CALIFORNIA HIGH-SPEED TRAIN PROJECT

Fresno–Palmdale Region

FINAL REPORT

Visalia-Tulare-Hanford Station Feasibility Study

Final Report

August 1, 2007

Prepared for:

California High-Speed Rail Authority

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Visalia-Tulare-Hanford Station Feasibility Study

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1.0 EXECUTIVE SUMMARY

This report considers the potential for a station on the California High Speed Train (HST) system to serve the Visalia-Tulare-Hanford area, and seeks to identify feasible alignment and station location alternatives. The alternatives are defined for further screening and study in the next phase, project-level environmental review under the National Environmental Policy Act (NEPA) and the California Environmental Quality Act (CEQA).

1.1. PROJECT HISTORY

The purpose of the California HST Program is to develop a more than 700-mile-long, electrically-powered high-speed train (HST) system capable of operation in excess of 200 miles per hour on a dedicated, fully grade-separated track with state-of-the-art safety, signaling, and automated train control systems. The system would serve the major metropolitan centers of California, extending from Sacramento and the San Francisco Bay Area, through the Central Valley, to Los Angeles and San Diego. The HST system is projected to carry 86 to 117 million passengers annually by the year 2030.

In 2005, the California High-Speed Rail Authority (Authority) and the Federal Railroad Administration (FRA) completed a Final Programmatic EIR/EIS (PEIR/EIS) for the California HST System as the first-phase of a tiered environmental review process. The Authority certified the Final PEIR under CEQA, approved the proposed HST System Alternative (the No Project and Modal Alternatives) and selected several corridor alignments and station locations. FRA issued a Record of Decision under NEPA on the Final PEIS. This statewide PEIR/EIS established the purpose and need for the HST system, analyzed an HST alternative, compared it with a No Project/No Action Alternative and a Modal Alternative and evaluated several corridor options. The PEIR/EIS stated that, as part of project-level environmental review, one of the first steps would be to study alignment alternatives between Fresno and Bakersfield to see if a station could be served in the vicinity of Visalia. The purpose of the Visalia-Tulare-Hanford Station Feasibility Study is to evaluate alternative high-speed rail alignments between Fresno and Bakersfield that would provide for a station serving the Visalia area.

The Authority has begun project-level environmental evaluation of the statewide HST system. The project-level environmental review process following federal and state laws will lead to selection of site-specific alternatives and specific mitigation measures to minimize and mitigate adverse impacts. The preparation of project environmental documents will be relied upon to grant approvals and provide financial assistance necessary to construct and operate the HST system.

1.2. METHODOLOGY

The methodology for this project has entailed the creation of an initial set of a range of alternatives, which were screened based on stakeholder input and qualitative factors, and through an initial engineering assessment. These initial alternatives were subsequently refined, and the remaining alignments were characterized with more quantitative information developed through engineering and the application of Geographic Information Systems (GIS) data. The goal of this process was to provide enough information so that Authority can identify one or more feasible alternative for more detailed study in project-level environmental review.

1.3. INITIAL ALTERNATIVES

Thirteen draft alternative alignments were initially identified for this study. The first step in the creation of these initial alignment alternatives was to review the work done in the PEIR/EIS and preceding documents to identify all of the alignments and station locations that were considered and either carried forward or rejected. From those documents, the team identified two major types of alternatives – those in the existing railroad corridors and those largely outside of the existing railroad corridors. Based on assessments developed during the PEIR/EIS process, the team decided not to consider alignments that were located entirely or mostly outside of the existing railroad corridors. The team then developed thirteen initial alignments that would serve the overall corridor and also serve a station in the Visalia-Tulare-Hanford area (**see Executive Summary Figure 1**).

For the initial 13 alternatives, two zones were identified within which stations could be located. Each of the alternatives passed through at least one of these zones (**see Executive Summary Figure 1**). The zones correspond to the highway routes (SR-198 and SR-99) that would provide the principal access routes to the station sites.

The first potential station zone corresponds to the SR-99 highway corridor, with a north-south orientation generally parallel to the UPRR right-of-way. This station zone extends from north of Goshen near Traver to the south side of Tulare. Seven of the initial alternative alignments could serve a station located in this zone.

The second potential station zone is an area oriented east-west, roughly parallel to SR-198 and the Cross-Valley Rail Line between Armona (west of Hanford) and Goshen. Seven of the initial alternative alignments could serve a station located in this zone. The SR-198 highway connects Hanford and Visalia and would be the principal arterial serving a station in this zone.

Some of the alternatives that would be aligned with the UPRR through the cities of Fowler, Selma, and Kingsburg would employ a below-grade configuration to minimize impacts on those communities.

1.4. PRELIMINARY SCREENING PROCESS

The next step was a preliminary screening to reduce the number of alternatives. The project team conducted a series of field reviews of the original 13 alignments in the corridor and met with Technical Assessment Groups (TAGs) representing Fresno, Kings, and Tulare Counties. The team also met with agricultural commissioners and other interested stakeholders.

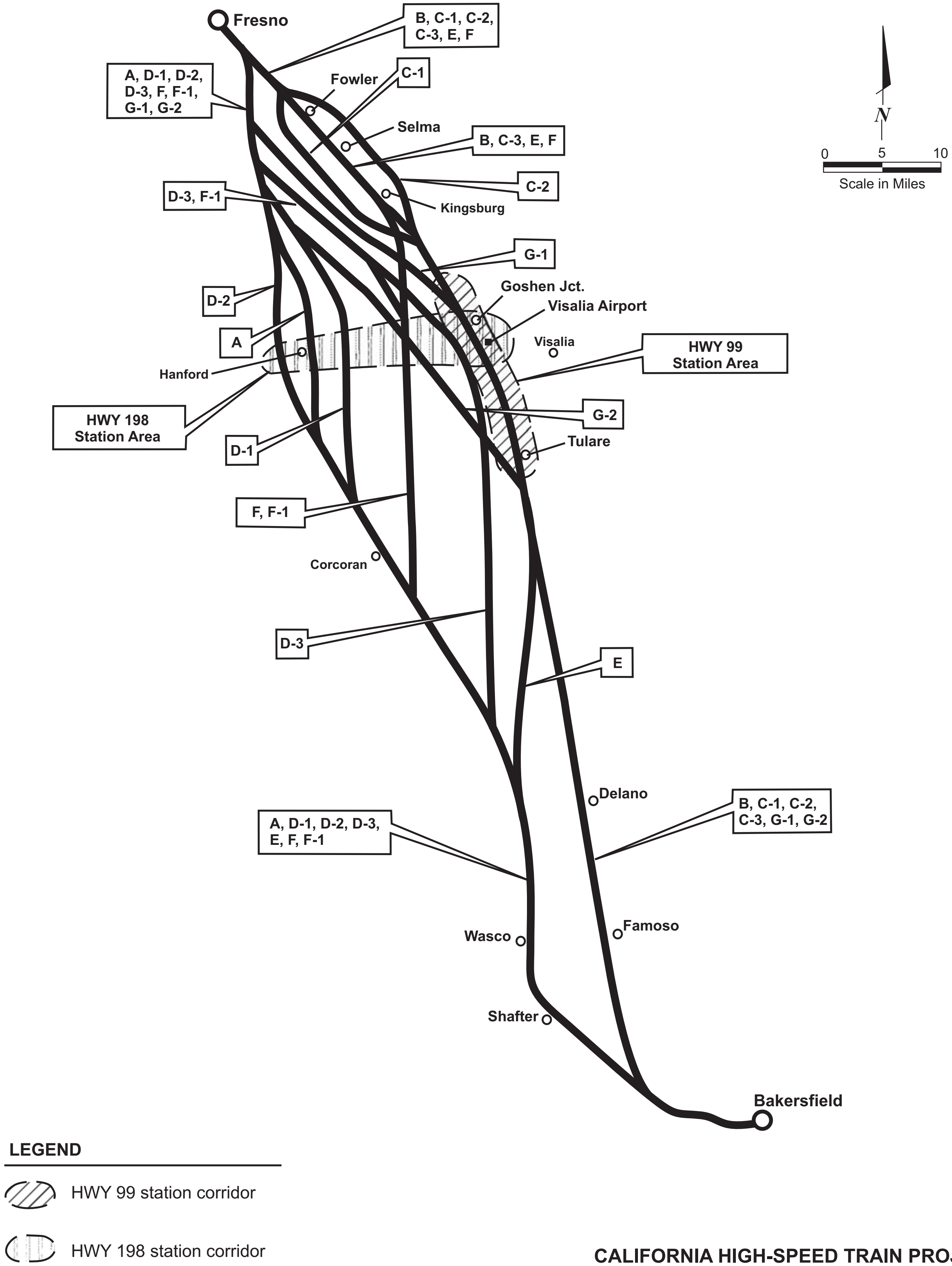
Using information from the TAG and stakeholder meetings, field work, and technical investigations, the team defined general geographic, cultural, or economic constraints. The team also applied the Authority's engineering criteria to the proposed initial alignments, which further constrained the alternatives with regard to curvature, station locations, junction locations, etc. In light of these constraints, a number of the original alignments were determined to be less feasible or desirable than the others and were eliminated, leaving eight feasible alternatives.

1.5. REVISED ALTERNATIVES

After the preliminary screening process, the eight remaining alignment alternatives were refined using a variety of tools, including GIS. This process created a base of information to enable comparison of the alternatives as to their affect on geographic, cultural, or economic features of the region, and to enable the Authority to identify alternatives to be advanced to a project-level EIR/EIS for this section of the HST system.

The eight revised alignment alternatives are shown in **Executive Summary Figure 2**. They fall into three categories:

1) **Alternatives A and A-1** are based on the existing BNSF alignment for most of the distance from Fresno to Bakersfield. Alternative A is essentially the alignment selected by the Authority for further study and the preferred alternative in the PEIR/EIS and is differentiated from the other alternatives in this study by having no station stop in the Visalia-Tulare-Hanford area.



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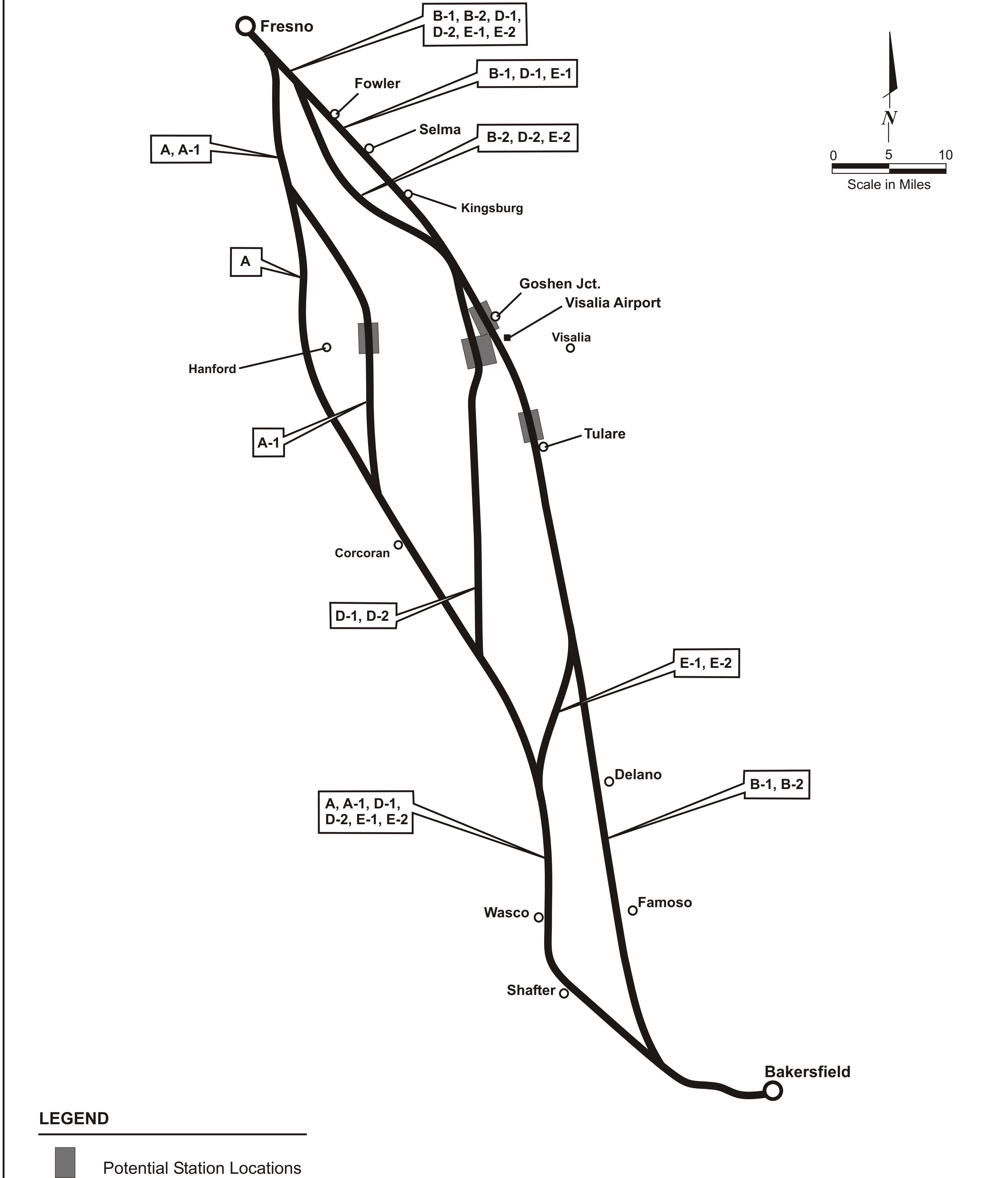
VISALIA-TULARE-HANFORD STATION FEASIBILITY STUDY
INITIAL ALIGNMENT ALTERNATIVES

FIGURE ES-1



CALIFORNIA HIGH-SPEED TRAIN PROJECT
VISALIA-TULARE-HANFORD STATION FEASIBILITY STUDY
REVISED ALIGNMENT ALTERNATIVES

FIGURE ES-2

2) **Alternatives B-1 and B-2** are alignments that are largely in the UPRR corridor between Fresno and Bakersfield, with the exception of the northern approach to Bakersfield, which is in the BNSF corridor.

3) **Alternatives D-1, D-2, E-1, and E-2** all start out on the UPRR corridor traveling south from Fresno, and cross over to the BNSF corridor in the mid-valley between Goshen Junction and Delano for the remainder of the distance to Bakersfield.

4) **Alternatives B-1, D-1, and E-1** all use a below-grade configuration through the cities of Fowler, Selma and Kingsburg to minimize impacts on those three cities.

No alternatives were retained that start out traveling south from Fresno on the BNSF corridor then cross over to the UPRR corridor. All such alternatives were eliminated in the preliminary screening, largely because of impacts to prime farmland and the location of potential stations in floodplains.

Potential station locations have been identified within the two original general station zones, corresponding with the SR-198 and SR-99 corridors. Potential station locations are identified for each revised alignment alternative (with the exception of Alternative A); in some cases there are two potential station locations. Alternatives A-1, D-1, and D-2 have station location sites along the SR-198 corridor, though D-1 and D-2 could also potentially use the station site on the SR-99/UPRR corridor at Goshen Junction. For the other alternatives, which are largely in the UPRR corridor through the Goshen Junction/Visalia Airport/Tulare area, two SR-99 corridor station area sites have been identified – one at Goshen Junction (99-North), and one on the north side of Tulare (99-South).

1.6. ASSESSMENT OF ALTERNATIVES

After the alignments were refined, the project team assessed the eight remaining alternatives to enable their comparison at a planning level of analysis. The alternatives were characterized according to the following criteria and measures (see **Executive Summary Table 1**):

- **Project performance**
  - Travel time
  - Length of alignment
  - Population and employment catchment
  - Operational issues
  - Constructability
  - Grade separation opportunities for freight railroads

- **Project capital cost** relative to that estimated for the preferred corridor alignment in the PEIR/EIS

- **Built environment impacts and benefits**
  - Sensitive land uses
  - Farmland impacts
  - Cultural resource impacts
  - Community and neighborhood impacts
  - General plan consistency

- **Natural environment impacts and benefits**
  - Water resources
  - Floodplain impacts
  - Wetlands
  - Sensitive species and critical habitats
  - 4(f) impacts

Executive Summary Table 1: Matrix of Assessment Measures

No.	Criteria	Measurement	Alternative A	Alternative A-1	Alternative B-1	Alternative B-2	Alternative D-1	Alternative D-2	Alternative E-1	Alternative E-2
1. Project Performance										
1a	Travel time	Minutes	30	30	30	30	31	31	31	31
1b	Length of alignment (1)	Linear distance in miles	111	111	110	111	112.6 (2)	113.3 (2)	113	114
1c	Operational Issues	Qualitative	None noted at this time							
1d	Construction Issues	Qualitative	Least complex	Low complexity	Highest complexity	High complexity	High complexity	Medium complexity	High complexity	Medium-high complexity
1e	Opportunity for grade separating freight RRs	Number of grade crossings	195	186	205	154	164	123	213	162
		Average number of grade crossing per mile	2.2	2.2	2.1	2.0	2.1	2.1	2.2	2.0
2. Project Capital Cost										
2a	Capital cost differential	Cost differential	Baseline	1-5%	25-30%	1-5%	25-30%	1-5%	25-30%	1-5%
3. Built Environment Impacts and Benefits										
3a	Land Use Compatibility and Conflicts	Number of sensitive land uses within 1/4-mile buffer	48	49	57	46	47	36	59	48
3b	Farmland Impacts	Acreage of affected agricultural parcels within 1/4-mile buffer	12,635	12,580	9,960	11,379	12,144	13,561	10,232	11,650
		Number of affected agricultural parcels within 1/4-mile buffer	565	563	426	579	482	628	450	603
3c	Cultural Resource Impacts	Number of cultural resources within 1/4-mile buffer	7	7	2	2	8	8	7	7
3d	Community and Neighborhood Impacts	Acreage of incorporated communities and unincorporated residential communities within 1/4-mile buffer	2,641	2,662	4,879	3,824	3,506	2,451	4,474	3,419
		Number of incorporated communities and unincorporated residential communities within 1/4-mile buffer	20	19	16	14	12	10	20	18

(1) Total alignment length measured from Truxton Station (Bakersfield) to Fresno Station (Fresno).`
(2) Length for alternative alignment serving SR 198 Station location nearest to SR 99. For optional SR 198 Station location, total alignment length would be reduced by 0.2 miles.

Executive Summary Table 1: Matrix of Assessment Measures
(Continued from previous page)

No.	Criteria	Measurement	Alt A	Alt A-1	Alt B-1	Alt B-2	Alt D-1	Alt D-2	Alt E-1	Alt E-2
4. Natural Environment Impacts and Benefits										
4a	Water resources	Number of stream crossings (excluding ditches and canals)	22	19	37	39	34	36	40	42
4b	Floodplain impacts	Acreage of floodplain within 1/4-mile buffer	4,548	4,744	4,575	4,292	4,896	4,529	4,488	4,205
4c	Wetlands	Number of crossings	97	93	79	75	91	87	95	91
		Acreage of wetlands within 1/4-mile buffer	229	308	144	130	175	161	188	174
	Vernal pools	Number of crossings	9	9	3	3	8	8	7	7
		Acreage of vernal pools within 1/4-mile buffer	623	793	171	171	660	640	973	973
4d	Threatened and endangered species and habitats	Number of critical habitats within 1/4-mile buffer	2	2	3	3	5	5	5	5
		Acreage of crossings within critical habitats	4,496	4,943	3,677	3,639	6,543	6,466	5,626	5,589
		Number of sightings, per CNDD	10	9	2	2	6	6	5	5
4e	4(f) Impacts (Public parks, wildlife refuges, historic properties on National Register of Historic Places)	Number of resources located within 1/4-mile buffer	7	7	2	2	8	8	7	7

Executive Summary Table 2 – Relative Strengths and Weaknesses

Alignment Alternative		Comparative Strengths	Comparative Weaknesses
A	**Baseline BNSF - Hanford West Bypass**	- Preferred alternative in PEIR/EIS - Least complex construction	- No station serving Visalia-Tulare-Hanford area
A-1	**BNSF - Hanford East Bypass**	- Adheres closely to preferred alternative in PEIR/EIS - Central station location - Low complexity construction - Highest population catchment	- Station location at edge of developed area
B-1	**UPRR – Fresno-South Below Grade**	-	- Highest complexity construction - Below-grade segment – impact on cities and additional cost - Affects greatest total acreage with dense residential development - Highest impacts on industrial and commercial uses
B-2	**UPRR – Fresno-South Bypass**	-	- High complexity construction
D-1	**UPRR to BNSF (198 Station) - Fresno-South Below Grade**	-	Below-grade segment – impact on cities and additional cost
D-2	**UPRR to BNSF (198 Station) - Fresno-South Bypass**	- Medium complexity construction - Affects lowest total acreage of residential development	- Affects greatest acreage of farmland
E-1	**UPRR to BNSF (99 Station) – Fresno-South Below Grade**	-	- Below-grade segment – impact on cities and additional cost
E-2	**UPRR to BNSF (99 Station)– Fresno-South Bypass**	-	- Longest alignment

1.7. RESULT OF ASSESSMENT

The assessment was based on a planning level of analysis, supported by a minimum of engineering. This assessment yielded relative measures of each alternative for consideration in a subsequent screening process. Because of the very similar length of the alternatives, several of the measures, such as travel time and track miles, did not reveal significant differences.

Several measures did effectively differentiate the alternatives. Capital cost is one such measure; the three alternatives using the below-grade section through Fowler, Selma, and Kingsburg (B-1, D-1, and E-1) show a capital cost approximately 25-30% higher than the other alternatives.

The alternatives that use the UPRR corridor south of Fresno (B-1, B-2, D-1, D-2, E-1, E-2) generally have higher levels of impact on existing land uses and sensitive land uses. They would be more complex to build, due to the proximity to both the UPRR corridor and SR-99, a limited access highway with frequent interchanges and overcrossings. The alternatives that use the BNSF corridor south of Fresno (A and A-1) generally cross more farmland of statewide importance, but are subject to less interference with adjacent highway and rail infrastructure. The station location for Alternative A-1 (SR-198 West) captures the greatest population and employment, both current and projected, within a radius of 20 miles.

Ridership information has not been developed at this time and is not included in this assessment.

1.8. NEXT STEPS

The results of the assessment summarized in this report will be used by the Authority to identify:

- Alternatives that should be taken forward into the project-level EIR/EIS process for study along with the selected PEIR/EIS alternative, and

- Potential HST station options that should be further considered to serve the Visalia-Tulare-Hanford area.

2.0 INTRODUCTION

This report examines the potential for a station on the proposed California High Speed Train (HST) system at a location in the Visalia-Tulare-Hanford area. Alignment alternatives and station options are defined and their feasibility assessed in this report, for consideration in the next phase of project-level environmental review under the National Environmental Policy Act (NEPA) and the California Environmental Quality Act (CEQA).

To develop this report, the project team met with a wide variety of stakeholders in the Visalia-Tulare-Hanford area. All the meetings have indicated support for a station in this area, as well as considerable enthusiasm for the overall statewide project.

Eight refined alternatives are defined and reviewed in Section 5. This level of analysis does not indicate a fatal flaw among them, though each alternative has different strengths and weaknesses. As the differences between the alternatives with regard to project performance are minor, the alternatives are differentiated mainly by their relative impacts and benefits to the cultural and natural environment. If one or more alternatives are identified for analysis in the project-level Environmental Impact Report/Environmental Impact Statement (EIR/EIS), the cultural and natural measures will be analyzed in much greater detail.

2.1. OVERALL PROJECT

The California HST Program would implement a more than 700-mile-long, electrically-powered HST system capable of operation in excess of 200 miles per hour on a dedicated, fully grade-separated track with state-of-the-art safety, signaling, and automated train control systems. The system described would serve the major metropolitan centers of California, extending from Sacramento and the San Francisco Bay Area, through the Central Valley, to Los Angeles and San Diego. The HST system is projected to carry 86 to 117 million passengers annually by the year 2030.

In 2005, the California High-Speed Rail Authority (Authority) and the Federal Railroad Administration (FRA) completed a Final Program EIR/EIS (PEIR/EIS) for the proposed California HST System as the first-phase of a tiered environmental review process. The Authority certified the Final PEIR under CEQA and approved the proposed HST System Alternative One (the No Project and Modal Alternatives) and made several corridor decisions. FRA issued a Record of Decision under NEPA on the Final PEIS. This statewide PEIR/EIS established the purpose and need for the HST system, analyzed an HST alternative, compared it with a No Project/No Action Alternative and a Modal Alternative, and evaluated several corridor options.

The Authority is now undertaking second-tier, project-level environmental evaluation. The project-level environmental review process following federal and state laws will lead to the selection of site-specific alternatives and specific mitigation measures to minimize and mitigate adverse impacts. The preparation of project environmental documents will be relied upon to grant approvals and provide financial assistance necessary to construct and operate the system.

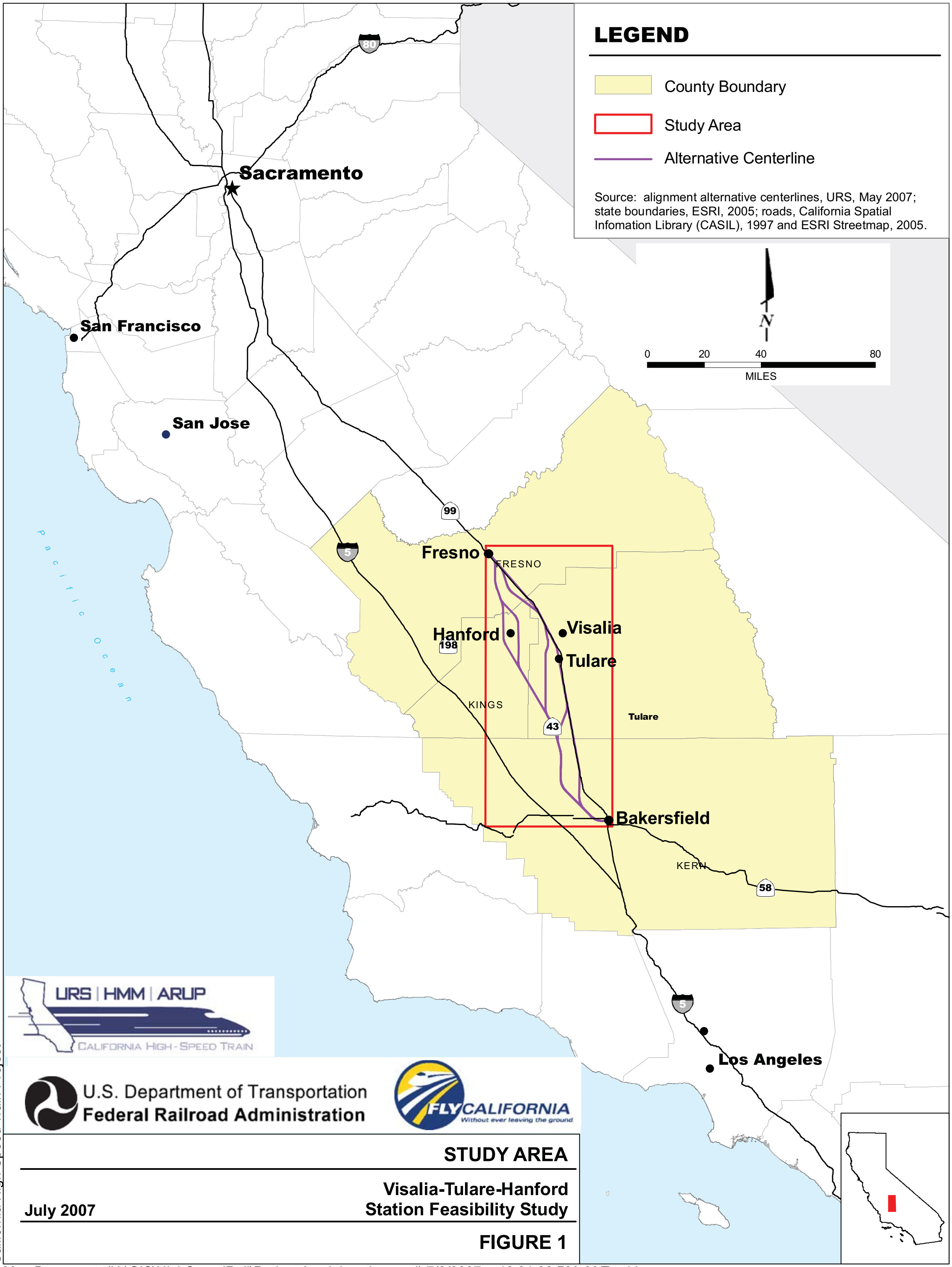
2.2. PURPOSE OF THIS STUDY

An HST alignment was selected with the PEIR/EIS between Fresno and Bakersfield that generally follows the Burlington Northern/Santa Fe Railroad (BNSF) alignment, with no station located between Fresno and Bakersfield. While making this selection, the Authority also noted that there was substantial local interest in having a station in the vicinity of Visalia. The PEIR/EIS stated that, as part of the project-level EIR/EIS process, one of the first steps would be to study alignment alternatives between Fresno and Bakersfield to see if a station could be served in the vicinity of Visalia. **Figure 1** shows the project study area for this Station Feasibility Study.

The purpose of the Visalia-Tulare-Hanford Station Feasibility Study is to evaluate alternative high-speed rail alignments between Fresno and Bakersfield that could provide for a station serving the Visalia area. The objective is to define, via consultation with local stakeholders, one or more alignments that the Authority may consider for further study in the project-level EIR/EIS.

The study used a planning-level assessment of alignment and station location alternatives. Existing data and mapping were used, supplemented by field work as needed. Each alternative was characterized using measures already defined for the statewide rail system for cost, running times, and likely environmental impacts on both developed communities and natural resources. An essential part of the analysis was input from local stakeholders on the proposed alternatives, obtained via an extensive outreach process.

The ultimate intent of the study is to help the Authority define potentially feasible alternatives that could provide HST service Visalia-Tulare-Hanford area, while minimizing impacts to local communities and the environment.



STUDY AREA

July 2007

Visalia-Tulare-Hanford Station Feasibility Study

FIGURE 1

California High-Speed Train Project

Map Document: (U:\GIS\HighSpeedRail\Projects\proj_location.mxd) 7/2/2007 -- 12:31:36 PM M Torchia

3.0 ASSUMPTIONS AND METHODOLOGY

This section describes the planning assumptions used in the development of the project alternatives, and the engineering assumptions and criteria applied to the alternatives developed. It also describes the measures used to characterize alternatives.

3.1. PLANNING ASSUMPTIONS

The planning assumptions described in this section were used to establish the general parameters within which alignment alternatives were created and analyzed.

3.1.1. TECHNOLOGY

The California HST project would use Very High Speed Steel-Wheel-on-Steel-Rail technology, capable of maximum line operating speeds of 220 miles per hour (350 kilometers per hour). The system would be fully electrified throughout, using an overhead catenary system for power distribution and collection. The system would be fully grade-separated and operated independently from the existing mainline freight railroad network, with a few possible exceptions outside of this study area (per CHST Project "Basis of Design Manual", Section 7.4, issued March 2007). This technology establishes parameters for such alignment design elements as curvature, grades, track configuration, station configuration, and other aspects of railroad alignment, as defined in **Section 3.2**.

3.1.2. PROJECT STUDY AREA

The study area is within the Fresno-Palmdale Region of the California HST Project and extends from the existing Fresno downtown train station in the north to the existing Bakersfield train station in the south. As a convention throughout this document, whenever alignments or other linear geographic features are described, they are described from north to south.

3.1.3. FIXED STATION LOCATIONS

For this study, the sites for the stations selected with the PEIR/EIS for Fresno and Bakersfield were assumed to be fixed. The Fresno station was assumed to be located along the existing Union Pacific Railroad (UPRR) alignment near the Chukchansi Park baseball stadium. The Bakersfield location was assumed to be the Truxtun station, located along the BNSF alignment and currently serving Amtrak San Joaquin train and connecting bus passengers.

3.1.4. BYPASS LOOPS

The original alignment alternatives considered in the PEIR/EIS contained options with express train bypass loops around several cities along the alignment, including Fresno and Tulare. These bypasses were not part of the selected PEIR/EIS alternative. This study did not consider any additional bypass loops, nor incorporate any bypass loops as part of the assumed configuration. Stations are assumed to have passing tracks to service the platforms, but these are assumed to be on the same general alignment as the through running tracks and not configured as bypass tracks on a separate alignment.

3.1.5. PROXIMITY TO RAILROAD RIGHT-OF-WAY

In general, the BNSF corridor alignment selected with the PEIR/EIS was located adjacent to the existing railroad right-of-way (ROW), with no buffer in-between and no diversions away from the railroad ROW to avoid city centers. The one exception was where the alignment was routed away from the BNSF line to pass around central Hanford, rather than through the center of this community. This study similarly assumed that where alternatives are in the railroad corridor, they would be adjacent to the existing railroad ROW. The existing freight railroad corridors were assumed to be 100 feet wide; thus the HST tracks were assumed to be no closer to the existing track centers than 50 feet.

Portions of some alternatives are specifically designed to avoid urban impacts, such as the diversion to the west of the cities of Fowler, Selma, and Kingsburg. In this case, the diversion is an integral part of the alternative and cannot be adjacent to the railroad ROW. During the project-level environmental process, which will follow this planning study, the Authority may consider diversions of the alignment around additional cities.

In some locations, especially in locations where the freight railroad ROW curves, the HST alignment must deviate from the freight railroad ROW to satisfy the speed criterion of the HST, which requires broader curves. In these cases, the HST ROW is not immediately adjacent to the freight railroad ROW in the curve and for some distance leading into and out of the curve.

3.1.6. WIDTH OF CORRIDOR

For characterization purposes, the corridor analyzed for each of the alternative alignments was assumed to be 1/4-mile wide. The width of the corridor extends 1/8 of a mile on either side of the centerline of the HST tracks.

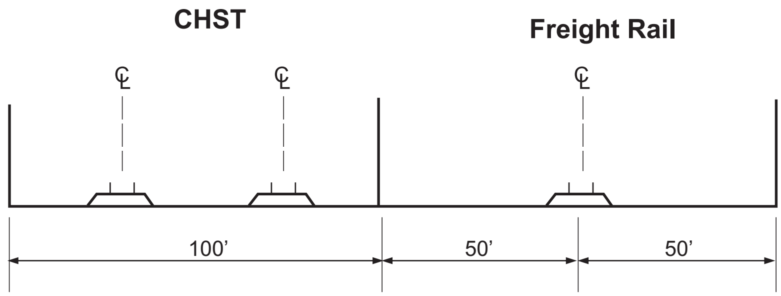
3.1.7. ALIGNMENT CONFIGURATION

Figure 2 illustrates the typical at-grade right-of-way sections in urban and rural settings for lineside locations in the corridor (not at locations with stations or sidings).

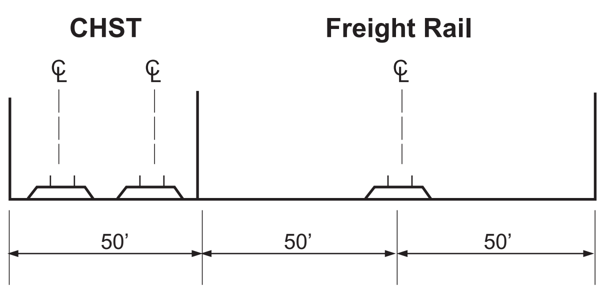
Portions of the HST right-of-way will need to be elevated to minimize impacts on farmland, water resources, urban development, and other uses. **Figure 3** illustrates the typical right-of-way configuration in an elevated section. The right-of-way will also need to be elevated in places to allow access underneath it for existing railroads and for road connectivity and traffic circulation. This study has not established the elevated sections of alternatives but has instead assumed that some percentage of the right-of-way would need to be elevated for cost-estimating purposes. Project-level environmental review will involve evaluation of alternatives and right-of-way needs in more detail.

Portions of the HST right-of-way may need to be constructed below grade to minimize impacts on existing and planned development. **Figure 4** illustrates what typical below-grade sections could look like. It also illustrates several possible configurations for existing freight railroads in the same corridor, depicting several ways to serve lineside industries.

TYPICAL RIGHT-OF-WAY SECTION: RURAL



TYPICAL RIGHT-OF-WAY SECTION: URBAN



Not to Scale

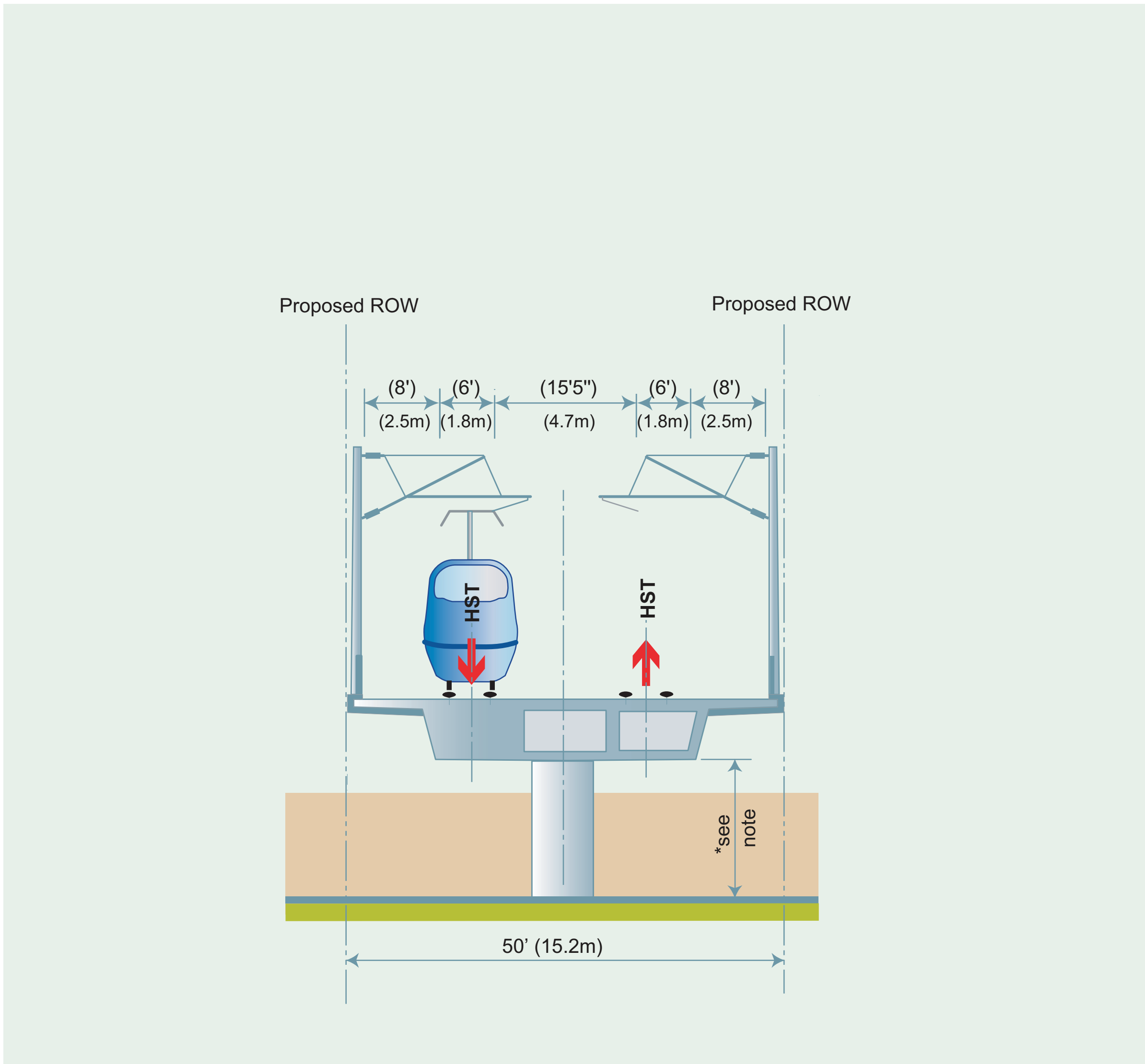
Note: Typical section widths are for lineside locations along HST corridors, not for locations at HST stations or sidings.

TYPICAL RIGHT-OF-WAY SECTIONS

FIGURE 2

Source:
CHST Engineering Criteria (2004)

6/29/07 hk ..\CAHST-Fresno-Palmdale\Graphics\F2_Typ ROW sections.cdr

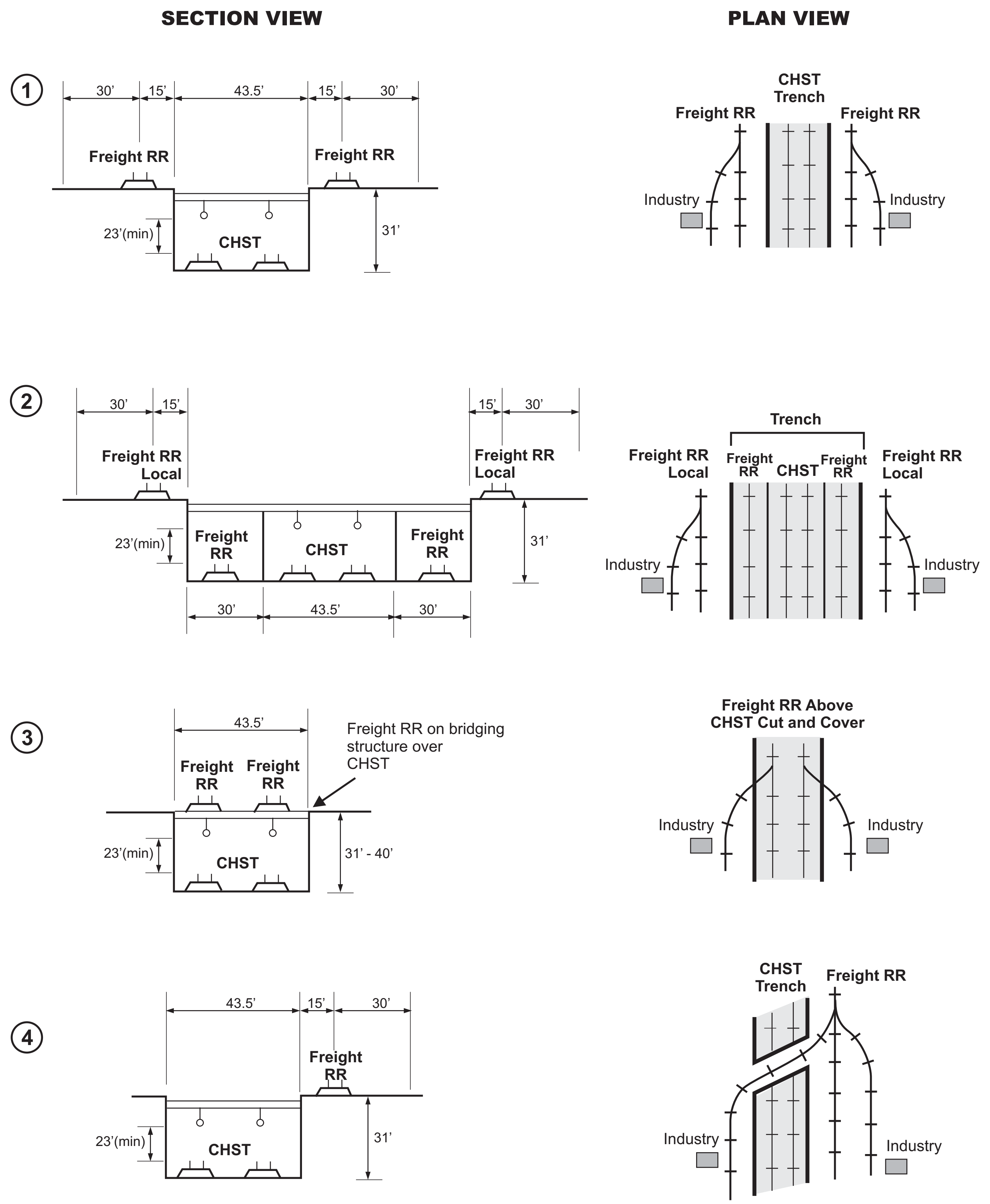


***Note:**
Minimum clearance under HST aerial structure:
- 16'9" (5.1 m) above roadway surface
- 23'3" (7.1 m) above top of rail

Source:
California High-Speed Train Program EIR/EIS (2005)

TYPICAL ELEVATED RIGHT-OF-WAY SECTION

FIGURE 3



Not to Scale

Source:
URS/HMM/ARUP (2007)

TYPICAL SECTION
BELOW-GRADE OPTIONS

FIGURE 4

3.1.8. RIDERSHIP

This study made no assumptions as to likely passenger demand and resulting ridership. Demand will be considered as part of a project-level EIR/EIS for this section of the HST system. Existing ridership assumptions in the *Engineering Criteria Report* (2004) were used for sizing the station footprint.

3.2. ENGINEERING ASSUMPTIONS

Certain engineering criteria were used to develop the alignments described in this feasibility study that are consistent with earlier studies and the PEIR/EIS. On a high-speed system, the curvatures and gradients necessary to enable the desired speeds – the 'geometry' – limit the range of possible designs. In the end, speed and geometry dictate many aspects of the design of the system, including possible station sites.

3.2.1. SPEED

The entire length of alignment alternatives between the downtown Fresno station and the Truxtun station in Bakersfield must deliver a design speed of 250 mph, and a standard operating speed of 220 mph, as specified in the Authority Design Criteria Manual (March 2007). The Authority Operations Report (January 2004) describes the several levels of service will operate on this section of the system including non-stop express trains. The maximum operating line speed will be 220 mph at any point, including through all stations on this section of the system.

The design criteria for speed on the high speed train system are as follows:

- Maximum Design Speed: 250 mph
- Maximum Line Operating Speed: 220 mph.

Each of the alternatives presented in this report meets or exceeds these speed standards.

3.2.2. GEOMETRY

The operative Criteria for Conceptual and Preliminary Design, issued March 19, 2007, include some basic alignment and platform criteria and other design information. Of primary importance were the horizontal alignment criteria as the basis of fesible alignment alternatives that can be carried forward into design.

Each of the alignment alternatives was developed to meet or exceed the design speed criteria cited above. For a Maximum Design Speed of 250 mph, a corresponding radius of curvature of 31,680 ft. was applied to the various alternatives. This value represents the desired radius and should be used for design wherever conditions will permit. As design progresses, there would be some opportunity to refine the curves used on the alignment to minimize impacts to the natural and built environment. See **Table 1** for the curve radius standards used in this study.

This report assumed that the Authority desirable maximum of 3.5% specified in the *Engineering Criteria Report* (2004) would not be exceeded in this section of the project, given that the topography in the region is principally flat.

Table 1– Curve Radii

Standard	Radius
Desirable Curve Radius	31,680 feet
Minimum Curve Radius for Design Speed (250 mph)	25,700 feet
Minimum Curve Radius for Maximum Line Operating Speed (220 mph)	20,000 feet

3.2.3. STATION DESIGN

The Authority's Engineering Criteria Manual (January 2004) dictates that all HST station platforms must be on tangent (straight) track and that all platforms will be on sidings off of the mainline. This will allow non-stop express trains to operate through each station at full line speed (220 mph) on center express tracks, while local trains can be stopped at sidings on platforms serving the local station. Thus, each station will have a minimum of four tracks – two tracks for station platforms and two for the non-stop express trains.

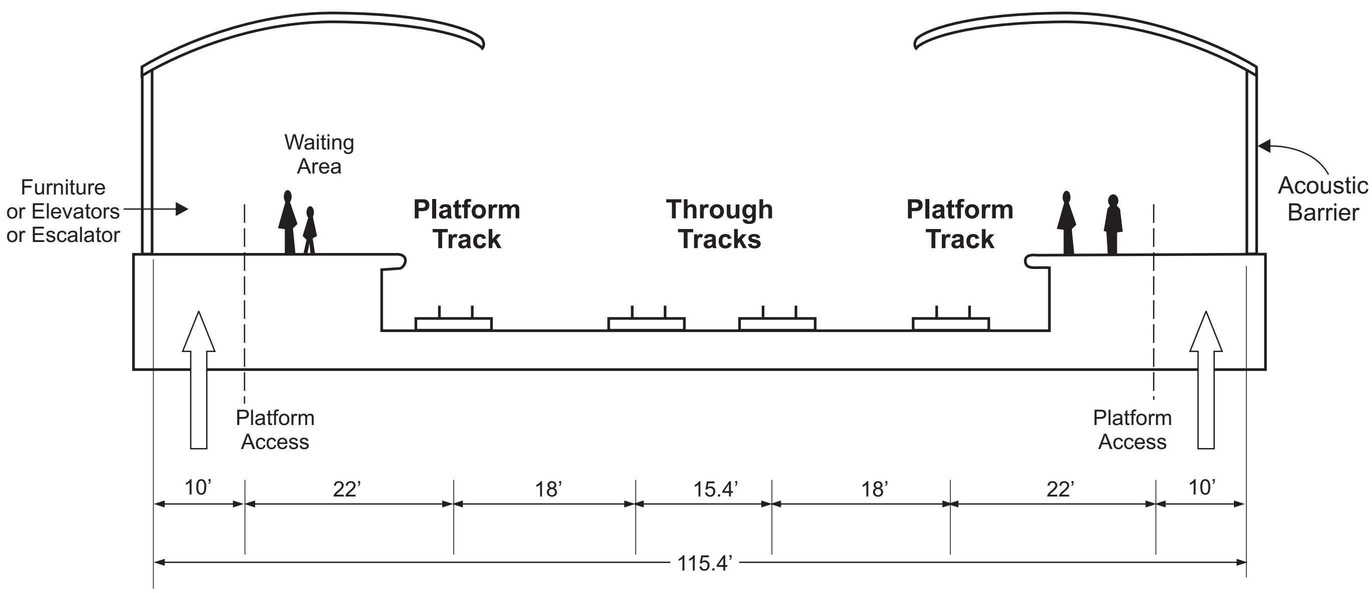
Platforms must be 1,320 feet long and all on tangent track. Because of clearance requirements related to super-elevation of track, station platforms can be no closer to a curve than 560 feet.

The sidings for the station platforms must allow for deceleration off of the mainline and re-acceleration back up to speeds to switch back onto the mainline. Sidings must be a minimum of 7540 feet long before and after the platform for deceleration and re-acceleration. Thus, sidings for the station platforms are a minimum of 16,400 feet long (2 × 7540 + 1320). The switches from the mainline onto the sidings must also be placed on tangent track and are designed for 110 mph diverging movements (full design speed for through movements if not diverging).

All of these criteria in combination restrict possible station locations. **Figure 5** is a section view showing how a station at this location could be configured, with assumed side platforms. Given different site circumstances at the location ultimately chosen for a station, the design concept may be different depending on access restrictions from the surrounding development, relationship to curves or other alignment features, or other operational issues.

3.2.4. STATION FOOTPRINT

Figure 6 shows a typical station footprint for a potential Visalia-Tulare-Hanford station in plan view, subject to specific site conditions and operating needs that would be developed during design of the station. The requirements for the station size were established in the *Engineering Criteria* document prepared in January 2004 for the Authority. Table 4.7-1 in this report establishes a Tulare/Kings-Visalia or Hanford station as a Category VI station, expected to serve 316 daily passengers, or 26 per peak hour. Table 4.7-2 in this report establishes the desired size for a Category VI station as 11,880 square feet. The anticipated parking requirements for this station are established in Table 4.6-2 in this same document as requiring parking for 62 vehicles. For simplification purposes, Figure 6 shows parking at one acre, or enough for approximately 100 cars.

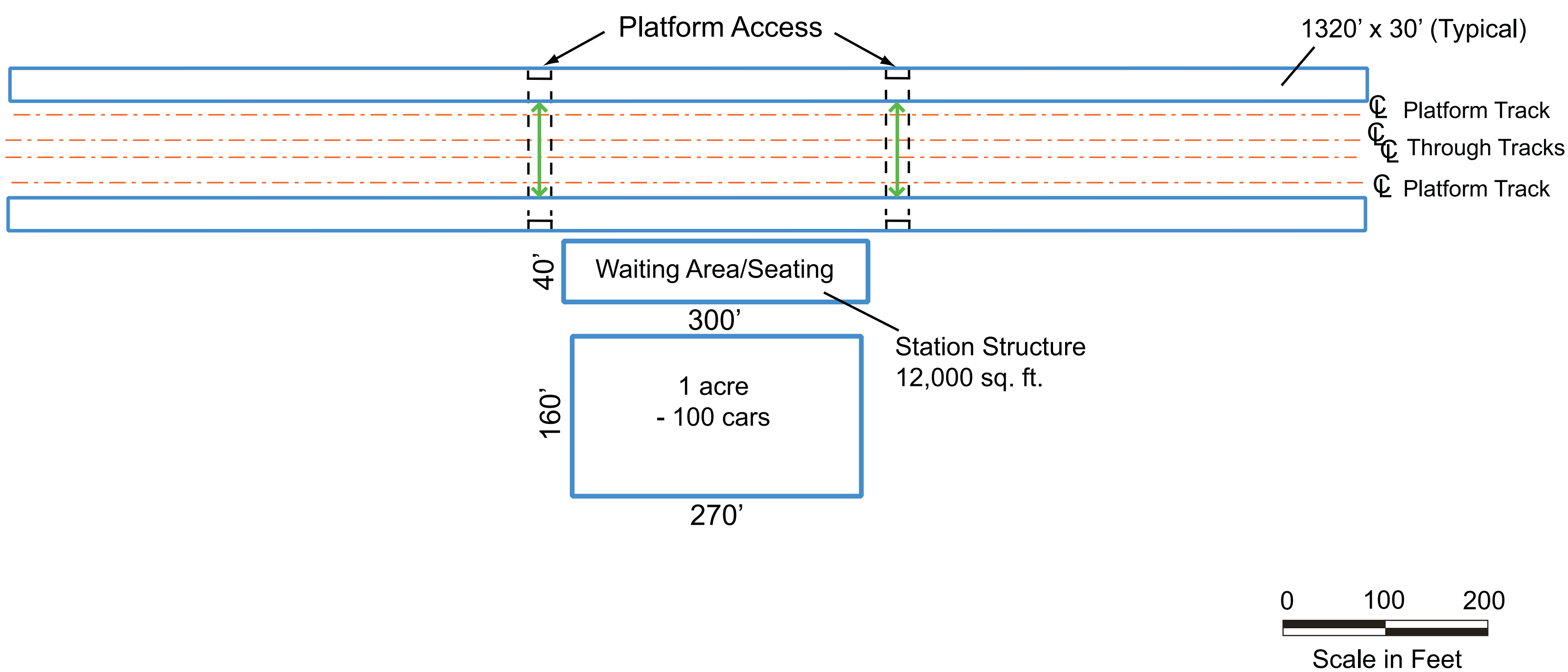


Not to Scale

Source:
URS/HMM/ARUP (2007)

STATION CONFIGURATION CONCEPT – SECTION VIEW

FIGURE 5



Source:
CHST Engineering Criteria (2004)

STATION CONFIGURATION CONCEPT – PLAN VIEW

FIGURE 6

6/27/07 hk/vsa ..\CAHST-Fresno-Palmdale\Graphics\F6_station config plan.ai

3.3. METHODOLOGY

This study has followed a fairly standard planning process, using both qualitative and quantitative measures that reflect a mixture of applicable policy and technical considerations. A broad initial set of alternatives were screened based on stakeholder input and qualitative factors, supplemented by rudimentary engineering assessment. These initial alternatives were subsequently refined, and the remaining alignments were analyzed on the basis of more quantitative information developed through engineering and the use of Geographic Information Systems (GIS). The goal was to provide sufficient information to enable Authority to identify one or more feasible alternatives for more detailed study in a Project EIR/ EIS.

The techniques used in refining the alignment and station alternatives and assessing their feasibility for each of the four steps of the process are shown in **Table 2**.

Table 1 – Assessment Methodology

	STUDY STEPS			
Techniques	**1. Creation of Initial Alternatives**	**2. Initial Screening**	**3. Refinement of Alternatives**	**4. Characterization**
Field Inspections	✓	✓	✓	✓
Outreach – Stakeholder Input	✓	✓	✓	✓
Qualitative Assessment	✓	✓	✓	✓
Engineering Assessment	✓	✓	✓	✓
GIS Assessment				✓

The four steps were:

1) **Create** an initial set of a wide variety of alternatives,

2) **Screen** the initial alternatives using criteria based on stakeholder input and qualitative factors, supplemented by initial engineering assessments. This resulted in a number of alternatives being dropped,

3) **Refine** the remaining alternatives, and

4) **Characterize** the refined alternatives using quantitative information developed through engineering and the application of GIS data.

These steps are detailed in **Sections 5.0, 6.0, and 7.0** below, illustrating the development, screening and refinement of the alternatives.

<u>Field Inspections of Corridor</u> – The potential alignment, right-of-way, and station location alternatives were the subjects of field inspection by experienced planning and engineering staff, to identify conditions and factors not visible in aerial photos or on maps. Over the course of the study, field inspections have become progressively more detailed as the alternatives have been refined by planning and engineering work.

Members of the study team first inspected the BNSF and UPRR alignments in January 2007, as part of a general survey of the entire Fresno-Palmdale Region. The planning and engineering team inspected the BNSF and UPRR alignments between Fresno and Bakersfield in more detail on March 12-14, 2007. Additional engineering staff reviewed the alignment alternatives on April 26-27, 2007. As the evaluation progressed and data became available from the GIS assessment, project planners and GIS specialists traveled the region from May 7-9, 2007, to survey the alignment alternatives not on the BNSF or UPRR alignments and to inspect all of the potential station locations. On the May trip, the team collected field information to supplement and verify the GIS information, and compiled a photo log of the alignments and station sites.

Outreach – Stakeholder Input – The project team conducted a number of meetings with stakeholders in the area. The project team met regularly with TAGs, composed of city and county staff within each county, agricultural commissioners, and other interested stakeholders. The outreach process is described more completely in Section 4.0.

Qualitative Assessment – A number of the measures used to describe alternatives are qualitative, provided by professionals with experience in the construction and operation of high speed rail and other transportation systems, through discussions with local stakeholders, and by review of planning documents. These measures include constructability and operability, general plan consistency, and station site availability.

Engineering Assessment – Engineering assessments are provided for a number of measures that can be readily quantified at this stage of development of the project. The engineering assessment can provide information on project length, travel time, opportunities for grade-separating freight railroads along with the HST, and for capital costs based on unit measures at this time.

GIS Assessment – The bulk of the assessment has been performed using GIS data, which enables detailed assessments of the project's interactions with a variety of measurable geographic features, both natural and built. GIS data have been used to assess impacts on farmland, water resources, floodplains, wetlands, threatened and endangered species, cultural resources, and current urban development.

4.0 OUTREACH PROCESS

A project of this scope and size requires communication with a broad spectrum of the affected community, to ensure that as many people as possible know about the project, understand its potential benefits and impacts, and have an opportunity to comment on all aspects of the project. Although the Visalia-Tulare-Hanford Study has been performed over less than four months, it has involved comprehensive outreach among communities along the alignment. The goal of this effort was to foster understanding and buy-in among the communities within the study area, reflective of their needs and community values.

4.1. AGENCIES/GROUPS CONTACTED

Listed below are the agencies and groups that were contacted during this study. The team started the outreach effort by contacting local government staff involved in transportation and planning within the study area or otherwise involved in the earlier PEIR/EIS for the HST system. These initial meetings led to additional contacts with these communities and the identification of other groups or agencies to contact, including agricultural groups who identified how best to assess impacts to agriculture.

- City of Fresno, Planning and Development Services Staff
- City of Fresno, Economic Development Department
- Fresno County, Public Works and Planning Staff
- Fresno Redevelopment Agency
- Council of Fresno County Governments
- Fresno County Board of Supervisors
- Fresno County Agricultural Commissioner's Office
- Fresno Rail Consolidation Committee
- Fresno County Rail Committee
- Fresno Area Residents for Rail Consolidation
- Fresno County Technical Assessment Group
- Greater Fresno Chamber
- Selma City Manager's Office
- Fowler City Manager's Office
- California State University, Fresno, Vintage Days
- Lancaster City Manager's Office
- California Partnership with the San Joaquin Valley
- Valley Regional Policy Council
- Antelope Valley Board of Trade
- Tulare/Kings Technical Assessment Group
- Kings County Association of Governments
- Palmdale Mayor and City Manager's Offices
- Kingsburg City Manager's Office
- Hanford City Manager's Office
- Tulare City Manager's Office
- Tulare County Resource Management Agency
- Tulare County Council of Governments
- Madera County
- City of Corcoran
- Visalia City Manager's Office
- Antelope Valley Women's Conference
- Friends of Allensworth Park
- Fresno/Fowler/Kingsburg/Selma Transportation Planning Meeting
- Caltrans

4.2. MEETINGS HELD IN STUDY AREA

Two types of meetings were held within the study area. The first meetings were directly with agency staffs, decision makers, and members of the public to inform them of the project, gain their knowledge of the area, and learn about important individuals and organizations the project team should include in its outreach efforts. The second type of meetings held were with two Technical Assessment Groups (TAGs) that were organized to provide concerted regional input. One TAG consisted of representatives from cities and organizations within Fresno County. The other TAG was composed of representatives within Tulare and Kings Counties and representatives from Corcoran and McFarland in Kern County.

Team members met, either on an individual basis or in groups, with agency staff directors, planners, and managers throughout the project study area to explain the purpose of the study, obtain information on local issues and ideas, and identify other individuals or organizations to meet with to discuss the project. Through this process, the project team was able to gain valuable insight on the needs of each of the communities, background data and history of their communities, and unique or important areas for the HST to avoid. These meetings enabled the team to assemble the two TAGs that provided for fair input for all communities within the study area in a collaborative setting.

Two well-attended meetings were held individually with each TAG, to obtain initial input to the study team and to provide the team with expert local knowledge, then to obtain feedback on initial study results. A final joint TAG meeting was held to present the results of the study and obtain input on its findings. The Fresno TAG meetings were held at the Council of Fresno County Governments' offices in downtown Fresno. The Kings/Tulare TAG meetings and the joint TAG meeting were held at the Visalia Convention Center in Downtown Visalia.

Attendees at these TAG meetings included the following:

Fresno County Technical Assessment Group April 18, 2007	
TAG Attendees	HST Attendees
Brandon Erickson, City of Fresno Economic Development Department Cathy Crosby, Fresno County Stan Nakagawa, Fresno County Don Pauley, City of Kingsburg Sophia Pagoulatos, City of Fresno Darrel Unruh, City of Fresno Enrique Mendez, Fresno RDA Tom Bailey, FARRC Paul Marquez, Caltrans Matt Treber, Madera County John Downs, Fresno COG/FAX Clark Thompson, Fresno COG	Howard Smith Dominic Spaethling Duncan Watry Bob Schaevitz Sandy Stadtfeld David Hilliard Alan Boone

Tulare/Kings Technical Assessment Group April 23, 2007	
TAG Attendees	HST Attendees
Don Pauley, City of Kingsburg	Howard Smith
Scott Cochran, Tulare County Association of Governments	David Hilliard
Karin Ford, Economic Development Corp.	Eric VonBerg
Bill Hayter, Tulare County RMA	Bob Schaevitz
Darrel Pyle, City of Tulare	Sandy Stadtfeld
Andrew Benelli, City of Visalia	Arnold Luft
Bill Zumwalt, Kings County	
Marilyn Kinoshita, Tulare County Ag Commission	
Steve Kroeker, City of Corcoran	
Ron Hoggard, City of Corcoran	
Alan Christensen, City of Hanford	
Britt L. Fussel, Tulare County RMA	
Seth Eberhard, Kings County Association of Governments	
Carol Cairns, City of Visalia	
Michael Miller, City of Tulare	
Al Dias, Caltrans	
Rob Hunt, City of Tulare	
Mike Olmos, City of Visalia	

Fresno County Technical Assessment Group May 17, 2007	
TAG Attendees	HST Attendees
Cathy Crosby, Fresno County	Dominic Spaethling
Brandon Erickson, City of Fresno Economic Development Department	Howard Smith
Darrel Unruh, City of Fresno	David Hilliard
Tom Bailey, FARRC	Eric VonBerg
Dennis Manning, FARRC	Cheryl Lehn
Roseann Galvan, City of Selma	
Clark Thompson, Fresno COG	
Rico Aguayo, City of Fowler	
Leland Bergstrom, City of Kingsburg	
Allison Kessler, Fresno County Board of Supervisors	
Jeff Long, Fresno COG/FAX	

Tulare/Kings Technical Assessment Group May 17, 2007	
TAG Attendees	HST Attendees
Scott Cochran, Tulare County Association of Governments	Dominic Spaethling
Bill Zumwalt, Kings County	Howard Smith
Ron Hoggard, City of Corcoran	David Hilliard
Jeri Grant, City of Corcoran	Sandy Stadtfeld
Steve Saloman, City of Visalia	Eric VonBerg
Leland Bergstrom, City of Kingsburg	Cheryl Lehn
Alan Christensen, City of Hanford	Georgiena Vivian
Britt L. Fussel, Tulare County RMA	
Carol Cairns, City of Visalia	
Michael Miller, City of Tulare	
Mike Olmos, City of Visalia	
Paul Marquez, Caltrans District 6	

5.0 DEVELOPMENT OF STATION FEASIBILITY STUDY ALTERNATIVES

Alternatives considered in the Visalia-Tulare-Hanford Station Feasibility Study are the result of a series of study processes that developed and refined alternatives over a period of several years.

5.1. DESCRIPTION OF PROJECT ALTERNATIVES IN PROGRAMMATIC EIR/EIS

The PEIR/EIS defined and considered a system of corridors for traversing the Fresno-Bakersfield region. Two alternatives that were fully analyzed are summarized in **Section 5.1.1** below. The alternative that was selected is described in **Section 5.1.2**, and those that were rejected in technical studies prior to the full evaluation are summarized in **Section 5.1.3**.

5.1.1. ALTERNATIVES CONSIDERED

The Programmatic EIR/EIS fully analyzed two basic alternative alignments, shown in **Figure 7**.

UPRR – The first alternative was the UPRR alignment, which would start at the downtown Fresno station on the UPRR corridor and proceed southward via the existing UPRR alignment through the cities of Fowler, Selma, Kingsburg, and Goshen to a station stop at Visalia Airport. From there, this alignment proceeds south through Tulare, Pixley, Earlimart, Delano and McFarland to Bakersfield. Routing options considered included a bypass loop around Tulare, and two entrances to Bakersfield were considered. One entrance was via the UPRR corridor and served the Golden State station location on the UPRR, and the other transitioned to the BNSF corridor west of Bakersfield and entered via the BNSF corridor to serve the Truxtun station.

BNSF – The second alignment alternative analyzed was the BNSF alignment, which would start at the downtown Fresno station on the UPRR, and proceeds southward, requiring a transition onto the BNSF alignment south of downtown Fresno near Calwa. This alignment would then proceed south through Laton to a proposed station stop in Hanford at the current Amtrak station. From there, this alignment would travel south through the cities of Corcoran, Wasco and Shafter, entering Bakersfield on the BNSF alignment. Because this alternative stayed on the BNSF alignment through central Hanford, curvature on the alignment would limit operating speed. This option included a bypass around central Hanford (to the west) for through express train operation.

5.1.2. SELECTED HIGH-SPEED TRAIN ALTERNATIVE

The HST alternative selected with the PEIR/EIS between Fresno and Bakersfield was a variation of the BNSF alignment described above in **Section 5.1.1**. The main differences were that the selected alternative bypassed central Hanford, and that it did not include a station in Hanford or at any location between Fresno and Bakersfield. The bypass around Hanford diverged from the BNSF alignment on the north at approximately Laton, passed west of central Hanford between Hanford and Armona, and rejoined the existing BNSF alignment north of Corcoran near Kansas Avenue. This bypass had originally been intended only for express trains around Hanford but became the preferred alternative when Hanford preferred not to have a station located in the center of town. The alignment that would have served a station in central Hanford along the BNSF mainline was thus eliminated from consideration. The final selected alternative is shown in **Figure 7**, highlighted in yellow.

5.1.3. ALTERNATIVES ELIMINATED FROM CONSIDERATION

Two other alternatives were considered and rejected in technical studies prior to the full evaluation in the PEIR/EIS. These are also shown in **Figure 7**.

W99 – This alternative paralleled the UPRR/SR-99 corridor but was placed approximately 2-4 miles west of SR-99. This alternative was considered a "greenfield" alternative, passing largely through farmland just to the west of the cities of Fowler, Selma, Kingsburg, Goshen and Visalia Airport to a station stop west of Tulare. From there, this alignment proceeded south just west of the cities of Tulare, Pixley, Earlimart, Delano and McFarland to a station west of Bakersfield. This alternative also connected at Fresno with a series of bypasses around the west side of Fresno, which were also eliminated.

E99 – This alternative also roughly paralleled the UPRR/SR-99 corridor but approximately 10-15 miles to the east. This alignment started at a station well to the east of Fresno and then proceeded southeasterly roughly parallel to SR-99 between Reedley and Orange Cove, to a station east of Visalia, near Exeter. From there, this alignment proceeded due south parallel to Road 782 and rejoined the UPRR alignment south of McFarland.

5.1.4. STATION SITES ELIMINATED FROM CONSIDERATION

Along with the rejected alignment segments, several station sites were rejected in Fresno, Bakersfield and mid-valley along the W-99 and E-99 corridors during the technical studies prior to the PEIR/EIS. These are also shown in **Figure 7.**

Fresno – In Fresno, five station sites were rejected: Fresno West, Chandler Field, Fresno Amtrak, Fresno Airport, and Fresno East. All were on alignment segments that were rejected.

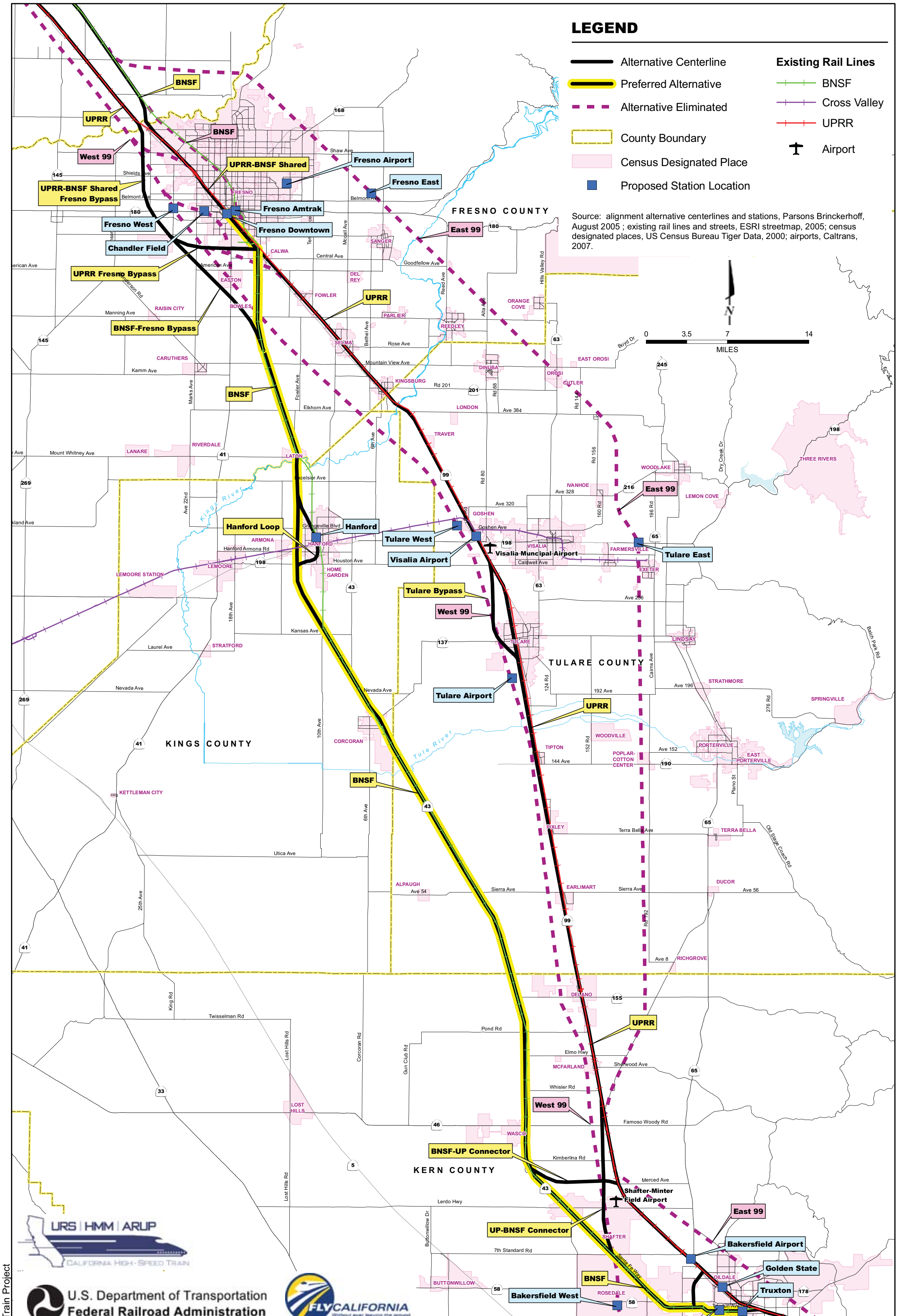
Mid-Valley – Three mid-valley station sites were rejected: Tulare West, Tulare East, and Tulare Airport. All were on alignment segments that were rejected. Tulare West is close to two of the station sites being considered in this Feasibility Study at SR 198-East.

Bakersfield – In Bakersfield, four station sites were rejected: Bakersfield West, Bakersfield South, Old Amtrak, and Bakersfield East. All four sites were on alignment segments that were rejected.

As a result of the PEIR/EIS analysis, additional station sites were rejected in mid-valley and Bakersfield.

Mid-Valley – Two additional mid-valley station sites were rejected: central Hanford and Visalia Airport. Central Hanford was rejected because of local concerns about having a high speed rail alignment through central Hanford. The Visalia Airport location is under consideration again as part of this Feasibility Study but was rejected because it was not on the preferred alternative alignment.

Bakersfield – In Bakersfield, two additional station sites were rejected: Bakersfield Airport and Golden State. All were on alignment segments that were not selected.



California High-Speed Train Project

ALTERNATIVES IN PROGRAMMATIC EIR/EIS

July 2007

Visalia-Tulare-Hanford Station Feasibility Study

FIGURE 7

Map Document: (U:\GIS\HighSpeedRail\Projects\PEIR_alternatives.mxd) 7/2/2007 -- 12:34:43 PM M Torchia

5.1.5. PEIR/EIS BASIS FOR VISALIA-TULARE-HANFORD STUDY

While stating the preference discussed above in **Section 5.1.2** (i.e., for the BNSF alignment without a station between Fresno and Bakersfield), the PEIR/EIS also noted that there was substantial local interest in siting a station in the vicinity of Visalia, which is east of the UPRR corridor. The document stated that, as part of the project-level EIR/EIS process, one of the first steps would be to undertake a study of route alignment alternatives between Fresno and Bakersfield to see if a station could be located in the vicinity of Visalia.

5.2. DESCRIPTION OF ALTERNATIVES DEVELOPED FOR VISALIA-TULARE-HANFORD STATION FEASIBILITY STUDY

As noted in **Section 3.3.1**, the development of alignment and station alternatives for the Visalia-Tulare-Hanford Station Feasibility Study has been a four-step process. The first step was the creation of an initial set of 13 alternatives, representing a wide variety of concepts for how to create an alignment that could serve a station in this area. Second, these 13 alternatives were screened based on stakeholder input and qualitative factors, supplemented by initial engineering assessment. Third, the alternatives were then refined to produce 8 final alignment alternatives. Finally, the remaining 8 alignment alternatives were assessed and then characterized using more quantitative information developed through engineering and the application of GIS data.

5.2.1. INITIAL ALTERNATIVES

Thirteen draft alternative alignments were initially identified for this study. The first step in the creation of these 13 initial alignment alternatives was to review the work done in the PEIR/EIS and predecessor documents to identify all of the alignments and station locations that were considered and rejected or those considered and carried forward. From those documents, the team identified two major types of alternatives – those in the existing railroad corridors and those largely outside of the existing railroad corridors. Based on assessments developed during the PEIR/EIS process, the team decided to not consider alignments that were located entirely or mostly outside of the existing railroad corridors. The team developed four alignment concepts that would serve the overall corridor and also serve a station in the Visalia-Tulare-Hanford area:

<u>All BNSF</u> – this type of alternative would start in Fresno on the UPRR corridor at the downtown station in Fresno but would then transition to the BNSF corridor in south Fresno and then stay wholly within the BNSF corridor, as with the PEIR/EIS preferred alternative. This category includes line deviations around Hanford. This category includes Alternatives A, D-1, D-2, D-3, and F-1.

<u>All UP</u> – This type of alternative would stay wholly within the UPRR corridor, with the exception of the entrance to Bakersfield, which would need to be on the BNSF to serve the Truxtun station site. This category includes alternatives with minor line deviations around the downtowns of the cities in southern Fresno County. This category includes Alternatives B, C-1, C-2, and C-3.

<u>UP-BNSF</u> – This type of alternative would start in Fresno on the UPRR and transition to the BNSF corridor in the vicinity of mid-valley in order to serve a specific station site. This category includes Alternatives E and F.

<u>BNSF-UP</u> – This type of alternative would start in Fresno on the UPRR corridor at the downtown station in Fresno, transition to the BNSF corridor in south Fresno, and then transition back to the UPRR corridor in the vicinity of mid-valley in order to serve a specific station site. This type of alternative would then transition back to the BNSF by the southern portion of the valley in order to serve the Truxtun station in Bakersfield. This category includes Alternatives G-1 and G-2.

From the four concepts described above, the initial set of 13 alternatives was developed and are described briefly in a table in **Table 3**, mapped together in **Figure 8** and are described more fully in this section.

Each alternative is illustrated with a corresponding thumbnail map to show the relationship to the other alternatives in **Figures 9 through 21**.

5.2.2. RELATIONSHIP TO ALTERNATIVES IN PROGRAMMATIC EIR/EIS

Three of the 13 alternatives above were derived largely from alternatives considered in the PEIR/EIS. This feasibility study's Alternative A – 'BNSF Refined' is essentially the same as the initial version of the BNSF alignment considered in the PEIR/EIS that included a station stop in central Hanford but without the express train bypass to the west of Hanford. Alternative B is the same as the UPRR corridor alternative considered in the PEIR/EIS. Both of these alternatives were eliminated from further consideration in the PEIR/EIS. Alternative D-2 – Hanford West Bypass is essentially the same as the preferred alternative in the PEIR/EIS.

5.2.3. DEVELOPMENT OF STATION LOCATION ZONES

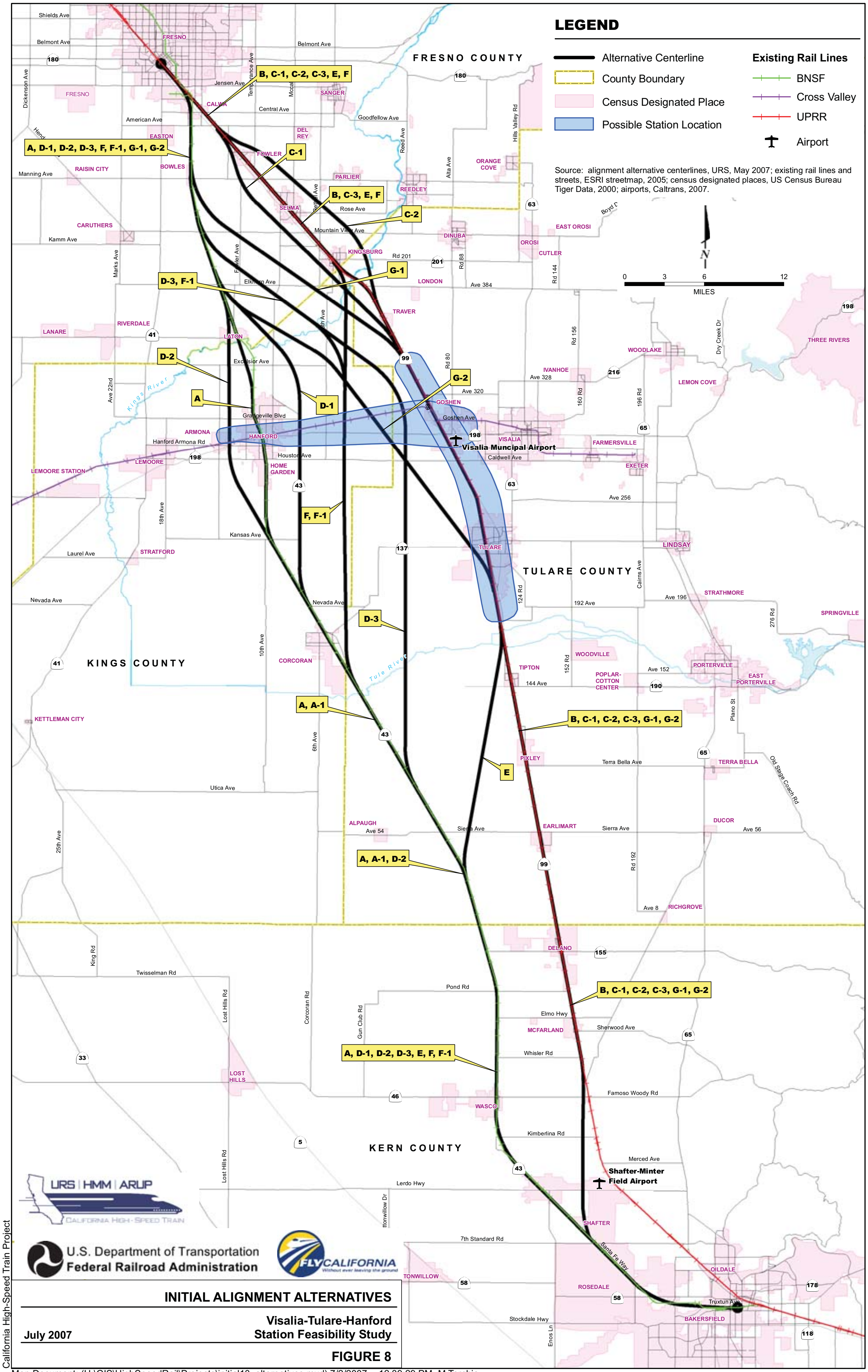
For the initial 13 alternatives, two potential station location zones were identified, with each alternative passing through at least one of these areas (**see Figure 8**). These zones were defined on the basis of the proximity of existing arterials (SR-198 and SR-99) to serve the potential station sites.

The first potential station zone is in the SR-99 corridor, parallel to the UPRR corridor. The station zone identified extends roughly from north of Goshen near Traver to the southside of Tulare. Alignments that could serve a station within this corridor are B, C-1, C-2, C-3, E, G-1, and G-2.

The second potential station zone is an area roughly parallel to SR-198 and the Cross-Valley Rail Line between Armona (west of Hanford) and Goshen. Alignments that could serve a station location within this area are A, D-1, D-2, D-3, F, F-1, and G-2. The SR-198 provides a connector function between the two rail corridors – the UPRR and the BNSF, connecting Hanford on the west with Goshen and Visalia, and extending further eastward to the vicinity of Exeter. A station located along SR-198 would provide good connectivity throughout the Visalia-Tulare-Hanford region.

Table 2 – Initial Alignment Alternatives

Alignment Alternative	Alignment Description	Station Corridor	Comments
A	**BNSF - Refined**	No Station	- Refined according to current design criteria and constraints while still remaining entirely in existing RR corridor
B	**UPRR - Refined**	SR-99	- Refined according to current design criteria and constraints while still remaining entirely in existing RR corridor
C-1	**UPRR - Diverted West** (from Kingsburg to Fowler)	SR-99	- Two possible options - a) Full avoidance b) Close as possible to UPRR. - Minimizes impacts on Fowler, Kingsburg and Selma - Could be combined with E or F
C-2	**UPRR - Diverted East** (from Kingsburg to Fowler)	SR-99	- Two possible options - a) Full avoidance b) Close as possible to UPRR. - Minimizes impacts on Fowler, Kingsburg and Selma - Could be combined with E or F
C-3	**UPRR – Below Grade** (below grade, from Kingsburg to Fowler)	SR-99	- Below-grade within same right-of-way constraints as other alignments - Minimizes impacts on Fowler, Kingsburg and Selma - Could be combined with E or F
D-1	**BNSF - Hanford East Bypass**	SR-198	- Follows Hwy 43 N-S alignment as much as possible - Avoids almost all mid-corridor urban development
D-2	**BNSF - Hanford West Bypass**	SR-198	- Follows abandoned SP alignment as much as possible Hardwick to Armona - Station may be several miles north of Hwy 198 due to rail geometry - Avoids almost all mid-corridor urban development - Baseline alternative
D-3	**BNSF - Hanford Far-East Bypass** (SR-198 Station)	SR-198	- Serves Visalia Airport vicinity from BNSF alignment - Follows N-S section line as much as possible - Avoids almost all mid-corridor urban development
E	**UPRR to BNSF 99** (SR-99 Station)	SR-99	- Cross-valley south of Tulare - Could be combined with G-1
F	**UPRR to BNSF 198** (SR-198 Station)	SR-198	- Follows N-S section line as much as possible
F-1	**BNSF to BNSF** (Center of Valley**)**	SR-198	- Uses same alignment as D-3 north of Hwy 198. - Avoids almost all mid-corridor urban development
G-1	**BNSF to UPRR 99** (SR-99 Station)	SR-99	- Could be combined with E
G-2	**BNSF to UPRR 198** (SR-198 Station)	SR-198	- Avoids almost all mid-corridor urban development



California High-Speed Train Project

INITIAL ALIGNMENT ALTERNATIVES

Visalia-Tulare-Hanford Station Feasibility Study

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FIGURE 8

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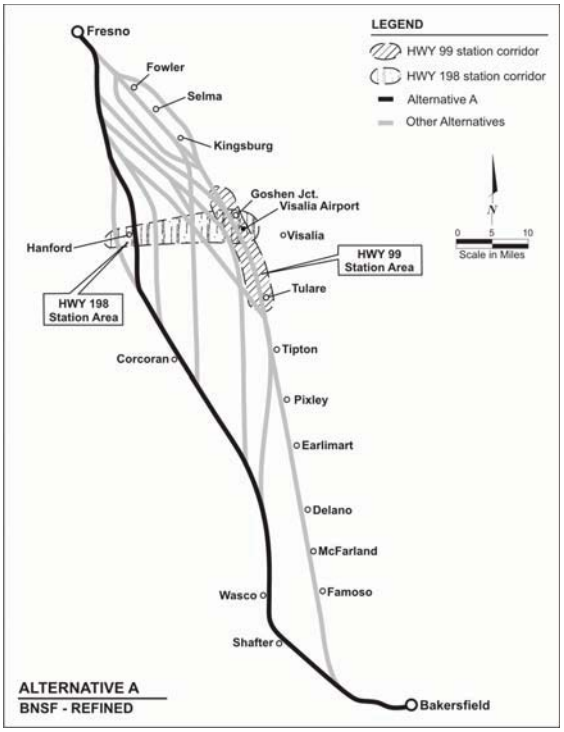
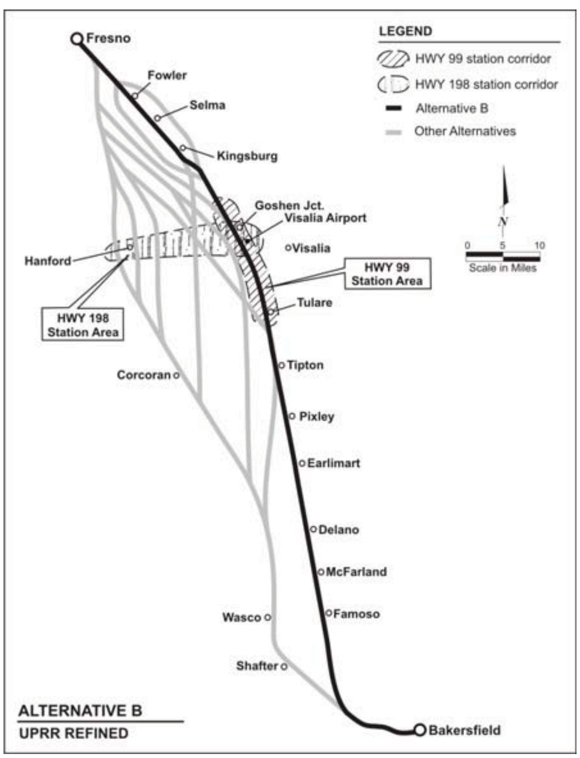
Figure 9 – Map of Alternative A (Initial)



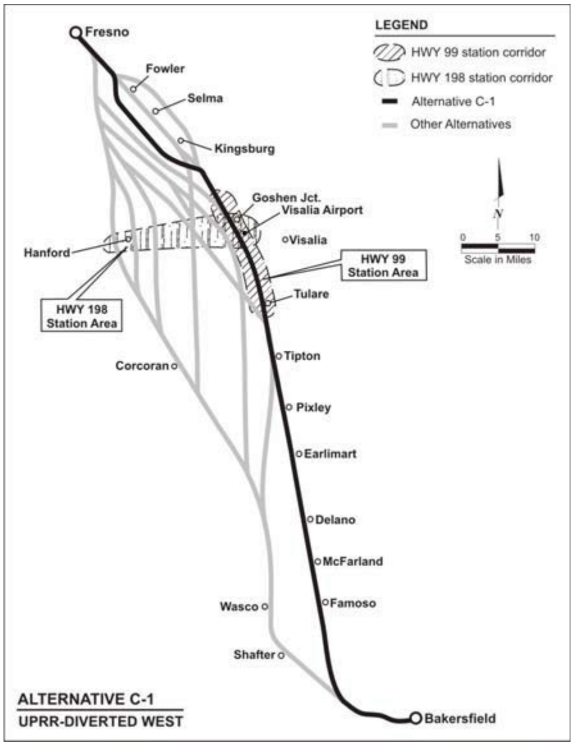
Alternative A – BNSF Refined – This alternative would be an alignment wholly along the existing BNSF Railway corridor. Because of the limitations of the current railroad geometry through central Hanford and the density of development around the railroad, this alternative would impose either significant impacts to the urban environment to accommodate high speed geometry or would require going to substandard speeds to adhere to the existing BNSF alignment geometry. The PEIR/EIS dealt with this issue by initially proposing a high-speed bypass around central Hanford (similar to Alternative D-2), with a low speed line through central Hanford to serve a station site (which was later dropped). This alternative was not envisioned to serve a station in the Visalia-Tulare-Hanford area, as the City of Hanford did not want a station in the central downtown area.

Figure 10 – Map of Alternative B (Initial)



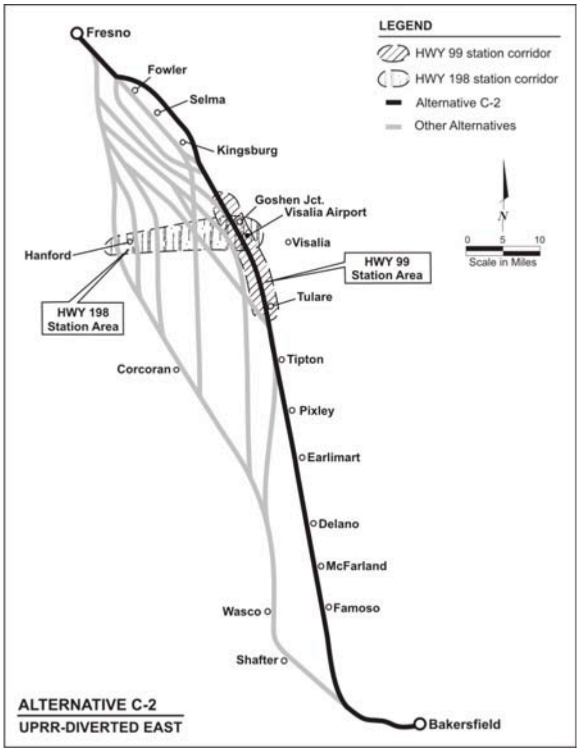
Alternative B – UPRR Refined – This alternative would be an alignment wholly along the existing UPRR railroad corridor. This alternative could serve a station site in the Visalia-Tulare-Hanford area along SR-99.

Figure 11 – Map of Alternative C-1 (Initial)



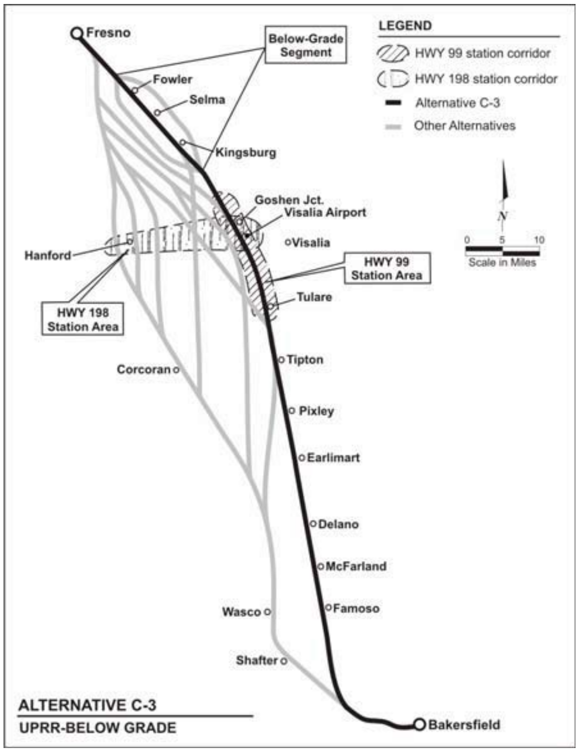
Alternative C-1 – UPRR Diverted West – This alternative would be an alignment largely along the existing UPRR railroad corridor, with the exception of the segment through Fowler, Selma, and Kingsburg, where this alternative would be diverted to the west around these three cities. This alternative could serve a station site in the Goshen-Visalia-Tulare area along SR-99.

Figure 12 – Map of Alternative C-2 (Initial)



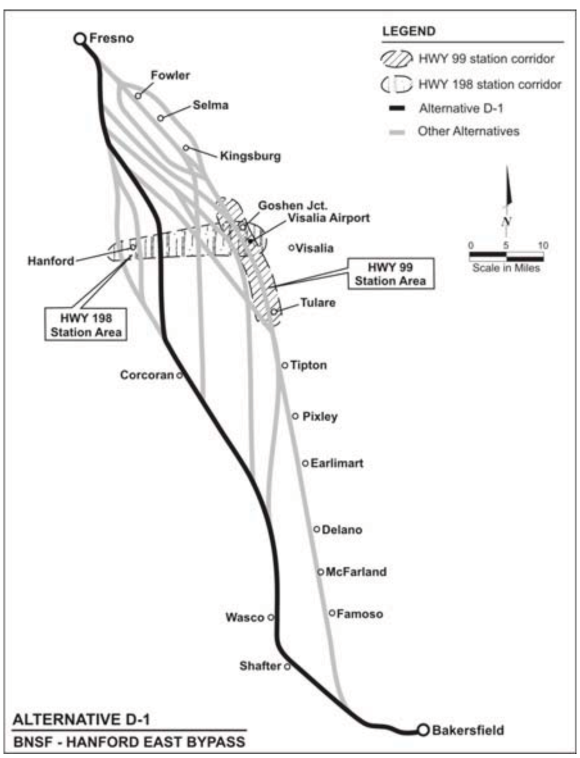
Alternative C-2 – UPRR Diverted East – This alternative would be an alignment largely along the existing UPRR railroad corridor, with the exception of the segment between Fowler and Kingsburg, where this alternative would be diverted to the east. This alternative could serve a station site in the Goshen-Visalia-Tulare area along SR-99.

Figure 13 – Map of Alternative C-3 (Initial)



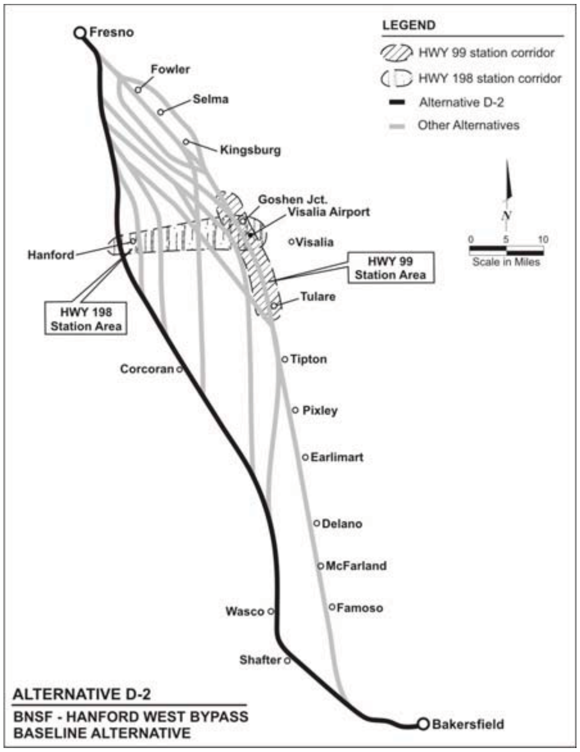
<u>Alternative C-3 – UPRR Below-Grade</u> – This alternative would be an alignment wholly along the existing UPRR railroad corridor. The segment through Fowler, Selma and Kingsburg would be constructed below grade, similar to the Alameda Corridor trench through Los Angeles. This alternative could serve a station site in the Goshen-Visalia-Tulare area along SR-99. The below-grade segment is illustrated in Figure 5 and described in Section 3.1.10.

Figure 14 – Map of Alternative D-1 (Initial)



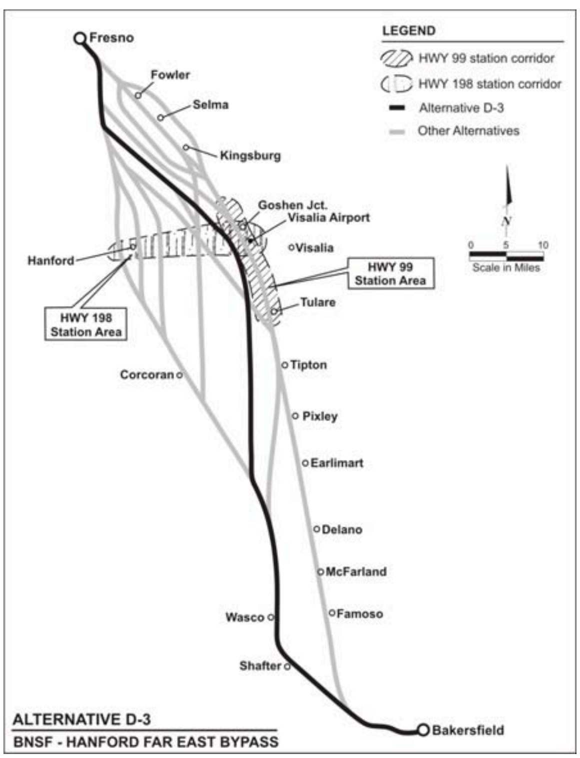
<u>Alternative D-1 – Hanford East Bypass</u> – This alternative would be an alignment mostly along the existing BNSF Railway corridor, with the exception of the segment between a point north of Laton to one north of Corcoran, where the alignment would deviate easterly, using the SR-43 alignment to traverse the central portion of the valley. This alternative would serve a station near where SR-43 intersects SR-198 and the Cross-Valley rail line, east of Hanford.

Figure 15 – Map of Alternative D-2 (Initial)



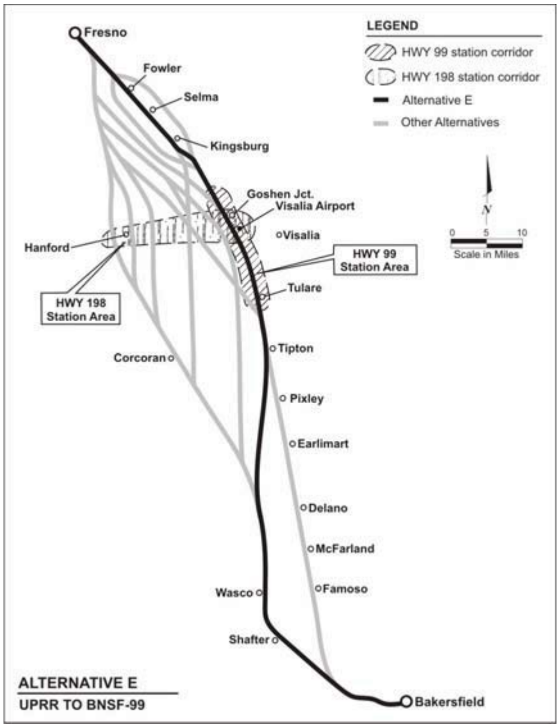
<u>Alternative D-2 – Hanford West Bypass</u> – This alternative would be an alignment mostly along the existing BNSF Railway corridor, except between Laton and Corcoran, where the alignment would divert westerly. This alternative could serve a station near where the alignment intersects SR-198 and the Cross-Valley rail line, near Armona. This alignment follows the PEIR/EIS preferred alternative, although that preferred alternative did not serve a station site in this area. In order to avoid splitting the community of Laton, this alternative was moved slightly to the west of the preferred alternative alignment.

Figure 16 – Map of Alternative D-3 (Initial)



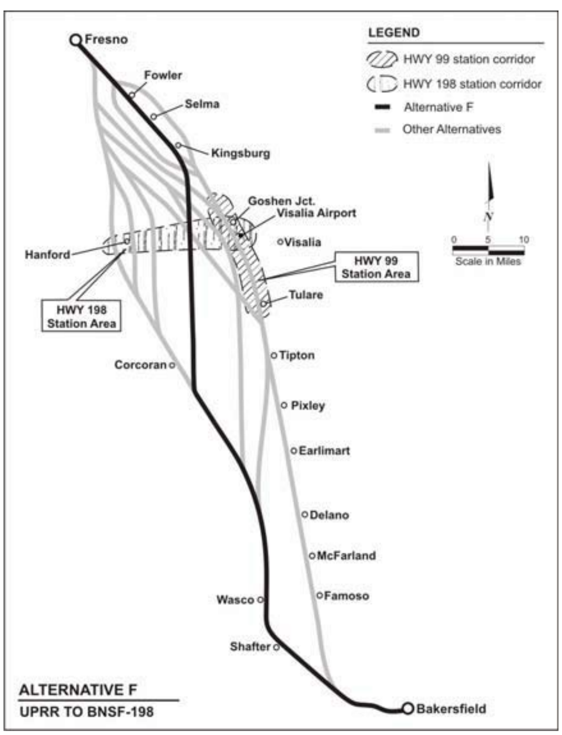
<u>Alternative D-3 – Hanford Far East Bypass</u> – This alternative would be an alignment mostly along the existing BNSF Railway corridor, with the exception of the segment between Conejo and a point south of Corcoran, where the alignment would divert to the east. This alternative would serve a station site where the alignment would intersect SR-198 and the Cross-Valley rail line, just west of Goshen.

Figure 17 – Map of Alternative E (Initial)



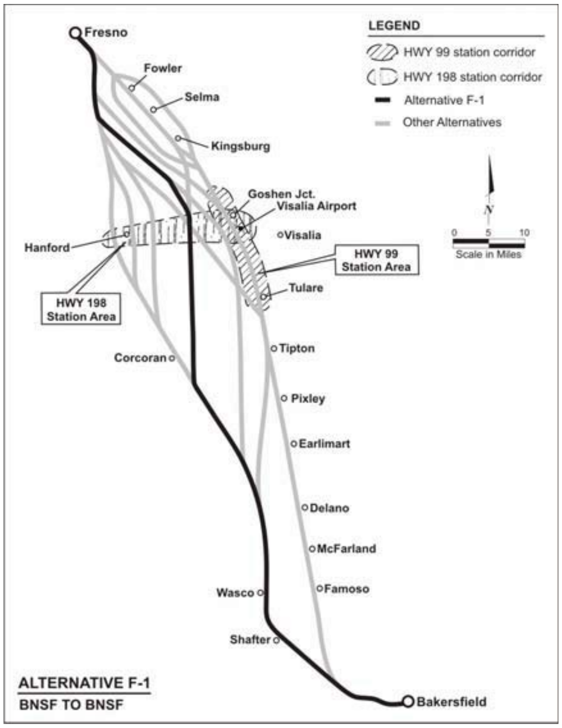
Alternative E – UPRR to BNSF 99 – This alternative would be an alignment that would transition from the UPRR corridor to the BNSF corridor in mid-valley. The segment through Fowler, Selma and Kingsburg would be constructed below grade. This alternative could serve a station site in the Visalia-Tulare-Hanford area along SR-99.

Figure 18 – Map of Alternative F (Initial)



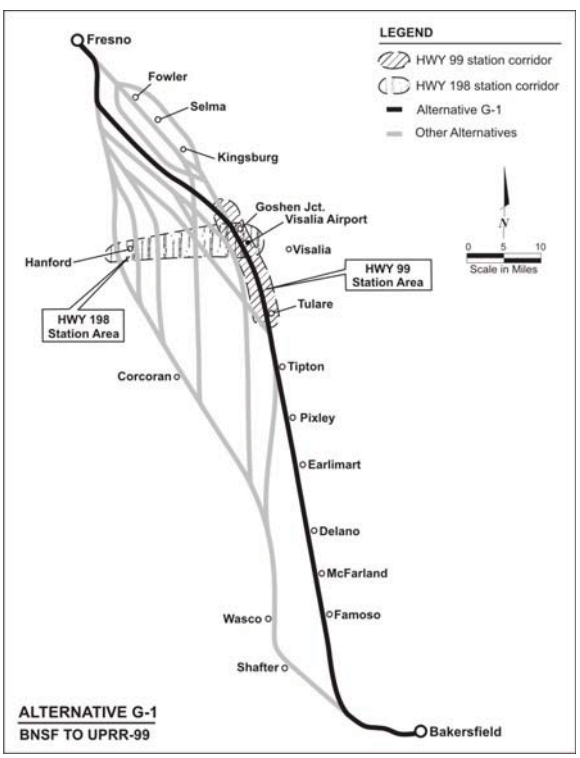
Alternative F – UPRR to BNSF 198 – This alternative would be an alignment that would transition from the UPRR corridor to the BNSF corridor in mid-valley. The segment through Fowler, Selma and Kingsburg would be constructed below grade. This alternative would serve a station site near where the alignment would intersect SR-198 and the Cross-Valley rail line in the middle of the valley between Goshen and Hanford.

Figure 19 – Map of Alternative F-1 (Initial)



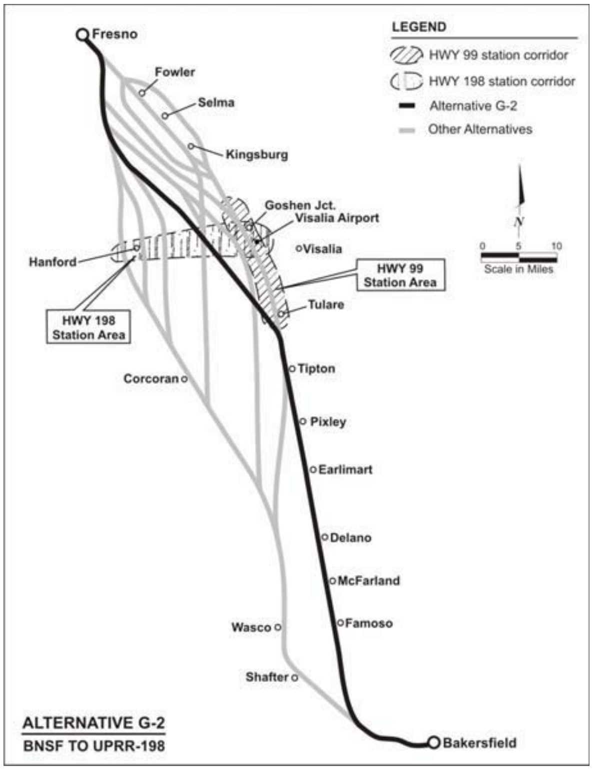
Alternative F-1 – BNSF to BNSF – This alternative would be similar to D-3 and would be an alignment mostly along the existing BNSF Railway corridor, with the exception of the segment between Conejo and a point south of Corcoran, where the alignment would divert to the east. This alternative would serve a station site near where the alignment would intersect SR-198 and the Cross-Valley rail line, in the middle of the valley between Goshen and Hanford.

Figure 20 – Map of Alternative G-1 (Initial)

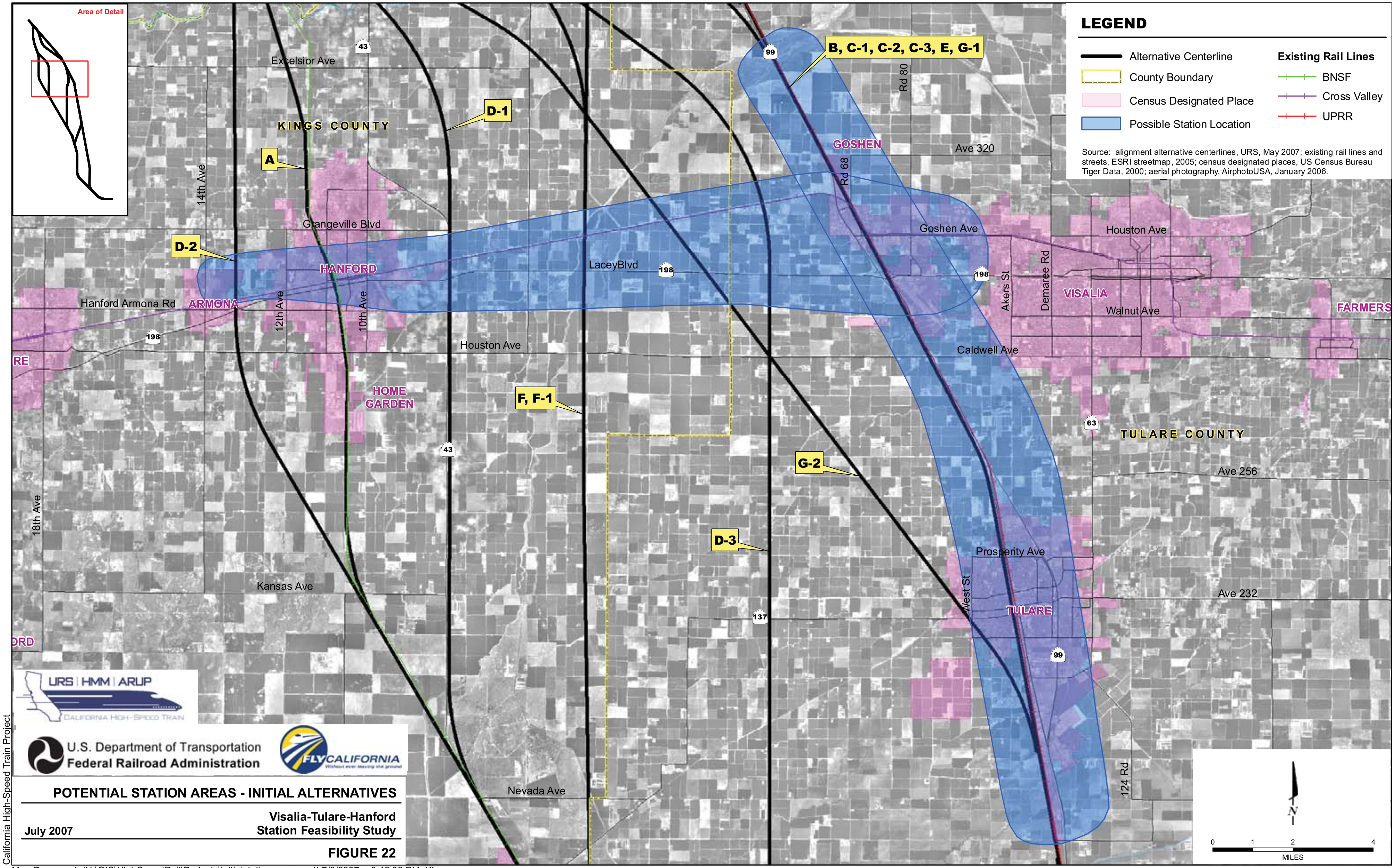


Alternative G-1 – BNSF to UPRR 99 – This alternative would be an alignment connecting the north end of the BNSF corridor with the southern end of the UPRR corridor with a crossover between the BNSF and the UPRR roughly parallel to C-1 but slightly westerly. This alternative could serve a station site in the Goshen-Visalia-Tulare area along SR-99.

Figure 21 – Map of Alternative G-2 (Initial)



<u>Alternative G-2 – BNSF to UPRR 198</u> – This alternative would be an alignment connecting the north end of the BNSF corridor with the southern end of the UPRR corridor with a crossover between the BNSF and the UPRR roughly parallel to C-1 but more southwesterly. This alternative could serve a station site either near where the alignment would intersect SR-198 and the Cross-Valley rail line, in the middle of the valley between Goshen and Hanford, or it could serve a station in the SR-99 corridor south of Tulare.



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FLY CALIFORNIA
Without ever leaving the ground

POTENTIAL STATION AREAS - INITIAL ALTERNATIVES

July 2007

Visalia-Tulare-Hanford
Station Feasibility Study

FIGURE 22

California High-Speed Train Project

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6.0 PRELIMINARY SCREENING PROCESS

A preliminary screening process was developed to reduce the number of alternatives from 13 to a smaller group of those judged most feasible. The project team conducted a series of field reviews of the original 13 alignment segments in the corridor and met with TAGs in Fresno, Kings and Tulare Counties. The team also met with agricultural commissioners and other interested stakeholders.

Based on information from the TAG and stakeholder meetings, field work, and technical investigations, the team introduced some geographic, cultural, and economic constraints. The team also applied the Authority's engineering criteria concepts to the proposed initial alignments, which introduced some further constraints as to curvature, station locations, junction locations, etc. This resulted in a number of the original alignments appearing as less feasible or less desirable than when they were initially conceived.

6.1. RESULTS OF INITIAL SCREENING

In light of the constraints identified by the study team, a number of the initial alternatives were eliminated, several of the remaining alternatives were modified, and many which were combined with other alternatives. The results are summarized in **Table 4**.

Table 3 – Results of Screening of Initial Alignment Alternatives

Alternative	Alignment Description	Result of Initial Screening	Reason
A	**BNSF – Refined –** through central Hanford on BNSF	**Eliminate** alternative through central Hanford – incorporate D-2 as new baseline alternative A, as in Program EIR/EIS.	**Local concerns** - Program EIR/EIS eliminated routing through central Hanford on BNSF, due to concerns of City of Hanford. Also, BNSF alignment through Laton and Hanford does not conform to HST geometry, and would create substantial impacts on urbanized area to correct.
B	**UPRR – Refined** – all UPRR surface alignment	**Eliminate** as independent alternative – combine with portions of other alternatives	**Local concerns** - Constrained right-of-way for surface operation through cities of Fowler, Selma & Kingsburg – downtowns would be heavily impacted.
C-1	**UPRR - Diverted West** (from Kingsburg to Fowler)	**Combine** C-1 with old B, D-3 and E to form new B-1, D-1, and E-1	Retained as northern segment of 3 new alternatives B-1, D-1 and E-1 as one method for avoiding downtowns of Fowler, Selma & Kingsburg.
C-2	**UPRR - Diverted East** (from Kingsburg to Fowler)	**Eliminate** alternative	**Agricultural Impacts** - Impacts high-value agricultural area between Selma, Parlier and Kingsburg (Golden Triangle).
C-3	**UPRR – Below Grade** (below grade, from Kingsburg to Fowler)	**Combine** C-3 below-grade segment with B, D-3 and E to form new B-2, D-2, and E-2	Retained as northern segment of 3 new alternatives B-2, D-2 and E-2 as one method for avoiding downtowns of Fowler, Selma & Kingsburg.
D-1	**BNSF - Hanford East Bypass** – via SR-43	**Retain** and rename as A-1.	Retained as similar alignment to Program EIR/EIS alignment, but passes to east of Hanford instead of west in order to serve a station site, and uses SR-43 alignment to minimize creation of new transportation corridor.
D-2	**BNSF - Hanford West Bypass** – generally same bypass of Hanford in programmatic EIR/EIS.	**Incorporate as baseline A** to represent PEIR/EIS baseline alignment, eliminate station site	Retained and renamed as baseline Alternative A as alignment closest to Program EIR/EIS alignment. Station site eliminated to conform to Program EIR/EIS.
D-3	**BNSF - Hanford Far-East Bypass** (SR-198 Station)	**Reconfigure** to merge into UPRR corridor on north end and combine with C-1 and C-3. Rename as D-1 and D-2.	Retained and merged into UPRR corridor on north end to avoid impacting agricultural land caused by re-crossing valley to BNSF in original D-3. Moved slightly easterly to avoid wildlife refuges, and to bring station location site closer to urbanized area at Visalia Airport.
E	**UPRR to BNSF 99** (SR-99 Station)	**Combine** with C-1, C-3 on north end to form new E-1 and E-2	Retained and cross-valley segment moved slightly easterly to avoid wildlife refuges.
F	**UPRR to BNSF 198** (SR-198 Station)	**Eliminate** alternative	**Floodplain** - Potential station location too remote from existing urban development and in floodplain.
F-1	**BNSF to BNSF** (Center of Valley)	**Eliminate** alternative	**Floodplain** - Potential station location too remote from existing urban development and in floodplain.
G-1	**BNSF to UPRR 99** (SR-99 Station)	**Eliminate** alternative	**Floodplain** - Alignment similar to new B-1, but impacts more farmland. No benefits above new B-1.
G-2	**BNSF to UPRR 198** (SR-198 Station)	**Eliminate** alternative	**Floodplain** - Potential station location too remote from existing urban development and in floodplain.

7.0 DESCRIPTION OF REVISED ALTERNATIVES

Following the preliminary screening process described in **Section 5.2.1**, the alignments for the eight remaining alternatives were revised. The purpose of revising the alignments was to prepare them for characterization and assessment, using a variety of tools, including GIS. This would allow a base of knowledge to be developed regarding each alternative's effects on geographic, cultural, and economic features of the region, and would establish a basis for the Authority to consider if any of the alternatives should be taken forward for consideration in a project-level EIR/EIS.

The eight revised alignment alternatives are shown in **Table 5** below, and are illustrated in **Figure 23**. Each of these alignments has been mapped on an air photo base, which is attached in the Appendix. The alignments have also been mapped in GIS, which allows characterization and comparison of a number of geographic, cultural, and economic features, which has aided in the selection of the exact alignments portrayed in this report. In addition to the table and map, each revised alternative is described more fully in this section, and each alternative is illustrated with a corresponding thumbnail map to show its relationship to the other alternatives in **Figures 24 through 31**.

The revised alignment alternatives can be grouped into three categories.

1) **Alternatives A and A-1** are based on the existing BNSF alignment for most of the distance from Fresno to Bakersfield. Alternative A is essentially the PEIR/EIS preferred alternative and is differentiated from the other alternatives in this study by having no station stop in the Visalia-Tulare-Hanford area.

2) **Alternatives B-1 and B-2** are alignments that are largely in the UPRR corridor between Fresno and Bakersfield, with the exception of the northern approach to Bakersfield, which is in the BNSF corridor.

3) **Alternatives D-1, D-2, E-1 and E-2** all start out on the UPRR corridor in Fresno and cross over to the BNSF corridor in the mid-valley segment between Goshen Junction and Delano for the remainder of the distance to Bakersfield.

There are no alternatives remaining under consideration that start out in Fresno on the BNSF corridor and then cross over to the UPRR corridor. All of those alternatives were eliminated in the preliminary screening, largely because of impacts to farmland and the location of potential stations in floodplains.

Table 6 shows the history of how each of the revised alternatives was constructed from portions of the initial alternatives. This table describes the origin of the northern, central and southern segments of each alignment alternative.

7.1. RELATIONSHIP TO ALTERNATIVES IN PROGRAMMATIC EIR/EIS

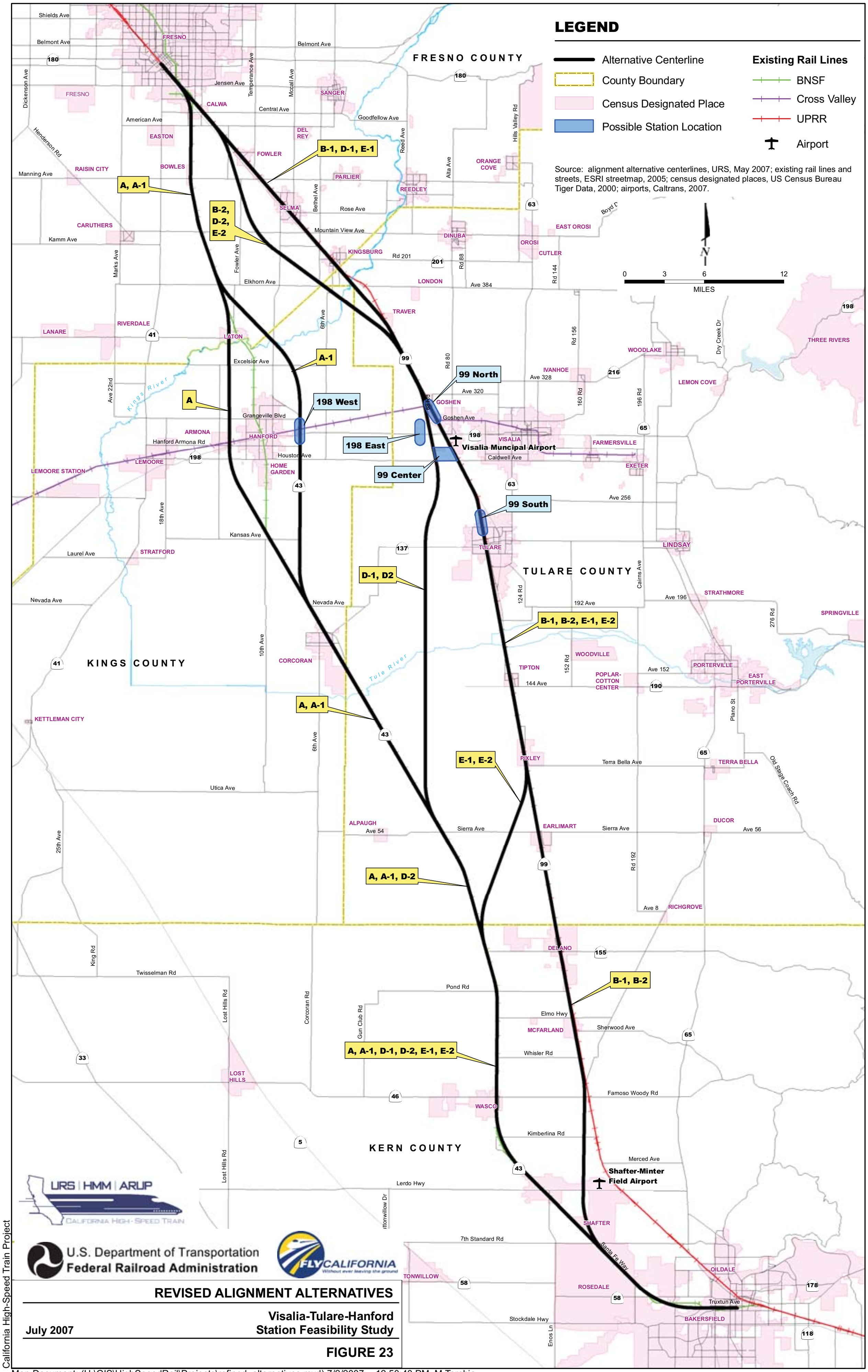
One of the eight revised alternatives, the revised Alternative A – BNSF Hanford West Bypass, is essentially the same as the alternative PEIR/EIS preferred alternative selected by the Authority.

7.2. DEVELOPMENT OF STATION LOCATIONS

Potential station locations have been identified **(Table 7 and Figure 32)** within the two original general station zones, which correspond with the SR-198 and SR-99 corridors. Potential station locations are identified for each revised alignment alternative (with the exception of Alternative A); in some cases there are two potential station locations. Alternatives A-1, D-1, and D-2 have station location sites along the SR-198 corridor, though D-1 and D-2 could also potentially use the station site on the SR-99/UPRR corridor at Goshen Junction. For the other alternatives, which are largely in the UPRR corridor

Table 4 – Revised Alignment Alternatives

Alignment Alternative	Alignment Description	Station Location	Description
A	**Baseline BNSF - Hanford West Bypass**	No Station	- Baseline Alternative - Slightly modified version of preferred alternative from programmatic EIR/EIS - Uses BNSF corridor throughout except for west bypass of Hanford. Modified westerly bypass is aligned slightly to the west of that assumed in programmatic EIR/EIS to avoid splitting Laton.
A-1	**BNSF - Hanford East Bypass**	198 West	- Uses BNSF corridor throughout except for east bypass of Hanford between location south of Conejo and location north of Corcoran. - Uses SR-43 alignment as much as possible for east bypass of Hanford.
B-1	**UPRR – Fresno-South Below Grade**	99 North or 99 Center or 99 South	- Uses existing UPRR corridor throughout, except placed in below-grade trench through portions of the cities of Fowler, Selma, and Kingsburg in south Fresno County. - Crosses over to BNSF west of Bakersfield to provide access to the Bakersfield Truxtun station location.
B-2	**UPRR – Fresno-South Bypass**	99 North or 99 Center or 99 South	- Uses existing UPRR corridor throughout, except uses western bypass of cities of Fowler, Selma, and Kingsburg in south Fresno County. - Crosses over to BNSF west of Bakersfield to provide access to the Bakersfield Truxtun station location.
D-1	**UPRR to BNSF (198 Station) - Fresno-South Below Grade**	198 East or 99 Center	- Uses existing UPRR corridor between Fresno and location between Kingsburg and Goshen Jct, except placed in below-grade trench through portions of the cities of Fowler, Selma, and Kingsburg in south Fresno County.- Crosses over to BNSF between location south of Kingsburg on UPRR to location between Corcoran and Allensworth SHP on BNSF. Follows BNSF to Bakersfield Truxtun station.
D-2	**UPRR to BNSF (198 Station) - Fresno-South Bypass**	198 East or 99 Center	- Uses existing UPRR corridor between Fresno and location between Kingsburg and Goshen Jct, except uses western bypass of cities of Fowler, Selma, and Kingsburg in south Fresno County. - Crosses over to BNSF between location south of Kingsburg on UPRR to location between Corcoran and Allensworth SHP on BNSF. Follows BNSF to Bakersfield Truxtun station.
E-1	**UPRR to BNSF (99 Station) – Fresno-South Below Grade**	99 North or 99 Center or 99 South	- Uses existing UPRR corridor between Fresno and location between Tulare and Earlimart, except placed in below-grade trench through portions of the cities of Fowler, Selma, and Kingsburg in south Fresno County. - Crosses over from UPRR at location between Tulare and Earlimart to BNSF at location south of Allensworth SHP. Continues on BNSF to Bakersfield Truxtun station.
E-2	**UPRR to BNSF (99 Station)– Fresno-South Bypass**	99 North or 99 Center or 99 South	- Uses existing UPRR corridor between Fresno and location between Tulare and Earlimart, except uses western bypass of cities of Fowler, Selma, and Kingsburg in south Fresno County. Crosses over from UPRR at location between Tulare and Earlimart to BNSF at location south of Allensworth SHP. Continues on BNSF to Bakersfield Truxtun station.



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REVISED ALIGNMENT ALTERNATIVES

July 2007

Visalia-Tulare-Hanford Station Feasibility Study

FIGURE 23

California High-Speed Train Project

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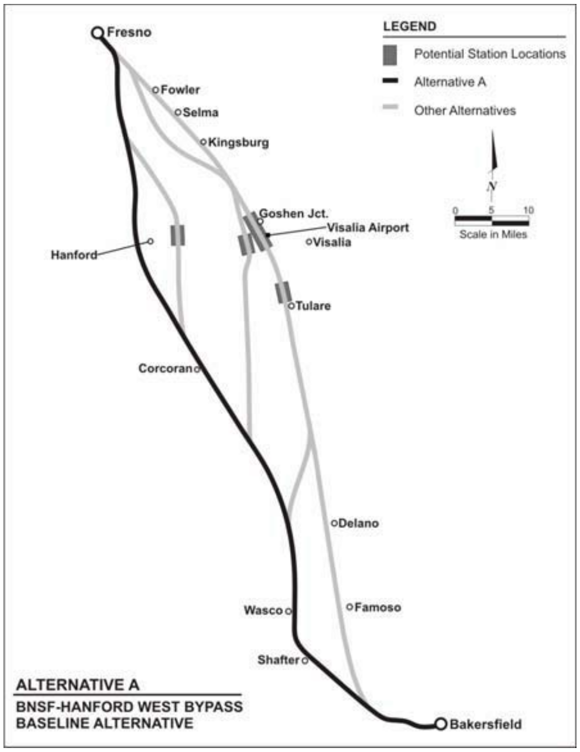
Table 5 – Segment History of Alternatives for Secondary Screening

Revised Alignment Alternative	Alignment Description	Original Alignment Components (April 2007)		
		North Segment	Central Segment	South Segment
A	**BNSF - Hanford West Bypass** – BNSF corridor with western bypass of Hanford near Armona.	D-2	D-2	D-2
A-1	**BNSF - Hanford East Bypass** – BNSF corridor with eastern bypass of Hanford via SR-43.	D-1	D-1	D-1
B-1	**UPRR – Fresno-South Below Grade** – UPRR corridor with below grade bypass south of Fresno from Fowler to Kingsburg.	C-3	C-3	C-3
B-2	**UPRR – Fresno South Bypass** – UPRR corridor with western bypass south of Fresno from Fowler to Kingsburg.	C-1	C-1	C-1
D-1	**UPRR to BNSF (198 Station) – Fresno-South Below Grade** UPRR corridor with below grade bypass south of Fresno from Fowler to Kingsburg, crosses to BNSF via a north-south alignment, leaving UPRR corridor north of Goshen, and joining the BNSF corridor south of Allensworth.	C-3	D-3	D-3
D-2	**UPRR to BNSF (198 Station) - Fresno-South Bypass** – UPRR corridor with western bypass south of Fresno from Fowler to Kingsburg, crosses to BNSF via a north-south alignment, leaving UPRR corridor north of Goshen, and joining the BNSF corridor south of Allensworth.	C-1	D-3	D-3
E-1	**UPRR to BNSF (99 Station) - Fresno-South Below Grade** – UPRR corridor with below-grade bypass south of Fresno from Fowler to Kingsburg, leaving UPRR corridor near Earlimart, and joining the BNSF corridor north of Wasco.	C-3	E	E
E-2	**UPRR to BNSF (99 Station) - Fresno-South Bypass** – UPRR corridor with western bypass south of Fresno from Fowler to Kingsburg, leaving UPRR corridor near Earlimart and joining the BNSF corridor north of Wasco.	C-1	E	E

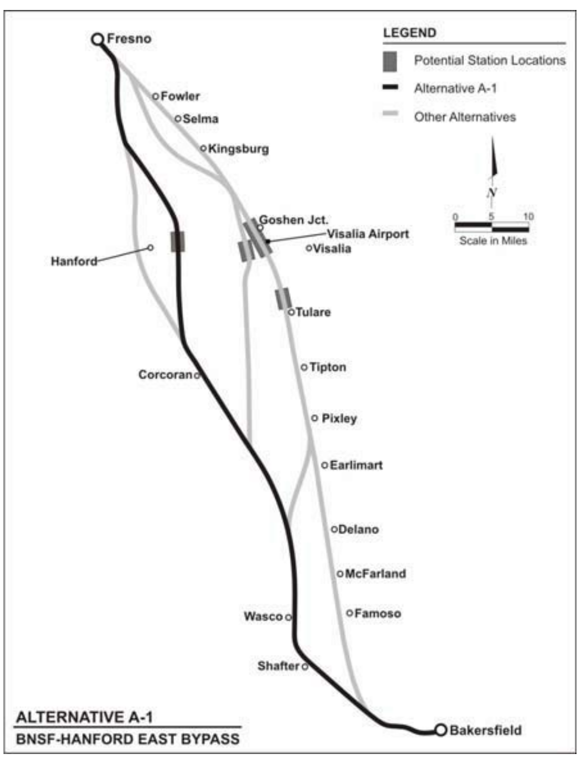
Figure 24 – Map of Revised Alternative A



Revised Alternative A – Baseline BNSF – Hanford West Bypass - This alternative is essentially the former (initial) D-2, which is an alignment that follows very closely the preferred alternative in the PEIR/EIS. This alignment is mostly along the existing BNSF Railway corridor, with the exception of the segment between Laton and Corcoran, where the alignment diverts to the west, passing between the west side of Hanford and Armona. As with the preferred alternative in the PEIR/EIS, this alternative would not serve a station between Fresno and Bakersfield.

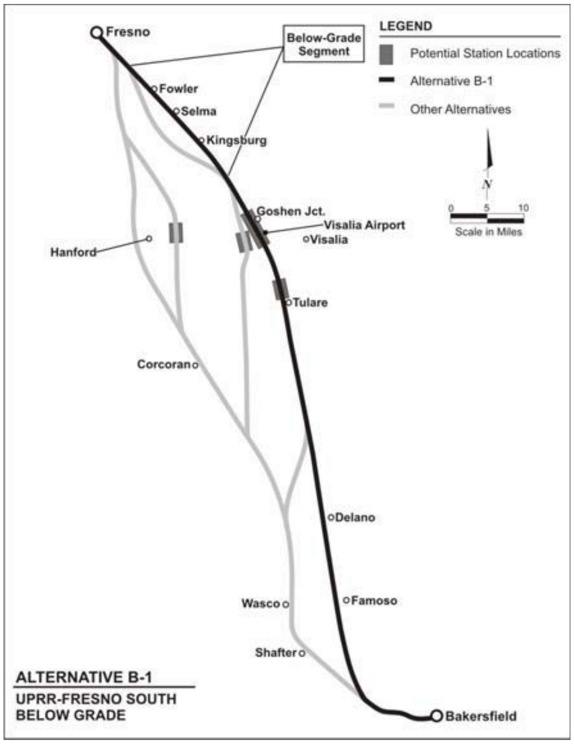
This alternative is the new baseline alternative for the purposes of this study.

Figure 25 – Map of Revised Alternative A-1



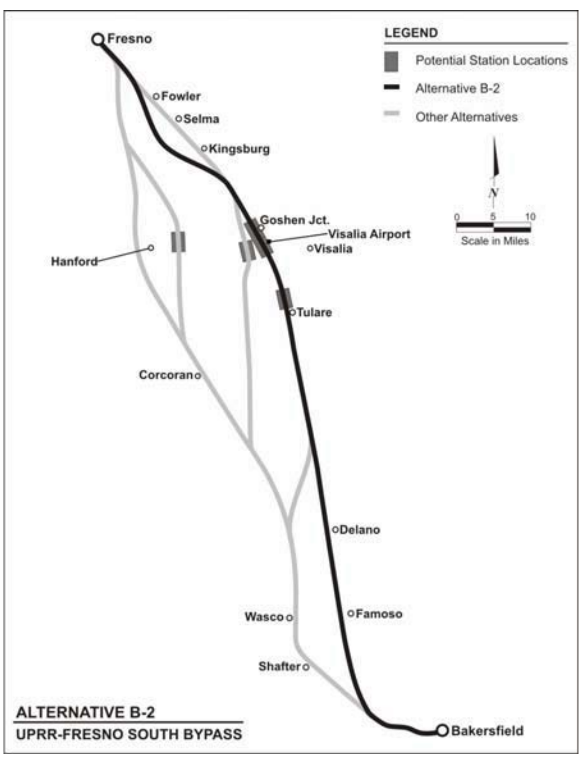
Revised Alternative A-1 – Hanford East Bypass – This alternative is essentially the old (initial) D-1 alternative. This would be an alignment mostly along the existing BNSF Railway corridor, with the exception of the segment between Laton and Corcoran, where the alignment would divert easterly, using the SR-43 alignment to traverse the central portion of the valley. This alternative would serve the station site known as 198-West near where SR-43 intersects SR-198 and the Cross-Valley rail line, east of Hanford.

Figure 26 – Map of Revised Alternative B-1



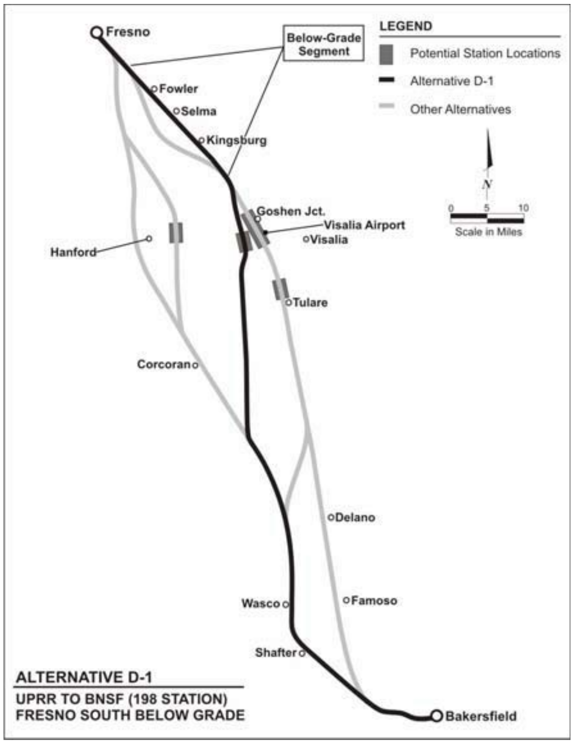
Revised Alternative B-1 – UPRR Fresno South Below Grade – This alternative is essentially the old (initial) C-3 alternative. This alternative uses the UPRR corridor but with the segment between Fowler and Kingsburg in a below-grade configuration. This alternative could serve one of three station sites in the Goshen-Visalia-Tulare area along SR-99, either 99-North. 99-South, or 99-Center. Several configurations for the below-grade segment are possible and are illustrated in **Figure 4**.

Figure 27 – Map of Revised Alternative B-2



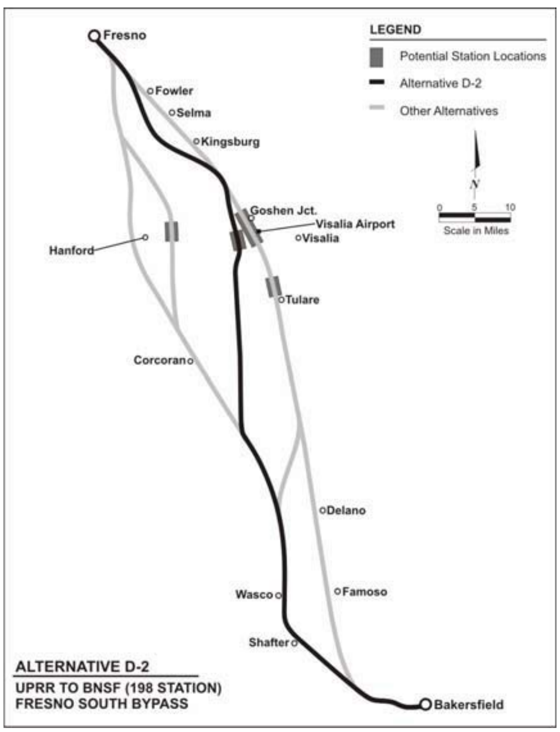
Revised Alternative B-2 – UPRR Fresno South Bypass – This alternative is essentially the old (initial) C-1 alternative. This alternative would be an alignment largely along the existing UPRR railroad corridor, with the exception of the segment between Fowler and Kingsburg where this alternative would be diverted to the west. This alternative could serve one of three station sites in the Goshen-Visalia-Tulare area along SR-99, either 99-North, 99-South, or 99-Center.

Figure 28 – Map of Revised Alternative D-1



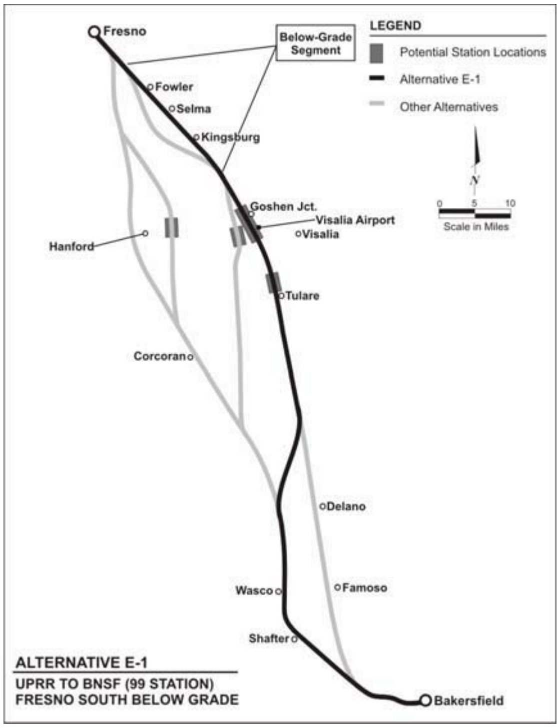
Revised Alternative D-1 – UPRR to BNSF (198 Station) – Fresno South Below Grade – This alternative would be a combination of the northern portion of the former C-3 and the central and southern portions of D-3. This alternative largely uses the UPRR and the BNSF corridor but with the segment between Fowler and Kingsburg in a below-grade configuration. This alternative could serve a station site at either the point where the alignment would cross SR-198 near SR-99, known as 198 East, or it could also serve a station site across SR-99 from the Visalia Airport, at a site owned by the City of Visalia, which is an extension of the 99-North station site.

Figure 29 – Map of Revised Alternative D-2



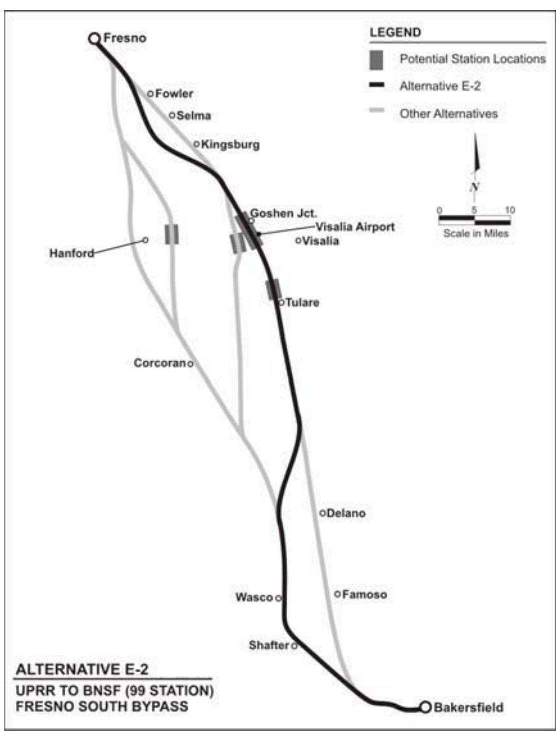
Revised Alternative D-2 – UPRR to BNSF (198 Station) – Fresno South Bypass – This alternative would be a combination of the northern portion of the former C-1, and the central and southern portions of D-3. This alternative would be an alignment largely along the existing UPRR and BNSF railroad corridors, with the exception of the segment between Fowler and Kingsburg, where this alternative would be diverted to the west. This alternative could serve a station site at either the point where the alignment would cross SR-198 near SR-99, known as 198 East, or it could also serve a station site across SR-99 from the Visalia Airport, at a site owned by the City of Visalia, which is an extension of the 99-North site.

Figure 30 – Map of Revised Alternative E-1



Revised Alternative E-1 – UPRR to BNSF (99 Station) – Fresno South Below Grade – This Alternative would be a combination of the northern portion of the former C-3, and the central and southern portions of the former alignment E. This alternative largely uses the UPRR and the BNSF corridors but with the segment between Fowler and Kingsburg in a below-grade configuration. This alternative could serve one of two station sites in the Visalia-Tulare-Hanford area along SR-99, either 99-North or 99-South.

Figure 31 – Map of Revised Alternative E-2

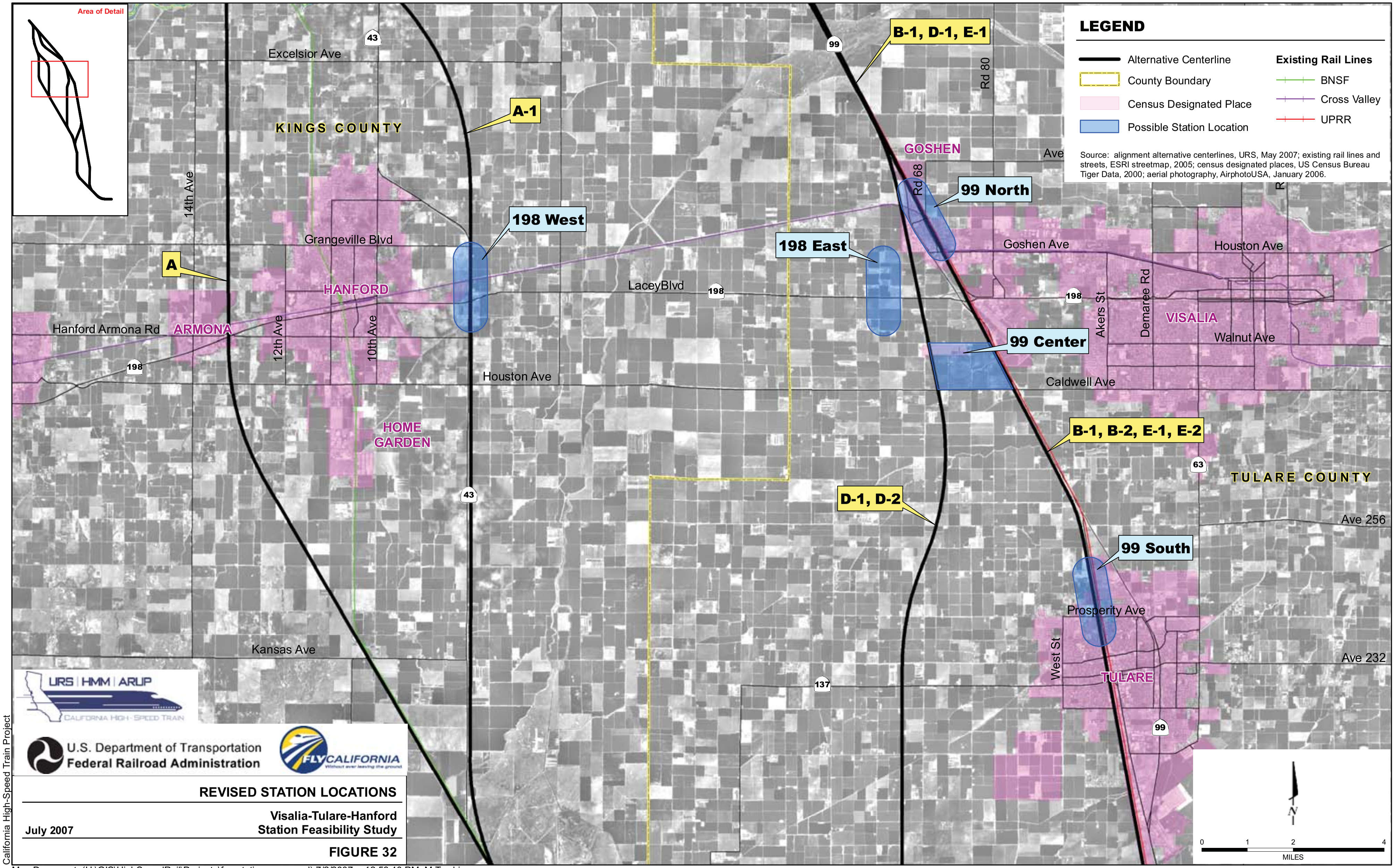


Revised Alternative E-2 – UPRR to BNSF (99 Station) – Fresno South Bypass – This alternative would be a combination of the northern portion of the former C-1, and the central and southern portions of the former alignment E. This alternative would be an alignment largely along the existing UPRR and BNSF railroad corridors, with the exception of the segment between Fowler and Kingsburg, where this alternative would be diverted to the west. This alternative could serve one of two station sites in the Visalia-Tulare-Hanford area along SR-99, either 99-North or 99-South.

the Goshen Junction/Visalia Airport/Tulare area, two SR-99 corridor station area sites have been identified – one at Goshen Junction (99-North), and one on the north side of Tulare (99-South). Station locations will be further refined in light of engineering considerations for guideway geometry and train performance, as well as land use, socioeconomic, and access considerations and stakeholder preferences.

Table 6 – Table of Revised Station Locations

Station Name	Location	Alternatives Serving Station Site
99-North	- SR-99 Corridor - Vicinity of Goshen Junction, NE quadrant of SR-198/SR-99 interchange	B-1, B-2, D-1, D-2, E-1, E-2
99-South	- SR-99 Corridor - North side of Tulare	B-1, B-2, E-1, E-2
99-Center	- SR-99 Corridor - Site owned by City of Visalia	B-1, B-2, D-1, D-2, E-1, E-2
198-West	- SR-198 Corridor - 2.9 miles east of Hanford near intersection of SR-198 and SR-43 or intersection of SR-43 and Cross-Valley rail line	A-1
198-East	- SR-198 Corridor - Approximately 1-1.5 miles southwest of SR-198/SR-99 interchange (SW quadrant), across SR-99 from Visalia Airport	D-1, D-2



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CALIFORNIA HIGH-SPEED TRAIN

U.S. Department of Transportation
Federal Railroad Administration

FLY CALIFORNIA

REVISED STATION LOCATIONS

July 2007

Visalia-Tulare-Hanford Station Feasibility Study

FIGURE 32

California High-Speed Train Project

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8.0 ASSESSMENT OF ALTERNATIVES

This section provides an assessment of the revised alignment and station alternatives to support the Authority in identifying which alternatives, if any, should be evaluated in the project-level EIR/EIS for this section of the HST system. The measures used to assess the alternatives are intended to clearly indicate differences at a planning level of analysis. Of the wide range of criteria initially considered for the assessment, some were more appropriate for the detailed, project-level EIR/EIS assessments which will follow this phase. A number of more general, easily measured criteria were used to characterize alternatives at this planning level, and to enable comparison. Many of the criteria for the environmental assessments are based on GIS data, others on analyses of simple measures and assumed unit costs.

Should the Authority elect to consider one or more of these alternatives in the project-level EIR/EIS, the following descriptions provide a starting point for detailed evaluation and comparison.

8.1. MEASURES AND DATA SOURCES USED

The measures used to characterize alternatives are broken into four general criteria:

- **Project Performance**,
- **Capital Cost,**
- **Built Environment Impacts and Benefits**, and
- **Natural Environment Impacts and Benefits**.

8.1.1. PROJECT PERFORMANCE MEASURES

Project performance measures are those used to describe how an alternative will perform, with regard to revenue service, constructability, or operations or maintenance.

8.1.1.1. Travel Time

Approximate travel times for each of the alternatives were calculated for a non-stop train between the study limits, as shown in **Table 8**. These travel times were calculated assuming operation at top speed (220 mph) for the length of each alternative. These times represent the duration of travel through the study area for an assumed San Francisco to Los Angeles express train, which would not service Fresno, the Visalia-Tulare-Hanford area, or Bakersfield. Given the similar lengths of all 8 alternatives, the spread of travel times is only one minute between the shortest and the longest of the alignment alternatives. None of the alternatives therefore offers significant travel time advantages over the others for express trains.

While the operation of trains stopping at a Visalia-Tulare-Hanford station has not been analyzed with any precision, operational modeling done for the PEIR/EIS can be used to estimate the relative running time impacts of this service. The modeling completed for the Central Valley portions of alignments in the PEIR/EIS showed that stopping at an intermediate station can be assumed to add approximately 5 minutes and 30 seconds of travel time. In addition, a train would dwell at the station to accommodate passenger boarding and alighting and baggage handling for a period of 2 to 3 minutes.

Taking these differentials in total, and depending on the stopping patterns instituted, a train stopping at a Visalia-Tulare- Hanford station could be expected to take 7½ or 8½ minutes longer to travel between Bakersfield and Fresno than a train that operated through the Visalia-Tulare-Hanford station without stopping.

Table 7 – Table of Alignment Length and Travel Times

Revised Alignment Alternative	Length (miles)	Line Speed (mph)	Travel Time for Non-stop Trains (min)
A – BNSF Hanford West Bypass – Baseline Alternative	110.5	220	30.1
A-1 – BNSF Hanford East Bypass	111.1	220	30.3
B-1 – UPRR Fresno South Below Grade	110.4	220	30.1
B-2 – UPRR Fresno South Bypass	111.1	220	30.3
D-1 – UPRR to BNSF (198 Station) - Fresno South Below Grade (Note 2)	112.6	220	30.7
D-2 – UPRR to BNSF (198 Station) - Fresno South Bypass (Note 2)	113.3	220	30.9
E-1 – UPRR to BNSF (99 Station) - Fresno South Below Grade	113.4	220	30.9
E-2 – UPRR to BNSF (99 Station) - Fresno South Bypass	114.1	220	31.1

Notes:
1) Total alignment length for all alignments measured from downtown Fresno Station (Fresno) to Truxtun Station (Bakersfield).
2) Length for alternative alignment serving SR 198 Station location nearest to SR 99. For optional SH 198 Station location, total alignment length would be reduced by 0.2 miles.

8.1.1.2. Length of Alignment

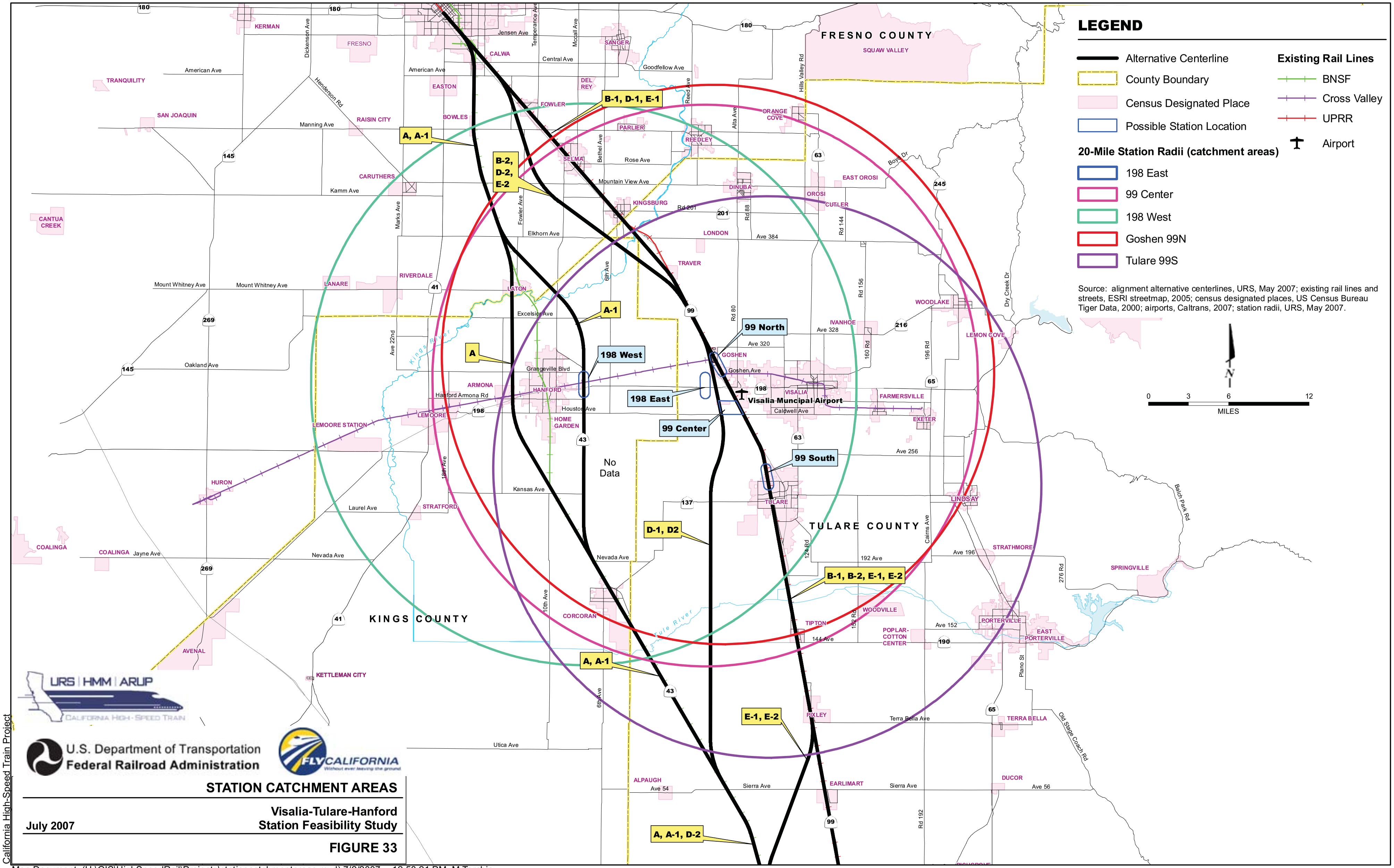
Alignment lengths for each of the alternatives between the Fresno Station and the Bakersfield (Truxtun) Station are shown in **Table 8**. With the shortest overall length of 110.4 miles, Alternative B-1 represents the shortest and most direct route. This alternative would utilize the UPRR corridor to a greater extent than the other alternatives, with the HST alignment constructed below-grade between Fowler and Kingsburg.

Comparatively, Alternative E-2 yields the longest travel distance. While this alternative would also utilize much of the UPRR corridor, there is some out-of-direction-travel associated with transitioning from the UPRR alignment to the BNSF alignment at the south end of the corridor. In addition, Alternative E-2 would use a bypass alignment around the cities of Fowler, Selma, and Kingsburg adding 0.7 miles to the overall route length.

In general, the alternatives are all very similar in overall length. The differential between the shortest and longest alternative alignments is only 3.7 miles. At a full operating speed of 220 mph, this differential length represents approximately 60 seconds of travel time.

8.1.1.3. Population and Employment Catchment

Population and employment data were compiled to determine the number of existing and projected residents and jobs that would be captured with a 20-mile radius of the station location alternatives. An illustration of this 20-mile radius superimposed on the study area is depicted in **Figure 33**. Population and employment data were provided by three metropolitan planning organizations: Kings County.



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U.S. Department of Transportation
Federal Railroad Administration

FLY CALIFORNIA
Without ever leaving the ground

STATION CATCHMENT AREAS

July 2007

Visalia-Tulare-Hanford Station Feasibility Study

FIGURE 33

Association of Governments (KCAG), Tulare County Association of Governments (TCAG), and Fresno Council of Governments (COG).

In general, the population data for each of the station sites' catchment areas were relatively similar, as shown in **Table 9**. The existing population for the five station catchment areas ranges from approximately 340,000 people to more than 420,000 people. Forecasts indicate that the population in each of the areas would grow by at least 60% to more than half a million people by 2030. In absolute numbers, the catchment area for station 198-West had the highest existing and projected population – 424,743 and 683,250 respectively.

Table 8 – Existing and Projected Population with Station Catchment Areas

Station Location	Existing Population	Projected Population (2030)	Percent Change
99-North	343,200	555,400	62%
99-South	422,300	680,500	61%
99-Center	389,722	628,499	62%
198-West	424,700	683,300	61%
198-East	389,700	628,500	61%

Sources: Kings County Association of Governments (2007), Tulare County Association of Governments (2003), and Fresno Council of Governments (2007)

Existing and projected employment within 20 miles of each alternative station location is shown in **Table 10**. The areas encompass from about 128,000 jobs to more than 150,000 existing jobs. While all the alternative station areas are forecasted to experience more than 50 percent growth in employment by 2030, the 99-North and 198-East station areas are projected to experience the highest rate of employment growth – 59 percent.

Table 9 – Existing and Projected Employment with Station Catchment Areas

Station Location	Existing Jobs	Projected Jobs (2030)	Percent Change
99-North	127,955	203,442	59%
99-South	148,117	232,614	57%
99-Center	143,323	227, 516	63%
198-West	151,802	237,054	56%
198-East	143,323	227,516	59%

Sources: Kings County Association of Governments (2007), Tulare County Association of Governments (2003), and Fresno Council of Governments (2007)

8.1.1.4. Operational Issues

The alignment alternatives have been laid out for a 250 mph design speed and for a line speed of 220 mph over the entire route. At the current level of conceptual design, there do not appear to be any train operation issues that distinguish between the alternatives. At this level of design, all appear to accommodate operations in full accordance with Authority's design criteria.

One issue that does differentiate three of the alternatives is that of maintenance for the below-grade segment of Alternatives B-1, D-1, and E-1. The below-grade segment would present a more constrained environment for routine and major maintenance, which could translate into higher regular operating costs. Drainage, pumping, and treatment will also be necessary to remove liquid that collects in the depressed structure, which will contribute to the operating cost of these alternatives.

8.1.1.5. Constructability

The extent of construction-related issues can be correlated to the characteristics of the natural and built environment around a given alternative. Factors such as terrain, level of urbanization, environmental sensitivity, drainage, and proximity to other transportation facilities pose variable design and construction challenges. Many of these construction-related issues can be anticipated and addressed during the design process. It is notable though that many of these issues arise from the fact that operating speed renders the HST alignment less flexible than conventional rail or highway design. The HST system will be designed to operate at planned line speeds of 220 mph throughout this region; reductions in line speed cannot be considered a design solution to avoid impacts at this stage of planning. The high-speed design criteria do not permit localized shifts in horizontal curvature or elevation to avoid natural features or development. All curves, whether horizontal or vertical, are necessarily very long. While elevated and below-grade sections of the alignment can be designed to avoid physical and environmental impacts, these design solutions increase complexity and cost.

- **Construction issues between the various modes of transportation –** Where conflicts arise between the HST, freight rail, and the highway system, the local highway system is the most flexible in terms of horizontal and vertical alignment. While freight rail geometric design is somewhat less restrictive than high-speed rail geometric design, the achievement of significant changes in vertical elevation for freight rail still require significant lengths of track to accommodate, since freight rail systems are limited to less than one-half the amount of vertical grade that can be used in the design of a major highway. Freight rail switching facilities, sidings, and branchlines to support adjacent industry add to the complexity of construction-related issues that are likely to be encountered along the HST corridor.

- **Construction-related issues in an urban environment –** Routing a HST through urbanized and developed areas can generate a high level of construction-related impacts and conflicts. Development such as existing local roads, major highways, utilities, storm sewer systems, retail businesses, commercial/industrial operations, and residential properties comprise the built environment. Conflicts with the built environment will likely exacerbate the construction of a high-speed system through these areas. The HST has its own requirements for infrastructure as well, including overhead catenary systems, electrical feeder lines and substations. Each of these requirements would require additional land to be developed for these systems.

- **Construction-related issues with existing utilities –** One of the more problematic areas for any transportation project involves the resolution of conflicts with underground and overhead utilities. In urban areas, these conflicts can be numerous. Often times, in older urban areas underground utilities may be encountered that were not known during the design process. The location of overhead utilities is easily identified, but the modification of these utilities to accommodate HST construction must be performed in accordance with applicable safety codes, operational limitations, and accessibility to perform routine maintenance.

- **Other construction-related issues** that may be encountered could result from unknown underground site conditions uncovered during the excavation of rights-of-way acquired for the project. Despite every effort to perform an adequate subsurface investigation of the alignment, conditions can still be encountered that were unforeseen or have changed, such as the presence of groundwater.

For the purpose of evaluating the relative level of construction-related issues that may be encountered for a given alternative, **Table 11** summarizes the different types of environments that construction will occur in and tabulates mileages for each type of construction for each alternative. In general, the complexity of construction increases as one reads downward in the table, and this is indicated in the column headed "Level of Complexity".

- **HST in agricultural areas –** This type of construction will likely have the fewest construction related issues. The HST can be placed at-grade in most cases, and the local county road system can be relocated vertically on an overpass to maintain system continuity. Utilities are not likely to be present.

- **HST co-located with state highway only (not limited access) –** Where the HST is co-located with a highway facility, such as SR-43, construction-related issues are anticipated to be proportional to the level of functional classification of the highway facility itself. SR-43 is currently planned as a four-lane conventional highway (not limited access) and the right-of-way required for the highway is 146 feet. The right-of-way may be reduced to 110 feet within the smaller cities. SR-43 typically has at-grade intersections with the local road system.

- **HST co-located with freight rail only –** Construction-related issues for the HST co-located with the freight rail are similar to those encountered for co-location with the highway. The need for grade separation requires that either the HST be elevated at highway crossings or that the crossing roads be elevated over the rail line. The freight rail system can benefit from this scenario by extending the proposed HST over-crossing beyond the freight rail line and eliminating an existing at-grade crossing with the freight rail alignment. In places, the HST system will also need to be elevated over freight rail sidings to access industries, or at freight rail junctions.

- **HST Co-located with freight rail and state highway (not limited access) –** For much of the length of the alignments using the BNSF corridor, HST would be co-located in the corridor with freight rail and with state highway SR-43 (not limited access). Construction-related issues for the HST in this situation are similar to those encountered for co-location with the highway or for freight rail, but slightly more complex because of the combination of the two elements. The need for grade separation requires that either the HST be elevated at highway crossings or that the crossing roads be elevated over the rail line, and that the HST system also would be elevated over freight rail sidings to access industries, or at freight rail junctions.

- **Elevated construction.** In some locations, it may be desirable to place the HST alignment on an elevated structure. Example locations where this approach may be necessary include flood plain areas or areas such as in the vicinity of the Fresno and Bakersfield (Truxtun) stations, through existing dense urban development. While an elevated design has its advantages, conflicts are anticipated for the location and placement of the foundations, the location of the overhead catenary system with respect to other overhead utilities, and the ability to maintain highway system continuity.

- **HST Co-located with limited access highway and freight rail –** For much of the length of the alternatives using portions of the UPRR corridor, HST would be co-located with freight rail and with limited access state highway SR-99. Construction-related issues for the HST in this situation will be similar but much more complex than those encountered for co-location with a non-limited access state highway and freight rail, because of the close proximity of the existing rail alignment to the freeway alignment, including all of the existing grade separations and bridging and fill structures in place for the frequent freeway interchanges. The need for grade separation requires that either the HST be elevated at highway crossings or that the crossing roads be elevated over the rail line, and that the HST system also would be elevated over freight rail sidings to access industries, or at freight rail junctions. CA-99 is ultimately planned to be an 8-lane freeway with a 250-foot right-of-way. The UPRR alignment has significant, frequent sidings for access to local industries that must be maintained, and which will require grade separation to continue servicing. The rail line is generally straight with only minor curvature, and CA-99 moves back and forth across the UPRR alignment to avoid the urban development along the way. Routing the HST through these areas will likely generate a high level of construction-related issues, particularly through the more urbanized areas along the corridor.

- **HST Below-Grade –** One of the most complex solutions for routing the HST through urbanized areas is the placement of the high-speed alignment below-grade. Construction phasing, drainage (gravity flow or mechanical pumping), retaining wall construction where ground water may be present, and re-construction of impacted highways over the below-grade sections to maintain system continuity all combine to make this solution the most complex and costly over any of the other methods of high-speed rail construction. The segment considered for below-grade construction is also adjacent to the UPRR corridor and SR-99, making the construction phasing and the design solutions more complex.

Table 10 – Construction

Type of Construction	Level of Complexity	Alternative Length (Miles) A	A-1	B-1	B-2	D-1	D-2	E-1	E-2
Agricultural areas	Low	18.8	10.9	12.4	28.8	27.5	43.9	17.0	33.4
Co-located with state highway only (not limited access)	Low-Medium		15.2						
Co-located with freight rail only	Medium-Low	13.3	10.5						
Co-located with freight rail and state highway (not limited access)	Medium	64.7	60.8	7.5	7.5	45.8	45.8	32.9	32.9
Elevated construction	Medium-High	13.7	13.7	15.1	18.5	17.1	20.5	13.1	16.5
Co-located with limited access highway and freight rail	High-Medium			62.5	56.3	9.3	3.1	37.5	31.3
Below-grade construction	High			12.9		12.9		12.9	
Total Length (miles)		**110.5**	**111.1**	**110.4**	**111.1**	**112.6**	**113.3**	**113.4**	**114.1**

Alternatives A and A-1 are anticipated to have the least amount of construction-related issues for any of the alternatives, followed by D-2. Alternatives B-1 and E-1 are anticipated to have the highest amount of construction-related issues.

8.1.1.6. Opportunity for Grade-Separating Railroads

A significant current public policy issue is the grade-separation of freight railroads from the public road and highway systems. This issue is driven largely by rail-related fatalities involving trespassers or vehicles at highway-rail grade crossings.

It may be desirable, along with the development of alternatives for the HST, to investigate the potential for elevating the freight rail alignment along with the HST alignment in those areas where the two systems may be co-located. Site conditions where grade separation of the freight rail may particularly be favorable are locations where 1) there has been some recent accident history which may warrant major improvements, 2) the volume of cross traffic has increased due to growth and there exists a greater potential for safety concerns, and 3) freight rail share use of the same track alignment.

Table 12 provides a preliminary count of the opportunities for each of the refined alternatives to grade-separate freight railroads from streets, roads, and highways at the same time the HST system is built. The numbers were obtained by tallying the locations where streets would intersect with the existing freight alignments on the study's aerial maps (see Appendix) using the following criteria.

- All streets were included in the tally, whether they were major arterials or unpaved county roads.
- However, only streets that crossed the alignment and continued for an additional 2000 feet or so were included in the count.

Table 11 – Table of Grade Separation Opportunities

Preliminary Summary of Grade Crossings for Refined Alternatives								
	A	A-1	B-1	B-2	D-1	D-2	E-1	E-2
Miles co-located with freight rail	90.7	84.0	96.0	79.2	80.1	63.3	96.4	79.6
Number of grade crossings	195	186	205	154	164	123	213	162
Average number of grade crossings per mile	2.2	2.2	2.1	1.9	2.0	1.9	2.2	2.0

Additional field surveying would be required to finalize the counts presented in Table 12.

The planned implementation of a HST system provides an opportunity to investigate the potential to grade separate the freight rail along with the HST. Opportunities for grade-separating are closely linked with the complexity of construction issues discussed in the previous section. In general, the more grade-separations planned, the more complex the construction will be.

- **Grade Separation of Local Highway System over Freight and High-Speed Rail –** In the more rural stretches of track where the HST will be co-located adjacent to the existing freight rail at-grade, the freight rail could benefit from the planned vertical re-alignment of existing county road crossings due to the construction of the HST. Since a new bridge will be required to grade separate the HST crossing, the same bridge could be extended to cross over the existing freight rail line as well.

- **HST and Freight Rail, Elevated –** In more urbanized areas, attempting to vertically relocate the local road system over the rail lines can generate greater impacts than elevating the HST itself. Elimination of local access to business and residential areas, costly retaining walls to avoid fill slope encroachment to adjacent property, and visual impacts to accommodate the higher clearance envelope required to cross over the rail lines should be weighed against the alternative of an elevated rail system. In those locations where an elevated HST alignment may be deemed more advantageous, the opportunity to elevate the existing freight rail line should be investigated as well. Possible site and safety conditions that are conducive to co-location as an elevated system include the following:

  - Locations where modifications to the local road system to grade separate the freight rail alone cannot be accomplished without significant impacts to local business, industry, and residential property.

  - Locations where the HST and freight rail line would travel through rural communities, such as Shafter or Wasco, and the rail alignments effectively bisect the community or create physical growth boundaries.

  - Locations through the more fully developed urban areas surrounding the station approaches into Fresno and Bakersfield. In these areas, the benefits of co-locating elevated freight and high-speed rail together offer the ability to improve system safety, and reduce whistle noise and vibration. An added option could be to maintain the existing at-grade freight rail alignment and use the elevated section to add capacity (double track) that would otherwise not be available.

    At a minimum, where the HST alignment may need to be designed as an elevated section, some advance planning and coordination should be performed so as not to preclude the opportunity for the freight rail line to become elevated at some point in the future.

- **HST and Freight Rail, Below-Grade –** Alternatives B-1, D-1 and E-1 utilize the same below-grade concept to navigate the HST through the urbanized communities of Fowler, Selma, and Kingsburg. As part of the development of these design alternatives, Figure 5 was prepared to show the potential configurations of high-speed rail and freight rail operation.

8.1.2. PROJECT CAPITAL COST

Rough order-of-magnitude cost estimates were calculated for each alternative using unit costs derived from the cost estimating done for the PEIR/EIS. **Table 13** illustrates the rough estimation of capital cost differentials from the baseline alternative.

The first step was to update the per-mile cost used in the PEIR/EIS for the preferred alternative. In Appendix 4-C to the PEIR/EIS, the cost of the preferred alternative was estimated at approximately $696 million between Fresno and Hanford and approximately $2.15 billion between Hanford and Bakersfield, for a total of approximately $2.85 billion. This yields an average cost per mile of approximately $24 million in 2003 dollars. This was escalated at 3.5% annually to 2007 to obtain a cost of approximately $28 million per mile in 2007 dollars. This figure was subsequently multiplied by the mileage in each alternative to get the base cost for each alternative, shown in **Table 13** in the column titled "Basic Alignment Subtotal".

For the three alternatives that use the below-grade alignment through southern Fresno County, an add-on cost for the below-grade section was created, because the original estimate did not include a trench section. This was developed using the per-km cost for a long trench identified in Appendix 4-B to the PEIR/EIS, which was converted to a per-mile cost and escalated to 2007 dollars. This yields a per-mile cost for the below grade segment of approximately $65.1 million, which is additive to the basic alignment cost. The below-grade cost includes the costs for excavation and construction of the structural elements of the trench section but not any trackage, power delivery or other systems. Thus, the trench costs are not duplicative of the basic alignment costs and can be added.

The estimate of $28 million per mile described above and used as a standard per-mile cost for the basic alignment for purposes of generating this rough estimate includes an assumption that the same proportion of the alignments considered in this report would be constructed on aerial structure as was assumed in the estimating for the preferred alternative in the PEIR/EIS. Thus, this unit cost of $28 million per mile already includes an allowance for aerial structure and grade separations comparable to the percentages of aerial structures assumed in the PEIR/EIS. As more detail is developed on each alignment in the future, more refined costs for aerial structures can be developed based on more refined engineering of the alignment.

The result of this exercise is that the alignment costs fall into two groups – those with a trench section, and those without. The alternatives without a below-grade segment (A, A-1, B-2, D-2 and E-2) are estimated to cost about $3.1 to $3.2 billion, while the alternatives with a below-grade segment (B-1, D-1, and E-1) are estimated to cost about $3.9 to $4.0 billion.

Further engineering work will be needed on each alternative in order to more precisely differentiate costs. The method used here is general and cannot take into account potential differences between the alignments in terms of length of elevated sections, grade separations, or other potential differences requiring a higher level of design to specify. The engineering work on the project has not yet advanced to a level that will allow estimation of these differences between alternatives at the more detailed level.

Table 12 – Table of Capital Cost Differentials from Baseline Estimate

		Basic Alignment			Add-ons			
	Alternative	Miles	Estimated cost per mile[1] (2007 $)	Basic Alignment Subtotal (2007 $)	Below-grade miles	Estimated cost per mile[2] (2007 $)	Add-ons Subtotal (2007 $)	RELATIVE COST ESTIMATE (2007 $)
A	BNSF Hanford West Bypass – Baseline Alternative	110.5	$ 28,000,000	$ 3,094,000,000				$ 3,094,000,000
A-1	BNSF Hanford East Bypass	111.1	$ 28,000,000	$ 3,110,800,000				$ 3,110,800,000
B-1	UPRR Fresno South Below Grade	110.4	$ 28,000,000	$ 3,091,200,000	12.9	$ 65,100,000	$ 839,790,000	$ 3,930,990,000
B-2	UPRR Fresno South Bypass	111.1	$ 28,000,000	$ 3,110,800,000				$ 3,110,800,000
D-1	UPRR to BNSF (198 Station) - Fresno South Below Grade	112.6	$ 28,000,000	$ 3,152,800,000	12.9	$ 65,100,000	$ 839,790,000	$ 3,992,590,000
D-2	UPRR to BNSF (198 Station) - Fresno South Bypass	113.3	$ 28,000,000	$ 3,172,400,000				$ 3,172,400,000
E-1	UPRR to BNSF (99 Station) - Fresno South Below Grade	113.4	$ 28,000,000	$ 3,175,200,000	12.9	$ 65,100,000	$ 839,790,000	$ 4,014,990,000
E-2	UPRR to BNSF (99 Station) - Fresno South Bypass	114.1	$ 28,000,000	$ 3,194,800,000				$ 3,194,800,000

[1] Per-mile cost estimates for basic alignment calculated using cost estimates from Appendix 4-C Authority PEIR/EIS (August 2005) for average per-mile cost for preferred alternative, escalated to 2007 dollars.

[2] Per -mile cost estimates for trench calculated using cost estimates from Appendix 4-B Authority PEIR/EIS (August 2005) for per-km cost for long trench, converted to per-mile and escalated to 2007 dollars. Long trench cost estimates are inclusive of all excavation and structures required, but not track, power, and other systems, which are included in basic alignment.

8.1.3. BUILT ENVIRONMENT IMPACTS AND BENEFITS

For assessment of Built Environment measures, the alignment alternatives were plotted on a GIS map base, and the totals for each alignment were calculated from GIS. Using the GIS system, a 1/4-mile buffer was defined around each proposed alignment, measuring 1/8 mile to either side of the alignment centerline. The data results for all measures are shown in **Table 14**, and each measure is mapped separately in **Figures 34 through 42.**

Sensitive Land Uses – **Figure 34** maps all sensitive land uses, which are also tabulated in the "Land Conditions & Land Use" column entries in **Table 14**, except for wildlife refuges. Measurements were made using land cover data in GIS, supplemented with "windshield" survey data. These all address the issue of land use compatibility and conflicts, including:

- Areas of relatively dense residential development (acreage and number in buffer);
- Industrial and commercial areas/employment centers (acreage and number in buffer);
- Incorporated communities and unincorporated residential communities (acreage and number in buffer);
- Government facilities (number in buffer); and
- Sensitive land uses (number in buffer).

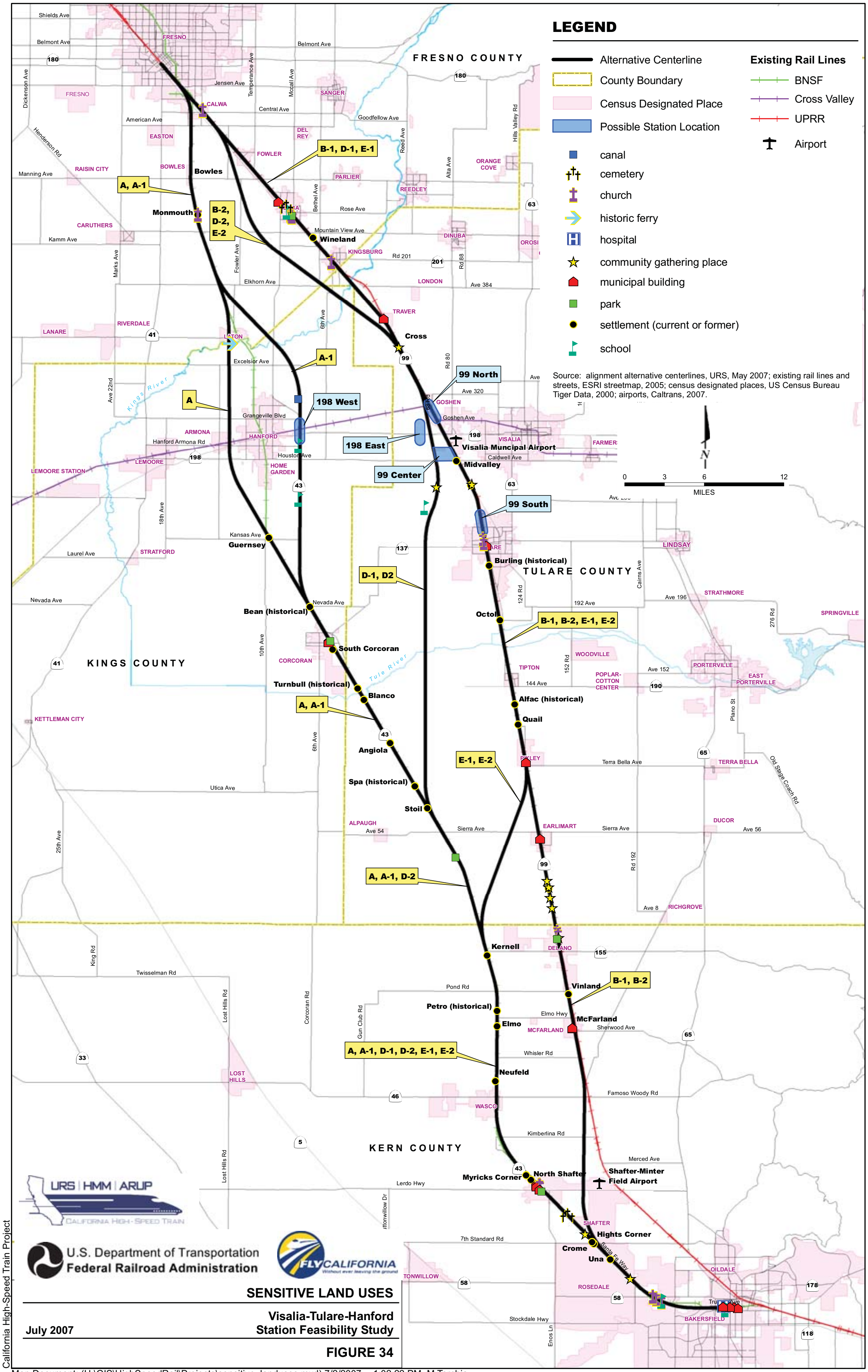
Government facilities may include city halls, county administration complexes, courthouses, fire and police stations, government-owned stadiums and performing arts centers, jails and prisons, and so forth. Sensitive land uses consist of hospitals, schools, convalescent centers, assisted living facilities, senior citizen centers, and other similar land uses.

As shown in **Table 14**, the B and E alternatives would affect areas of relatively dense residential development. Each would affect one such area totaling about 11-½ acres falling within their respective buffers. All alternatives would have impacts on industrial and commercial areas and employment centers; Alternative B-1 would have the most impacts both in acreage and number of such affected areas. Every alternative would also affect incorporated communities and unincorporated residential communities, with the greatest numbers of affected areas in Alternatives B-1 and E-1.

Each alignment alternative would affect government facilities and sensitive land uses. As indicated in **Table 14**, Alternatives B-1, B-2, and E-1 would affect the most government facilities; Alternatives B-1 and E-1 would impact the most sensitive land uses.

Farmland Impacts – Farmland Impacts are mapped in **Figure 35** and addressed by the "Farmlands" columns in **Table 14**. All results, as measured with GIS, report acreages with the exception of the total number of affected parcels under agricultural use; Alternatives D-2 and E-2 affect the greatest number of parcels. (Note this does not indicate either size or ownership of the potentially affected parcels.) In respect to Prime Farmland, Alternatives B-2, D-2, and E-2 would have the greatest impact in terms of acreage affected. For Farmland of Local Importance, Alternatives B-1 and D-1 would have the greatest impact. For Farmland of Statewide Importance, Unique Farmland, and Grazing Lands, **Table 14** shows that Alternatives A (the baseline) and A-1 would affect the greatest quantity of acreage.

Cultural Resource Impacts – Cultural Resources are mapped in **Figure 36** and have been measured specifically by the number of historic sites on the National Register of Historic Places within the 1/4-mile buffer zone for each alignment alternative. **Table 14** indicates that the fewest number of sites (2 sites) would be within the buffer for Alternatives B-1 and B-2, and the most number of sites (4 sites) would be within the buffer for by Alternatives A (the baseline), A-1, D-1, and D-2.



SENSITIVE LAND USES

Visalia-Tulare-Hanford Station Feasibility Study

July 2007

FIGURE 34

California High-Speed Train Project

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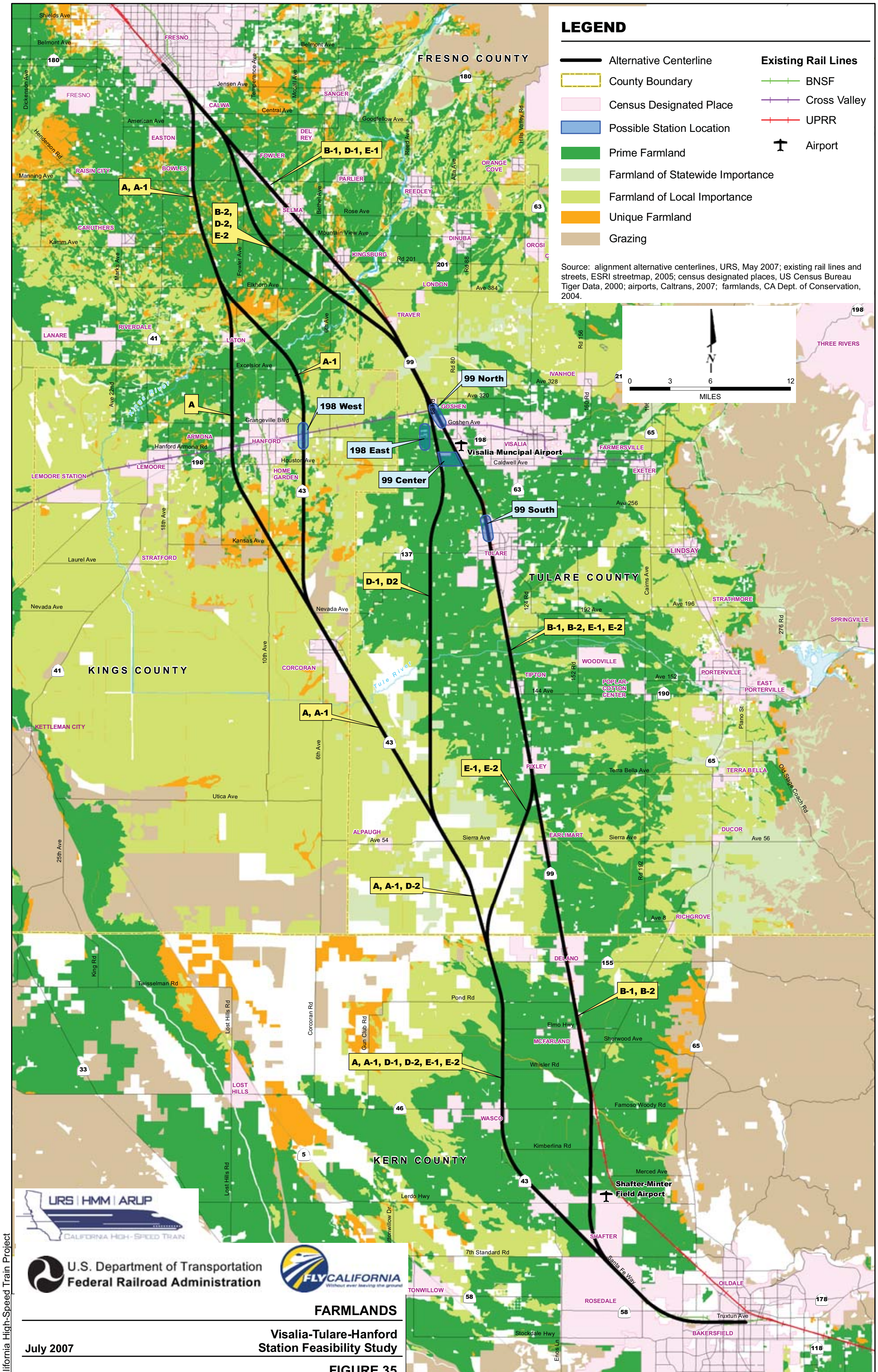

California High-Speed Train Project

FARMLANDS

Visalia-Tulare-Hanford Station Feasibility Study

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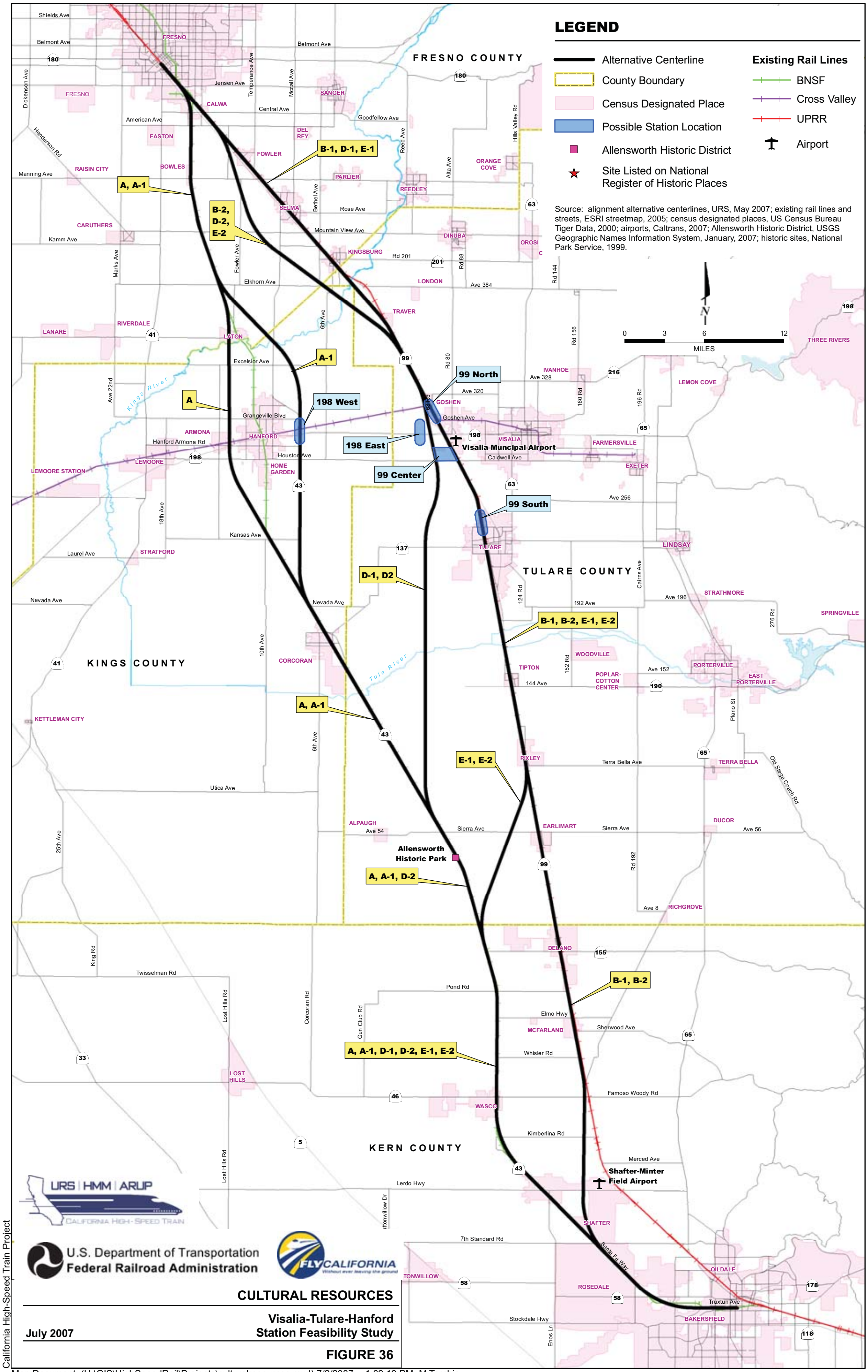
FIGURE 35

Map Document: (U:\GIS\HighSpeedRail\Projects\farmlands.mxd) 7/2/2007 -- 1:05:17 PM M Torchia



California High-Speed Train Project

CULTURAL RESOURCES

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Visalia-Tulare-Hanford Station Feasibility Study

FIGURE 36

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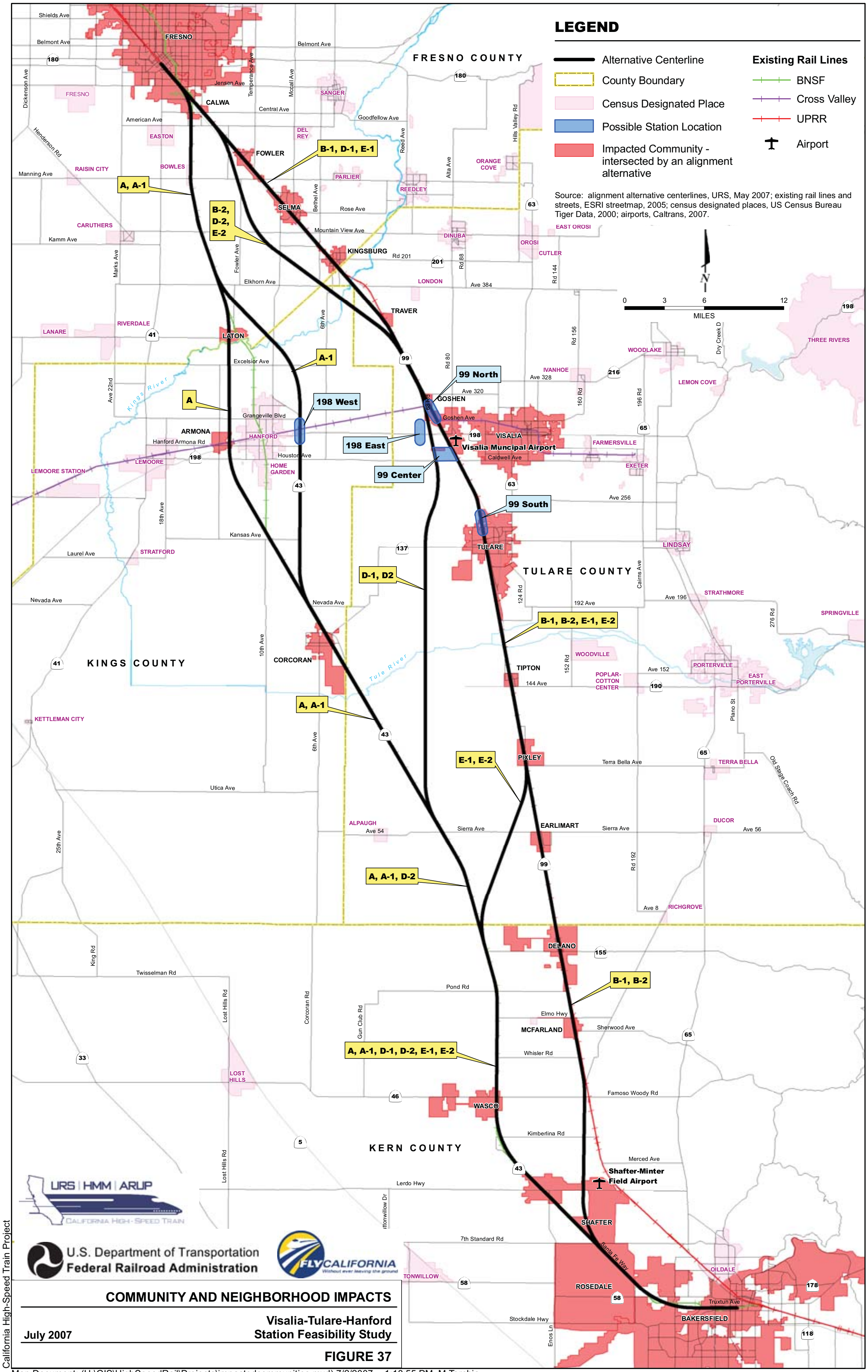

U.S. Department of Transportation
Federal Railroad Administration

California High-Speed Train Project

COMMUNITY AND NEIGHBORHOOD IMPACTS

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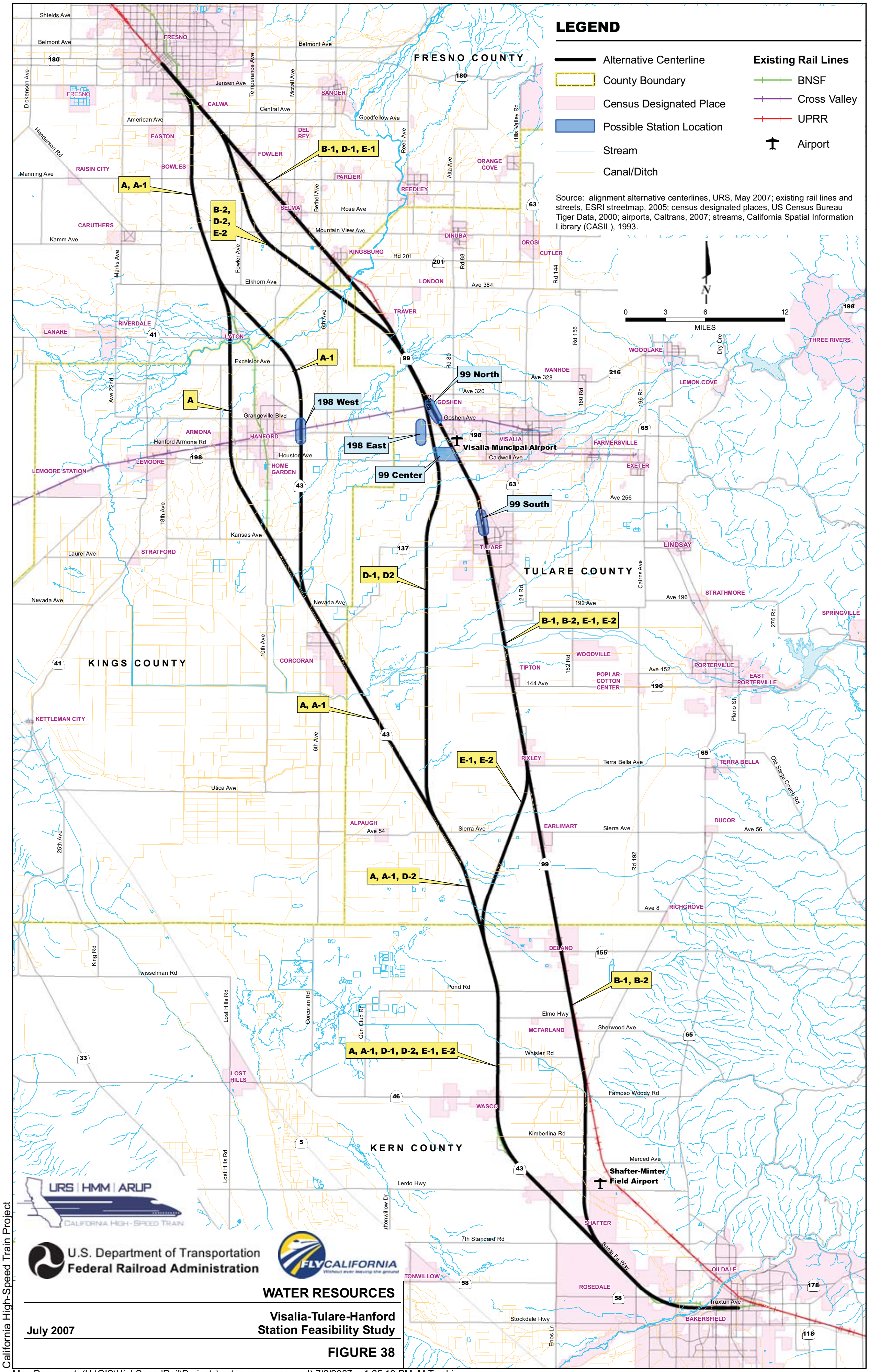
Station Feasibility Study

FIGURE 37

Map Document: (U:\GIS\HighSpeedRail\Projects\impactedcommunities.mxd) 7/2/2007 -- 1:18:55 PM M Torchia



WATER RESOURCES

Visalia-Tulare-Hanford
Station Feasibility Study

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FIGURE 38

California High-Speed Train Project

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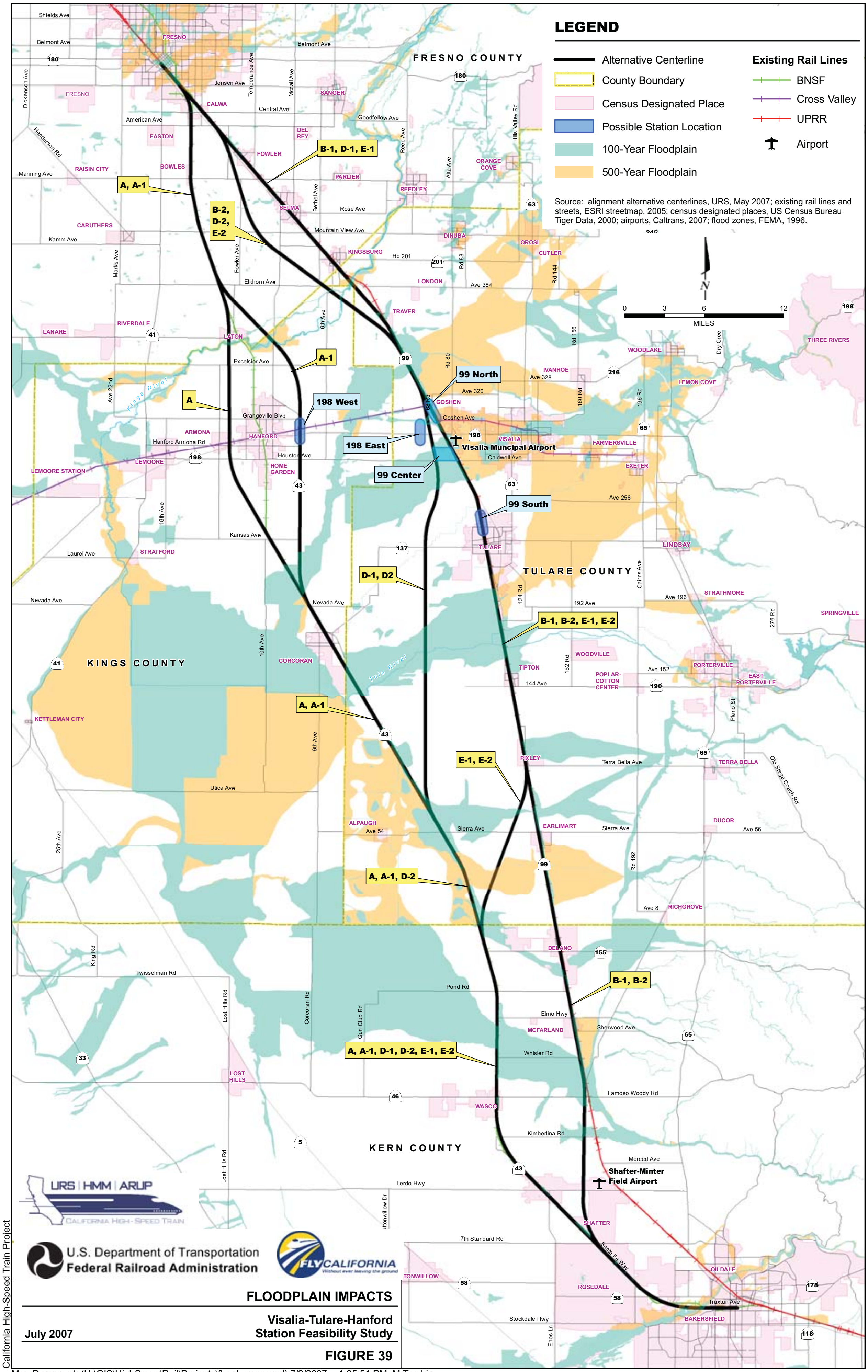

California High-Speed Train Project

FLOODPLAIN IMPACTS

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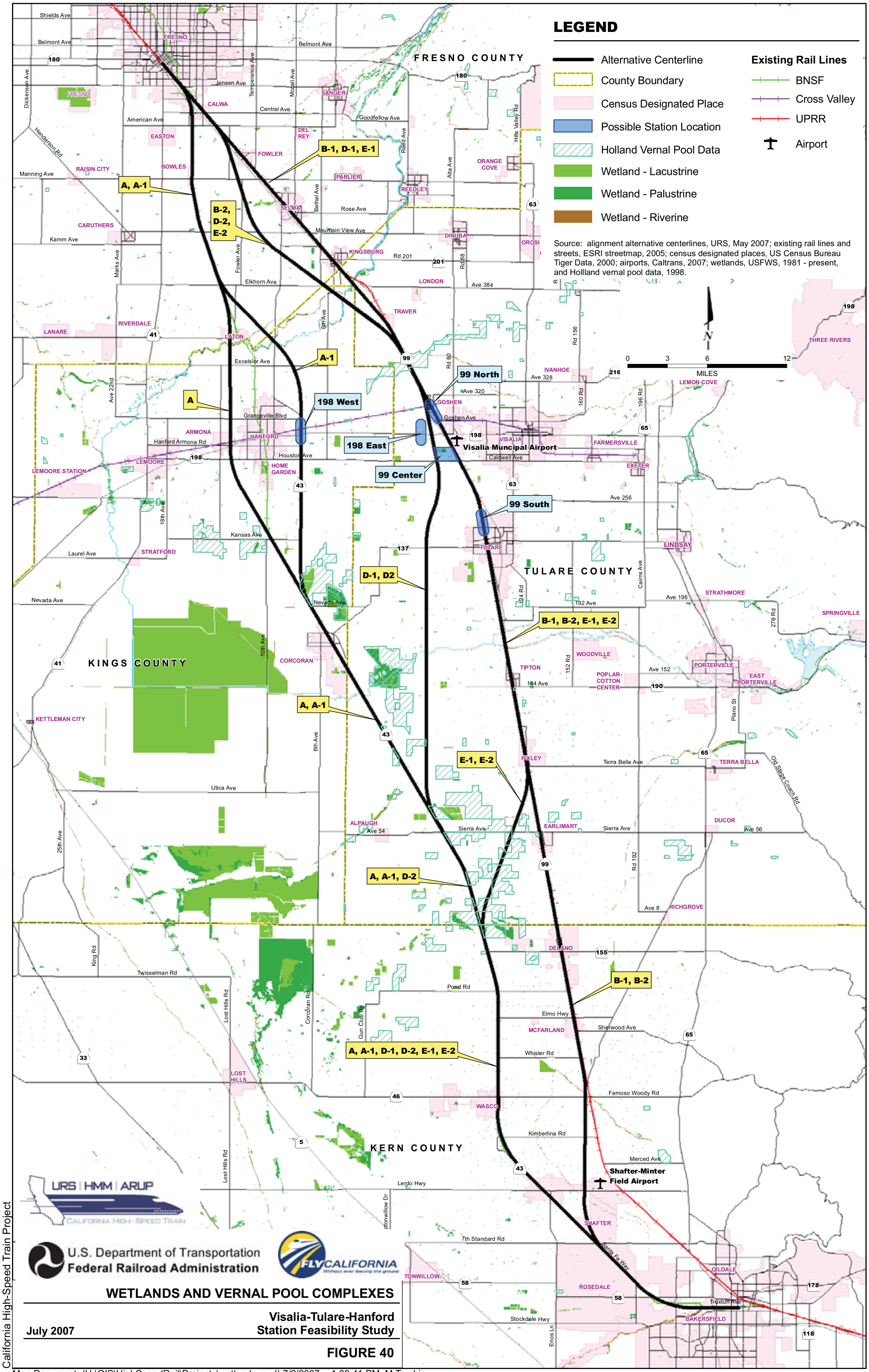
FIGURE 39

Map Document: (U:\GIS\HighSpeedRail\Projects\floodzones.mxd) 7/2/2007 -- 1:35:51 PM M Torchia



California High-Speed Train Project

WETLANDS AND VERNAL POOL COMPLEXES

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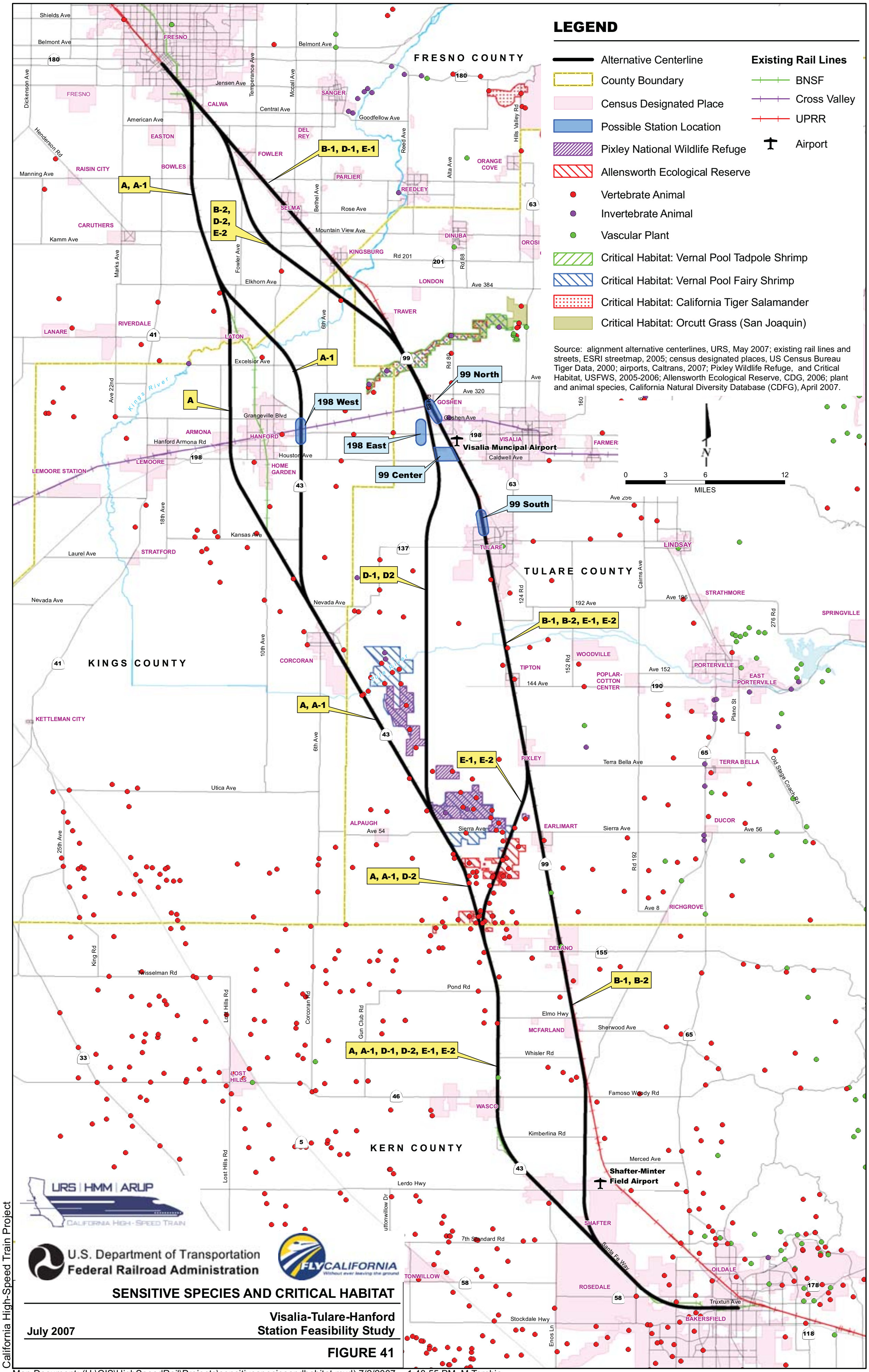
Visalia-Tulare-Hanford Station Feasibility Study

FIGURE 40

Map Document: (U:\GIS\HighSpeedRail\Projects\wetlands.mxd) 7/2/2007 -- 1:39:41 PM M Torchia



California High-Speed Train Project

SENSITIVE SPECIES AND CRITICAL HABITAT

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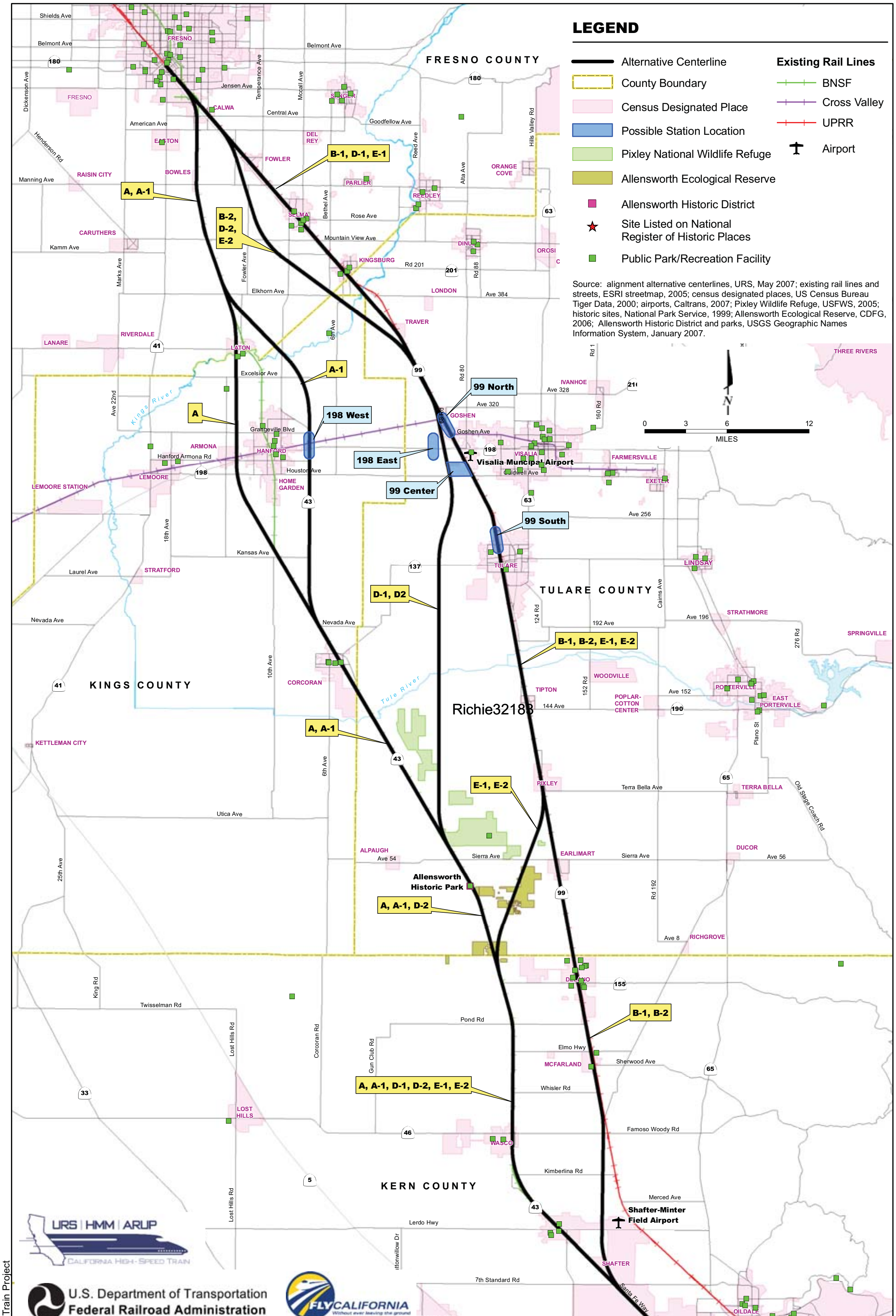
Visalia-Tulare-Hanford
Station Feasibility Study

FIGURE 41

Map Document: (U:\GIS\HighSpeedRail\Projects\sensitivespeciesandhabitat.mxd) 7/2/2007 -- 1:48:55 PM M Torchia



California High-Speed Train Project

POTENTIAL 4(F) IMPACTS

Visalia-Tulare-Hanford Station Feasibility Study

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FIGURE 42

Map Document: (U:\GIS\HighSpeedRail\Projects\4F.mxd) 7/2/2007 -- 1:52:40 PM M Torchia

Community and Neighborhood Impacts – Community and Neighborhood Impacts have been mapped in **Figure 37** and are tabulated in **Table 14**. These impacts overlap to a degree with Land Use Compatibility and Conflicts with respect to impacts to incorporated communities and unincorporated residential communities. Community and neighborhood impacts would be greatest in cases where the proposed alignment physically bisects or isolates a given community. From the total number of acres affected, Alternatives B-1 and E-1 would have the greatest impact.

General Plan Consistency – General plans were reviewed for the jurisdictions in which potential station sites would be located. This included an examination of each jurisdiction's land use elements and zoning maps.

- **99 North** – This station location falls within unincorporated Tulare County, in an area that is designated for a mix of industrial and commercial uses, according to Tulare County's Goshen Community Plan. The area appears to be significantly constrained for future development by the junction of the railroad tracks, as well as the presence of industrial uses to the northwest and residential uses to the south.

- **99 Center -** Future planning information for the area around the 99 Center station is not available at this time. The City of Visalia's current zoning designation for this land is quasi-public in the northwest section and agricultural for the remaining parts. Existing land use includes the City of Visalia's water treatment plant and agricultural uses.

- **99 South** – The City of Tulare Land Use Diagram designates most of the area of this station location as Residential, Commercial, or Industrial within the Urban Reserve Line. These reserve designations assume that these areas will develop beyond the planning horizon of the General Plan (2030). Prior to then, the General Plan proposes restricting uses to those consistent with the Agricultural and Open Space designation of the Land Use Diagram. Since these designations will effectively hold off development, the likelihood of new development that might compromise the viability of a new HST station is low. Furthermore, the amount of undeveloped land in the area would provide an excellent opportunity to establish substantial new development that could complement the HST station.

- **198 West** – This station location falls within the jurisdictions of the City of Hanford and of Kings County. The City of Hanford's General Plan designates over 100 acres to the east of the alignment and 60 acres to the west as Planned Highway Development. This designation anticipates development that will be oriented to highway travelers. The City intends to prepare an area plan for this area and will further require that developers prepare a detailed plan for City approval. Given the City's intent to prepare a focused plan for the area, there should be an opportunity to adapt proposed development to support a rail station. Conversely, Kings County has zoned the unincorporated portion of this station site as agricultural.

- **198 East** – This station location lies in unincorporated Tulare County on land designated as Valley Agriculture, which would not accommodate a future train station and associated development. Furthermore, the area falls beyond the City of Visalia's Urban Area Boundary, so it is unlikely that the City would extend into this area. These factors pose considerable constraints to the viability of this location.

8.1.4. NATURAL ENVIRONMENT IMPACTS AND BENEFITS

Water Resources – Water Resources are mapped in **Figure 38** and are tabulated under the greater "Habitats, Biological Resources and Wetlands" category in **Table 14.** Alternatives A-1 and A would yield the least number of stream crossings, whereas Alternatives E-2 and E-1 would produce the greatest number of stream crossings.

Floodplain Impacts – Floodplain impacts are mapped in **Figure 39** and tabulated in the Floodplains columns of **Table 14.** These figures refer to acreage in FEMA 100-year and 500-year floodplains. The highest amount of acreage with 100-year floodplain impacts would occur with Alternative D-1, followed by Alternative B-1. The worst 500-year floodplain impacts would occur under the baseline Alternative A and Alternative A-1.

Wetlands – Wetlands and vernal pools are mapped in **Figure 40**, and GIS measurements for lacustrine, palustrine, and riverine wetlands and vernal pools are presented in **Table 14.** Both acreages and number of crossings are provided. For lacustrine wetlands, no impacts would occur with Alternatives B-2 or E-2; impacts would be the highest with Alternative A-1. For palustrine wetlands, impacts would be the least under Alternative B-2 and the most under Alternative E-1. For riverine wetlands, the least impacts would be exhibited by Alternative D-1 and the most by Alternative B-2. For vernal pools, impacts would be the least under Alternative A-1 and the greatest under Alternative E-2.

Sensitive Species and Critical Habitats – Sensitive species and critical habitats are mapped in **Figure 41**, and the GIS measurements are tabulated in **Table 14** under the greater category of "Habitats, Biological Resources and Wetlands". Acreage and crossings data are furnished for a variety of threatened and endangered species and habitats. For *critical habitats*, Alternatives A (the baseline) and A-1 would have the fewest impacts (see first six columns in **Table 14**). Among the most sensitive species habitats, that associated with the foraging of the *Swainson's hawk is affected least by* Alternatives B-1 and B-2, and most by Alternatives D-1 and D-2. Regarding *vernal pool complexes*, Alternatives B-1 and B-2 would have the least amount of affected area; Alternatives E-1 and E-2 the most impact in acreage and Alternatives A and A-1 the most impact in number of crossings.

No occurrences of California Natural Diversity Database (NDDB) are noted for invertebrate animals with any of the alternatives. California NDDB occurrences for vascular plants would be either 2 or 3, depending on alternative. For California NDDB vertebrate animals, no occurrences are noted for Alternatives B-1 or B-2, however as many as 6 or 7 occurrences may be noted for Alternatives A-1 and (baseline) A.

Potentially affected acreages of California NDDB terrestrial or aquatic communities would be least with Alternatives B-1 and B-2 (around 315 acres), and most with Alternatives E-1 and E-2 (an estimated 1,400 acres).

4(f) Resources – 4(f) resources are mapped in **Figure 42**, and tabulated in **Table 14**. This category overlaps with "Cultural Resources", as presented earlier. Section 4(f) potentially affected historic sites on the National Register of Historic Places (NRHP) were also listed in **Figure 36**, which indicates that the fewest such sites (two sites) would be affected by Alternatives B-1 and B-2, and the most such sites (four sites) would be impacted by Alternatives A (the baseline), A-1, D-1 and D-2. Wildlife refuges also fall under the 4(f) category. As shown in the "Land Conditions & Land Use" area of **Figure 34**, no impacts would accrue to wildlife refuges with either Alternative B-1 or B-2. The highest number of occurrences are with Alternatives E-1 and E-2, and to a lesser extent with Alternatives D-1 and D-2.

8.1.5. MEASURES NOT USED

Two additional measures were initially considered for inclusion in this characterization process and were presented at meetings with the TAGs and other local stakeholders. These measures have been omitted from this phase of the evaluation, as they did not enable clear differentiation among the alternatives.

Environmental Justice Impacts – The geographic units used to report the data are so disparate in size as to preclude meaningful comparison. In many cases, the geographic reporting units are very large, and consequently, the data available is spread over a very wide area and may not be valid for the portion of the geographic unit closest to the alignment. This measure will be fully analyzed in the project-level EIR/EIS, and it will be possible during that phase to break the data down into smaller, more uniform units which will enable more meaningful analysis of this measure.

Intermodal Connections – The station sites are constrained by the required geometry for HST operation, and existing transit systems are not configured with this type of connectivity in mind. Local transit networks are more adaptable and are in fact modified on a regular basis to adapt to changing conditions. Any future HST station will be an important connection point to which local networks will most likely be adapted. The team therefore concluded that the current design of local transit networks should not be assessed as a constraint for this study.

Archaeological/Paleontological/Architectural Resources – These resources will be analyzed for the alignment(s) to be included in the EIR/EIS via field survey and a review of the California Historical Resources Information System (CHRIS).

8.2. ASSESSMENT PROCESS - ALTERNATIVES

This section summarizes the analysis of alternative alignments using the characteristics described in the preceding discussion. Of the original criteria, the following did not significantly differentiate among the alternatives, and were not used for this evaluation.

Travel time – The difference in travel time among alternatives is only one minute between the shortest and the longest of the alignment alternatives. This differential was not sufficient to distinguish between the alternatives as the selection of any one would not alter significantly overall travel times for express trains between endpoints of the system.

Length of alignment – The difference in length between the shortest and longest alternative alignments is only 3.7 miles. At HST's full operating speed of 220 mph, this differential length represents approximately 60 seconds of travel time, which is not significant enough to distinguish among the alternatives.

Operational issues – At the current level of conceptual design for these alignments, there do not appear to be any HST operational issues that would distinguish between these alternatives. Each alignment appears to be fully operational within Authority's design criteria. However, as discussed above, maintenance issues for above-grade segments may be a challenge for some alternatives, as discussed further below.

8.2.1. ALTERNATIVE A – BNSF HANFORD WEST BYPASS – BASELINE ALTERNATIVE

Alternative A is the baseline option and closely follows the BNSF corridor throughout most of its alignment. It is a modified version of the preferred alternative in the programmatic EIR/EIS, differing in that it bypasses Hanford slightly more to the west than the PEIR/EIS preferred alignment. This alternative would not include a station between Fresno and Bakersfield.

This alternative, along with A-1, is expected to have the least amount of construction-related issues. It travels through relatively undeveloped areas, i.e., agricultural land or areas where there are relatively little or no built structures that would need to be demolished or relocated (e.g., utilities). While it is co-located along a freight rail alignment, it is not located near a state highway. Along with Alternative A-1, this alternative would require the least amount of elevated construction.

Alternative A would have relatively high impacts on existing land uses and biological resources. This alignment would cross through the greatest number of acres of Farmland of Statewide Importance compared to the other alternatives. Its alignment traverses the greatest acreage of 500-year floodplain.

At the same time, relative to the other alternatives, this alignment impacts the second lowest number of acres of 100-year floodplain, crosses the lowest number of acres of critical habitats (along with Alternative A-1), and would travel through the smallest number of acres of Prime Farmland.

8.2.2. ALTERNATIVE A-1 – BNSF HANFORD EAST BYPASS

Alternative A-1 uses the BNSF corridor throughout its alignment except where it bypasses Hanford, closely paralleling Highway 43 between Laton and Corcoran. Alternative A-1 would serve a station located about three miles east of Hanford near the intersection of SR-198 and SR-43 or the intersection of SR-43 and the Cross-Valley rail line.

It is anticipated that Alternative A-1 would have the second lowest amount of construction-related issues. It runs through the least acreage of developed land, and along with Alternative A, would require the least amount of elevated construction. Because some parts of it are co-located with a highway and other parts are co-located with a freight alignment, this alternative would have slightly more construction-related issues than Alternative A.

This alternative would affect the largest number of acres of Farmland of Statewide Importance and Grazing Lands, the second highest number of acres of 500-year floodplain, and the highest acreage of lacustrine wetlands. Along with the baseline alternative (Alternative A), this alignment would cross the lowest acreage of critical habitats.

8.2.3. ALTERNATIVE B-1 – UPRR FRESNO SOUTH BELOW GRADE

Alternative B-1 would use the existing UPRR corridor throughout its length but would travel via a below-grade alignment through portions of the cities of Fowler, Selma, and Kingsburg. South of McFarland, B-1 would transition to the BNSF corridor and travel toward the Truxtun station in Bakersfield. It would include a station located on Highway 99, either at the interchange of SR-198/SR-99 or north of the city of Tulare.

It is anticipated that Alternative B-1 would have the some of the highest amount of construction issues. It through relatively developed areas, requires below-grade construction, and is located adjacent to a state highway and freight rail alignment for 64% of its length. These attributes would increase the complexity of construction issues.

This alignment would have some of the greatest impact on existing land uses. Compared to the other alternatives, it would affect the greatest number and acreage of industrial and commercial uses. It would affect relatively high numbers and acreages of government facilities; sensitive land uses; relatively dense residential development; and both incorporated and unincorporated residential communities. Additionally, along with E-1, it would have the greatest impact on existing communities and neighborhoods. Alternative B-1 would travel through the second highest number of acres of land considered Farmland of Local Importance.

For biological resources, this alternative impacts the second highest acreage of 100-year floodplain. However, it affects the second lowest number of acres of 500-year floodplain, and the lowest acreage of Swainson hawk's foraging habitat (along with Alternative B-2).

Table 14: Matrix of Assessment Measures

No.	Criteria	Measurement	Alternative A	Alternative A-1	Alternative B-1	Alternative B-2	Alternative D-1	Alternative D-2	Alternative E-1	Alternative E-2
1. Project Performance										
1a	Travel time	Minutes	30	30	30	30	31	31	31	31
1b	Length of alignment (1)	Linear distance in miles	111	111	110	111	112.6 (2)	113.3 (2)	113	114
1c	Operational Issues	Qualitative	None noted at this time							
1d	Construction Issues	Qualitative	Least complex	Low complexity	Highest complexity	High complexity	High complexity	Medium complexity	High complexity	Medium-high complexity
1e	Opportunity for grade separating freight RRs	Number of grade crossings	195	186	205	154	164	123	213	162
		Average number of grade crossing per mile	2.2	2.2	2.1	2.0	2.1	2.1	2.2	2.0
2. Project Capital Cost										
2a	Capital cost differential	Cost differential	Baseline	1-5%	25-30%	1-5%	25-30%	1-5%	25-30%	1-5%
3. Built Environment Impacts and Benefits										
3a	Land Use Compatibility and Conflicts	Number of sensitive land uses within 1/4-mile buffer	48	49	57	46	47	36	59	48
3b	Farmland Impacts	Acreage of affected agricultural parcels within 1/4-mile buffer	12,635	12,580	9,960	11,379	12,144	13,561	10,232	11,650
		Number of affected agricultural parcels within 1/4-mile buffer	565	563	426	579	482	628	450	603
3c	Cultural Resource Impacts	Number of cultural resources within 1/4-mile buffer	7	7	2	2	8	8	7	7
3d	Community and Neighborhood Impacts	Acreage of incorporated communities and unincorporated residential communities within 1/4-mile buffer	2,641	2,662	4,879	3,824	3,506	2,451	4,474	3,419
		Number of incorporated communities and unincorporated residential communities within 1/4-mile buffer	20	19	16	14	12	10	20	18

(1) Total alignment length measured from Truxton Station (Bakersfield) to Fresno Station (Fresno).`
(2) Length for alternative alignment serving SR 198 Station location nearest to SR 99. For optional SR 198 Station location, total alignment length would be reduced by 0.2 miles.

Table 14: Matrix of Assessment Measures
(Continued from previous page)

No.	Criteria	Measurement	Alt A	Alt A-1	Alt B-1	Alt B-2	Alt D-1	Alt D-2	Alt E-1	Alt E-2
4. Natural Environment Impacts and Benefits										
4a	Water resources	Number of stream crossings (excluding ditches and canals)	22	19	37	39	34	36	40	42
4b	Floodplain impacts	Acreage of floodplain within 1/4-mile buffer	4,548	4,744	4,575	4,292	4,896	4,529	4,488	4,205
4c	Wetlands	Number of crossings	97	93	79	75	91	87	95	91
		Acreage of wetlands within 1/4-mile buffer	229	308	144	130	175	161	188	174
	Vernal pools	Number of crossings	9	9	3	3	8	8	7	7
		Acreage of vernal pools within 1/4-mile buffer	623	793	171	171	660	640	973	973
4d	Threatened and endangered species and habitats	Number of critical habitats within 1/4-mile buffer	2	2	3	3	5	5	5	5
		Acreage of crossings within critical habitats	4,496	4,943	3,677	3,639	6,543	6,466	5,626	5,589
		Number of sightings, per CNDD	10	9	2	2	6	6	5	5
4e	4(f) Impacts (Public parks, wildlife refuges, historic properties on National Register of Historic Places)	Number of resources located within 1/4-mile buffer	7	7	2	2	8	8	7	7

8.2.4. ALTERNATIVE B-2 – UPRR FRESNO SOUTH BYPASS

Alternative B-2 would closely follow the existing UPRR corridor throughout its alignment except through Fowler, Selma, and Kingsburg, where it would be diverted to the west. It would return to the UPRR corridor near Traver and use the BNSF corridor south of McFarland to head toward the Truxtun station in Bakersfield. Alternative B-2 would include a station located on Highway 99, either at the interchange of SR-198/SR-99 or north of the city of Tulare.

Alternative B-2 would not require below-grade construction. However, it is co-located with both a state highway and freight alignment for 55% of its length and travels through a sizeable amount of developed land in the study area.

Generally, this alignment would have some of the higher impacts on existing land uses and some of the lowest impacts on biological resources of all the alternatives. It would affect relatively high numbers and acreage of dense residential developments, industrial and commercial areas, and government facilities. When measured by acreage and crossings, it has the highest effects on riverine wetlands but the least impacts on palustrine wetlands and none on lacustrine wetlands. Additionally, it impacts the lowest acreage of 500-year floodplain and of Swainson hawk's foraging habitat (along with Alternative B-1), and imposes the least impact on areas identified as vernal pool complexes (as does Alternative B-1).

8.2.5. ALTERNATIVE D-1 – UPRR TO BNSF (198 STATION) – FRESNO SOUTH BELOW GRADE

Alternative D-1 would closely follow the existing UPRR corridor between Fresno and transition to a below-grade alignment through the cities of Fowler, Selma, and Kingsburg. It returns to the UPRR corridor south of Kingsburg, shifts to the BNSF corridor at a location between Corcoran and Allensworth SHP, and travels to the Bakersfield Truxtun station on this corridor. This alignment would serve a station located either near the intersection of SR-198 and SR-99, or across from the Visalia Airport near SR-99.

Alternative D-1 would cross a relatively large amount of undeveloped land, requires below-grade construction, and is positioned next to a state highway and freight alignment along 55% of its length.

For existing land uses, this alternative impacts the greatest acreage of land classified as Farmland of Local Importance. For biological resources, it impacts the greatest acreage of 100-year floodplain and the of Swainson hawk's foraging habitat (along with Alternative D-2). Alternative D-1 has the least impact on riverine wetlands. A calculation of the total number of 4(f) resources found along each alternative shows that Alternatives D-1 and D-2 have the highest number of these resources.

8.2.6. ALTERNATIVE D-2 – UPRR TO BNSF (198 STATION) – FRESNO SOUTH BYPASS

Alternative D-2 would follow the existing UPRR corridor until it reaches Fowler, where it would be diverted to the west. It would return to the UPRR corridor at a location south of Kingsburg, shift to the BNSF corridor at a location between Corcoran and Allensworth SHP, and travel to the Bakersfield Truxtun station on this corridor. This alignment would include a station either located at the intersection of SR-198 near SR-99 or across from the Visalia Airport near SR-99.

Construction of Alternative D-2 would include many of the same construction issues as D-1 outside of the trench area. While it would not require below-grade construction, it also runs through the most developed parcels in the study area compared to the other alternatives. Additionally, it would be located adjacent to a state highway and freight alignment for 39% of its length.

For existing land uses, the analysis showed that Alternative D-2 would affect the greatest acreage categorized as Prime Farmland. It also has the highest number of 4(f) resources, e.g., wildlife refuges, and would intersect the greatest acreage of Swainson hawk's foraging habitat (along with Alternative D-1).

8.2.7. ALTERNATIVE E-1 – UPRR TO BNSF (99 STATION) – FRESNO SOUTH BELOW GRADE

Alternative E-1 would closely follow the existing UPRR corridor going south from Fresno, and would transition to a below-grade trench through the cities of Fowler, Selma, and Kingsburg. It would return to the UPRR corridor south of Kingsburg until it reaches Pixley where it would move to the BNSF corridor to reach the Truxtun station in Bakersfield. This alignment would include a station that could be located on Highway 99, near the Goshen Junction or at another point north of the City of Tulare.

It is expected that this alternative would have the most construction-related issues, as it requires below-grade construction and is located adjacent to a state highway and freight rail alignment for 65% of its entire length – more than any of the alternatives similarly co-located.

This alignment would have some of the greatest impacts on existing development, including large numbers of sensitive land uses; government facilities; incorporated communities and unincorporated residential communities. Moreover, along with Alternative B-1, it would have the greatest impact on existing communities and neighborhoods.

Alternative E-1 has the greatest impacts on palustrine wetlands and, with Alternative E-2, on areas identified as vernal pool complexes.

8.2.8. ALTERNATIVE E-2 – UPRR TO BNSF (99 STATION) – FRESNO SOUTH BYPASS

Alternative E-2 would follow the existing UPRR corridor until it reaches Fowler, where it would be diverted to the west to bypass Fowler, Selma, and Kingsburg. It returns to the UPRR corridor south of Kingsburg near Traver. When it reaches Pixley, the alignment would shift to the BNSF corridor and travel south to the Truxtun station in Bakersfield. This alignment includes a station that would be located on Highway 99, near the Goshen Junction or at another point north of the City of Tulare.

Alternative E-2 would entail the fourth highest amount of construction-related issues. Along with Alternatives B-2 and D-2, it requires the greatest amount of elevated construction and travels through the second greatest acreage of existing development in the study area. While it does not entail below-grade construction, this alternative is co-located with a state highway and freight alignment along 56% of its length.

In general, this alignment would have among the greatest impacts on existing land uses and some of the lower impacts on biological resources, compared to the other alternatives. It would affect relatively high amounts of relatively dense residential developments, industrial and commercial areas, and government facilities in terms of acreages and numbers. For biological resources, it has the highest impact on areas identified as vernal pool complexes (along with Alternatives E-1). It would have effect the second lowest number of acres of 100-year floodplain and no impacts on lacustrine wetlands.

8.3. ASSESSMENT PROCESS – STATIONS

The potential station locations were assessed largely based on the population and employment catchment within a 20-mile radius of the station locations. This was explored in detail in Section 8.1.1.3., and is also shown in Table 15. In addition to the population and employment within a specified distance of the station location, other features of the station location that are important are the access to the location, and the range of alternatives that could serve each potential station site. The number of alternatives that could serve each site is listed in Table 7.

99-North – This location would be served by six of the alignment alternatives (B-1, B-2, D-1, D-2, E-1, E-2), and would be located directly in the SR-99 corridor, north of SR-198 at Goshen. This location is adjacent to the Cross-Valley rail line, at the point where that rail line joins the UPRR corridor. This location has the lowest population and employment catchment of the five potential station locations.

99-South – This location would be served by four of the alternatives (B-1, B-2, E-1, E-2), and would be located directly in the SR-99 corridor, several miles south of SR-198 in Tulare. This location is not adjacent to the Cross-Valley rail line. This location has the second-highest population and employment catchment of the five potential station locations.

99-Center – This location would be served by six of the alternatives (B-1, B-2, D-1, D-2, E-1, E-2), and would be located directly in the SR-99 corridor, south of SR-198. This location is not adjacent to the Cross-Valley rail line. This location is owned by the City of Visalia.

198-West – This location would be served by one of the alternatives (A-1), and would be located at/near the intersection of SR-198 and SR-43, just east of Hanford. It would also be adjacent to the Cross-Valley rail line. This location has the highest population and employment catchment of the five potential station locations.

198-East - This location would be served by two of the alternatives (D-1, D-2), and would be located along the SR-198 corridor, slightly south of the Cross-Valley rail line just west and south of Goshen. This location would be served by a refined version of D-1 and D-2, if the station site owned by the City of Visalia (99-Center) were not used.

Table 14 – Station Assessment Measures

Station Location	Existing Population	Projected Population (2030)	Percent Change	Existing Jobs	Projected Jobs (2030)	Percent Change
99-North	343,200	555,400	62%	127,955	203,442	59%
99-South	422,300	680,500	61%	148,117	232,614	57%
99-Center	389,722	628,499	62%	143,323	227, 516	63%
198-West	424,700	683,300	61%	151,802	237,054	56%
198-East	389,700	628,500	61%	143,323	227,516	59%

8.4. RELATIVE STRENGTHS AND WEAKNESSES

Table 16 lists principal relative strengths and weaknesses for each of the alignment alternatives.

Table 15 – Relative Strengths and Weaknesses

Alignment Alternative		Comparative Strengths	Comparative Weaknesses
A	**Baseline BNSF - Hanford West Bypass**	- Preferred alternative in PEIR/EIS - Least complex construction	- No station serving Visalia-Tulare-Hanford area
A-1	**BNSF - Hanford East Bypass**	- Adheres closely to preferred alternative in PEIR/EIS - Central station location - Low complexity construction - Highest population catchment	- Station location at edge of urban area
B-1	**UPRR – Fresno-South Below Grade**		- Highest complexity construction - Below-grade segment – impact on cities and additional cost - Affects greatest acreage with dense residential development - Highest impacts on industrial and commercial uses
B-2	**UPRR – Fresno-South Bypass**		- High complexity construction
D-1	**UPRR to BNSF (198 Station) - Fresno-South Below Grade**		- Below-grade segment – impact on cities and additional cost
D-2	**UPRR to BNSF (198 Station) - Fresno-South Bypass**	- Medium complexity construction - Affects lowest total acreage of residential development	- Affects greatest acreage of farmland
E-1	**UPRR to BNSF (99 Station) – Fresno-South Below Grade**		- Below-grade segment – impact on cities and additional cost
E-2	**UPRR to BNSF (99 Station)– Fresno-South Bypass**		- Longest alignment