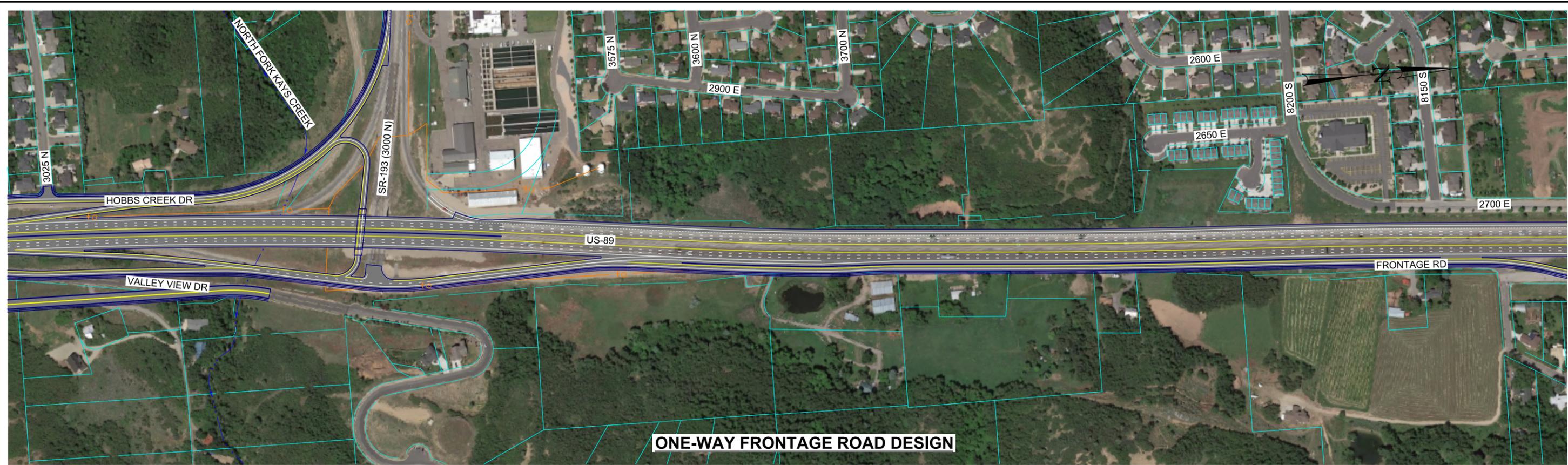


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| | ADVANCE ACQUISITION PARCELS | | PARKS |
| | POTENTIAL RELOCATIONS | | CHURCHES |
| | FORMER PARKS | | PARK AND RIDES |
| | STREAMS, CREEKS, BODIES OF WATER | | |

US-89
FIGURE 3

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ONE-WAY FRONTAGE ROAD DESIGN



ONE-WAY FRONTAGE ROAD DESIGN

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| | ADVANCE ACQUISITION PARCELS | | PARKS |
| | POTENTIAL RELOCATIONS | | FORMER PARKS |
| | CHURCHES | | PARK AND RIDES |
| | STREAMS, CREEKS, BODIES OF WATER | | |