NOISE STUDY REPORT AND HIGH SPEED RAIL VIBRATION IMPACT ASSESSMENT

High Desert Corridor Project

Los Angeles and San Bernardino Counties, CA

District 7 - LA - 14 - PM 57.8 to PM 64.1
District 8 - SB – SR-18 PM 84.3

EA 26000 (0712000035)

March 7, 2016

Prepared by

PARSONS

Prepared for

California Department of Transportation

Caltrans

Noise Study Report and High Speed Rail Vibration Impact Assessment

High Desert Corridor (HDC) Project

LOS ANGELES and SAN BERNARDINO COUNTIES, CALIFORNIA
District 07 – LOS ANGELES – PM 57.8 to PM 64.1
District 08 – SAN BERNARDINO – SR 18 to PM 84.3
Caltrans Project No.: 071200035 (EA: 2600U)

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STATE OF CALIFORNIA
Department of Transportation

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The environmental review, certification, and any other action required in accordance with applicable federal laws for this Project is being, or has been, carried out by Caltrans under its assumption of responsibility pursuant to 23 U.S.C. 327.

EXECUTIVE SUMMARY

This Noise and Vibration Impact Assessment report assesses the noise and vibration effects generated by both the freeway traffic and the high-speed rail components of the proposed High Desert Corridor (HDC) Project. The traffic noise analysis is based entirely on and extracted from the traffic Noise Study Report (NSR) prepared by California Department of Transportation (Caltrans) District 7. The NSR evaluates potential traffic noise impacts that may result from the proposed project. The proposed project is to improve air quality and public health, improve traffic safety, and provide new freeway/expressway linking State Route (SR) 14 in Los Angeles County with SR-18 in San Bernardino County. This new freeway/expressway connection not only addresses projected traffic volumes and projected growth in population, employment, and economic activities related to goods movement through the region, but it also would link some of the fastest residential, commercial, and industrial growth areas in southern California, including the cities of Palmdale, Lancaster, Adelanto, Victorville, and the Town of Apple Valley. This NSR has been prepared to comply with Title 23 Part 772 of the *Code of Federal Regulations* (23CFR772), "Procedures for Abatement of Highway Traffic Noise and Construction Noise," as described in the May 2011 Traffic Noise Analysis Protocol for New Highway Construction, Reconstruction, and Retrofit Barrier Projects (Protocol) and Section 216 of the California Street and Highways Code.

This NSR evaluates the entire area within the project limits. Preliminary noise abatement measures necessary for the proposed project to comply with state and federal noise abatement regulations are also analyzed and presented in this document. This report will be used to provide information for the environmental document that will be prepared for the proposed project in compliance with the California Environmental Quality Act (CEQA) and the National Environmental Policy Act (NEPA).

High-speed rail noise and vibration effects were analyzed in accordance with guidelines and procedures set forth in the Federal Railroad Administration (FRA) High-Speed Ground Transportation Noise and Vibration Assessment manual. Relevant FRA noise and vibration impact criteria were used for the analysis.

Several project alternatives and design variations have been considered and evaluated. A No Build Alternative and four build alternatives were selected for detailed evaluation in the Draft Environmental Impact Report (EIR)/Environmental Impact Statement (EIS).

No Build Alternative

Under the No Build Alternative, no new transportation infrastructure would be built within the project area to connect Los Angeles and San Bernardino counties aside from existing SR-138 safety corridor improvements in Los Angeles County and SR-18 corridor improvements in San Bernardino County. Traffic circulation and congestion currently experienced on Palmdale Boulevard, Air Expressway, and Happy Trails Highway (existing SR-18) would remain. The no action alternative functions as a baseline to compare against all of the proposed build alternatives.

Freeway/Expressway Alternative (Avenue P-8, I-15, and SR-18)

This alternative would consist of a combination of a controlled-access freeway and an expressway. It generally would follow Avenue P-8 in Los Angeles County and just south of El Mirage Road in San Bernardino County. This alternative then extends east to Air Expressway Road near Interstate 15 (I-15) and curves south, terminating at Bear Valley Road. The incorporation of green energy technologies and a bike path along segments of the alternative would also be considered.

Four physical alignment variations are being considered, including:

- Variation A: Near Palmdale, the freeway/expressway would dip slightly south of the main alignment, approximately between 15th Street East and Little Rock Wash.
- Variation B: East of the county line, the freeway/expressway would flare out slightly south of the main alignment between Oasis Road and Coughlin Road. Variation B1 would be at the same location, but it would flare out a little less and pass through the Krey airfield.
- Variation D: Near the community of Lake Los Angeles, the freeway/expressway would dip slightly south of the main alignment, just south of Avenue R approximately between 180th Street East and 230th Street East.
- Variation E: Near Adelanto and Victorville, the freeway/expressway would dip south of the federal prison.

Freeway/Tollway Alternative (Avenue P-8, I-15 and SR-18)

This alternative follows the same physical alignment as the Freeway/Expressway Alternative (including Variations A, B, D, and E), but it would have a section between 100th Street East and US 395 operate as a tollway. Details of this operating feature are being evaluated as part of the ongoing public-private partnership analysis. The incorporation of green energy technologies and a bike path would also be considered.

Freeway/Expressway Alternative with High-Speed Rail (HSR) Feeder/Connector Service

This alternative would be the same as the Freeway/Expressway Alternative except that it would also include an HSR Feeder/Connector Service between the cities of Palmdale and Victorville. The HSR Feeder/Connector Service would utilize proven steel wheel-on-steel track technology and have a design speed of 180 miles per hour (mph) with an operating speed of 125 mph assumed for the purpose of this analysis. Additional details of this operating feature, including the type of train technology (i.e., electric versus diesel-electric), its location in relation to the HDC (median-running alignment), and its connections to existing and proposed rail stations, are being evaluated as part of an ongoing Rail Alternatives Analysis. The incorporation of green energy technologies and a bike path would also be considered.

Freeway/Tollway Alternative with High-Speed Rail Feeder/Connector Service

This alternative would be the same as the Freeway/Expressway Alternative except that it would also include an HSR Feeder/Connector Service between the cities of Palmdale and Victorville. The incorporation of green energy technologies and a bike path would also be considered.

Under 23CFR772.7, projects are categorized as Type I, Type II, or Type III projects. The Federal Highway Administration (FHWA) defines a Type I project as a proposed federal or federal-aid highway project for the construction of a highway on a new location, or the physical alteration of an existing highway that significantly changes either the horizontal or vertical alignment, or increases the number of through-traffic lanes. Based on the above brief description of the alternatives, this project has been deemed a Type I project. As such, traffic noise analysis has been conducted for this project in accordance with the Protocol for Type I projects.

Field investigations were conducted to determine existing noise levels and gather information to develop and calibrate the traffic noise model that was used for predicting future noise levels. Ambient noise levels are measured along the HDC main alignment area to assess new freeway traffic noise impacts for new HDC construction project. Existing ambient noise levels provide a baseline for comparison to predicted future noise levels. The measurements are also used to describe the current noise environment in the area of the proposed project. The entire area within the project limits was acoustically represented by 101 noise site locations. Existing noise levels were recorded at 71 locations and modeled at 32 locations. These locations are acoustically representative of the noise environment and land uses within the limits of the project. The existing

ambient noise levels measured were between 42 and 70 decibels (dBA). A total of 10 long-term (24-hour) noise level readings were conducted to determine the noisiest hour within the project limits.

Sound level readings, traffic counts, and pertinent field data, such as traffic flow speed and topography of the locations, were used to develop the computer traffic noise model for each analysis site. The computer traffic noise model was then used to predict future noise levels to identify traffic noise impacts and recommend abatement for the impacted area. The computer program Traffic Noise Model (TNM 2.5), FHWA's Traffic Noise Prediction Model (FHWA-RD-77-108), was used in this analysis to develop the traffic noise model for both existing and design year conditions.

The traffic noise analysis has been performed for only the Freeway/Expressway Alternative and Freeway/Tollway Alternative. Because the HDC is a new freeway and there is no existing traffic for the main alignment, there are no future no-build noise levels for the HDC main alignment. Alternatives were based on the project year (2035) traffic data prepared for this project. It must be noted that there are some substantial noise increases in most of the areas because the mainline alignment is a new freeway and noise sensitive receivers have no existing traffic. In contrast, some areas actually have a drop in noise levels in the after-project scenario because the retaining wall of the new connectors is shielding traffic noise from the mainline to the receptors. The future noise levels have been predicted to be in the range of 52 to 77 dBA-L_{eq}(h). Tables 7-1-1 through 7-1-7 provide a summary of the traffic noise modeling results for the Freeway/Expressway Alternative with all alignment variations, including the no build on SR-14.

The train noise and vibration analysis was performed for the alternatives with the HSR feeder/connector services. Train analysis results indicated that there would be no HSR noise or vibration impact expected as a result of the project. The primary reason that the HSR operation noise is not anticipated to have a significant effect on the overall noise level is due to the continuous dominant noise effect of freeway vehicular traffic, compared to the relatively infrequent HSR operations. When the acoustical energy of the relatively low train noise is combined with that of the much higher vehicular traffic noise, the effect of the train noise component on the overall noise is mostly negligible. The traffic noise component is the more dominant noise source. In addition, there are no other noise sources associated with the HSR system found to be potentially affecting the overall noise environment.

The traffic noise analysis indicates that residential areas, a school, a park, and a church within the project limits will be impacted after project completion under the Freeway/ Expressway Alternative (i.e., the noise level will approach or exceed FHWA Noise Abatement Criteria [NAC]). NAC are given in Table 4-1. A traffic noise impact also occurs when there is a substantial noise increase (12 dBA or more from existing baseline conditions).

Because traffic noise impacts have been identified, noise abatement has been considered for the impacted receptors. As stated in 23CFR772 and in the Caltrans Protocol, noise abatement is considered where noise impacts are predicted, frequent human use occurs, and a lowered noise level would be of benefit. For all impacted receptors, noise abatement has been evaluated for preliminary acoustical feasibility (noise reduction of 5 dBA or more) with calculated reasonable allowances. The overall reasonableness is determined by the noise reduction design goal, the cost of abatement, and viewpoints of benefited receptors, including property owners and residents of the benefited receptors. For a sound barrier to be considered reasonable, the 7-dB design goal must be achieved at one or more benefited receptors. The noise barrier is not required to reduce noise levels to below the NAC for any noise-sensitive land uses.

Because no HSR noise impact would be expected, the project impact would be entirely attributed to traffic noise effects; the combined project noise impacts would be the same as the traffic noise impacts. Therefore, all abatement measures considered for the traffic noise impacts would also abate the overall noise impacts of the proposed project.

Only acoustically feasible noise abatement measures are provided in Tables ES-1 through ES-6 as part of this project. Based on the studies already conducted, Caltrans intends to incorporate noise abatement measures for the proposed project in the form of soundwalls to attenuate traffic noise in the impacted areas. Tables ES-1 through ES-6 summarize acoustically feasible soundwall locations, height range, approximate length, noise attenuation range, number of benefited receivers, and reasonable allowance.

The design of noise barriers presented in this report is preliminary and has been conducted at a level appropriate for environmental review and not for final design of the project. Preliminary information on the physical location, length, and range of heights of noise barriers is provided in this report. If pertinent parameters change substantially during the final project design, preliminary noise barrier designs may be modified or eliminated from the final project. A final decision on construction of the noise abatement will be made upon completion of the project design.

Table ES-1 Summary of Proposed Soundwalls on SR-14: Freeway/Expressway Alternative							
Proposed Soundwall	**Direction**	**Location**	**Acoustically Feasible Height Range (Feet)**	**Approximate Length (Feet)**	**Noise Attenuation Range (dBA)**	**Number of Benefited Receivers**	**Reasonable Allowance**
SW-100	NB	Between Avenue S and Palmdale Blvd	10 to 16	3150	5 to 9	1 to 14	$71,000 to $994,000
SW-101				1993			
SW-102	SB	Between Avenue S and Palmdale Blvd	10 to 16	2940	7 to 11	36 to 62	$2,556,000 to $4,402,000
SW-103				970			
SW-104	SB	Between New SR138/HDC and 10th St West	12 to 16	1780	5 to 7	11	$781,000
SW-105	SB	Between Avenue O-8 West and Avenue O	10 to 16	400	6 to 8	2	$142,000

Table ES-2 Summary of Proposed Soundwalls on HDC: Freeway/Expressway Alternative - Main Alignment - Segment 1 (Between SR-14 and 100th St.)							
Proposed Soundwall	**Direction**	**Location**	**Acoustically Feasible Height Range (Feet)**	**Approximate Length (Feet)**	**Noise Attenuation Range (dBA)**	**Number of Benefited Receivers**	**Reasonable Allowance**
SW-106	WB	between Division Street and 3rd Street East	10 to 16	1594	8 to 11	14	$994,000
SW-109	WB	Between 10th St. East and 15th St. East	8 to 16	2500	5 to 7	11 to 22	$781,000 to $1,562,000
SW-107	EB	Between Sierra Hwy and 15th St. East	10 to 16	3400	6 to 7	1	$71,000

Table ES-3 Summary of Proposed Soundwalls on HDC: Freeway/Expressway Alternative - Main Alignment - Segment 1 (Between SR-14 and 100th St.) Variation A

Proposed Soundwall	Direction	Location	Acoustically Feasible Height Range (Feet)	Approximate Length (Feet)	Noise Attenuation Range (dBA)	Number of Benefited Receivers	Reasonable Allowance
SW-106	WB	between Division Street and 3rd Street East	10 to 16	1594	8 to 11	14	$994,000
SW-109	WB	Between 10th St. East and 15th St. East	8 to 16	2800	6 to 8	11 to 22	$781,000 to $1,562,000
SW-107	EB	Between Sierra Hwy and 15th St. East	8 t0 16	3000	5 to 9	1	$71,000

Table ES-4 Summary of Proposed Soundwalls on HDC: Freeway/Expressway Alternative - Main Alignment - Segment 2 (Between 100th St. and LA/SB County Line)

Proposed Soundwall	Direction	Location	Acoustically Feasible Height Range (Feet)	Approximate Length (Feet)	Noise Attenuation Range (dBA)	Number of Benefited Receivers	Reasonable Allowance
SW-111	WB	Between 140th St. East and 170th St.East	8 to 16	4290	5 to 8	2	$142,000
SW-112	EB	Between 140th St. East and 170th St.East	12 to 16	2000	6 to 7	1	$71,000

Table ES-5 Summary of Proposed Soundwalls on HDC: Freeway/Expressway Alternative - Main Alignment - Segment 2 (Between 100th St. and LA/SB County Line) Variation D							
Proposed Soundwall	**Direction**	**Location**	**Acoustically Feasible Height Range (Feet)**	**Approximate Length (Feet)**	**Noise Attenuation Range (dBA)**	**Number of Benefited Receivers**	**Reasonable Allowance**
SW-111	WB	Between 140th St. East and 170th St.East	8 to 16	4290	5 to 8	2	$142,000
SW-112	EB	Between 140th St. East and 170th St.East	12 to 16	2000	6 to 7	1	$71,000
SW-113	WB	Between 140th St. East and 170th St.East	8 to 16	4500	5 to 9	2	$142,000

Table ES-6 Summary of Proposed Soundwalls on HDC: Freeway/Expressway Alternative - Main Alignment 3 - Expressway							
Proposed Soundwall	**Direction**	**Location**	**Acoustically Feasible Height Range (Feet)**	**Approximate Length (Feet)**	**Noise Attenuation Range (dBA)**	**Number of Benefited Receivers**	**Reasonable Allowance**
SW-114	EB	Between Joshua Rd. and Standing Rock Rd.	12 to 16	2000	7 to 9	1	$71,000

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List of Abbreviated Terms

°F	degrees Fahrenheit
Caltrans	California Department of Transportation
CE	Categorical Exclusion
CEQA	California Environmental Quality Act
CFR	*Code of Federal Regulations*
CNEL	Community Noise Equivalent Level
dB	Decibels
dBA	A-weighted decibels
EIR	Environmental Impact Report
EIS	Environmental Impact Statement
EMU	Electric Multiple Unit
FHWA	Federal Highway Administration
FONSI	Finding of No Significant Impact
FRA	Federal Railroad Administration
GHG	Greenhouse Gas
HDC	High Desert Corridor
HSR	High-Speed Rail
Hz	Hertz
I-15	Interstate 15
kHz	Kilohertz
L_{dn}	Day-Night Level
L_{eq}	Equivalent Sound Level
$L_{eq(h)}$	Equivalent Sound Level over one hour
L_{max}	Maximum Sound Level
LOS	Level of Service
L_{xx}	Percentile-Exceeded Sound Level
Metro	Los Angeles County Metropolitan Transportation Authority
mPa	Micro-Pascals
mph	Miles per Hour
MRI	Magnetic Resonance Imaging
NAC	Noise Abatement Criteria
NADR	Noise Abatement Decision Report
NEPA	National Environmental Policy Act
NSR	Noise Study Report
PPV	Peak Particle Velocity
Protocol	Caltrans Traffic Noise Analysis Protocol for New Highway Construction, Reconstruction, and Retrofit Barrier Projects
RMS	Root Mean Square

ROD	Record of Decision
ROW	Right-of-Way
SEL	Sound Exposure Level
SPL	Sound Pressure Level
SR	State Route
TeNS	Technical Noise Supplement
TNM 2.5	Traffic Noise Model Version 2.5
UPRR	Union Pacific Railroad
VdB	Vibration Decibels

Chapter 1. Introduction

1.1. Purpose of the Noise Study Report

The purpose of this Noise and Vibration Impact Assessment is to evaluate the potential noise and vibration effects of the High Desert Corridor (HDC) Project. This report analyzes (1) traffic noise impacts and abatement under the requirements of Title 23, Part 772 of the *Code of Federal Regulations* (23CFR772) "Procedures for Abatement of Highway Traffic Noise" (23CFR772 provides procedures for preparing operational and construction noise studies and evaluating noise abatement considered for federal and federal-aid highway projects); and (2) the high-speed rail (HSR) operation noise and vibration impacts related to the HSR component of the proposed project based on Federal Railroad Administration (FRA) guidelines and procedures set forth in the FRA High-Speed Ground Transportation Noise and Vibration Impact Assessment.

The California Department of Transportation (Caltrans) Traffic Noise Analysis Protocol for New Highway Construction, Reconstruction, and Retrofit Barrier Projects (Protocol) (Caltrans 2011) provides Caltrans policy for implementing 23CFR772 in California. The Protocol outlines the requirements for preparing noise study reports (NSRs). The purpose of the NSR is to evaluate noise impacts consistent with the requirements of 23CFR772 and to determine whether the noise abatement satisfies Federal Highway Administration (FHWA) requirements.

The traffic noise component of the analysis discussed in this noise impact assessment report was extracted from and based entirely on results derived in the *Noise Study Report for the High-Speed Rail Corridor Project* prepared by Caltrans, District 7, dated June 1, 2015.

Noise impacts associated with this project under the National Environmental Policy Act (NEPA) and the California Environmental Quality Act (CEQA) are evaluated in the project's Environmental Impact Report/Environmental Impact Statements (EIR/EIS).

1.2. Project Purpose and Need

The purpose of the proposed project is to improve east-west mobility within the High Desert region of southern California by addressing present and future travel demand and mobility needs within the Antelope and Victor valleys. The proposed action is intended to achieve the following objectives:

- Increase capacity of east-west transportation facilities to accommodate existing and future transportation demand
- Improve travel safety and reliability within the High Desert region
- Improve the regional goods movement network
- Provide improved access and connectivity to regional transportation facilities, including airports and the existing and future passenger rail systems, including, the proposed California HSR system and the proposed XpressWest HSR system.
- Contribute to state greenhouse gas (GHG) reduction goals through the use of green energy features

The specific needs to be addressed by the proposed action include:

- Recent and future planned population growth within the High Desert region
- Limited and unreliable west-east connectivity within the High Desert region
- Regional demands for goods movement to support the growth of the regional economy
- Future demands for the use of green energy, including sustainability and green energy provisions in state law and policy

Chapter 2. Project Description

Caltrans, in cooperation with the Los Angeles County Metropolitan Transportation Authority (Metro), proposes construction of the HDC as a new transportation facility in the High Desert region of Los Angeles and San Bernardino counties. The proposed 63-mile-long west-east facility would provide route continuity and relieve traffic congestion between State Route (SR) 14 in Los Angeles County and SR-18 and Interstate 15 (I-15) in San Bernardino County. The project would comprise of one or more of the following major components, including highway, tollway, rail transit, bikeway, and recommendation for green energy facilities. Figures 2-1 and 2-2 are project vicinity and location maps, respectively.

2.1. Purpose and Need

The purpose of the proposed action is to improve west-east mobility through the High Desert region of southern California. This can be achieved by addressing present and future travel demand and mobility needs within the Antelope and Victor valleys. The proposed project is intended to achieve the following objectives:

- Increase capacity of west-east transportation facilities to accommodate existing and future transportation demand
- Improve travel safety and reliability within the High Desert region
- Improve the regional goods movement network
- Provide improved access and connectivity to regional transportation facilities, including airports and existing and future passenger rail systems (which include the proposed California HSR system and the proposed XpressWest HSR system)
- Contribute to state GHG reduction goals by supporting future plans for green energy features along the corridor

The specific needs to be addressed by the proposed action include:

- Recent and future planned population growth within the High Desert region
- Limited and unreliable west-east connectivity within the High Desert region
- Regional demands for goods movement to support the growth of the regional economy
- Future demands for the use of green energy, including sustainability and green energy provisions in state law and policy

Figure 2-1. Project Vicinity Map

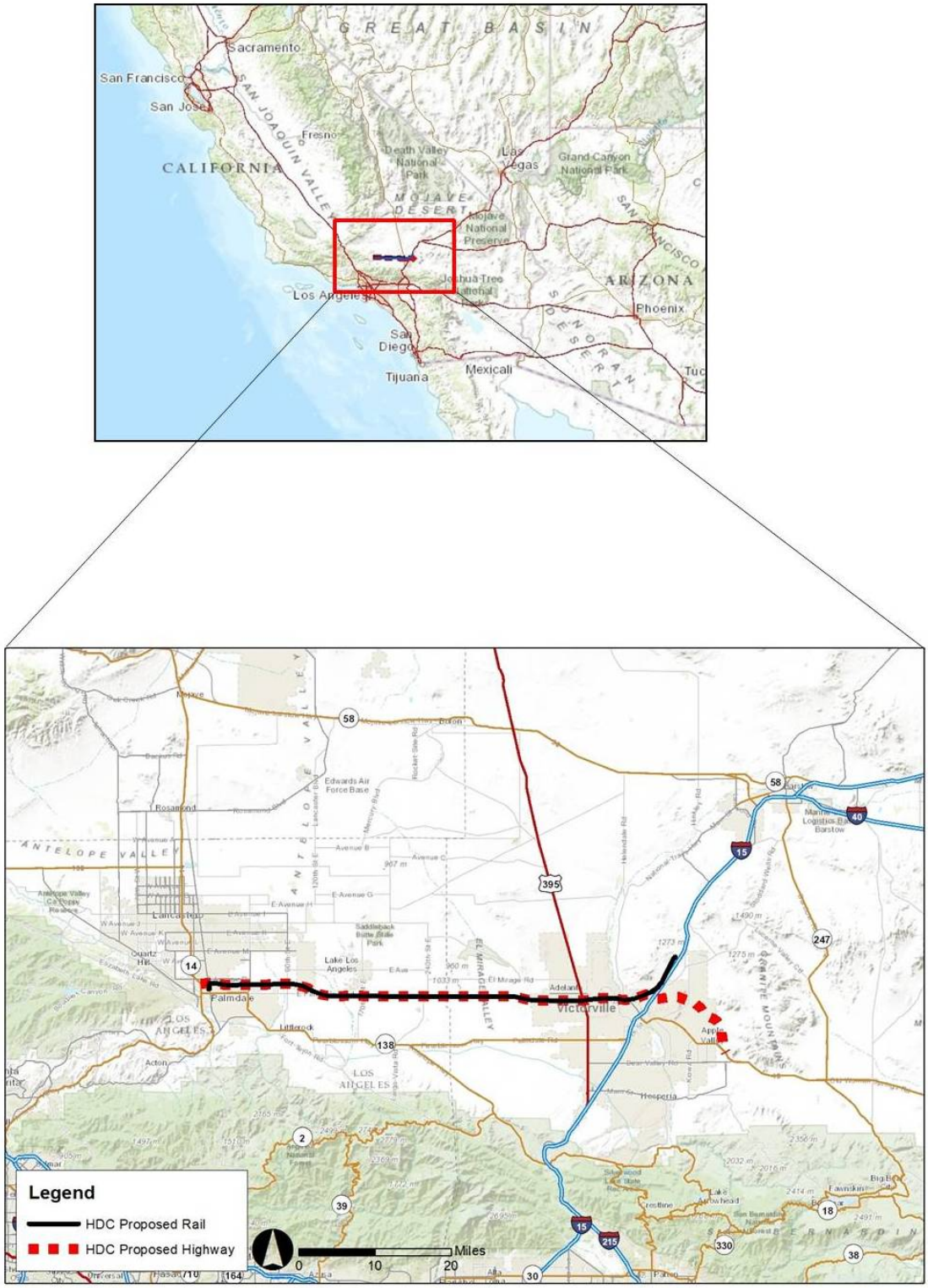
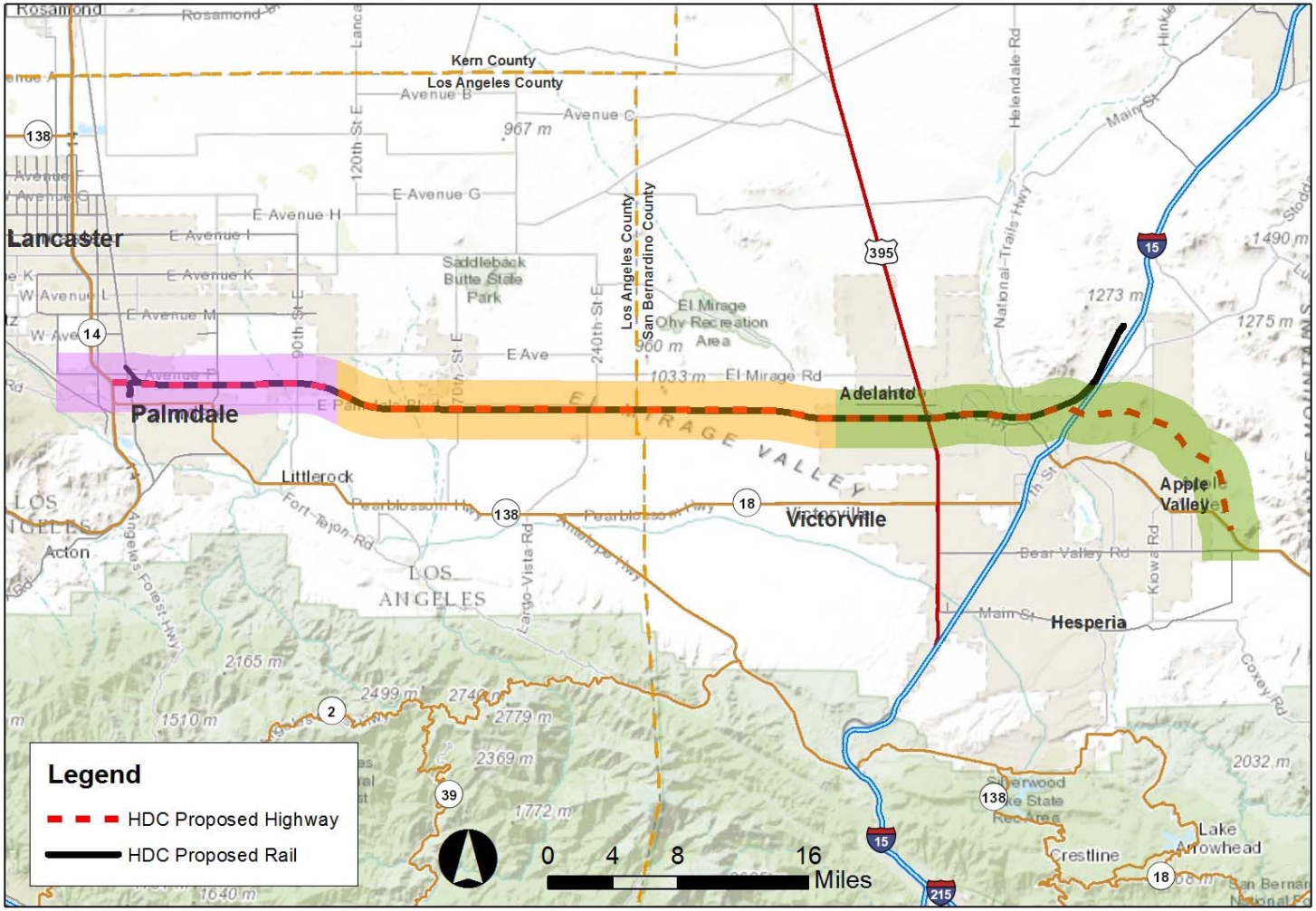


Figure 2-2. Project Location Map



ANTELOPE VALLEY	HIGH DESERT	VICTOR VALLEY
Los Angeles County	**Los Angeles County–San Bernardino County**	**San Bernardino County**
Lancaster, Palmdale	Lake Los Angeles, El Mirage	Adelanto, Victorville, Apple Valley, Hesperia

2.2. Project Alternatives

Several project alternatives and design variations have been considered and evaluated. A No Build Alternative and four build alternatives were selected for detailed evaluation in the Draft and Final EIR/EIS. Figure 2-3 shows the primary alignment and variations in certain location.

2.2.1. No Build Alternative

Under the No Build alternative, no new transportation infrastructure would be built within the project area to connect Los Angeles and San Bernardino counties aside from existing SR-138 safety corridor improvements in Los Angeles County and SR-18 corridor improvements in San Bernardino County. Traffic circulation and congestion currently experienced on Palmdale Boulevard, Pearblossom Highway, Air Expressway, Palmdale Road, and Happy Trails Highway (existing SR-18) would remain from increasing transportation demand. The No Build Alternative functions as a baseline to compare against all of the proposed build alternatives.

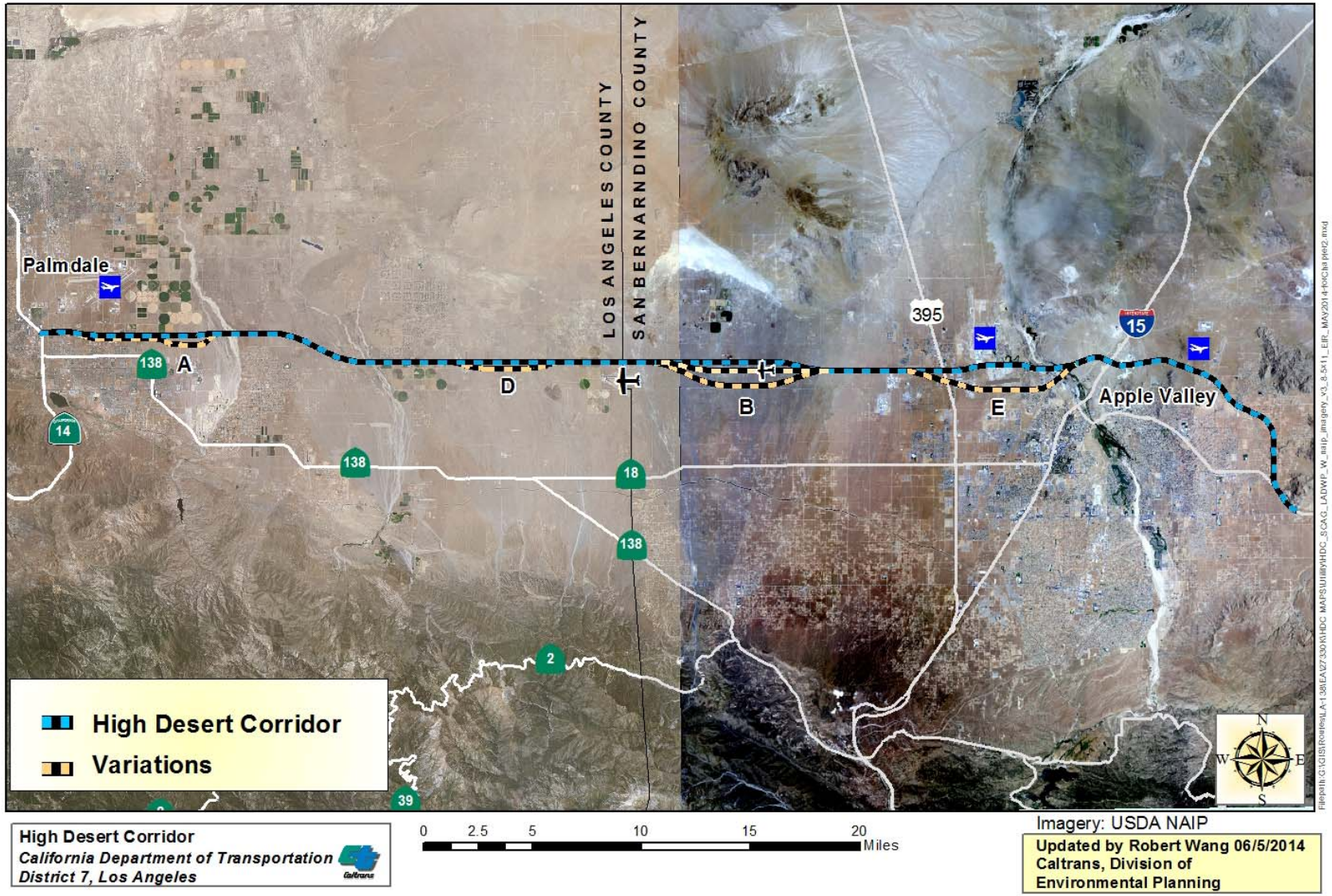
2.2.2. Freeway/Expressway Alternative (Avenue P-8, I-15, and SR-18)

This alternative would consist of a combination of a controlled-access freeway and at-grade expressway for a total distance of 63 miles. The alignment generally follows Avenue P-8 in Los Angeles County and then runs slightly south of El Mirage Road in San Bernardino County. The alignment then extends east to Air Expressway Road near I-15 and curves slightly southeast to terminate at Bear Valley Road near Apple Valley. Bicycle facility and green energy components would be incorporated into the design features of this alternative.

Four physical alignment variations are being considered, including:

- Variation A: Near Palmdale, the freeway/expressway would dip slightly south of the main alignment, approximately between 15th Street East and Little Rock Wash.
- Variation B: East of the county line, the freeway/expressway would flare out slightly south of the main alignment between Oasis Road and Coughlin Road. Another option for Variation B is called Variation B1, which is shorter than Variation B and would run slightly south of the main alignment.
- Variation D: Near the community of Lake Los Angeles, the freeway/expressway would dip slightly south of the main alignment, just south of Avenue R approximately between 180th Street East and 230th Street East.
- Variation E: Near Adelanto and Victorville, the freeway/expressway would dip south of the federal prison.

Figure 2-3. Alternative Alignments



High Desert Corridor
California Department of Transportation
District 7, Los Angeles

0 2.5 5 10 15 20 Miles

Imagery: USDA NAIP
Updated by Robert Wang 06/5/2014
Caltrans, Division of
Environmental Planning

2.2.3. Freeway/Tollway Alternative (Avenue P-8, I-15, and SR-18)

This alternative would follow the same physical alignment as the Freeway/Expressway Alternative (with Variations A, B, D, and E), but it would have sections that operate as a tollway. The segment where toll lanes are proposed, four in each direction, would begin from 100th Street East in Palmdale and end at US 395 in Victorville. The Central Segment would consist of a toll facility, and motorists who choose not to use this segment of the HDC would have the option to exit and use local west-east parallel roads adjacent to the HDC and reenter the freeway segments from either 90th Street East in Palmdale or US 395 in Adelanto. Bicycle facility and green energy components would be incorporated into the design features of this alternative.

2.2.4. Freeway/Expressway Alternative with HSR Feeder/Connector Service

This alternative would be the same as the Freeway/Expressway Alternative, but it also includes an HSR Feeder Service between Palmdale and Victorville. Variations A, B, D, and E were considered, but Variation A was later determined to not be a viable variation for the alternatives with HSR due to some geometric constraints. Additional elements would include bikeways and green energy facilities as described under the Freeway/ Expressway Alternative.

The HSR component of the HDC would operate as a new west-to-east passenger rail corridor from the existing Metrolink station in Palmdale (Antelope Valley) to Victorville (Victor Valley). The HSR Feeder Service would consist of steel wheels on track and would have a maximum operating speed of 125 miles per hour (mph). The HSR Feeder would be built within the HDC right-of-way (ROW). The rail alignment would primarily run in the median of the HDC freeway.

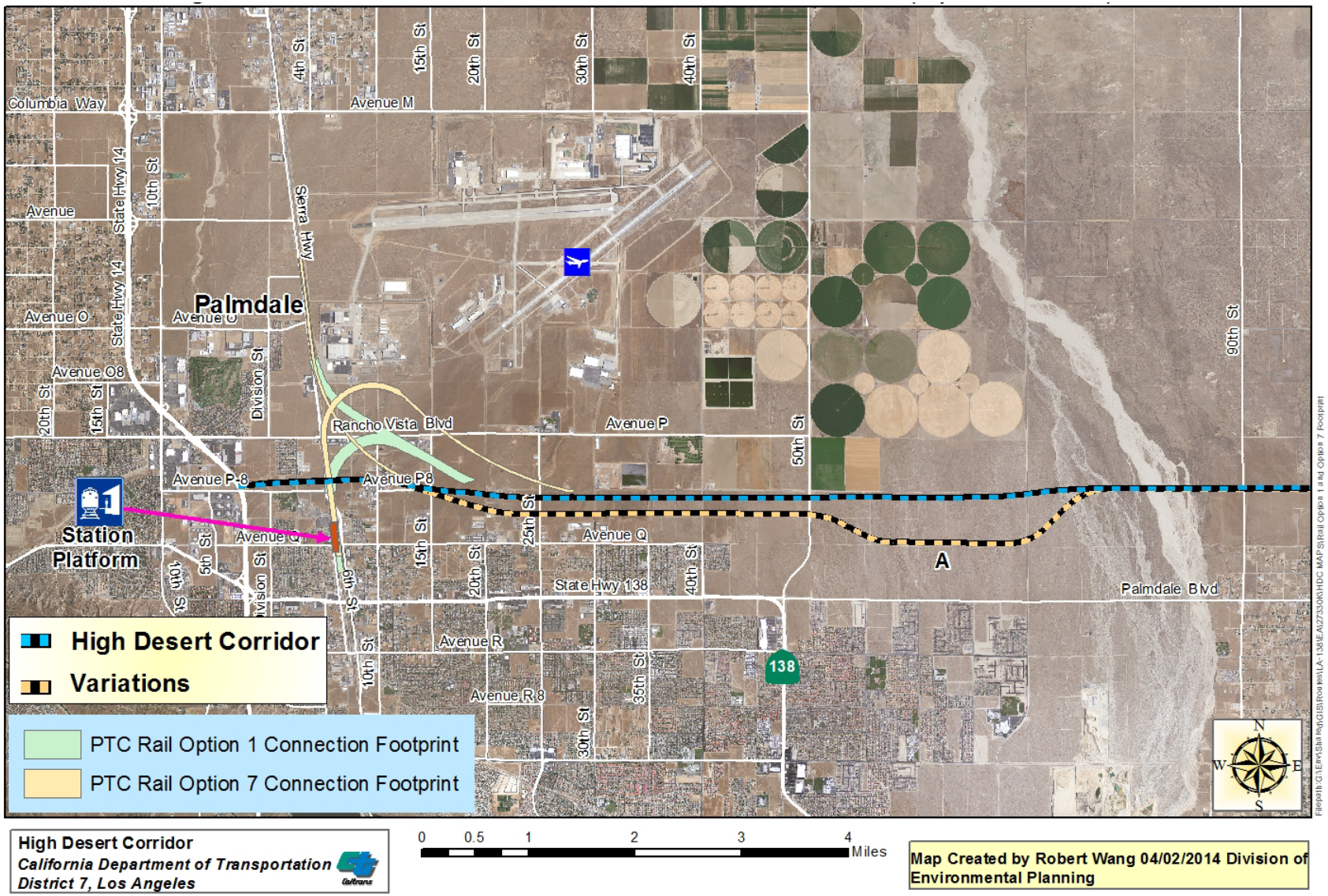
Station Connection

To connect to the Palmdale and Victorville rail stations, ROW would be required for the station connection approaches as the HSR Feeder/Connector alignment curves away from the HDC ROW and to provide overnight storage for the trains.

Palmdale Rail Connection

For the Palmdale rail connection, two rail connection approaches are proposed for connecting the HDC to the California HSR network, Options 1 and 7 (see Figure 2-4). Both options allow for eastbound and westbound tracks on the HDC to connect to the California HSR network northbound and southbound tracks by using a combination of aerial and cut-and-cover or tunneling structures.

Figure 2-4. Palmdale Rail Connection Options 1 and 7 Alignment



High Desert Corridor
California Department of Transportation
District 7, Los Angeles

0 0.5 1 2 3 4 Miles

Map Created by Robert Wang 04/02/2014 Division of Environmental Planning

Rail Option 1

Option 1 would shift the existing Palmdale Transportation Center south approximately 800 feet and would require a cut-and-cover box and mined tunnels configuration. This option would run adjacent to the Air Force Plant 42 parking lot associated with the Palmdale Airport. The alignment would also cross under commercial development at Rancho Vista Boulevard and 15th Street East. This option would diverge outside of the HDC median and would require only two rail tracks to cross under the HDC westbound lanes, reducing the ROW needed for the HDC. Three station variations are being considered under Rail Option 1, as described below.

Variation A

This variation would place the HDC and Metrolink station platforms on the west side of Sierra Highway inside the Union Pacific Railroad (UPRR) ROW. The HDC platforms would be approximately 20 feet in width and 1,400 feet in length. The Metrolink platforms would be approximately 50 feet in width and 500 feet in length. The HDC platforms would extend from Transportation Drive to approximately 700 feet north of Avenue Q. Station area parking is proposed at the terminus of 6th Street (UPRR/Sierra Highway) and would provide 6,200 surface parking spaces. The existing Palmdale Transportation Center would be shifted approximately 800 feet south of its current location.

Variation B

This variation is the same as Variation A with the following exceptions: (1) HDC station platforms would extend from just north of Avenue Q and immediately north of Avenue Q3; and (2) this option would not affect the location of the existing Palmdale Transportation Center.

Variation C

This option would place the HDC and Metrolink station platforms on the west side of Clock Tower Plaza East and outside of the UPRR ROW. The HDC platforms would extend from East Avenue Q to East Avenue Q4. Station area parking is proposed at the terminus of 6th Street (UPRR/Sierra Highway) and would provide 6,200 parking spaces (via an above-grade structure). This option would not affect the location of the existing Palmdale Transportation Center.

Station location variations are the same for Rail Options 1 and 7, although the “wye” connections differ, as well as the corresponding details on location and tunnel/aerial configurations.

Rail Option 7

Option 7 would require a mix of aerial structures and tunneling, and it would allow the Palmdale Transportation Center to remain at its current location. This option would encroach into a small residential area near 10th Street East and would require a four-track section within the HDC median, necessitating a larger ROW section for the HDC in this area.

Three station variations are being considered under Rail Option 7 the same as Rail Option 1, as described above.

2.2.5. Freeway/Tollway Alternative with HSR Feeder/Connector Service

This alternative would be the same as the Freeway/Tollway Alternative (including Variations A, D, B, and E), but it also includes an HSR Feeder Service between Palmdale and Victorville. Similar to the Freeway/Tollway Alternative, the bicycle facility and green energy components would be incorporated into the design features of this alternative. Rail Options 1 and 7 and three station variations described in the Freeway/ Tollway Alternative with HSR Feeder Connector Service are also being considered.

Chapter 3. Fundamentals of Noise and Vibration

This section provides a brief discussion of the nature of noise vibration.

3.1. The Nature of Noise

Sound is a vibratory disturbance created by a moving or vibrating source in a gaseous or liquid medium or in the elastic strain of a solid that is capable of being detected by the hearing organs. Sound may be thought of as mechanical energy of a vibrating object transmitted by pressure waves through a medium to human (or animal) ears. The medium of main concern is air. In absence of any other qualifying statements, sound will be considered airborne sound, as opposed to, for example, structureborne or earthborne sound.

Noise is defined as (airborne) sound that is loud, unpleasant, unexpected, or undesired, and may therefore be classified as a more specific group of sounds. Sound (and noise) is actually a process that consists of three components: (1) the sound source, (2) the sound path, and (3) the sound receiver. All three components must be present for sound to exist. Without a source to produce sound, there obviously is no sound. Likewise, without a medium to transmit sound pressure waves there is also no sound. And finally, sound must be received (i.e., a hearing organ, sensor, or object must be present to perceive, register, or be affected by sound or noise). In most situations, there are many different sound sources, paths, and receivers, instead of just one of each.

Acoustics is the field of science that deals with the production, propagation, reception, effects, and control of sound. The field is very broad, and transportation-related noise and its abatement covers just a small, specialized part of acoustics.

Traffic noise typically results from the interaction of the sources (i.e., moving vehicles) and the roadway. A considerable portion of traffic noise derives from the sound emitted by the combustion engines of these vehicles. From the source to the receiver, noise varies both in level and frequency.

3.2. Frequency

Sound can be described by its frequency (pitch) and amplitude (loudness). Frequency relates to the number of pressure oscillations per second. Low-frequency sounds are low

in pitch, like the low notes on a piano, whereas high-frequency sounds are high in pitch, like the high notes on a piano. Frequency is expressed in terms of oscillations, or cycles per second. Cycles per second are commonly referred to as Hertz (Hz). A frequency of 250 cycles per second is referred to as 250 Hz. High frequencies are sometimes more conveniently expressed in units of kilohertz (kHz), or thousands of Hertz. The extreme ranges of frequencies that can be heard by the healthiest human ears spans from 16 to 20 Hz on the low end to approximately 20,000 Hz (or 20 kHz) on the high end.

3.3. Sound Pressure Levels and Decibels

The amplitude of pressure waves generated by a sound source determines the loudness of that source. Sound pressure amplitude is measured in micro-Pascals (mPa). One micro-Pascal is approximately one hundred billionths (0.00000000001) of normal atmospheric pressure. Sound pressure amplitudes for different kinds of noise environments can range from less than 100 to 100,000,000 mPa. Because of this huge range of values, sound is rarely expressed in terms of mPa. Instead, a logarithmic scale is used to describe sound pressure level (SPL) in terms of decibels (dB). The threshold of hearing for young people is approximately zero dB, which corresponds to 20 mPa.

3.4. Addition of Decibels

Because decibels are logarithmic units, SPL cannot be added or subtracted through ordinary arithmetic. Under the decibel scale, a doubling of sound energy corresponds to a 3-dB increase. In other words, when two identical sources are each producing sound of the same loudness, the resulting sound level at a given distance would be 3 dB higher than one source under the same conditions. For example, if one automobile produces an SPL of 70 dB when it passes an observer, two cars passing simultaneously would not produce 140 dB—rather, they would combine to produce 73 dB. Under the decibel scale, three sources of equal loudness together produce a sound level 5 dB louder than one source.

3.5. A-Weighted Decibels

The decibel scale alone does not adequately characterize how humans perceive noise. The dominant frequencies of a sound have a substantial effect on the human response to that sound. Although the intensity (energy per unit area) of the sound is a purely physical quantity, the loudness or human response is determined by the characteristics of the human ear.

Human hearing is limited in the range of audible frequencies as well as in the way it perceives the SPL in that range. In general, people are most sensitive to the frequency range of 1,000 to 8,000 Hz and perceive sounds within that range better than sounds of the same amplitude in higher or lower frequencies. To approximate the response of the human ear, sound levels of individual frequency bands are weighted, depending on the human sensitivity to those frequencies. Then, an “A-weighted” sound level (expressed in units of dBA) can be computed based on this information.

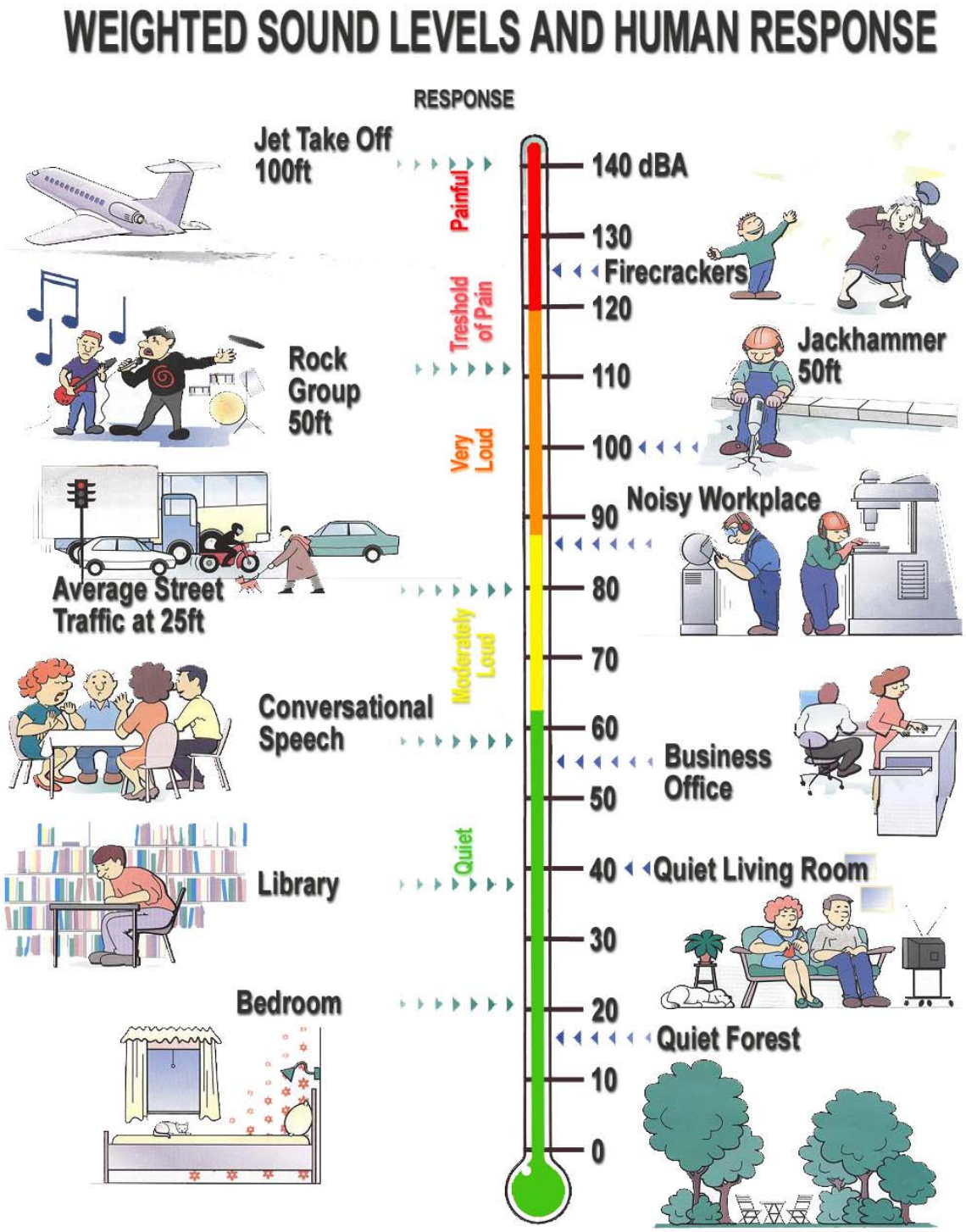
The A-weighting network approximates the frequency response of the average young ear when listening to most ordinary sounds. When people make judgments of the relative loudness or annoyance of a sound, their judgments correlate well with the A-scale sound levels of those sounds. Other weighting networks have been devised to address high noise levels or other special problems (e.g., B-, C-, and D-scales), but these scales are rarely used in conjunction with highway-traffic noise. Noise levels for traffic noise reports are typically reported in terms of A-weighted decibels or dBA. Figure 3-1 describes typical A-weighted noise levels for various noise sources and shows levels of noise associated with common activities and human response.

3.6. Human Response to Changes in Noise Levels

As discussed above, doubling sound energy results in a 3-dB increase in sound. However, given a sound level change measured with precise instrumentation, the subjective human perception of a doubling of loudness will usually be different than what is measured.

Under controlled conditions in an acoustical laboratory, the trained, healthy human ear is able to discern 1-dB changes in sound levels, when exposed to steady, single-frequency (“pure-tone”) signals in the mid-frequency (1,000 to 8,000 Hz) range. In typical noisy environments, changes in noise of 1 to 2 dB are generally not perceptible. However, it is widely accepted that people are able to begin to detect sound level increases of 3 dB in typical noisy environments. Furthermore, a 5-dB increase is generally perceived as a distinctly noticeable increase, and a 10-dB increase is generally perceived as a doubling of loudness. Therefore, a doubling of sound energy (e.g., doubling the volume of traffic on a highway) that would result in a 3-dB increase in sound, would generally be perceived as barely detectable.

Figure 3-1. Typical A-Weighted Noise Levels



Source: B&K

3.7. Noise Descriptors

Noise in our daily environment fluctuates over time. Some fluctuations are minor, but some are substantial. Some noise levels occur in regular patterns, but others are random. Some noise levels fluctuate rapidly, but others slowly. Some noise levels vary widely, but others are relatively constant. Various noise descriptors have been developed to describe time-varying noise levels. The following are the noise descriptors most commonly used in traffic noise analysis.

- **Equivalent Sound Level (L_{eq}):** L_{eq} represents an average of the sound energy occurring over a specified period. In effect, L_{eq} is the steady-state sound level containing the same acoustical energy as the time-varying sound that actually occurs during the same period. The 1-hour A-weighted equivalent sound level (L_{eq}[h]) is the energy average of A-weighted sound levels occurring during a 1-hour period and is the basis for noise abatement criteria (NAC) used by Caltrans and FHWA.
- **Percentile-Exceeded Sound Level (L_{xx}):** L_{xx} represents the sound level exceeded for a given percentage of a specified period (e.g., L_{10} is the sound level exceeded 10 percent of the time, and L_{90} is the sound level exceeded 90 percent of the time).
- **Maximum Sound Level (L_{max}):** L_{max} is the highest instantaneous sound level measured during a specified period.
- **Day-Night Level (L_{dn}):** L_{dn} is the energy average of A-weighted sound levels occurring over a 24-hour period, with a 10-dB penalty applied to A-weighted sound levels occurring during nighttime hours between 10:00 p.m. and 7:00 a.m.
- **Community Noise Equivalent Level (CNEL):** Similar to L_{dn}, CNEL is the energy average of the A-weighted sound levels occurring over a 24-hour period, with a 10-dB penalty applied to A-weighted sound levels occurring during the nighttime hours between 10:00 p.m. and 7:00 a.m., and a 5-dB penalty applied to the A-weighted sound levels occurring during evening hours between 7:00 p.m. and 10:00 p.m.

3.8. Sound Propagation

When sound propagates over a distance, it changes in level and frequency content. The manner in which noise reduces with distance depends on the following factors.

3.8.1. Geometric Spreading

Sound from a localized source (i.e., a point source) propagates uniformly outward in a spherical pattern. The sound level attenuates (or decreases) at a rate of 6 dB for each

doubling of distance from a point source. Highways consist of several localized noise sources on a defined path; hence, they can be treated as a line source, which approximates the effect of several point sources. Noise from a line source propagates outward in a cylindrical pattern, often referred to as cylindrical spreading. Sound levels attenuate at a rate of 3 dB for each doubling of distance from a line source.

3.8.2. Ground Absorption

The propagation path of noise from a highway to a receiver is usually very close to the ground. Noise attenuation from ground absorption and reflective-wave canceling adds to the attenuation associated with geometric spreading. Traditionally, the excess attenuation has also been expressed in terms of attenuation per doubling of distance. This approximation is usually sufficiently accurate for distances of less than 200 feet. For acoustically hard sites (i.e., sites with a reflective surface between the source and the receiver, such as a parking lot or body of water,), no excess ground attenuation is assumed. For acoustically absorptive or soft sites (i.e., those sites with an absorptive ground surface between the source and the receiver, such as soft dirt, grass, or scattered bushes and trees), an excess ground-attenuation value of 1.5 dB per doubling of distance is normally assumed. When added to the cylindrical spreading, the excess ground attenuation results in an overall drop-off rate of 4.5 dB per doubling of distance.

3.8.3. Atmospheric Effects

Receptors located downwind from a source can be exposed to increased noise levels relative to calm conditions, whereas locations upwind can have lowered noise levels. Sound levels can be increased at large distances (e.g., more than 500 feet) from the highway due to atmospheric temperature inversion (i.e., increasing temperature with elevation). Other factors, such as air temperature, humidity, and turbulence, can also have significant effects.

3.8.4. Shielding by Natural or Human-Made Features

A large object or barrier in the path between a noise source and a receiver can substantially attenuate noise levels at the receiver. The amount of attenuation provided by shielding depends on the size of the object and the frequency content of the noise source. Natural terrain features (e.g., hills and dense woods) and human-made features (e.g., buildings and walls) can substantially reduce noise levels. A barrier that breaks the line of sight between a source and a receiver will typically result in at least 5 dB of noise reduction. Taller barriers provide increased noise reduction. Vegetation between the

highway and receiver is rarely effective in reducing noise because it does not create a solid barrier.

3.9. The Nature of Vibration

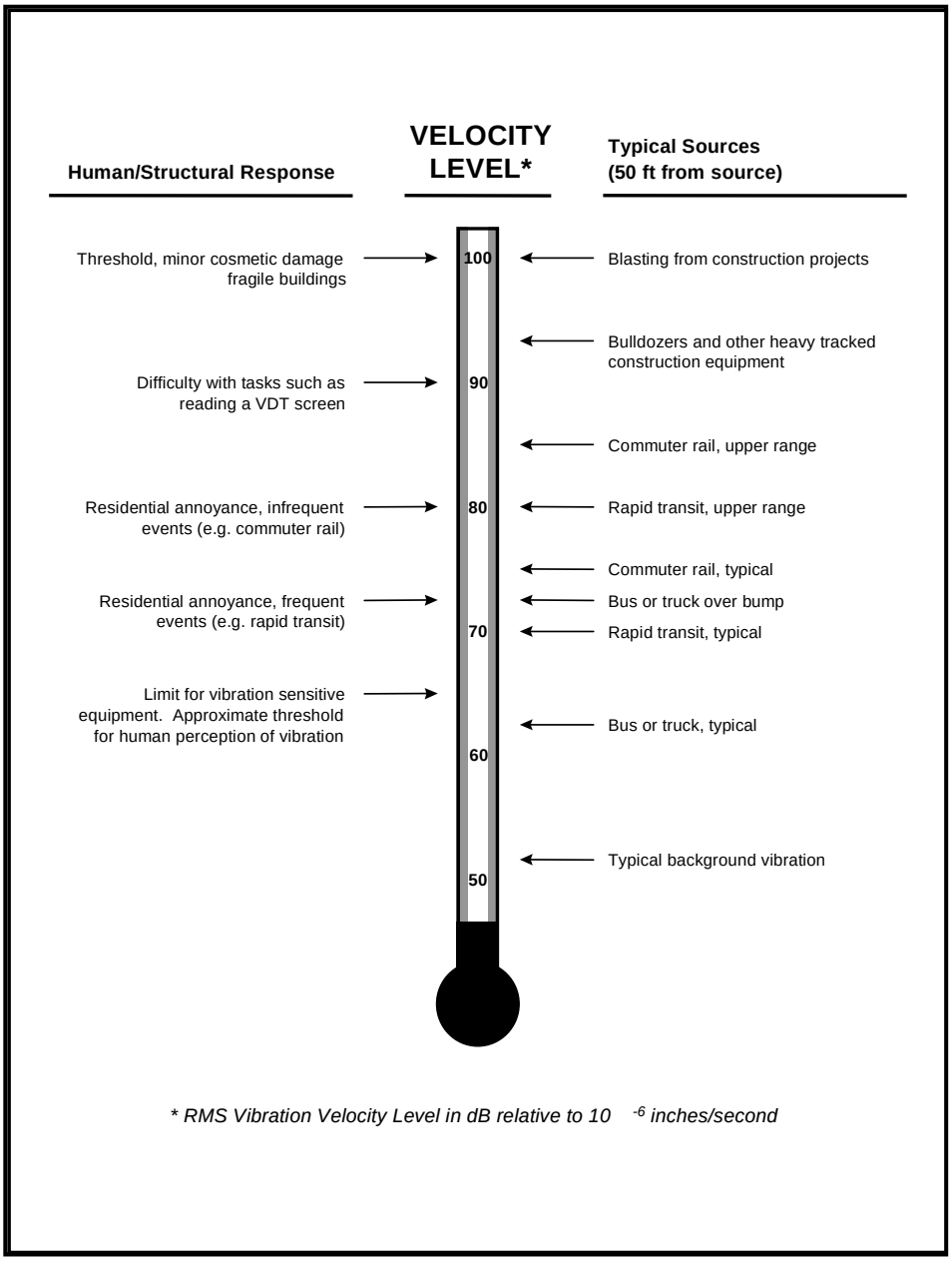
Vibration is an oscillatory motion, which can be described in terms of displacement, velocity, or acceleration. Displacement, in the case of a vibrating floor, is simply the distance that a point on the floor moves away from its static position. The velocity represents the instantaneous speed of the floor movement, and acceleration is the rate of change of the speed. The response of humans, buildings, and equipment to vibration is normally described using velocity or acceleration. In this section, velocity would be used in describing ground-borne vibration.

Vibration amplitudes are usually expressed as either peak particle velocity (PPV) or the root mean square (RMS) velocity. The PPV is defined as the maximum instantaneous peak of the vibration signal in inches per second. The RMS of a signal is the average of the squared amplitude of the signal in vibration decibels (VdB), ref one micro-inch per second. The FRA uses the abbreviation “VdB” for vibration decibels to reduce the potential for confusion with sound decibel. Although PPV is appropriate for evaluating the potential of building damage, it is not suitable for evaluating human response. Because it takes some time for the human body to respond to vibration signals, RMS amplitude is more appropriate to evaluate human response to vibration than PPV. For sources such as trucks or motor vehicles, peak vibration levels are typically 6 to 14 dB higher than RMS levels.

Decibel notation acts to compress the range of numbers required in measuring vibration. Similar to the noise descriptors, L_{eq} and L_{max} can be used to describe the average vibration and the maximum vibration level observed during a single vibration measurement interval.

Figure 3-2 illustrates common vibration sources and the human and structural responses to ground-borne vibration. As shown in the figure, the threshold of perception for human response is approximately 65 VdB; however, human response to vibration is not usually substantial unless the vibration exceeds 70 VdB. Vibration tolerance limits for sensitive instruments such as magnetic resonance imaging (MRI) or electron microscopes could be much lower than the human vibration perception threshold.

Figure 3-2. Typical Levels of Ground-borne Vibration



Chapter 4. Federal Regulations and State Policies

This report focuses on the requirements of 23CFR772, as discussed below.

4.1. Federal Regulations

4.1.1. 23CFR772

23CFR772 provides procedures for preparing operational and construction noise studies and evaluating noise abatement considered for federal and federal-aid highway projects. Under 23CFR772.7, projects are categorized as Type I, Type II, or Type III projects. FHWA defines a Type I project as a proposed federal or federal-aid highway project for construction of a highway on a new location, or the physical alteration of an existing highway that significantly changes either the horizontal or vertical alignment, or increases the number of through-traffic lanes. A Type II project is a noise barrier retrofit project that involves no changes to highway capacity or alignment. A Type III project is a project that does not meet the classifications of a Type I or Type II project. Type III projects do not require a noise analysis.

Type I projects include those that create a completely new noise source, as well as those that increase the volume or speed of traffic or move the traffic closer to a receiver. Type I projects include the addition of an interchange, ramp, auxiliary lane, or truck-climbing lane to an existing highway, or the widening of an existing ramp by a full lane width for its entire length. Projects unrelated to increased noise levels, such as striping, lighting, signing, and landscaping projects, are not considered Type I projects.

Under 23CFR772.13, noise abatement must be considered and evaluated for feasibility and reasonableness for Type I projects if the project is predicted to result in a traffic noise impact. In such cases, 23CFR772 requires that the project sponsor “consider” noise abatement before adoption of the NEPA Categorical Exclusion (CE), Finding of No Significant Impact (FONSI), or Record of Decision (ROD). This process involves identification of noise abatement measures that are feasible, reasonable, and likely to be incorporated into the project, and noise impacts for which no noise abatement measures are feasible and reasonable.

Traffic noise impacts, as defined in 23CFR772.5, occur when the predicted noise level in the design year approaches or exceeds the NAC specified in 23CFR772, or a predicted noise level substantially exceeds the existing noise level (a “substantial” noise increase).

Noise levels are expressed in terms of the *A-weighted decibel (dBA)* and the *1-hour equivalent sound level* ($L_{eq}[h]$).

In California a noise level is considered to approach the NAC for a given activity category if it is within 1 dBA of the NAC. In California, a substantial noise increase is considered to occur when the project's predicted worst-hour design-year noise level exceeds the existing worst-hour noise level by 12 dBA or more. The use of 12 dB was established in California many years ago and is based on the concept that a 10-dB increase generally is perceived as a doubling of loudness. A collective decision by Caltrans staff, which was approved by FHWA, was made to use 12 dB.

Table 4-1 summarizes NAC corresponding to various land use activity categories. Activity categories and related traffic noise impacts are determined based on the actual land use in a given area.

Table 4-1. Activity Categories and Noise Abatement Criteria

Activity Category	Activity $L_{eq}[h]$[1]	Evaluation Location	Description of Activities
A	57	Exterior	Lands on which serenity and quiet are of extraordinary significance and serve an important public need and where the preservation of those qualities is essential if the area is to continue to serve its intended purpose.
B[2]	67	Exterior	Residential.
C[2]	67	Exterior	Active sport areas, amphitheaters, auditoriums, campgrounds, cemeteries, day care centers, hospitals, libraries, medical facilities, parks, picnic areas, places of worship, playgrounds, public meeting rooms, public or nonprofit institutional structures, radio studios, recording studios, recreation areas, Section 4(f) sites, schools, television studios, trails, and trail crossings.
D	52	Interior	Auditoriums, day care centers, hospitals, libraries, medical facilities, places of worship, public meeting rooms, public or nonprofit institutional structures, radio studios, recording studios, schools, and television studios.
E	72	Exterior	Hotels, motels, offices, restaurants/bars, and other developed lands, properties or activities not included in A–D or F.
F			Agriculture, airports, bus yards, emergency services, industrial, logging, maintenance facilities, manufacturing, mining, rail yards, retail facilities, shipyards, utilities (water resources, water treatment, electrical), and warehousing.
G			Undeveloped lands that are not permitted.

[1] The $L_{eq}(h)$ and $L_{10}(h)$ Activity Criteria values are for impact determination only, and are not design standards for noise abatement measures. All values are A-weighted decibels (dBA).

[2] Includes undeveloped lands permitted for this activity category.

In identifying noise impacts, primary consideration is given to exterior areas of frequent human use. In situations where no exterior activities are to be affected by traffic noise, or where the exterior activities are far from or physically shielded from the roadway in a manner that prevents an impact on exterior activities, the Activity Category D is used as the basis for determining a noise impact.

4.1.2. FRA High-Speed Rail Noise Impact Criteria

The criteria in the FRA High-Speed Ground Transportation Noise and Vibration Impact Assessment (USDOT 2012) are for assessing future noise impacts from train operations. They are founded on well-documented research on community reaction to noise and are based on change in noise exposure using a sliding scale. The amount that transit projects are allowed to change the overall noise environment is reduced with increasing levels of existing noise. The FTA noise impact criteria applicable to three categories of land use are summarized in Table 4-2.

L_{dn} is used to characterize noise exposure for residential areas and hotels (Category 2). The maximum 1-hour L_{eq} during the period that the facility is in use is used for other noise-sensitive land uses such as school buildings and parks (Categories 1 and 3). There are two levels of impact included in the FTA criteria, as shown in Figure 2. The interpretations of these two levels of impact are summarized as follows:

Severe Impact: Project noise above the upper curve is considered to cause severe impact because a significant percentage of people would be highly annoyed by the new noise. Severe noise impact is considered "significant" as this term is used in NEPA and implementing regulations. Noise mitigation would normally be specified for severe impact areas unless there is no practical method of mitigating the noise.

Moderate Impact: The change in cumulative noise level in this range is noticeable to most people but may not be sufficient to cause strong, adverse reaction from the community; therefore, other project-specific factors must be considered to determine the magnitude of the impact and the need for mitigation. These other factors can include the existing noise level, the predicted increase over existing noise levels, and the types and number of noise-sensitive land uses affected.

Table 4-2. Land Use Categories and Metrics for Transit Noise Impact Criteria

Land Use Category	Noise Metric, dBA	Description of Land Use Category
1	Outdoor $L_{eq}(h)$*	Tracts of land where quiet is an essential element in their intended purpose. This category includes lands set aside for serenity and quiet, and such land uses as outdoor amphitheaters and concert pavilions, as well as national historic landmarks with significant outdoor use. Also included are recording studios and concert halls.
2	Outdoor L_{dn}	Residences and buildings where people normally sleep. This category includes homes, hospitals, and hotels where a nighttime sensitivity to noise is assumed to be of utmost importance.
3	Outdoor $L_{eq}(h)$*	Institutional land uses with primarily daytime and evening use. This category includes schools, libraries, theaters, and churches, where it is important to avoid interference with such activities as speech, meditation, and concentration on reading material. Places for meditation or study associated with cemeteries, monuments, and museums can also be considered to be in this category. Certain historical sites, parks, campgrounds, and recreational facilities are also included.
* L_{eq} for the noisiest hour of transit-related activity during hours of noise sensitivity.		

The horizontal axis in Figure 2 is the existing L_{dn} without any project noise, and the vertical axis (right side) is the L_{dn} at residential land uses caused by the project.

Although the curves in Figure 3 are defined in terms of project noise exposure and the existing noise exposure, it is important to emphasize that the increase in the cumulative noise (i.e., when the project noise is added to existing noise) is the basis for the criteria. Figure 4-1 shows the noise impact criteria for Category 1 and 2 land uses in terms of the allowable increase in the cumulative noise exposure.

Figure 4-2 shows that the criterion for impact allows a noise exposure increase of 10 dBA if the existing noise exposure is 42 dBA or less but only a 1 dBA increase when the existing noise exposure is 70 dBA. As the existing level of ambient noise increases, the allowable level of project noise increases, but the total allowable increase in community noise exposure is reduced. This reduction accounts for an unexpected result: project noise exposure levels that are less than the existing noise exposure can still cause impact.

Figure 4-1. Noise Impact Criteria for High-Speed Rail Projects

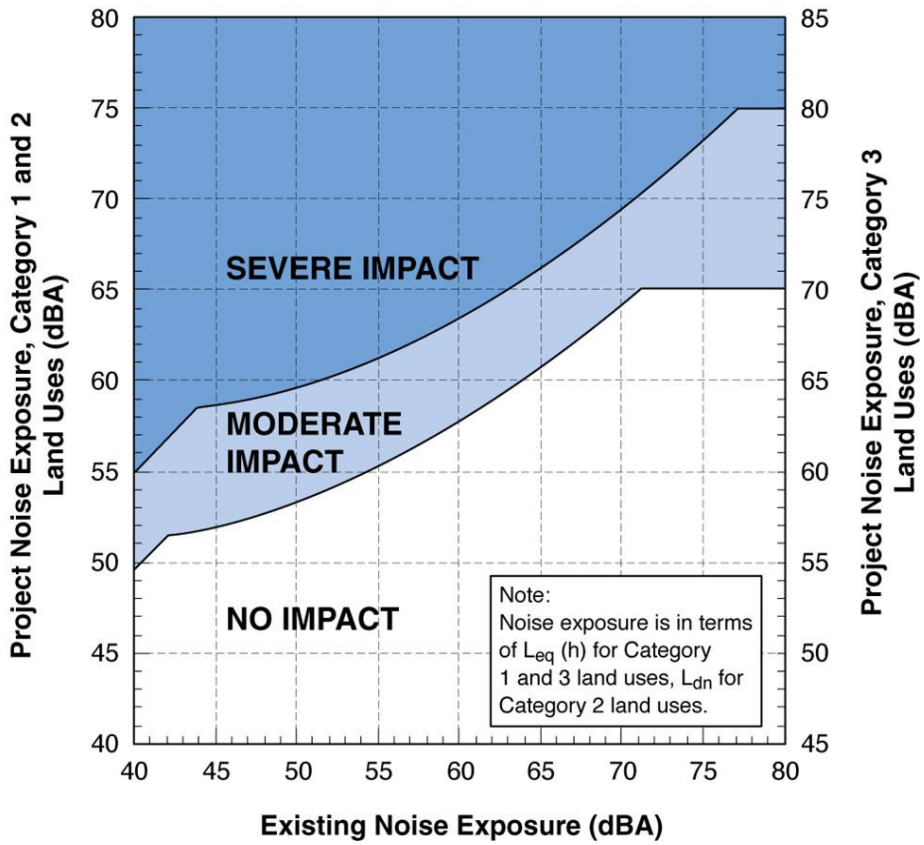
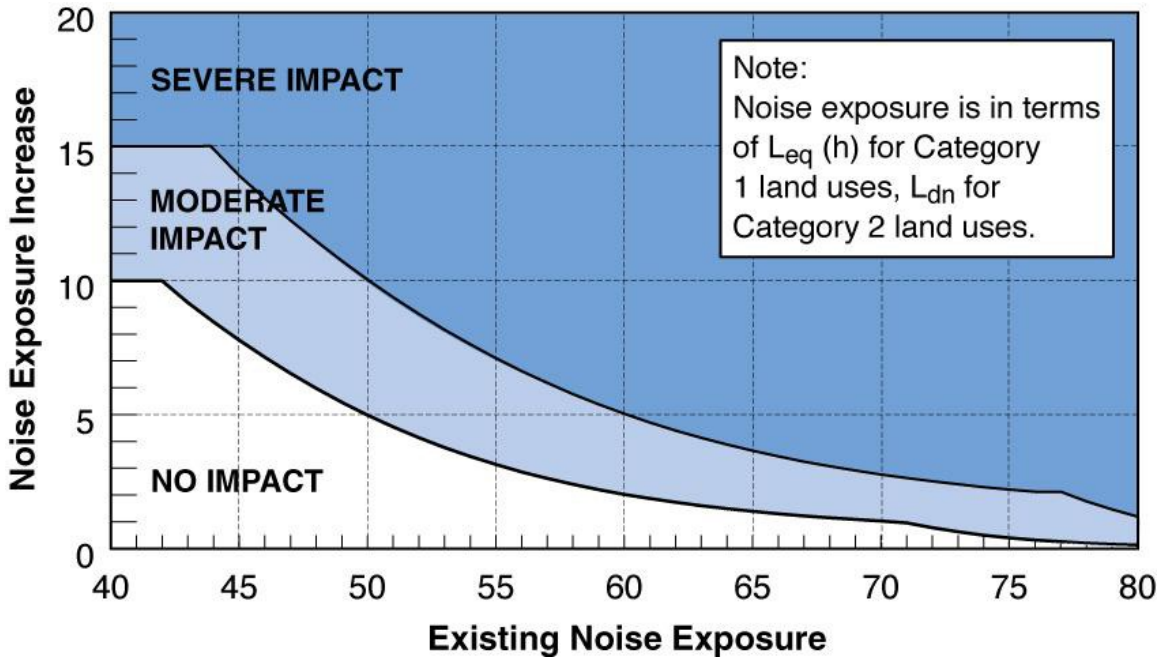


Figure 4-2. Increase in Cumulative Noise Levels Allowed by Criteria



The described FRA criteria are normally used for assessing HSR projects where the train operation noise would be a primary or major noise source. The HDC project is considered a multimodal facility where both a highway and HSR would be sharing the same corridor, with the HSR running in the median of the freeway. Both the highway and the HSR would be part of the proposed project. As such, the freeway noise would be the more dominant noise source as results have indicated. Due to this special circumstance, it has been concurred with the FRA that peak-hour noise level instead of day-night noise level would be used to assess the rail noise impact for this specific project for all identified sensitive land uses (FRA 2014). This would allow the rail noise levels to be combined with the peak-hour noise levels of the highway noise levels. Consequently, this would enable the overall noise impacts and abatement to be assessed and analyzed using the FHWA NAC, which has been agreed upon between FRA and Caltrans as the approach to use for the proposed project.

4.1.3. FRA High-Speed Rail Vibration Impact Criteria

The criteria set forth in the *FRA High-Speed Ground Transportation Noise and Vibration Impact Assessment* (USDOT 2012) were used to evaluate vibration impacts from train operations.

Table 4-3 presents the criteria for various land use categories, as well as the frequency of events. The criteria are related to ground-borne vibration causing human annoyance or interfering with the use of vibration-sensitive equipment. The criteria for acceptable ground-borne vibration are expressed in terms of RMS velocity levels in VdB and are based on the maximum levels for a single event (L_{max}).

The sensitive receptors within the project boundary (i.e., residences, parks, or churches) fall under Land Use Categories 2 and 3; thus, the maximum allowable vibration levels of 75 and 78 VdB, respectively, will be used as project criteria because the estimated number of HSR operations will be between 30 and 70 per day. Hence, the operation can be categorized as “Occasional Events.” No Category 1 land use was identified along the proposed commuter rail alignment.

Table 4-3. Ground-Borne Vibration Impact Criteria

Land Use Category	Ground-Borne Vibration Impact Levels (dB ref. 1 micro-inch/sec)		
	Frequent[1] Events	Occasional[2] Events	Infrequent[3] Events
Category 1: Buildings where low ambient vibration is essential for interior operations.	65 VdB[4]	65 VdB[4]	65 VdB[4]
Category 2: Residences and buildings where people normally sleep.	72 VdB	75 VdB	80 VdB
Category 3: Institutional land uses with primarily daytime use.	75 VdB	78 VdB	83 VdB

Notes:
1. "Frequent Events" is defined as more than 70 vibration events of the same source per day.
2. "Occasional Events" is defined as between 30 and 70 vibration events of the same source per day.
3. "Infrequent Events" is defined as fewer than 30 vibration events of the same source per day.
4. This criterion limit is based on levels that are acceptable for most moderately sensitive equipment such as optical microscopes. Ensuring lower vibration levels in a building often requires special design of the HVAC systems and stiffened floors.

Source: FTA, 2006.

4.2. State Regulations and Policies

4.2.1. Traffic Noise Analysis Protocol for New Highway Construction and Reconstruction Projects

The Protocol specifies the policies, procedures, and practices to be used by agencies that sponsor new construction or reconstruction of federal or federal-aid highway projects. The NAC specified in the Protocol are the same as those specified in 23CFR772. The Protocol defines a noise increase as substantial when the predicted noise levels with project implementation exceed existing noise levels by 12 dBA. The Protocol also states that a sound level is considered to approach an NAC level when the sound level is within 1 dB of the NAC identified in 23CFR772 (e.g., 66 dBA is considered to approach the NAC of 67 dBA, but 65 dBA is not).

The Caltrans Technical Noise Supplement (TeNS) to the Protocol provides detailed technical guidance for the evaluation of highway traffic noise. This includes field measurement methods, noise modeling methods, and report preparation guidance.

4.2.2. Section 216 of the California Streets and Highways Code

Section 216 of the California Streets and Highways Code relates to the noise effects of a proposed freeway project on public and private elementary and secondary schools. Under

this code, a noise impact occurs if, as a result of a proposed freeway project, noise levels exceed 52 dBA-L_{eq}(h) in the interior of public or private elementary or secondary classrooms, libraries, multipurpose rooms, or spaces. This requirement does not replace the “approach or exceed” NAC criterion for FHWA Activity Category D for classroom interiors, but it is a requirement that must be addressed in addition to the requirements of 23CFR772.

If a project results in a noise impact under this code, noise abatement must be provided to reduce classroom noise to a level that is at or below 52 dBA-L_{eq}(h). If the noise levels generated from freeway and no-freeway sources exceed 52 dBA-L_{eq}(h) prior to construction of the proposed freeway project, then noise abatement must be provided to reduce the noise to the level that existed prior to construction of the project.

Chapter 5. Study Methods and Procedures

5.1. Methods for Identifying Land Uses and Selecting Noise Measurement and Modeling Receiver Locations

Per the Traffic NSR completed by Caltrans, a field investigation was conducted to identify land uses that could be subject to traffic and construction noise impacts from the proposed project. Land uses in the project area were categorized by land use types, Activity Categories as defined in Table 4-1, and the extent of frequent human use. As stated in the Protocol, noise abatement is only considered for areas of frequent human use that would benefit from a lowered noise level. Although all developed land uses are evaluated in this analysis, the focus is on locations of frequent human use that would benefit from a lowered noise level. Accordingly, this noise impact analysis focuses on locations with defined frequent human use areas, such as residences, schools, libraries, churches and temples, hospitals, recreation and sport areas, playgrounds, cemeteries, golf courses, hotels, and motels.

Short-term measurement locations were selected to represent each major developed area within the project area. Long-term measurements were conducted to capture diurnal traffic noise level patterns in the project area. Short-term measurement locations were selected to serve as representative modeling locations. Several other non-measurement locations were selected as modeling locations. The field survey for all noise measurements included visiting the project sites to identify land uses within the project limits and to select the noise measurement sites. The entire area within the project limits was acoustically represented by 88 noise site locations. Traffic noise readings were taken at 68 locations and modeled at 20 sites.

The noise measurement sites were selected taking into consideration the following general site requirements:

1. Sites were acoustically representative of areas and conditions of interest. They were located at areas of human use.
2. Sites were clear of major obstructions between source and receiver. Microphone positions were more than 10 feet away from reflecting surfaces.
3. Sites were free of noise contamination by sources other than those of interest. Sites were not located near barking dogs, lawn mowers, pool pumps, air conditioners, etc.

4. Sites were not exposed to prevailing meteorological conditions that are beyond the constraints discussed in the TeNs.

5.2. Field Measurement Procedures

As detailed in the Traffic NSR, a field noise study was conducted in accordance with recommended procedures in the TeNS. Caltrans Division of Environmental Planning conducted noise measurements (i.e., short-term, long-term, and background). For the area between Palmdale Boulevard and 10th Street West on SR-14, and between SR-14 and 100th Street East on the HDC main alignment, noise measurements were used from a previous NSR (dated 12/7/2009) for the 07-LA-138 – EA 116720 Route 138 Construct Freeway/Conventional Highway Project. However, most of the noise measurements were conducted by Caltrans Noise & Vibration staff for this project; they include areas between Avenue S and Palmdale Boulevard on SR-14 and between 10th Street West and Avenue N on SR-14; and areas along the HDC alignment from 100th Street East to Bear Valley Road on SR-18. The field measurements were conducted in April 2009; April, May, and November 2011; and September and October 2013.

The following is a summary of the procedures used to collect short-term and long-term sound level data. All noise monitoring locations and modeling locations are shown in Layouts L-1 through L-45 in Appendix A.

5.2.1. Short-Term Measurements

Short-term monitoring was conducted by Caltrans at 61 locations, using Metrosonics Model db-3080 sound level meters. Measurements were taken over a 10-minute period at most sites (a few sites included 20-minute noise monitoring). The short-term measurement locations are also listed in Tables 6-1 through 6-1.

During the short-term measurements, field staff attended each meter. 10-minute L_{eq} values collected during the measurement period were logged into the meter's internal memory, and dominant noise sources observed during each individual 10-minute period were also identified and logged. Using this approach, other non-traffic noise sources (e.g., aircraft and lawn equipment) can be identified and excluded from the noise readings. The calibration of the meter was checked before and after the measurement using the corresponding calibrators for each meter.

Temperature was recorded manually during the short-term monitoring session while the wind speed was recorded using Kestrel 1000. During the short-term noise measurements, temperatures typically ranged from approximately 65 degrees Fahrenheit (°F) to 90°F,

with clear weather conditions, and the wind speed was mostly 1 to 5 mph. Traffic on SR-14 was classified and counted during short-term noise measurements. Vehicles were classified as automobiles, medium-duty trucks, or heavy-duty trucks. An automobile was defined as a vehicle with two axles and four tires that are designed primarily to carry passengers. Small vans and light trucks were included in this category. Medium-duty trucks included all cargo vehicles with two axles and six tires. Heavy-duty trucks included all vehicles with three or more axles. The posted speed limit on SR-14 within the project limits was 65 mph.

Additionally, eight community background noise readings (duration of 10 minutes) were taken within the project limits. They ranged between 48 and 62 dBA-L_{eq}(h). Background noise is the total of all noise generated within a community and is measured away from the freeway where freeway traffic noise does not contribute to the total noise level. Background noise levels are typically measured to determine the acoustical feasibility (noise reducibility of 5 dBA) of noise abatement and to ensure that noise reduction goals can be achieved. Noise abatement cannot reduce noise levels below background noise levels.

5.2.2. Long-Term Measurements

Long-term monitoring was conducted at five locations by Caltrans using Metrosonics Model db-3080 sound level meters. The purpose of these measurements was to identify variations in sound levels throughout the day. Long-term 24-hour readings were taken at locations representative of residential areas to determine the noisiest hour. A sound level meter was placed at the representative site and was left to run continuously monitoring and recording noise levels for a 24-hour period. The short-term noise levels were recorded within the 24-hour noise monitoring for that particular area. The noise level data collected was then analyzed and adjusted using the 24-hour noise readings to determine the noisiest hour.

In addition to the Caltrans measurements, long-term noise measurements of at least 24 hours in dictation were also conducted at five additional locations along the project corridor. The noise monitoring was conducted using Larson Davis Model LD 812 sound level meters. The measurements were conducted to assess the existing L_{dn} noise levels and further document and identify the variations in noise levels throughout a typical day.

5.3. Traffic Noise Levels Prediction Methods

Traffic noise levels were predicted using the FHWA Traffic Noise Model Version 2.5 (TNM 2.5). TNM 2.5 is a computer model based on two FHWA reports: FHWA-PD-96-009 and FHWA-PD-96-010 (FHWA 2004). Key inputs to the traffic noise model were the locations of roadways, shielding features (e.g., topography and buildings), noise barriers, ground type, and receivers. Three-dimensional representations of these inputs were developed using CAD drawings, aerials, and topographic contours provided by the Caltrans Design team.

Traffic noise was evaluated under existing conditions, design year no-project conditions, and design year conditions with the project alternatives. Peak-hour traffic volumes, vehicle classification percentages, and traffic speeds in design-year (2035) conditions were input into the traffic noise model; however design year no-project conditions on the HDC main alignment were not evaluated due to the new freeway/expressway construction.

To validate the accuracy of the model, TNM 2.5 was used to compare measured traffic noise levels to modeled noise levels at field measurement locations. For each receiver, traffic volumes counted during the short-term measurement periods were normalized to 1-hour volumes. These normalized volumes were assigned to the corresponding project area roadways to simulate the noise source intensity from the roadways during the actual measurement period. Modeled and measured sound levels were then compared to determine the accuracy of the model and if additional calibration of the model was necessary.

5.4. Methods for Identifying Traffic Noise Impacts and Consideration of Abatement

Traffic noise impacts are considered to occur at receiver locations where predicted design-year noise levels are at least 12 dBA greater than existing noise levels, or where predicted design year noise levels approach (within 1 dB) or exceed the NAC for the applicable activity category. Where traffic noise impacts are identified, noise abatement must be considered for feasibility and reasonableness as required by 23CFR772 and the Protocol.

According to the Protocol, abatement measures are considered acoustically feasible if a minimum noise reduction of 5 dBA at impacted receiver locations is predicted with implementation of the abatement measures. In addition, barriers should be designed to

intercept the line-of-sight from the exhaust stack of a truck to the first tier of receivers, as recommended by the Highway Design Manual, Chapter 1100. Other factors that affect feasibility include topography, access requirements for driveways and ramps, presence of local cross streets, utility conflicts, other noise sources in the area, and safety considerations.

The overall reasonableness is determined by these factors: acoustical design goal, the cost of abatement, and viewpoints of benefited receptors, including property owners and residents of the benefited receptors. 23CFR722 requires that an acoustical design goal be applied to all noise abatement. Caltrans' acoustical design goal is that a barrier must be predicted to provide at least 7 dB of noise reduction at one or more benefited receptors. For a sound barrier to be considered reasonable, the 7-dB design goal must be achieved at one or more benefited receptors. This design goal applies to any receptor and is not limited to impacted receptors. Cost considerations in the reasonableness determination of noise abatement are based on a 2015 allowance per *benefited receptor* of $71,000. A benefited receptor is a dwelling unit that is predicted to receive a noise reduction of at least 5 dBA from the proposed noise abatement measure. A receptor can be a benefited receptor even if it is not subject to a traffic noise impact. The noise barrier is not required to reduce noise levels to below the NAC for any noise sensitive land use.

5.5. High-Speed Rail Noise Levels Prediction Methods

Procedures outlined in the FRA High-Speed Ground Transportation Noise and Vibration Impact Assessment were followed to predict high-speed train pass-by noise levels at representative noise-sensitive locations along segments of the project alignment where there would be an HSR component. Noise from high-speed train systems is similar to noise from other rail systems except for a few unique features resulting from the higher speeds of travel. The rail systems defined as "high-speed" are primarily steel wheeled, both electrically powered and fossil fueled, capable of maximum speeds of 125 mph and greater. The standard FRA source reference sound exposure levels (SELs) for a high speed electric multiple unit (EMU) system were used – 86 dBA at 50 feet and 20 mph for the propulsion and 91 dBA at 50 feet and 90 mph for the wheel-rail component.

Per discussion earlier, due to the special circumstance of this project such that this is a multimodal facility where the freeway noise would be the dominant noise source, it has been determined and agreed upon with FRA that rail noise impact would be assessed using Category 3 (L_{eq}) criteria for all noise sensitive land uses (FRA 2014).

Future project noise levels, as well as the combined cumulative noise levels, which include the projected traffic noise levels, were calculated in term of L_{eq}. Noise levels of different source components were combined by combining their acoustical energy together.

Train pass-by noise levels at the sensitive locations were calculated using the operation schedule, speed, and distance to track alignment that were available at the time of the study. For consistency and worst-case analysis, the operating schedules used in the XpressWest project were utilized for the purpose of the rail noise prediction. Some of the parameters used in the analysis are as follows:

- A 10-car EMU train would be operating.
- Operating speed of 125 mph assumed throughout the length of the corridor for worst-case analysis.
- The operating times for the proposed service would be between 6:00 a.m. and midnight. The operating plan for HSR service specifies mid-day headways of 20 minutes, morning and evening headways of 30 minutes, and early morning and late night headways of 1 hour. Ten-car trains would operate throughout the day.
- Track geometry would be tracks on embankment and elevated aerial structure.

5.6. High-Speed Rail Vibration Levels Prediction Methods

Following guidelines presented in the FRA High-Speed Ground Transportation Noise and Vibration Assessment manual, the vibration screening procedure and generalized ground vibration assessment methods were used to evaluate the potential impacts related to the HSR pass-bys.

The screening method allows a quick check to identify whether and where impacts from ground-borne vibration are likely. Screening distances for three different speed ranges and two general types of land use are given in Table 5-1.

Table 5-1. Screening Distances for Vibration Assessments (applicable to steel-wheel/steel-rail high-speed rail systems)

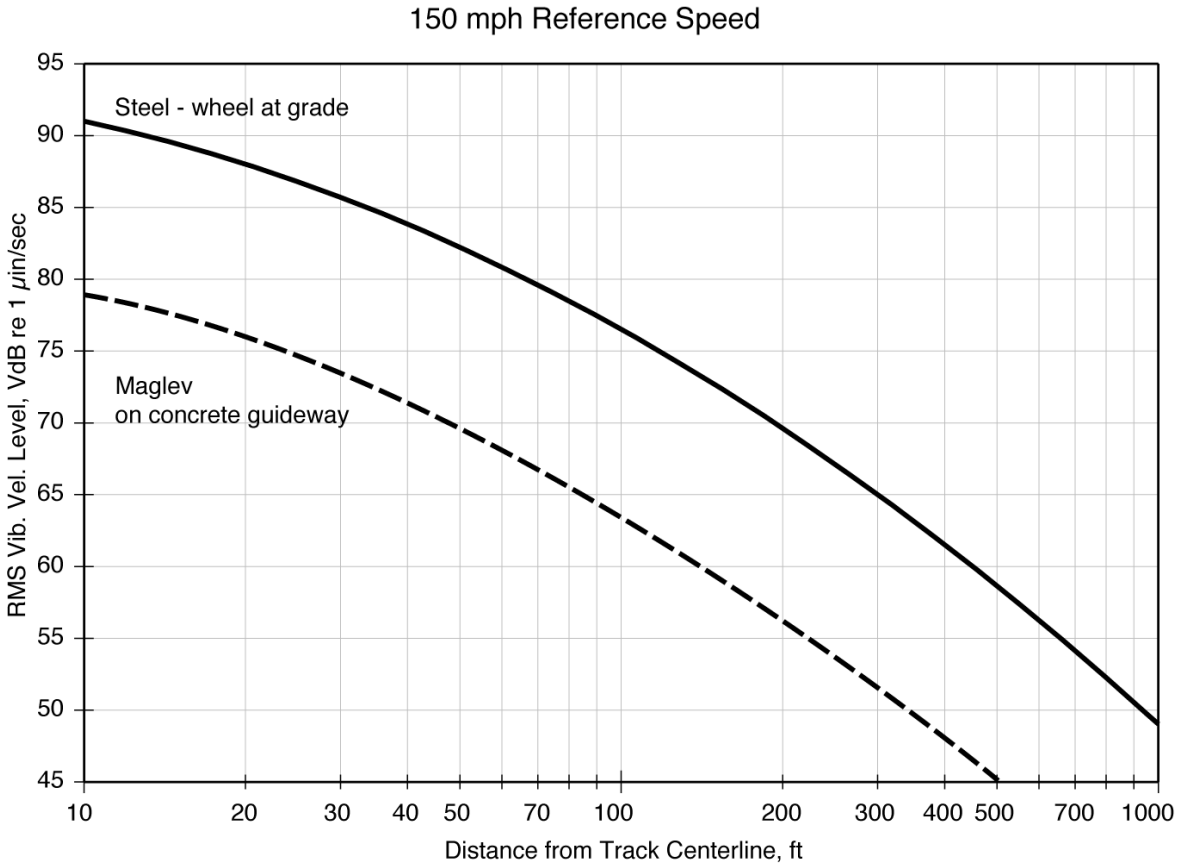
Land Use	Train Frequency*	Screening Distance, ft Train Speed		
		Less than 100 mph	100 to 200 mph	200 to 300 mph
Residential	Frequent or Occasional	120	220	275
	Infrequent	60	100	140
Institutional	Frequent or Occasional	100	160	220
	Infrequent	20	70	100

*Frequent = greater than 70 pass-bys per day;
Infrequent = less than 70 pass-bys per day.

The basic approach of the General Assessment procedure is to use a base curve of overall ground-surface vibration as a function of distance from the source, then to apply adjustments to this curve to account for factors such as track support system, train speed, track and wheel condition, building type, and receiver location within the building. Steel-wheel/steel-rail technology has, in terms of ground-borne vibration, similar characteristics to existing intercity passenger train and transit trains. Maglev technology has some unique characteristics based on measurements at the test facility in Germany.

The generalized projection curves for high-speed trains are shown in Figure 5-1. These curves represent typical ground-surface vibration levels assuming equipment in good condition and speeds of 150 mph. The levels must be adjusted to account for factors such as different speeds, equipment, and geologic conditions than those assumed in the figure. The steel-wheel curve in Figure 5-1 is applicable to high-speed trains.

Figure 5-1. Generalized Ground-Borne Vibration Curve



As discussed earlier, the FRA limits for ground-borne vibration related to train pass-bys for this project would be 75 VdB and 78 VdB for Category 2 and Category 3 land uses, respectively.

Chapter 6. Existing Noise Environment

6.1. Existing Land Uses

Field surveys were conducted to identify land uses that could be subject to traffic, HSR, and construction noise impacts from the proposed project. Single-family residences and multi-family residences were identified as FHWA NAC Activity Category B, while schools, parks, recreation areas, playgrounds, golf courses, places of worship, medical facilities, and cemeteries were identified as Activity Category C land uses in the project area. Hotels/motels and restaurants were identified under Activity Category E.

As required by the Protocol, all developed land uses are evaluated in this analysis; however noise abatement is only considered for areas of frequent human use that would benefit from a lowered noise level. Accordingly, this impact analysis focuses on locations with defined outdoor activity areas, such as residential backyards and common use areas at multi-family residences.

Per earlier discussion, as for the purpose of the rail noise analysis, all identified noise sensitive land uses are categorized as FRA Category 3 for this specific project.

6.1.1. Existing Traffic Noise

A field noise investigation was conducted to determine existing noise levels and gather information to develop and calibrate the traffic noise model that was used for predicting future noise levels. Existing noise levels were recorded at 66 locations and modeled at 32 locations, which were acoustically representative of the entire area within the limits of the project. The existing ambient noise levels measured were between 42 and 70 dBA. Twenty-four (24) long-term (24-hour) noise level readings were conducted to determine the noisiest hour within the project limits. Tables 7-1 through 7-6 summarize sound level measurements taken in the project area and the noise modeling results for existing conditions.

6.1.2. Existing Sound Barriers

The following is a list of existing sound barriers within the project limits.

1) 12-foot-high soundwall along edge of shoulder on northbound SR-14 between Avenue S and Palmdale Boulevard.

2) 12-foot-high soundwalls along the edge of shoulder on southbound SR-14 between Avenue S and Palmdale Boulevard.

6.2. Noise Measurement Results

The existing noise levels in the project area are summarized in Tables 6-1 through Table 6-5 and Tables 6-7 and 6-8 and Figures 6-1 through 6-7; they consist of short-term and long-term noise monitoring at representative noise sensitive locations within the project limits.

6.2.1. Short-Term Monitoring

Short-term monitoring was conducted at 61 locations, using Metrosonics Model db-3080 sound level meters. Measurements were taken over a 10-minute period at each site. Tables 6-1 through 6-5 summarize the results of the short-term noise monitoring conducted in the project area. Table 6-6 summarizes the 8 community background noise levels within the project limits.

6.2.2. Long-Term Monitoring

Caltrans conducted long-term monitoring at five locations using Metrosonics Model db-3080 Type 2 sound level meters. The purpose of these measurements was to capture variations in traffic noise levels throughout the day, rather than absolute noise levels at a specific receptor of concern. The long-term sound level data was collected over 144 consecutive 10-minute intervals over a 24-hour period. Tables 6-7 and 6-8 summarize the results of the long-term noise monitoring conducted in the project area. Figures 6-1 and 6-2 show graphically the results of the 24-hour noise testing

In addition to the Caltrans measurements, conducted long-term measurements were conducted using Larson Davis model LD 812 sound lever meters at another five locations located along the project corridor to capture the typical daily ambient noise profiles or patterns and L_{dn}. L_{dn} takes into consideration the increased sensitivity towards noise during nighttime hours between 10:00 p.m. and 7:00 a.m.; therefore, it includes a 10-dB penalty for noise levels recorded during those hours. The results of these measurements are summarized and graphed as presented in Figures 6-3 through 6-7.

Table 6-1 Summary of Short-Term Measurements on SR-14 (EA 116720)

Site	Address	Land Uses	Date	Start Time	Duration (minutes)	Measured L_{eq}	Freeway Direction	Number of Lanes		Autos	Medium Trucks	Heavy Trucks	Buses	Motorcycles	Observed Speed (mph)
								MF	HOV						
A1	Starbucks 39570 Lowes Dr	Commercial	4/1/2009	11:30 AM	10	65.6	NB	3	0	284	11	17	1	0	65
							SB	3	0	549	12	13	0	0	65
A2	Hompton Inn & Suites Palmdale 39428 Trade Center Dr (Indoor)	Hotel	4/1/2009	12:34 AM	10	44.0	NB	3	0	352	7	18	0	1	65
							SB	3	0	426	12	19	1	0	65
A3	635 Callet St	Residential	4/1/2009	1:06 PM	10	68.7	NB	3	0	342	12	17	0	0	65
							SB	3	0	393	11	22	0	1	65
A4	Hompton Inn & Suites Palmdale 39428 Trade Center Dr (Pool)	Hotel	4/1/2009	11:31 AM	10	62.6	NB	3	0	284	11	17	1	0	65
							SB	3	0	549	12	13	0	0	65
A5	Hompton Inn & Suites Palmdale 39428 Trade Center Dr (Outdoor)	Hotel	4/1/2009	12:39 PM	10	65.5	NB	3	0	352	7	18	0	1	65
							SB	3	0	426	12	19	1	0	65
A6	Wienerchnitzel 560 W. Rancho Vista Blvd	Commercial	4/1/2009	1:09 PM	10	69.8	NB	3	0	342	12	17	0	0	65
							SB	3	0	393	11	22	0	1	65
A7	38532 Division St	Residential	4/2/2009	9:54 AM	10	61.8	NB	3	0	375	18	26	2	0	65
							SB	3	0	390	7	15	1	0	65
A8	Motel 6 407 E Palmdale Blvd	Motel	4/2/2009	10:28 AM	10	61.1	NB	3	0	421	10	19	1	0	65
							SB	3	0	409	13	24	0	2	65
A9	Baseball Park Technology Dr & Division St	Park	4/2/2009	10:24 AM	10	59.5	NB	3	0	421	10	19	1	0	65
							SB	3	0	409	13	24	0	2	65
A10	38814 Division St	Residential	4/2/2009	9:48 AM	10	61.7	NB	3	0	375	18	26	2	0	65
							SB	3	0	390	7	15	1	0	65

Table 6-2 Summary of Short-Term Measurements on HDC Alignment (EA 116720)

Site	Address	Land Uses	Date	Start Time	Duration (minutes)	Measured L_{eq}	Freeway Direction	Number of Lanes		Autos	Medium Trucks	Heavy Trucks	Buses	Motorcycles	Observed Speed (mph)
								MF	HOV						
B1	38902, 25th St.	Residential	4/6/2009	11:01 AM	20	59.1	EB	1	0	50	1	0	0	0	35
							WB	1	0	50	0	0	0	0	35
B2	38757, Puerta Ave.	Residential	4/6/2009	11:42 AM	20	58.6	EB	1	0	73	3	0	1	1	35
							WB	1	0	73	4	0	1	0	35
B3	38753, 26th St. E.	Residential	4/6/2009	11:05 AM	20	59.1	EB	1	0	44	2	0	4	0	35
							WB	1	0	45	2	0	4	0	35
B4	2112, E. Ave Q	Residential	4/6/2009	11:45 AM	20	64.5	EB	1	0	84	1	2	2	0	35
							WB	1	0	84	0	1	2	0	35
B5	39149, 8th ST.	Church	4/6/2009	10:23 AM	20	47.8	EB	1	0	10	1	0	0	0	35
							WB	1	0	10	1	0	0	0	35
B6	39315 Carolside Ave.	Residential	4/7/2009	09::05AM	15	52.9	EB	1	0	35	0	4	6	0	35
							WB	1	0	34	0	4	6	0	35

Table 6-3 Summary of Short-Term Measurements on SR-14

Site	Address	Land Uses	Date	Start Time	Duration (minutes)	Measured L_{eq}	Freeway Direction	Number of Lanes		Autos	Medium Trucks	Heavy Trucks	Buses	Motorcycles	Observed Speed (mph)
								MF	HOV						
E2	37753 Mountainside Dr Palmdale	Residential	11/2/2011	10:40 AM	10	53.1	NB	4	0	333	7	18	0	0	65
							SB	4	0	264	6	17	0	1	65
E3	38148 San Mateo Ave Palmdale	Residential	11/2/2011	11:13 AM	10	58.7	NB	4	0	271	14	21	0	0	65
							SB	4	0	299	10	14	0	0	65
E4	38330 San Mateo Ave Palmdale	Residential	11/2/2011	11:30 AM	10	61.7	NB	4	0	347	9	25	0	0	65
							SB	4	0	286	9	14	0	0	65
E6	Palmdale Learning Plaza School, 38043 Division Street Palmdale (In-door)	School	11/3/2011	11:22 AM	10	54.2	NB	4	0	287	7	24	0	0	65
							SB	4	0	314	12	19	0	0	65
E7	Palmdale Learning Plaza School, 38043 Division Street Palmdale	School	11/3/2011	11:38 AM	10	64.3	NB	4	0	287	7	24	0	0	65
							SB	4	0	314	12	19	0	0	65
E8	40251 12TH St W Palmdale	Residential	11/3/2011	12:35 AM	10	54.7	NB	4	0	404	13	15	0	0	65
							SB	4	0	462	7	22	1	1	65
E9	40903 12TH St W Palmdale	Residential	11/3/2011	1:00 PM	10	55.7	NB	4	0	389	16	18	0	0	65
							SB	4	0	402	6	20	1	3	65
E10	1242 W Avenue 04 Palmdale	Residential	11/3/2011	1:23 PM	10	69.5	NB	4	0	392	23	10	0	0	65
							SB	4	0	458	17	21	0	3	65

Table 6-4 Summary of Short-Term Measurements on HDC Main Alignment

Site	Future HDC Direction	Address	Land Uses	Date	Start Time	Duration (minutes)	Measured L_{eq}
1	EB	13400 E Ave R, Palmdale	Residential	4/27/2011	9:54 AM	10	44.0
2	WB	14660 E Palmdale Blvd., Palmdale	Residential	4/27/2011	10:31 AM	10	44.8
3	EB	14745 E Ave Q14, Palmdale	Residential	4/27/2011	11:18 AM	10	45.8
4	WB	15366 Palmdale Blvd., Palmdale	Residential	4/27/2011	11:44 AM	10	45.5
7	WB	Lin-Lee Acres 17171 Ave R	Residential	4/27/2011	12:53 PM	10	42.8
9	WB	20150 Palmdale Blvd., Lancaster	Residential	4/28/2011	11:19 AM	10	55.1
10	EB/WB	20539 Ave R, Palmdale	Residential	4/28/2011	10:57 AM	10	57.1
15	WB	17713 Stevens St., Adelanto	Residential	5/20/2011	10:09 AM	10	56.0
16		11301 Air Expressway, Adlanto	Residential	5/20/2011	9:48 AM	10	52.3
17		The Boy & girl Club of the Victor villey 17537 MonteZuma St.	Commercial	5/20/2011	9:25 AM	10	56.6
18	EB	12200 Hibiscus Rd., Adelanto	Residential	5/19/2011	12:57 PM	10	59.4
19	WB	15059 Turner Rd. , Victorville	Residential	5/19/2011	11:02 AM	10	49.3
20		18003 Westwind Rd., Victorville	Residential	5/19/2011	11:32 AM	10	63.6
21	EB	17442 D St., Victorville	Residential	5/19/2011	10:23 AM	10	63.3
22e		17284 Dante St.	Residential	11/8/2011	1:11 PM	10	47.9

Table 6-5 Summary of Short-Term Measurements on HDC Main Alignment (Expressway)

Site	Future HDC Direction	Address	Land Uses	Date	Start Time	Duration (minutes)	Measured L_{eq}
23	EB	21330 Waladi Rd, Apple Valley	Residential	5/17/2011	11:33 AM	10	61.7
24	WB	21522 Papago Rd, Apple Valley	Residential	5/17/2011	11:14 AM	10	65.3
26	EB	Party Art Pumping Service, Apple Valley	Commercial	5/17/2011	-	10	51.5
27	EB	21849 Waalew Rd, Appple Valley	Residential	5/17/2011	-	10	56.2
28	EB	16735 Quinnault Rd, Apple Valley	Residential	5/17/2011	10:17 AM	10	58.8
29	WB	22149 Waalew Rd, Apple Valley	Residential	5/17/2011	10:36 AM	10	54.4
30	EB	29079 South Rd, Apple Valley	Residential	5/17/2011	9:53 AM	10	54.4
31	WB	16230 Lakeshore Cove, Apple Valley	Residential	5/16/2011	12:41 PM	10	57.5
32a	WB	16166 Lago Vista Ln., Apple Valley	Residential	5/17/2011	9:22 AM	10	53.7
33	WB	22789 Cahilla Rd., Apple Valley	Residential	5/16/2011	11:18 AM	10	63.3
34	WB	23065 Resoto Rd., Apple Valley	Residential	5/16/2011	10:47 AM	10	51.5
35	WB	15825 Joshua Rd., Apple Valley	Residential	5/16/2011	10:24 AM	10	56.2
36	EB	23164 Zuni Rd., Apple Valley	Residential	5/16/2011	9:29 AM	10	49.2
37	WB	23598 Zuni Rd., Apple Valley	Residential	5/16/2011	9:58 AM	10	47.4
39	EB	23667 Thunderbird Rd., Apple Valley	Residential	5/12/2011	1:06 PM	10	42.2
40	EB	23972 Standing Rock rd, Apple Valley	Residential	5/12/2011	12:46 PM	10	61.2
41	EB	14728 Moccasin Rd., Apple Valley	Residential	5/12/2011	12:30 PM	10	46.0
42	EB	23773 Ramona Ave., Apple Valley	Residential	5/12/2011	11:11 AM	10	50.0
43	EB	14310 Lynn Rd., Apple Valley	Residential	5/12/2011	10:45 AM	10	42.3
44	EB	23802 Yucca Loma Rd., Apple Valley	Residential	5/12/2011	9:38 AM	10	51.7
45	WB	13831 Lynn Rd., Apple Valley	Residential	5/12/2011	10:12 AM	10	46.5
18-2	WB	Paradise Mobile Home, Apple Valley	Residential	5/10/2011	9:48 AM	10	48.5

Table 6-6. Summary of Background Noise Measurements

Site	Address	Freeway Direction	Land Uses	Start Time	Date	Duration (minutes)	Measured L_{eq}
C1	38753, 26th St. E., Palmdale	EB	Residential	10:35 AM	4/13/2009	30	58.6
C2	4142 E. Ave Q., Palmdale	EB	Residential	9:49 AM	4/14/2009	30	57.9
C3	3620 E. Ave.P, Palmdale	WB	Golf Course	11:26 AM	4/14/2009	30	56.6
C4	38757 33 RD ST. E., Palmdale	EB	Residential	10:33 AM	4/13/2009	28	57.3
D1	6365 Atlas Way, Palmdale	WB	Residential	11:52 AM	4/7/2009	20	58.6
F2	16802 Village Dr., Victorville	WB	Residential	11:54 AM	11/8/2011	10	62.3
F3	14835 Mastodon Pl., Victorville	EB	Residential	12:20 PM	11/8/2011	10	47.5
F4	15209 Rancho Rd., Victorville	WB	Residential	12:42 PM	11/8/2011	10	49.3

Table 6-7 Summary of Long-Term Measures (EA 116720)

Site	Address	Land Uses	Start Time	Start Date	Duration (Hours)	Noisiest Hour	
						Noise Level (dBA)	Time
A0	612 Collet St.	Residential	10:58 AM	4/1/2009	24	67.8	3:18 PM - 4:18 PM
B0	1018 E Avenue P5		10:03 AM	4/6/2009	24	51.7	6:21 PM - 7:21 PM
C0	38757 Puerta Ave		10:00 AM	4/13/2009	24	55.2	8:47 AM -9:47 AM

Figure 6-1 Long-Term Monitoring at the Location Site #A0, April 1-2, 2009

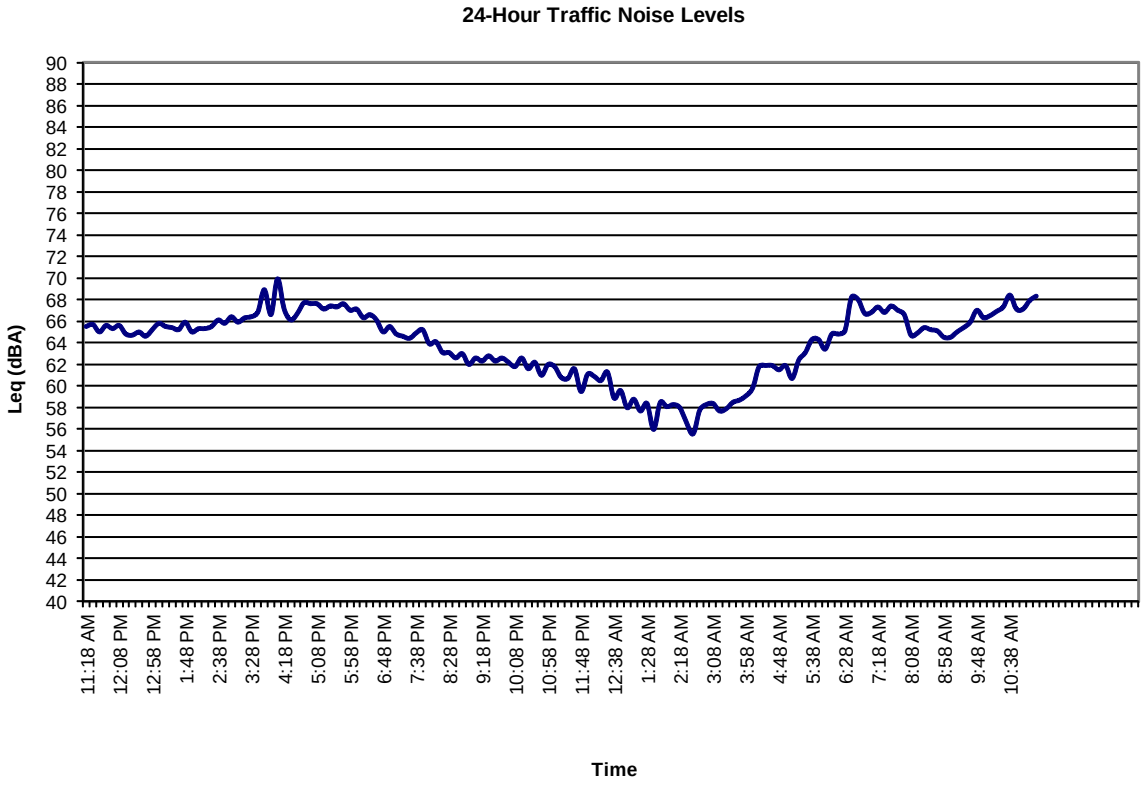


Table 6-8 Summary of Long-Term Measures (EA 116720)

Site	Address	Land Uses	Start Time	Start Date	Duration (Hours)	Noisiest Hour	
						Noise Level (dBA)	Time
E1	38100 San Mateo Ave, Palmdale	Residential	10:04 AM	11/2/2011	24	66.2	6:34 AM - 7:34 AM
E5	40708 13th St. West, Palmdale		12:27 PM	11/2/2011	24	62.9	6:32 AM - 7:31 AM

Figure 6-2 Long-Term Monitoring at the Location Site #E1, Nov. 2nd, 2011

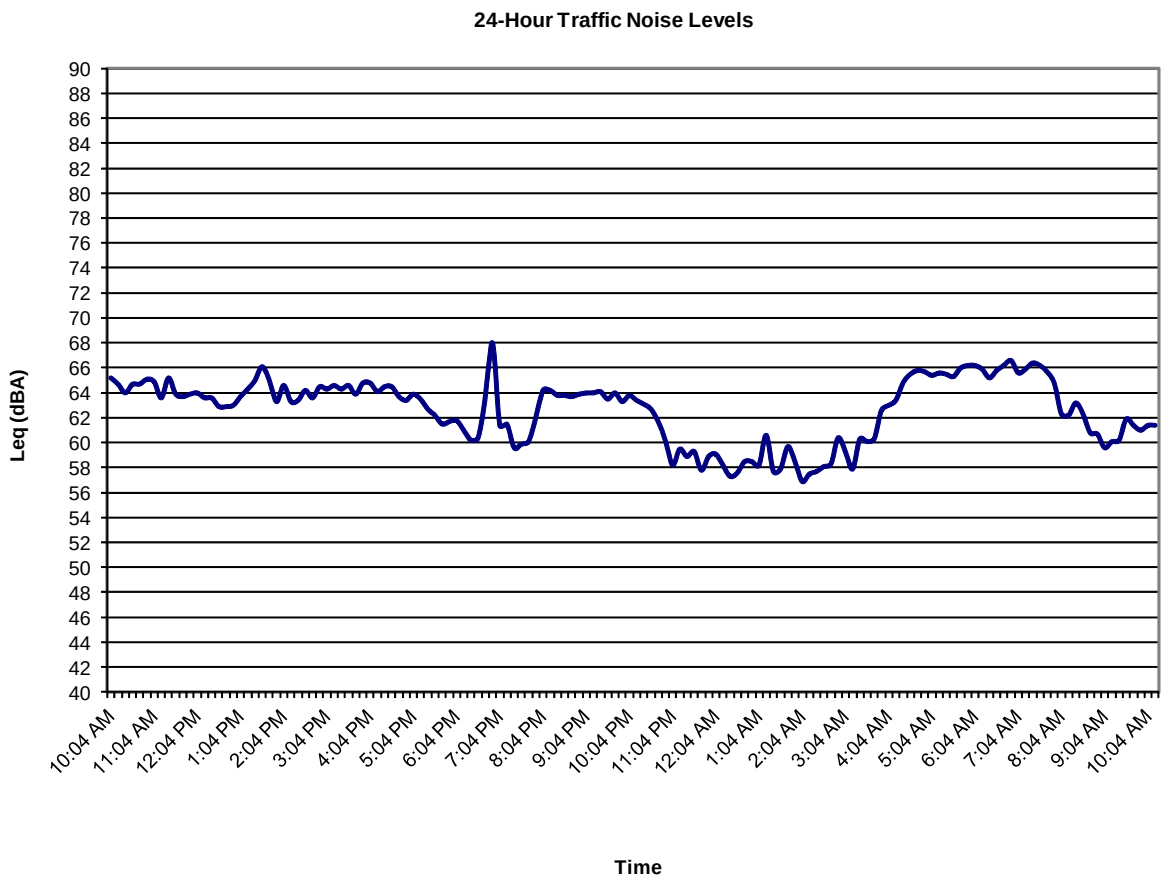


Figure 6-3. Summary of Long-Term Noise Monitoring at Site LT1

Site LT1 Hourly Noise Levels, $L_{eq}(h)$

Location: 39315 Carolside Ave.
Position: Side Yard
Sources: Highway
Date: 9/25/13 - 9/27/13

TIME	9/25 - 9/26 $L_{eq(h)}$ dBA	'9/26 - 9/27 $L_{eq(h)}$ dBA
03:00 - 04:00 PM	57	51
04:00 - 05:00 PM	58	51
05:00 - 06:00 PM	58	52
06:00 - 07:00 PM	57	52
07:00 - 08:00 PM	55	52
08:00 - 09:00 PM	55	47
09:00 - 10:00 PM	52	45
10:00 - 11:00 PM	50	45
11:00 - 12:00 AM	49	44
12:00 - 01:00 AM	49	42
01:00 - 02:00 AM	49	46
02:00 - 03:00 AM	46	41
03:00 - 04:00 AM	47	44
04:00 - 05:00 AM	50	49
05:00 - 06:00 AM	52	52
06:00 - 07:00 AM	54	52
07:00 - 08:00 AM	55	52
08:00 - 09:00 AM	50	44
09:00 - 10:00 AM	49	41
10:00 - 11:00 AM	47	45
11:00 - 12:00 PM	45	46
12:00 - 01:00 PM	48	46
01:00 - 02:00 PM	44	46
02:00 - 03:00 PM	49	-
Ldn:	54.3	

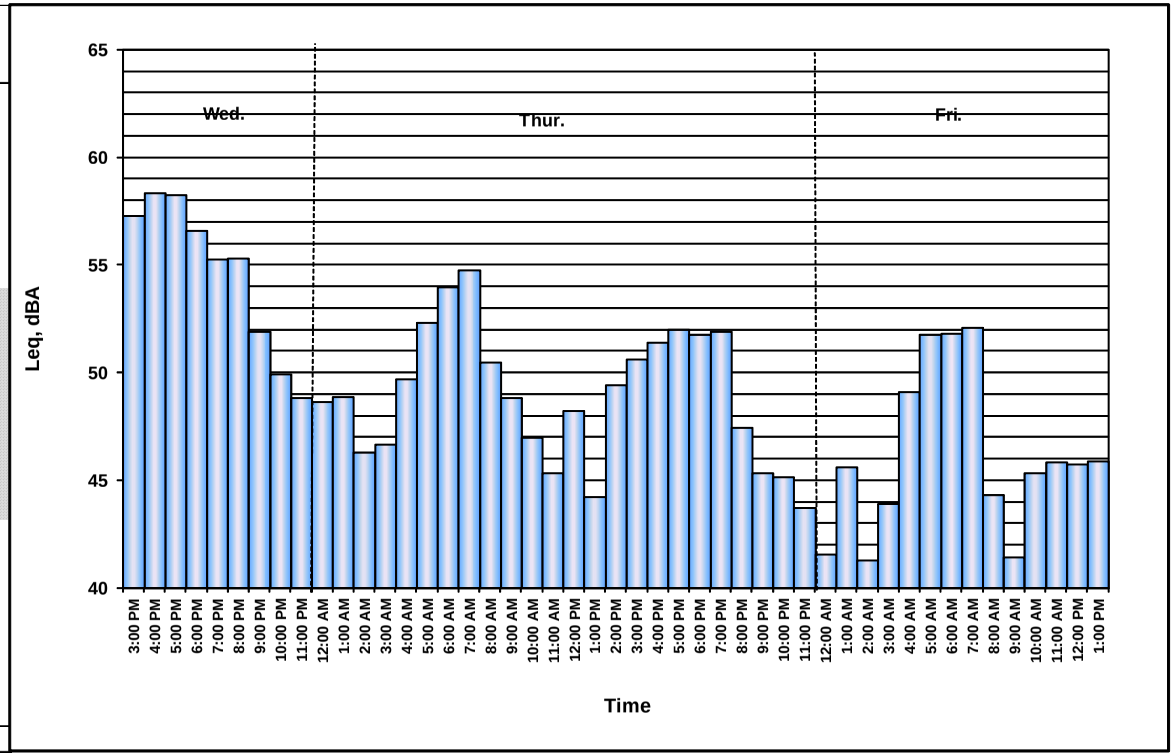


Figure 6-4. Summary of Long-Term Noise Monitoring at Site LT2

Site LT2 Hourly Noise Levels, $L_{eq}(h)$

Location: 3771 Sonora Way
Position: Back Yard
Sources:
Date: 9/25/13 - 9/30/13

TIME	9/25 - 9/26 $L_{eq(h)}$ dBA	'9/26 - 9/27 $L_{eq(h)}$ dBA	'9/27 - 9/28 $L_{eq(h)}$ dBA	'9/28 - 9/29 $L_{eq(h)}$ dBA	'9/29 - 9/30 $L_{eq(h)}$ dBA
02:00 - 03:00 PM	54	53	51	55	48
03:00 - 04:00 PM	56	58	52	57	50
04:00 - 05:00 PM	56	59	53	53	51
05:00 - 06:00 PM	59	57	56	52	52
06:00 - 07:00 PM	61	54	55	50	50
07:00 - 08:00 PM	60	52	59	49	57
08:00 - 09:00 PM	62	58	57	49	53
09:00 - 10:00 PM	60	46	48	48	56
10:00 - 11:00 PM	58	44	44	45	53
11:00 - 12:00 AM	52	43	45	46	54
12:00 - 01:00 AM	51	41	44	44	39
01:00 - 02:00 AM	51	43	43	42	35
02:00 - 03:00 AM	48	44	40	40	38
03:00 - 04:00 AM	45	40	39	39	39
04:00 - 05:00 AM	44	41	41	42	42
05:00 - 06:00 AM	47	45	45	44	47
06:00 - 07:00 AM	48	50	48	46	49
07:00 - 08:00 AM	49	52	46	44	51
08:00 - 09:00 AM	50	48	48	50	48
09:00 - 10:00 AM	52	49	49	50	49
10:00 - 11:00 AM	53	51	50	52	50
11:00 - 12:00 PM	50	51	45	47	51
12:00 - 01:00 PM	51	51	49	44	-
01:00 - 02:00 PM	51	52	50	46	-
Ldn:	54.3				

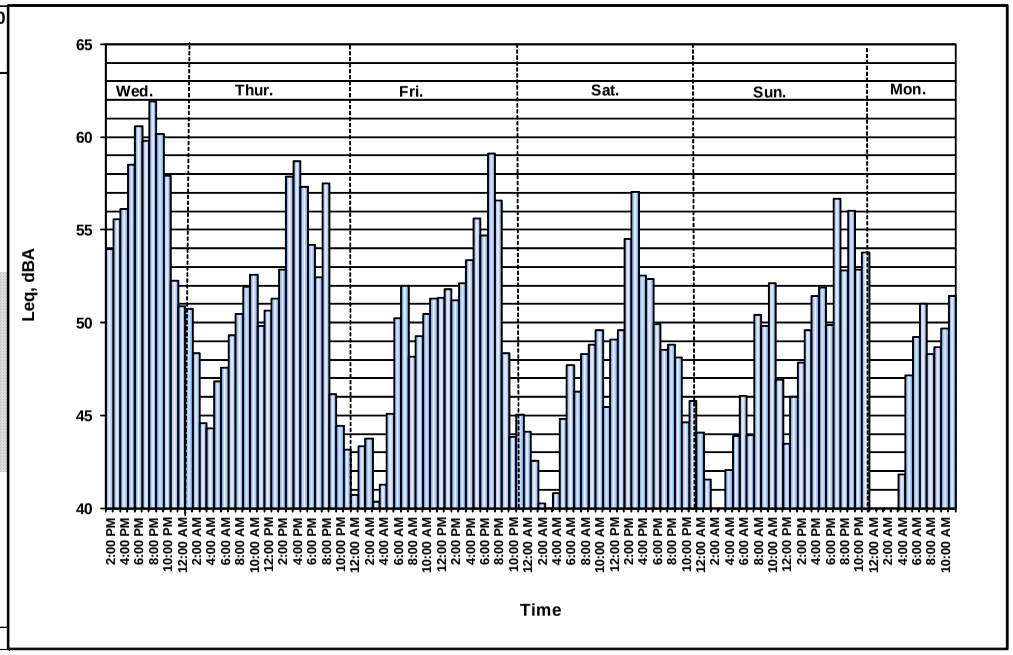


Figure 6-5. Summary of Long-Term Noise Monitoring at Site LT3

Site LT3 Hourly Noise Levels, $L_{eq}(h)$

Location: 9038 Q Avenue
Position: Front Yard
Sources:
Date: 9/25/13 - 9/27/13

TIME	9/25 - 9/26 Leq(h) dBA	'9/26 - 9/27 Leq(h) dBA	'9/26 - 9/27 Leq(h) dBA
02:00 - 03:00 PM	53	47	47
03:00 - 04:00 PM	54	54	48
04:00 - 05:00 PM	56	55	-
05:00 - 06:00 PM	57	55	-
06:00 - 07:00 PM	57	54	-
07:00 - 08:00 PM	56	52	-
08:00 - 09:00 PM	55	50	-
09:00 - 10:00 PM	54	51	-
10:00 - 11:00 PM	51	48	-
11:00 - 12:00 AM	50	47	-
12:00 - 01:00 AM	48	43	-
01:00 - 02:00 AM	50	45	-
02:00 - 03:00 AM	49	44	-
03:00 - 04:00 AM	48	44	-
04:00 - 05:00 AM	50	49	-
05:00 - 06:00 AM	53	54	-
06:00 - 07:00 AM	52	56	-
07:00 - 08:00 AM	54	55	-
08:00 - 09:00 AM	53	44	-
09:00 - 10:00 AM	51	41	-
10:00 - 11:00 AM	47	42	-
11:00 - 12:00 PM	46	42	-
12:00 - 01:00 PM	47	44	-
01:00 - 02:00 PM	48	49	-
Ldn:	56.6		

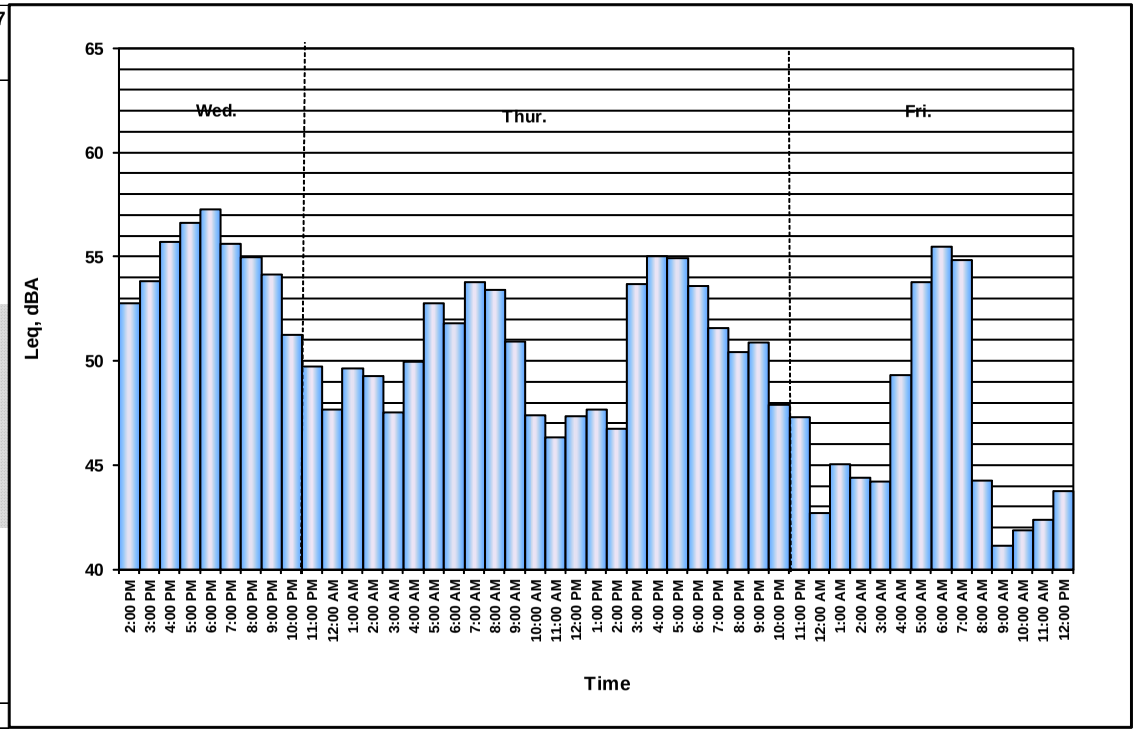


Figure 6-6. Summary of Long-Term Noise Monitoring at Site LT4

Site LT4 Hourly Noise Levels, $L_{eq}(h)$

Location: 10928 Lawson Ave
Position: Back Yard
Sources:
Date: 9/30/13 - 10/1/13

TIME	9/30 - 10/1 $L_{eq(h)}$ dBA	'10/1 $L_{eq(h)}$ dBA
09:00 - 10:00 AM	42	47
10:00 - 11:00 AM	42	42
11:00 - 12:00 PM	42	43
12:00 - 01:00 PM	41	47
01:00 - 02:00 PM	42	44
02:00 - 03:00 PM	43	44
03:00 - 04:00 PM	47	46
04:00 - 05:00 PM	49	-
05:00 - 06:00 PM	49	-
06:00 - 07:00 PM	49	-
07:00 - 08:00 PM	47	-
08:00 - 09:00 PM	45	-
09:00 - 10:00 PM	39	-
10:00 - 11:00 PM	38	-
11:00 - 12:00 AM	40	-
12:00 - 01:00 AM	37	-
01:00 - 02:00 AM	40	-
02:00 - 03:00 AM	37	-
03:00 - 04:00 AM	37	-
04:00 - 05:00 AM	44	-
05:00 - 06:00 AM	44	-
06:00 - 07:00 AM	43	-
07:00 - 08:00 AM	46	-
08:00 - 09:00 AM	48	-
Ldn:	48.7	

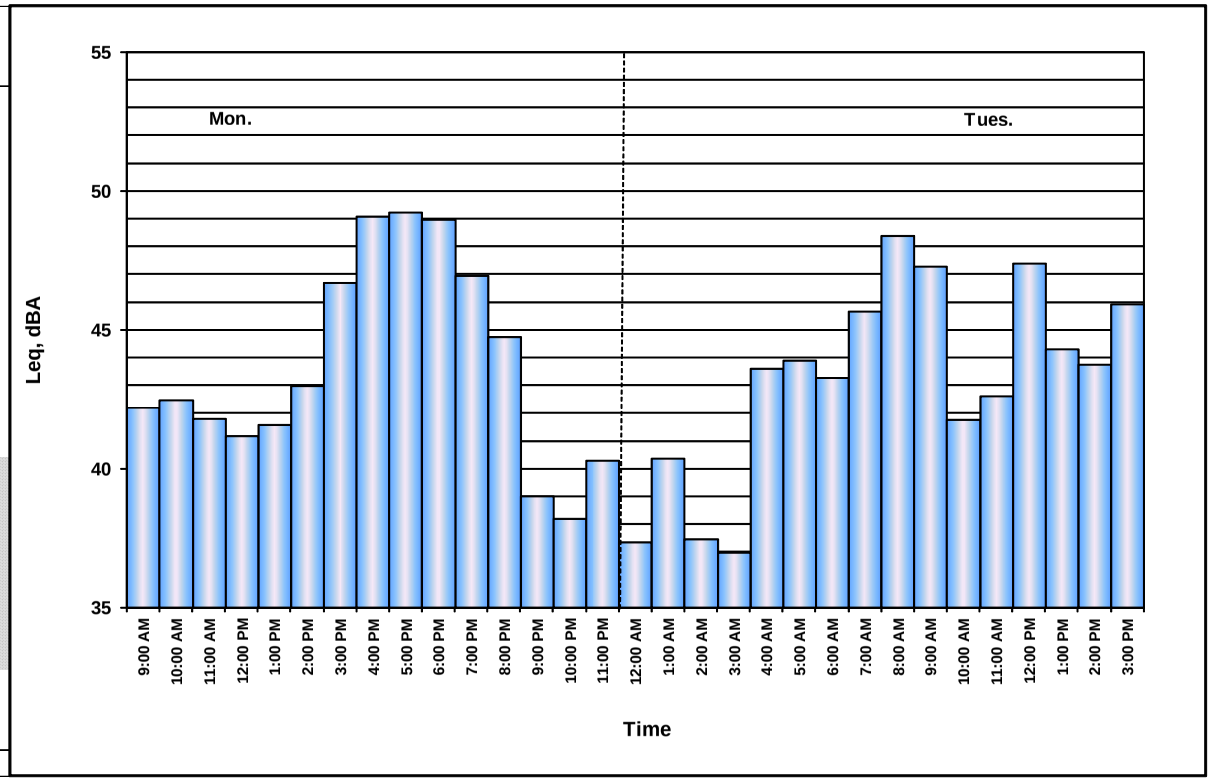
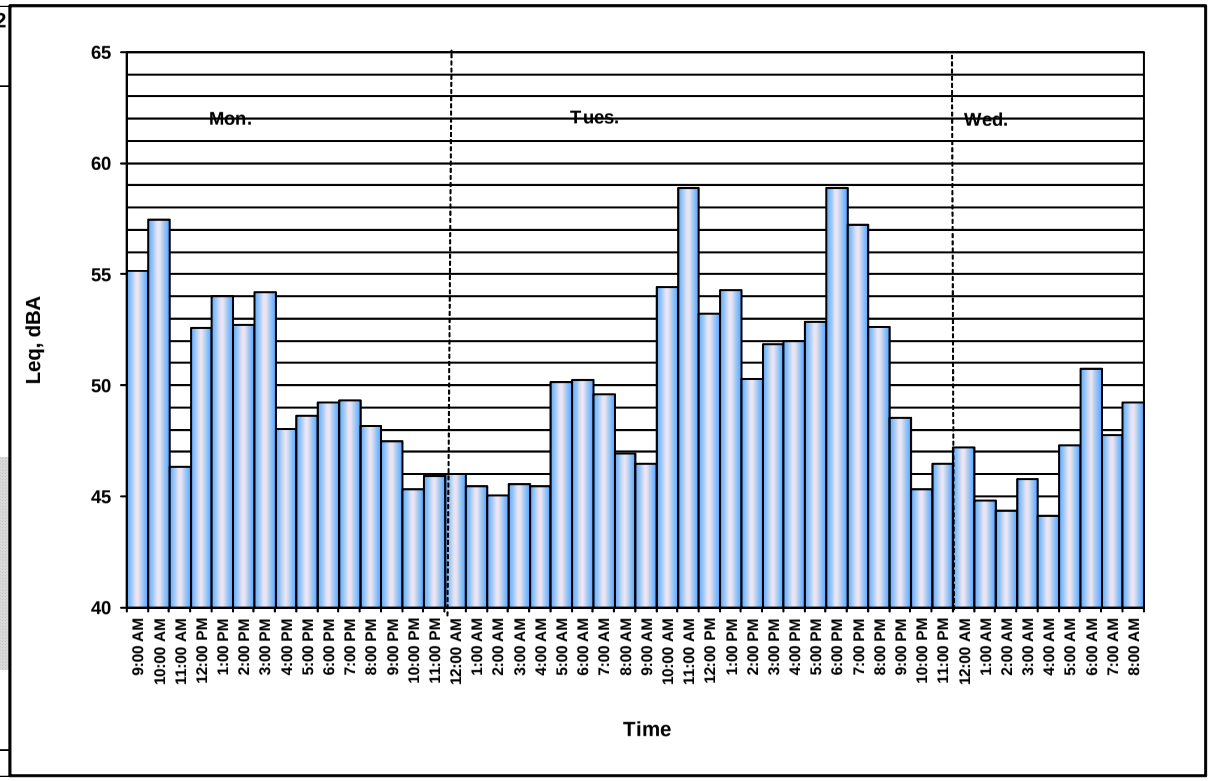


Figure 6-7. Summary of Long-Term Noise Monitoring at Site LT5

Site LT5 Hourly Noise Levels, $L_{eq}(h)$

Location: 9038 Q Avenue
Position: Back yard
Sources:
Date: 9/30/13 - 10/2/13

TIME	9/30 - 10/1 $L_{eq(h)}$ dBA	'10/1 - 10/2 $L_{eq(h)}$ dBA
09:00 - 10:00 AM	55	46
10:00 - 11:00 AM	57	54
11:00 - 12:00 PM	46	59
12:00 - 01:00 PM	53	53
01:00 - 02:00 PM	54	54
02:00 - 03:00 PM	53	50
03:00 - 04:00 PM	54	52
04:00 - 05:00 PM	48	52
05:00 - 06:00 PM	49	53
06:00 - 07:00 PM	49	59
07:00 - 08:00 PM	49	57
08:00 - 09:00 PM	48	53
09:00 - 10:00 PM	48	49
10:00 - 11:00 PM	45	45
11:00 - 12:00 AM	46	47
12:00 - 01:00 AM	46	47
01:00 - 02:00 AM	45	45
02:00 - 03:00 AM	45	44
03:00 - 04:00 AM	46	46
04:00 - 05:00 AM	45	44
05:00 - 06:00 AM	50	47
06:00 - 07:00 AM	50	51
07:00 - 08:00 AM	50	48
08:00 - 09:00 AM	47	49
Ldn:	55.3	



Chapter 7. Future Noise and Vibration Environment, Impacts, and Considered Abatement

7.1. Future Traffic Noise Environment and Impacts

Future traffic noise levels were predicted by Caltrans using traffic characteristics that would yield the worst hourly traffic noise impact on a regular basis. As described in Section 5.3 of this report, design year (2035) traffic volumes were used as the future traffic for entire project area.

Tables 7-1 through 7-2 summarize the traffic noise modeling results for existing conditions and design-year conditions with and without the project. Predicted design-year traffic noise levels with the project are compared to existing conditions and to design-year no-project conditions. The comparison to existing conditions is included in the analysis to identify traffic noise impacts under 23CFR772. The comparison to future no-build conditions indicates the traffic noise increase resulting from the project. Tables 7-3 through 7-7 summarize the traffic noise modeling results for existing conditions and design-year conditions with the project. There were no comparisons to future no build and design year traffic noise conditions due to this being new freeway construction.

As stated in the TeNS, modeling results are rounded to the nearest decibel before comparisons are made. In some cases, this can result in relative changes that may not appear intuitive. An example would be a comparison between sound levels of 64.4 and 64.5 dBA. The difference between these two values is 0.1 dBA. However, after rounding, the difference is reported as 1 dBA. Predicted noise levels have been rounded (to the nearest whole number) only after the determination of traffic noise impacts.

Traffic noise impacts are predicted to occur at Activity Category B, C, D, and E land uses within the project area, and noise abatement has been considered. The following is a discussion of noise abatement considered for each evaluation area where traffic noise impacts are predicted. For a detailed description of considered abatement (i.e. the location, length, height, and noise reduction of soundwalls) for the impacted receptors, see Sections 7.2 and 7.3.

This traffic noise analysis assumes that all ramps and connectors along SR-14 will be built on retaining walls, in accordance with current assumptions made by Caltrans

Division of Design. As a result, the noise modeling sites will exhibit a lower after-project noise level compared to existing worst-hour and future no-build noise levels. If the assumption has changed and the proposed connectors and ramps are to be built on piles, all modeling sites and soundwalls in the area will need to be reanalyzed and remodeled for after-project noise levels.

7.1.1. Activity Category A

There are no noise sensitive receptors under this activity category.

7.1.2. Activity Category B

Most of the noise sensitive land uses are residences along the new HDC freeway and SR-14 between Avenue S and Avenue N. Traffic noise impacts are considered to occur at receptor locations where predicted design-year noise levels are at least 12 dBA greater than existing noise levels (substantial noise increase) or where predicted design year noise levels approach (within 1) or exceed the NAC of 67 dBA. All impacted residential areas within the project limits have been considered for noise abatement, and acoustically feasible soundwalls have been provided in this report. Please see Tables 7-1 through 7-7 for all of the impacted sites where noise abatement has been considered. Please see Tables 7-8 through Table 7-13 for the predicted noise reduction of the soundwalls.

7.1.3. Activity Category C

This activity category includes parks and recreational areas, golf courses, a medical facility, places of worship, schools, and cemeteries.

1) Pelona Vista Park is located between Avenue S and Ray Burn Road along southbound SR-14 in Palmdale. It is represented by modeled Sites P1 and P2. The analysis did not indicate noise impacts at this location due to the proposed project.
2) There is a baseball park at the corner of Technology Drive and Division Street represented by Site A9. The analysis did not indicate noise impacts at this location due to the proposed project.
3) Along the new HDC freeway, west of 8th Street, is Unity Church. A substantial noise increase occurs due to the proposed project; therefore, noise abatement has been considered in the form of a soundwall.
4) The Palmdale School District office is located west of 10th Street East and is fully acquired by the new ROW for the proposed project by all of the alternatives; therefore, noise abatement was not considered for this area.

5) Rockview Park is located between Phantom E. Street and Gateway Drive along the westbound expressway along the westbound future HDC alignment in Victorville. It is represented by Site 20a. Noise measurement was conducted at an amphitheater to determine noise impacts. No freeway traffic noise impacts have been predicted to occur at this park as a result of the future HDC project; therefore, no noise abatement has been considered.
6) Richardson Park is located between US 395 and Air Express Boulevard in Adelanto and is represented by Site #M1-17. No freeway traffic noise impacts have been predicted to occur at this park as a result of the proposed project; therefore, no noise abatement has been considered.
7) Westwinds Golf Course is located between Phantom W. Street and Phantom E. Street along the westbound future HDC project in Victorville. Site #20 represents an outdoor golf course area, where no noise impacts were predicted to occur; therefore, no noise abatement has been considered.
8) The Boys and Girls Club of the Victor Valley is located on the northwest corner of US 395 and the future HDC in Adelanto and is represented by Site #17. The exterior noise levels at this location exceed the NAC under the new proposed project, but due to ROW acquired at this location, no noise abatement has been considered.
9) The Adelanto School District office is located near the northeast corner of US 395 and Air Expressway Boulevard in Adelanto. It represented by Site #M2-17. No freeway traffic noise impacts have been predicted to occur at this facility as a result of the future HDC project; therefore, no noise abatement has been considered.

7.1.4. Activity Category D

Interior noise measurements were conducted at the Palmdale Learning Plaza School, where exterior noise levels approached or exceeded the NAC, and its interior noise levels approached or exceeded the NAC of 52 dB, resulting in noise impacts.

1) Palmdale Learning Plaza School is located between Avenue S and Palmdale Boulevard, along northbound SR-14. Site E6 represents the noise monitoring at this school inside a classroom. Because noise impacts have been identified, noise abatement has been considered in the form of a noise barrier for Palmdale Learning Plaza School.

7.1.5. Activity Category E

Noise sensitive land uses under this activity category include a hotel, a motel, and a restaurant.

1) Famous Dave's BBQ, Johnny Carino's Italian Grill, and Olive Garden are located between Avenue O-8 and 10th Street W next to Antelope Valley Mall along southbound SR-14; however, there is no exterior area of frequent human use that would benefit from a lowered noise level.
2) Site A1 represents an outdoor eating/sitting area for a Starbucks Coffee, south of Rancho Vista Boulevard on the west side of SR-14. The predicted worst-hour noise level of 66.7 dBA-L_{eq}(h) is below the NAC for a commercial development (Activity Category E); therefore, no traffic noise abatement was considered.
3) Site A6 represents an outdoor sitting area at a Wienerschnitzel's restaurant, south of Rancho Vista Boulevard on the east side of SR-14. The predicted worst-hour noise level of 70.4 dBA-L_{eq}(h) is below the NAC for a commercial development (Activity Category E); therefore, no traffic noise abatement was considered.
4) Site A4 is located at the pool of the Hampton Inn and Suites Hotel. Site A5 is the exterior measurement taken for that hotel. The predicted worst-hour noise level of 62 to 64 dBA-L_{eq}(h) is below the NAC for a commercial development (Activity Category E); therefore, no traffic noise abatement was considered.
5) Motel 6 is represented by Site A8, located at the pool (an area of frequent human use) in the motel's property. The analysis did not indicate noise impacts at Site A8 based on the predicted noise level.
6) Model Site M6 represents Marriott Hotel. Site M6 is located outside of the hotel's room. The analysis did not indicate noise impacts at Site M6 based on the predicted noise level.

7.1.6. Activity Category F

There are many industrial buildings, maintenance facilities, manufacturing, and retail facilities located within the project limits. There is also an army training facility, a federal prison, an airport, and a rail yard identified along the HDC within the project limits.

Table 7-1. Traffic Noise Measurements & Modeling Results - Freeway/Expressway Alternative, SR-14 -1

Receiver	Direction	Location	Land Use	Noise Abatement Category	Field-Measured Noise Level	Modeled Noise Level	K - Factor	Existing Worst-Hour Noise Level	Future (2040) No Build Noise Level	Noise Increase (No Build Vs. Existing)	Future Worst-Hour Noise Level	Impact Type	Noise Increase (Build Vs. Existing)	Noise Increase (Build Vs. No Build)
E5	Southbound	40708 13TH St W	R	B (67)	62.5	62.8	-0.3	62.9	63.2	0	65.2	N	2	2
M1E5		40560 13TH St W	R	B (67)	-	61.9	-	62.3	62.7	0	65.4	N	3	3
M2E5		40816 13TH St W	R	B (67)	-	62.4	-	62.8	63.2	0	64.7	N	2	2
M3E5		41024 13TH St W	R	B (67)	-	58.8	-	59.2	59.6	0	62.4	N	3	3
M4E5		41128 13TH St W	R	B (67)	-	60.1	-	60.5	60.8	0	62.5	N	2	2
E8	Northbound	40251 12TH St W	R	B (67)	54.7	61.3	-6.6	58.0	62.2	4	62.2	N	4	0
M1E8		40251 12TH St W	R	B (67)	-	58.3	-	61.6	62.3	1	64.8	N	3	3
M2E8		40357 12TH St W	R	B (67)	-	57.1	-	60.4	61.0	1	61.9	N	2	1
M3E8		40106 12TH St W	R	B (67)	-	57.5	-	60.8	61.6	1	64.7	N	4	3
E9		40903 12TH St W	R	B (67)	55.7	64.3	-8.6	56.1	56.4	0	62.4	N	6	6
ME9		40903 12TH St W	R	B (67)	-	57.4	-	57.8	58.2	0	60.8	N	3	3
M1E9		40605 12TH St W	R	B (67)	-	52.9	-	53.3	53.6	0	57	N	4	3
E10	Southbound	1242 W Avenue O4	R	B (67)	69.5	73.5	-4	70.7	70.7	0	70.7	E	0	0
M1E10		40220 13TH St W	R	B (67)	-	61.9	-	63.1	64.3	1	65.2	N	2	1
M2E10		1225 W Avenue O8	R	B (67)	-	60.0	-	61.2	62.4	1	63.1	N	2	1
M3E10		40342 13TH St W	R	B (67)	-	60.8	-	62.0	63.2	1	63.6	N	2	0

R= Residential

Table 7-2. Traffic Noise Measurements & Modeling Results - Freeway/Expressway Alternative , SR-14 - 2

Receiver	Direction	Location	Land Use	Noise Abatement Category	Field-Measured Noise Level	Modeled Noise Level	K - Factor	Existing Worst-Hour Noise Level	Future (2040) No Build Noise Level	Noise Increase (No Build Vs. Existing)	Future Worst-Hour Noise Level	Impact Type	Noise Increase (Build Vs. Existing)	Noise Increase (Build Vs. No Build)
E2	Northbound	37753 Mountainside Dr	R	B (67)	53.1	54.7	-1.6	54.6	58.7	4	63.0	N	8	4
E6		Palmdale Learning Plaza School, 38043 Division Street	S	D (52)	54.2	-	-	-	-	-	-	-	-	-
E7		Palmdale Learning Plaza School, 38043 Division Street	S	C (67)	64.3	61.7	2.6	66.6	68.4	2	66.8	A/E	0	-2
A0		612 Callet St	R	B (67)	65.3	66.1	-0.8	67.8	69.6	2	67.8	A/E	0	-2
A3		635 Callet St.	R	B (67)	68.7	69.8	-1.1	70.7	71.7	1	70.0	A/E	-1	-2
A6		Wienerchnitzel 560 W. Rancho Vista Blvd	Rs	E (72)	69.8	69.7	0.1	71.8	72.0	0	70.6	N	-1	-1
M6		Marriot 530 W. Rancho Vista Blvd	H	E (72)	-	69.6	-	70.9	72.5	2	70.0	N	-1	-3
A7		38532 Division St	R	B (67)	61.8	61.4	0.4	62.6	62.9	0	58.8	N	-4	-4
A9		Baseball Park Technology Dr and Division St	P	C (67)	59.5	59.8	-0.3	60.0	61.2	1	65.2	N	5	4
A10		38814 Division St	R	B (67)	61.7	61.8	-0.1	62.5	63.3	1	59.2	N	-3	-4
E1	Southbound	38100 San Mateo Ave	R	B (67)	66.2	64.3	1.9	66.2	68.0	2	77.1	A/E	11	9
E3		38148 San Mateo Ave	R	B (67)	58.7	59.8	-1.1	60.0	64.3	4	67.8	A/E	8	4
E4		38330 San Mateo Ave	R	B (67)	61.7	59.3	2.4	62.7	63.0	0	68.8	A/E	6	6
A1		Starbucks 39570 Lowes Dr	Rs	E (72)	65.6	66.3	-0.7	67.7	67.9	0	66.3	N	-1	-2
A4		Hampton Inn & Suites (Pool) 39428 Trade Center Dr	H	E (72)	62.6	62.4	0.2	64.7	64.7	0	61.3	N	-3	-3
A5		Hampton Inn & Suites 39428 Trade Center Dr	H	E (72)	65.5	64.7	0.8	68.3	70.1	2	64.1	N	-4	-6
A8		Motel 6 407 E. Palmdale Blvd	H	E (72)	61.1	60.2	0.9	61.6	62.5	1	62.7	N	1	0
P1		Pelona Vista Park South Tierra Subida Ave, Palmdale	P	C (67)	-	59.9	1.9	61.8	62.4	1	64.6	N	3	2
P2		Pelona Vista Park North Tierra Subida Ave, Palmdale	P	C (67)	-	55.2	1.9	57.1	58.7	2	59.7	N	3	1

R = Residential
S = School
Rs = Restaurant
H = Hotel
P = Park

Table 7-3. Traffic Noise Measurements & Modeling Results - Freeway/Expressway Alternative, HDC Main Alignment-Segment- 1 (Between SR14 and 100th St.)

Receiver	Direction	Location	Land Use	Noise Abatement Category	Field-Measured Noise Level	Modeled Noise Level	Future Worst-Hour Noise Level	Impact Type	Noise Increase (Build Vs. Existing)
B0	WB	1018 E. Ave. P5, Palmdale	R	B (67)	49.4	-	67.6	E	18
BM0	WB	1045 E. Ave. P5, Palmdale	R	B (67)	-	49.4	68.4	E	19
B1	EB	38902, 25th St., Palmdale	R	B (67)	58.0	-	59.8	N	2
B5	EB	39149, 8th St., Palmdale	CH	B (67)	47.8	-	65.8	E	18
B6	WB	39315 Carolside Ave., Palmdale	R	B (67)	52.9	-	67.5	E	15
R = Residential									
CH = Church									

Table 7-3. Traffic Noise Measurements & Modeling Results - Freeway/Expressway Alternative, HDC Main Alignment -Segment- 1 (Between SR14 and 100th St.) Variation A

Receiver	Direction	Location	Land Use	Noise Abatement Category	Field-Measured Noise Level	Modeled Noise Level	Future Worst-Hour Noise Level	Impact Type	Noise Increase (Build Vs. Existing)
B0	WB	1018 E. Ave. P5, Palmdale	R	B (67)	49.4	-	70.9	E	22
BM0	WB	1045 E. Ave. P5, Palmdale	R	B (67)	-	49.4	70.9	E	22
B1	EB	38902, 25th St., Palmdale	R	B (67)	58.0	-	64.5	N	7
B5	EB	39149, 8th St., Palmdale	CH	B (67)	47.8	-	66.5	E	19
B6	WB	39315 Carolside Ave., Palmdale	R	B (67)	52.9	-	67.5	E	15

R = Residential

CH = Church

Table 7-4. Traffic Noise Measurements & Modeling Results - Freeway/Expressway Alternative, HDC Main Alignment-Segment - 2 (Between 100th St. and LA/SB County Line)

Receiver	Direction	Location	Land Use	Noise Abatement Category	Field-Measured Noise Level	Modeled Noise Level	Future Worst-Hour Noise Level	Impact Type	Noise Increase (Build Vs. Existing)
1	EB	13400 E Ave R, Palmdale	R	B (67)	44.0	-	55.2	E	12
2	WB	14660 E Palmdale Blvd., Palmdale	R	B (67)	44.8	-	62.7	E	18
3	EB	14745 E Ave Q14, Palmdale	R	B (67)	45.8	-	68.0	E	22
4	WB	15366 Palmdale Blvd., Palmdale	R	B (67)	45.5	-	62.2	E	17
M4	WB	15616 E Palmdale Blvd, Palmdale	R	B (67)	-	45.5	66.6	E	21
9	WB	20150 Palmdale Blvd., Lancaster	R	B (67)	55.1	-	58.7	N	4
M9	WB	38250, 200th St. E, Lancaster	R	B (67)	-	55.1	62.9	N	8
10	EB	20539 Ave R, Palmdale	R	B (67)	57.1	-	57.1	N	0
M10	EB	20847 Ave R, Palmdale	R	B (67)	-	57.1	57.5	N	0
M11	WB	22210 E Palmdale Blvd. Lake Los Angeles	R	B (67)	-	55.1	62.0	N	7

R = Residential

Table 7-4. Traffic Noise Measurements & Modeling Results - Freeway/Expressway Alternative, HDC Main Alignment-Segment - 2 (Between 100th St. and LA/SB County Line) Variation D

Receiver	Direction	Location	Land Use	Noise Abatement Category	Field-Measured Noise Level	Modeled Noise Level	Future Worst-Hour Noise Level	Impact Type	Noise Increase (Build Vs. Existing)
1	EB	13400 E Ave R, Palmdale	R	B (67)	44.0	-	55.2	E	12
2	WB	14660 E Palmdale Blvd., Palmdale	R	B (67)	44.8	-	62.7	E	18
3	EB	14745 E Ave Q14, Palmdale	R	B (67)	45.8	-	68.0	E	22
4	WB	15366 Palmdale Blvd., Palmdale	R	B (67)	45.5	-	62.2	E	17
M4	WB	15616 E Palmdale Blvd, Palmdale	R	B (67)	-	45.5	66.6	E	21
10	WB	20539 Ave R, Palmdale	R	B (67)	57.1	-	64.8	N	8
M10	WB	20847 Ave R, Palmdale	R	B (67)	-	57.1	60.2	N	3

R = Residential

Table 7-5. Traffic Noise Measurements & Modeling Results - Freeway/Expressway Alternative, HDC Main Alignment -Segment- 3 (Between LA/SB County line and I-15)

Receiver	Direction	Location	Land Use	Noise Abatement Category	Field-Measured Noise Level	Modeled Noise Level	Future Worst-Hour Noise Level	Impact Type	Noise Increase (Build Vs. Existing)
15	WB	17713 Stevens St., Adelanto	R	B (67)	56.0	-	56.0	N	0
16		11301 Air Expressway, Adlanto	R	B (67)	52.3	-	62.5	N	10
M1-17		Richardson Park, Adelanto	R	B (67)	-	56.6	58.2	N	2
M2-17		Adelanto School District Office	C	E (72)	-	56.2	56.2	N	0
18	EB	12200 Hibiscus Rd., Adelanto	R	B (67)	59.4	-	60.1	N	1
19	WB	15059 Turner Rd. , Victorville	R	B (67)	49.3	-	58.4	N	9
20		18003 Westwind Rd., Victorville	G	B (67)	63.6	-	63.6	N	0
20a		Rockview Park, victorville	P	B (67)	42.1	-	51.8	N	10
21	EB	17442 D St., Victorville	R	B (67)	63.3	-	63.3	N	0
22e		17284 Dante St.	R	B (67)	47.9	55.8	58.6	N	3
M22e		Modeled Sites	R	B (67)	-	56.5	59.1	N	3

R = Residential
C = Commercial
P = Park
G = Golf Course

Table 7-6. Traffic Noise Measurements & Modeling Results - Freeway/Expressway Alternative, HDC Alignment -Segment- 3 (Between LA/SB County line and I-15) Variation E

Receiver	Direction	Location	Land Use	Noise Abatement Category	Field-Measured Noise Level	Modeled Noise Level	Future Worst-Hour Noise Level	Impact Type	Noise Increase (Build Vs. Existing)
15	WB	17713 Stevens St., Adelanto	R	B (67)	56.0	-	56.0	N	0
C	EB	16924 Jurassic PL., Victorville	R	B (67)	47.5	-	53.5	N	6
M1C	EB	16982 Manning St., Victorville	R	B (67)	-	-	57.3	N	-
M2C	EB	16988 Jurassic PL., Victorville	R	B (67)	-	-	58.7	N	-
M3C	EB	17092 Jurassic PL., Victorville	R	B (67)	-	-	60.4	N	-
M4C	EB	17139 Jurassic PL., Victorville	R	B (67)	-	-	61.2	N	-
M5C	EB	17047 Jurassic PL., Victorville	R	B (67)	-	-	55.6	N	-
M6C	EB	17103 Jurassic PL., Victorville	R	B (67)	-	-	57.3	N	-

R = Residential

Table 7-7. Traffic Noise Measurements & Modeling Results - Freeway/Expressway Alternative, HDC Expressway

Receiver	Direction	Location	Land Use	Noise Abatement Category	Field-Measured Noise Level	Modeled Noise Level	Future Worst-Hour Noise Level	Impact Type	Noise Increase (Build Vs. Existing)
M23	EB	21330 Waladi Rd, Apple Valley	R	B (67)	-	54.4	54.4	N	0
M24	WB	21522 Papago Rd, Apple Valley	R	B (67)	-	54.4	56.0	N	2
M26	EB	Party Art Pumping Service, Apple Valley	C	E (72)	-	54.4	54.4	N	0
M27	EB	21849 Waalew Rd, Appple Valley	R	B (67)	-	54.4	54.4	N	0
28	EB	16735 Quinnault Rd, Apple Valley	R	B (67)	58.8		58.8	N	0
29	WB	22149 Waalew Rd, Apple Valley	R	B (67)	54.4		54.5	N	0
30	EB	29079 South Rd, Apple Valley	R	B (67)	54.4		56.9	N	3
31	WB	16230 Lakeshore Cove	R	B (67)	57.5		57.5	N	0
32a	WB	16166 Lago Vista Ln.	R	B (67)	53.7		53.7	N	0
33	WB	22789 Cahilla Rd.	R	B (67)	63.3		63.3	N	0
34	WB	23065 Resoto Rd.	R	B (67)	51.5		55.4	N	4
35	WB	15825 Joshua Rd.	R	B (67)	56.2		56.2	N	0
36	EB	23164 Zuni Rd.	R	B (67)	49.2		55.6	N	6
37	WB	23598 Zuni Rd.	R	B (67)	47.4		54.2	N	7
39	EB	23667 Thunderbird Rd.	R	B (67)	42.2		60.1	**E**	18
40	EB	23972 Standing Rock rd	R	B (67)	61.2		61.2	N	0
41	EB	14728 Moccasin Rd.	R	B (67)	46		55.9	N	10
42	EB	23773 Ramona Ave.	R	B (67)	50		57.9	N	8
43	EB	14310 Lynn Rd.	R	B (67)	42.3		54.7	E	12
44	EB	23802 Yucca Loma Rd.	R	B (67)	51.7		51.7	N	0
45	WB	13831 Lynn Rd.	R	B (67)	46.5		52.3	N	6
18-2	WB	Paradise Mobile Home	R	B (67)	48.5		53.1	N	5

R = Residential
C = Commercial

7.2. Preliminary Noise Abatement Analysis

In accordance with 23CFR772, noise abatement is considered where noise impacts are predicted in areas of frequent human use that would benefit from a lowered noise level. Potential noise abatement measures identified in the Protocol include the following:

- Avoiding the impact by using design alternatives, such as altering the horizontal and vertical alignment of the project;
- Constructing noise barriers;
- Acquiring property to serve as a buffer zone;
- Using traffic management measures to regulate types of vehicles and speeds; and
- Acoustically insulating public-use or nonprofit institutional structures.

All of these abatement options have been considered; however, because of the configuration and location of the project, abatement in the form of noise barriers is the only abatement that is considered to be practical.

Each noise barrier has been evaluated for feasibility based on achievable noise reduction. For each noise barrier found to be acoustically feasible, reasonable cost allowances were calculated using the 2011 figure of $71,000 per benefited residence. For any noise barrier to be considered reasonable from a cost perspective, the estimated cost of the noise barrier should be equal to or less than the total cost allowance calculated for the barrier. The cost calculations of the noise barrier should include all items appropriate and necessary for construction of the barrier, such as traffic control, drainage modification, and retaining walls.

Construction cost estimates are not provided in this NSR, but they are presented in the Noise Abatement Decision Report (NADR). The NADR is a design responsibility and is prepared to compile information from the NSR, other relevant environmental studies, and design considerations into a single, comprehensive document before public review of the project. The project engineer prepares the NADR after completion of the NSR and prior to publication of the draft environmental document. Noise abatement measures that are determined feasible and reasonable and likely to be incorporated into the project must be identified before adoption of the CE, FONSI, or ROD.

The purpose and goal of an NADR is to document noise abatement measures to be implemented as part of the proposed project, based on an "overall reasonableness" analysis approach. The overall reasonableness is determined by noise reduction design

goal, cost of abatement, and viewpoints of benefited receptors, including property owners and residents of the benefited receptors. For a sound barrier to be considered reasonable, the 7-dB design goal must be achieved at one or more benefited receptors.

The design of noise barriers presented in this report is preliminary and has been conducted at a level appropriate for environmental review and not for final design of the project. Preliminary information on the physical location, length, range of heights of noise barriers, and cost allowance is provided in this report. If pertinent parameters change substantially during the final project design, preliminary noise barrier designs may be modified or eliminated from the final project. A final decision on the construction of the noise abatement will be made upon completion of the project design.

For acoustically feasible noise abatement measures outside the state ROW (i.e., on the private property line), all owners of property where barriers would be placed must support the proposed abatement measure, location, and material to be used for construction. A permanent easement for the affected property needs to be secured to construct and maintain the soundwall outside the state ROW. Additionally, each property owner must enter into a contract with Caltrans the agreements as listed in the Protocol.

If any noise barrier blocks the view of commercial property to provide sufficient noise reduction to the nearby impacted residents, then an agreement must be reached with the affected residents and the commercial property owner.

The following section discusses the acoustically feasible noise barriers for this project. The considered sound barriers are graphically shown in layouts under Appendix A. In accordance with state and federal policies, noise barriers are not required to reduce noise levels to below the 67-dB threshold (or other NAC). A noise barrier, however, must be acoustically feasible (provide at least 5-dB noise reduction at impacted receivers) and reasonable (7-dB noise reduction to at least one receiver). Soundwalls (8 to 16 feet in height) that did not provide 5- to 7-dB noise reduction have been modeled for additional heights; however, there is a principle of diminishing returns, which means that for these higher walls (18, 20, or up to 30 feet), additional height does not necessarily provide additional noise reduction (but constant).

Table 7-8. Predicted Noise Reduction for Soundwalls on SR-14

Receiver	Predicted Worst-Hour Noise Level dBA - Leq[H]	Soundwall Number(s)	Soundwall Location	8 Ft.		10 Ft.		12 Ft.		14 Ft.		16 Ft.	
				Noise Level (dBA)	Noise Reduc-tion (dBA)	Noise Level (dBA)	Noise Reduc-tion (dBA)	Noise Level (dBA)	Noise Reduc-tion (dBA)	Noise Level (dBA)	Noise Reduc-tion (dBA)	Noise Level (dBA)	Noise Reduc-tion (dBA)
E10	71	SW-105	ES	67	4	**65**	**6**	**64**	**7**	**64**	**7**	**63**	**8**
E1	77	SW-102		73	4	**70**	**7**	**68**	**9**	**67**	**10**	**66**	**11**
E2	63	SW-100		59	4	**58**	**5**	**57**	**6**	**57**	**6**	**56**	**7**
E3	68	SW-102, SW-103		66	2	65	3	**63**	**5**	**62**	**6**	**61**	**7**
E4	69			67	2	66	3	65	4	**63**	**6**	**62**	**7**
E7	67	SW-100, SW-101		**62**	**5**	**61**	**6**	**60**	**7**	**59**	**8**	**58**	**9**
A0	68	SW-104		65	3	64	4	64	4	**63**	**5**	**62**	**6**
A3	70			67	3	66	4	**65**	**5**	**64**	**6**	**63**	**7**

ES= Edge of Shoulder

Note: Soundwall heights that provide 5 dBA or more noise reduction are in bold and yellow shaded

Minimum requirements: 1) 5 dB noise reduction
2) Soundwall must provide at least 7 dB noise reduction at one or more benefited receptors, to be considered reasonable

Freeway stations for feasible soundwalls	
SW-100	3096+00 (ML) To 127+50 (NB Off-Ramp)
SW-101	3126+07 (ML) To 146+00 (Conn A)
SW-102	3121+30 (ML) To 150+70 (SB On-Ramp)
SW-103	3146+80 (ML) To 3156+50 (ML)
SW-104	233+20 To 251+00 (NB Off-Ramp)
SW-105	3290+00 (ML) To 3294+00 (ML)

Table 7-9. Predicted Noise Reduction for Soundwalls on HDC Main Alignment - Segment 1 (Between SR-14 and 100th St.)

Receiver	Predicted Worst-Hour Noise Level dBA - Leq[H]	Soundwall Number(s)	Soundwall Location	8 Ft.		10 Ft.		12 Ft.		14 Ft.		16 Ft.	
				Noise Level (dBA)	Noise Reduc-tion (dBA)	Noise Level (dBA)	Noise Reduc-tion (dBA)	Noise Level (dBA)	Noise Reduc-tion (dBA)	Noise Level (dBA)	Noise Reduc-tion (dBA)	Noise Level (dBA)	Noise Reduc-tion (dBA)
B0	68	SW-109	ES	**63**	**5**	**62**	**6**	**62**	**6**	**62**	**6**	**61**	**7**
BM0	68			**63**	**5**	**62**	**6**	**62**	**6**	**62**	**6**	**61**	**7**
B5	66	SW-107	ES	62	4	**60**	**6**	**60**	**6**	**59**	**7**	**59**	**7**
B6	68	SW-106	PP	65	3	**60**	**8**	**59**	**9**	**58**	**10**	**57**	**11**

ES= Edge of Shoulder

PP= Private Properties

Note: Soundwall heights that provide 5 dBA or more noise reduction are in bold and yellow shaded

Minimum requirements: 1) 5 dB noise reduction
2) Soundwall must provide at least 7 dB noise reduction at one or more benefited receptors, to be considered reasonable

Freeway stations for feasible soundwalls	
SW-109	242+00 (ML) To 267+00 (ML)
SW-107	215+00 (ML) To 249+00 (ML)
SW-106	198+60 (ML) To 208+70 (ML)

Table 7-10. Predicted Noise Reduction for Soundwalls on HDC Main Alignment - Segment 1 (Between SR-14 and 100th St.) Variation A

Receiver	Predicted Worst-Hour Noise Level dBA - Leq[H]	Soundwall Number(s)	Soundwall Location	8 Ft.		10 Ft.		12 Ft.		14 Ft.		16 Ft.	
				Noise Level (dBA)	Noise Reduc-tion (dBA)	Noise Level (dBA)	Noise Reduc-tion (dBA)	Noise Level (dBA)	Noise Reduc-tion (dBA)	Noise Level (dBA)	Noise Reduc-tion (dBA)	Noise Level (dBA)	Noise Reduc-tion (dBA)
B0	71	SW-109	ES	**65**	**6**	**64**	**7**	**64**	**7**	**63**	**8**	**63**	**8**
BM0	71		ES	**66**	**5**	**63**	**8**	**62**	**9**	**61**	**10**	**60**	**11**
B5	67	SW-107	ES	**62**	**5**	**61**	**6**	**59**	**8**	**58**	**9**	**58**	**9**
B6	68	SW-106	PP	65	3	**60**	**8**	**59**	**9**	**58**	**10**	**57**	**11**

ES= Edge of Shoulder

PP= Private Properties

Freeway stations for feasible soundwalls	
SW-109	241+00 (ML) To 269+00 (ML)
SW-107	219+00 (ML) To 249+00 (ML)
SW-106	198+60 (ML) To 208+70 (ML)

Note: Soundwall heights that provide 5 dBA or more noise reduction are in bold and yellow shaded

Minimum requirements: 1) 5 dB noise reduction
2) Soundwall must provide at least 7 dB noise reduction at one or more benefited receptors, to be considered reasonable

Table 7-11. Predicted Noise Reduction for Soundwalls on HDC Main Alignment - Segment 2 (Between 100th St. and LA/SB County Line)

Receiver	Predicted Worst-Hour Noise Level dBA - Leq[H]	Soundwall Number(s)	Soundwall Location	8 Ft.		10 Ft.		12 Ft.		14 Ft.		16 Ft.	
				Noise Level (dBA)	Noise Reduc-tion (dBA)	Noise Level (dBA)	Noise Reduc-tion (dBA)	Noise Level (dBA)	Noise Reduc-tion (dBA)	Noise Level (dBA)	Noise Reduc-tion (dBA)	Noise Level (dBA)	Noise Reduc-tion (dBA)
Site#2	63	SW-111	ES	**58**	**5**	**58**	**5**	**56**	**7**	**56**	**7**	**55**	**8**
Site#3	68	SW-112	ES	65	3	64	4	**62**	**6**	**61**	**7**	**61**	**7**
Site#4	62	SW-113	ES	58	4	**58**	**5**	**56**	**6**	**55**	**7**	**55**	**7**
Site#M4	67		ES	62	5	**62**	**5**	**59**	**8**	**58**	**8**	**58**	**9**
Site#1*	55	SW-110A*	ES	53	2	52	3	51	4	**50**	**5**	**50**	**5**
				18 Ft.		**20 Ft.**							
				49	**6**	**49**	**6**						

ES= Edge of Shoulder

PP= Private Properties

Note: Soundwall heights that provide 5 dBA or more noise reduction are in bold and yellow shaded

Minimum requirements: 1) 5 dB noise reduction
2) Soundwall must provide at least 7 dB noise reduction at one or more benefited receptors, to be considered reasonable

SW-110A*= Soundwall 110A has only one receptor and not provide 7dBA reduction

Freeway stations for feasible soundwalls	
SW-111	982+10 (ML) To 1025+00 (ML)
SW-112	1000+00 (ML) To 1020+00 (ML)
SW-113	1025+00 (ML) To 1070+00 (ML)

Table 7-12. Predicted Noise Reduction for Soundwalls on HDC Main Alignment - Segment 2 (Between 100th St. and LA/SB County Line) Variation D

Receiver	Predicted Worst-Hour Noise Level dBA - Leq[H]	Soundwall Number(s)	Soundwall Location	8 Ft.		10 Ft.		12 Ft.		14 Ft.		16 Ft.	
				Noise Level (dBA)	Noise Reduc-tion (dBA)	Noise Level (dBA)	Noise Reduc-tion (dBA)	Noise Level (dBA)	Noise Reduc-tion (dBA)	Noise Level (dBA)	Noise Reduc-tion (dBA)	Noise Level (dBA)	Noise Reduc-tion (dBA)
Site#2	63	SW-111	ES	**58**	**5**	**58**	**5**	**56**	**7**	**56**	**7**	**55**	**8**
Site#3	68	SW-112	ES	65	3	64	4	**62**	**6**	**61**	**7**	**61**	**7**
Site#4	62	SW-113	ES	58	4	**58**	**5**	**56**	**6**	**55**	**7**	**55**	**7**
Site#M4	67		ES	62	5	**62**	**5**	**59**	**8**	**58**	**8**	**58**	**9**
Site#1*	55	SW-110A*	ES	53	2	52	3	51	4	**50**	**5**	**50**	**5**
				18 Ft.		**20 Ft.**							
				49	**6**	**49**	**6**						

ES= Edge of Shoulder

PP= Private Properties

Note: Soundwall heights that provide 5 dBA or more noise reduction are in bold and yellow shaded

Minimum requirements: 1) 5 dB noise reduction
2) Soundwall must provide at least 7 dB noise reduction at one or more benefited receptors, to be considered reasonable

SW-110A*= Soundwall 110A has only one receptor and not provide 7dBA reduction

Freeway stations for feasible soundwalls	
SW-111	982+10 (ML) To 1025+00 (ML)
SW-112	1000+00 (ML) To 1020+00 (ML)
SW-113	1025+00 (ML) To 1070+00 (ML)

Table 7-13. Predicted Noise Reduction for Soundwalls on HDC Expressway

Receiver	Predicted Worst-Hour Noise Level dBA - Leq[H]	Soundwall Number(s)	Soundwall Location	8 Ft.		10 Ft.		12 Ft.		14 Ft.		16 Ft.	
				Noise Level (dBA)	Noise Reduc-tion (dBA)	Noise Level (dBA)	Noise Reduc-tion (dBA)	Noise Level (dBA)	Noise Reduc-tion (dBA)	Noise Level (dBA)	Noise Reduc-tion (dBA)	Noise Level (dBA)	Noise Reduc-tion (dBA)
Site#39	60	SW-114	ES	**55**	**5**	**55**	**5**	**53**	**7**	**52**	**8**	**51**	**9**
Site#43	55	SW-113A*	ES	54	1	54	1	54	1	52	3	51	4
				18 Ft.		**20 Ft.**							
				50	**5**	**49**	**6**						

ES= Edge of Shoulder

Note: Soundwall heights that provide 5 dBA or more noise reduction are in bold and yellow shaded

Minimum requirements: 1) 5 dB noise reduction
2) Soundwall must provide at least 7 dB noise reduction at one or more benefited receptors, to be considered reasonable

SW-113A*= Soundwall 113A has only one receptor and not provide 7dBA reduction

Freeway stations for feasible soundwalls	
SW-114	1692+00(ML) To 1712+00 (ML)

7.3. Description of Acoustically Feasible Sound Barriers

Alternative 3: Freeway/Expressway Alternative

Northbound SR-14

Soundwalls SW-100 and SW-101 are located at the edge-of-shoulder and would benefit the single-family homes and the Palmdale Learning Plaza School between Avenue S and Palmdale Boulevard, along northbound SR-14. The proposed soundwall SW-100 would replace an existing 12-foot-high soundwall, which would be removed due to the proposed freeway widening. Soundwall SW-100, in combination with SW-101, would attenuate the predicted noise impacts at the school playground. A combination of the two proposed soundwalls would provide up to 9 dBA of noise reduction. The proposed soundwalls were analyzed based on the assumption that they are constructed on retaining walls of the connector and ramp along the northbound side. If the assumption has changed and the proposed connectors and ramps are to be built on piles, all soundwalls in the area would need to be reanalyzed and remodeled.

Soundwall SW-104 is located at the edge-of-shoulder, along northbound SR-14, between the new HDC freeway and 10th Street West. This soundwall would attenuate the noise impact at the residential area represented by Sites A0 and A3. The height of soundwall required meeting the design goals for feasibility and reasonableness is 16 feet. The traffic noise analysis for the area is based on the assumption that all soundwalls are built on retaining walls of connectors and ramps. If the assumption has changed and the proposed connectors and ramps are to be built on piles, all soundwalls in the area would need to be reanalyzed and remodeled.

Southbound SR-14

Soundwalls SW-102 and SW-103 are located at the edge-of-shoulder and would benefit the residential area consisting of single-family homes between Palmdale Boulevard and Avenue S along southbound SR-14. SW-102 would replace the entire existing 12-foot-high soundwall in the area south of Palmdale Boulevard. The existing 12-foot-high soundwall would be removed due to the proposed widening along southbound SR-14 and realignment of the southbound on-ramp from eastbound Palmdale Boulevard. The two proposed soundwalls would provide up to 11 dBA of noise reduction.

Soundwall SW-105 is located at the southbound edge of shoulder between Avenue O and Avenue O-8 W. This soundwall would benefit two residential properties.

Westbound HDC Main Alignment Segment 1

Soundwall SW-106 would benefit the residential area consisting of single-family homes located between Division Street and 3rd Street East. Soundwall SW-106 (ranging from 10 to 16 feet high) would provide noise reduction of 8 to 11 dBA to the residents.

Soundwall SW-109 would benefit the residential area consisting of single-family homes located between 10th Street East and 15th Street East. Soundwall SW-109 (ranging from 8 to 16 feet high) would provide noise reduction of 5 to 7 dBA to the residents.

Eastbound HDC Main Alignment Segment 1

Soundwall SW-107 would benefit the Unity Church located west of 8th Street along the eastbound HDC freeway. Soundwall SW-107 (ranging from 10 to 16 feet high) would provide noise reduction of 6 to 7 dBA to the Unity Church.

Westbound HDC Main Alignment Segment 1 Variation A

Soundwall SW-106 would benefit the residential area consisting of single-family homes located between Division Street and 3rd Street East. Soundwall SW-106 (ranging from 10 to 16 feet high) would provide noise reduction of 8 to 11 dBA to the residents.

Soundwall SW-109 would benefit the residential area consisting of single-family homes located between 10th Street East and 15th Street East. Soundwall SW-109 (ranging from 8 to 16 feet high) would provide noise reduction of 6 to 8 dBA to the residents.

Eastbound HDC Main Alignment Segment 1 Variation A

Soundwall SW-107 would benefit the Unity Church located west of 8th Street along the eastbound HDC freeway. Soundwall SW-107 (ranging from 8 to 16 feet high) would provide noise reduction from 5 to 9 dBA to the Unity Church.

Westbound HDC Main Alignment Segment 2

Soundwall SW-111 would benefit the residential area consisting of two single-family homes located between just east of 140th Street East and 150th Street East. Soundwall SW-111 (ranging from 8 to 16 feet high) would provide noise reduction from 5 to 8 dBA to the residents.

Soundwall SW-113 would benefit the residential area consisting of two single-family homes located between just east of 150th Street East and 160th Street East. Soundwall SW-113 (ranging from 8 to 16 feet high) would provide noise reduction from 5 to 9 dBA to the residents.

Eastbound HDC Main Alignment Segment 2

Soundwall SW-112 would benefit the residential area consisting of a single-family home located between 140th Street and 150th Street. Soundwall SW-112 (ranging from 12 to 16 feet high) would provide noise reduction from 6 to 7 dBA to the residence.

Eastbound HDC Main Alignment Expressway

Soundwall SW-114 would benefit the residential area consisting of a single-family home located between Joshua Road and Standing Rock Road. Soundwall SW-114 (ranging from 12 to 16 feet high) would provide noise reduction from 7 to 9 dBA to the residence.

Table 7-14 Summary of Reasonableness Determination Data for Soundwalls on SR-14: Freeway/Expressway Alternative

Soundwall No.	Design Year (2035) Noise Level dBA Leq(h)	Noise Increase (dBA)	Height (Feet)	Approxi-mate Length (Feet)	Noise Attenu-ation (dBA)	Number of Benefited Receivers	Reasonable Allowance Per Benefited Receiver	Total Reasonable Allowance Per Barrier
SW-100, SW-101	67	0	8	5143	5	1	$71,000	$71,000
			10		6	8	$71,000	$568,000
			12		7	10	$71,000	$710,000
			14		8	14	$71,000	$994,000
			16		9	14	$71,000	$994,000
SW-102, SW-103	77	11	8	3910	4	0	$71,000	$0
			10		7	36	$71,000	$2,556,000
			12		9	62	$71,000	$4,402,000
			14		10	62	$71,000	$4,402,000
			16		11	62	$71,000	$4,402,000
SW-104	70	0	8	1780	3	0	$71,000	$0
			10		4	0	$71,000	$0
			12		5	11	$71,000	$781,000
			14		6	11	$71,000	$781,000
			16		7	11	$71,000	$781,000
SW-105	71	0	8	400	4	0	$71,000	$0
			10		6	2	$71,000	$142,000
			12		7	2	$71,000	$142,000
			14		7	2	$71,000	$142,000
			16		8	2	$71,000	$142,000

Feasibility Requirement: Soundwall must provide at least 5 dB noise reduction at impacted receiver

Reasonableness Requirement: Soundwall must provide at least 7 dB noise reduction at one or more benefited receptors

Table 7-15 Summary of Reasonableness Determination Data for Soundwalls on HDC: Freeway/Expressway Alternative - HDC Main Alignment - Segment 1 (Between SR-14 and 100th St.)

Soundwall No.	Design Year (2035) Noise Level dBA Leq(h)	Noise Increase (dBA)	Height (Feet)	Approxi-mate Length (Feet)	Noise Attenu-ation (dBA)	Number of Benefited Receivers	Reasonable Allowance Per Benefited Receiver	Total Reasonable Allowance Per Barrier
SW-106	69	15	8	1594	3	0	$71,000	$0
			10		8	14	$71,000	$994,000
			12		9	14	$71,000	$994,000
			14		10	14	$71,000	$994,000
			16		11	14	$71,000	$994,000
SW-107	66	18	8	3400	4	0	$71,000	$0
			10		6	1	$71,000	$71,000
			12		6	1	$71,000	$71,000
			14		7	1	$71,000	$71,000
			16		7	1	$71,000	$71,000
SW-109	68	19	8	2500	5	11	$71,000	$781,000
			10		6	11	$71,000	$781,000
			12		6	22	$71,000	$1,562,000
			14		6	22	$71,000	$1,562,000
			16		7	22	$71,000	$1,562,000

Feasibility Requirement: Soundwall must provide at least 5 dB noise reduction at impacted receiver

Reasonableness Requirement: Soundwall must provide at least 7 dB noise reduction at one or more benefited receptors

Table 7-16 Summary of Reasonableness Determination Data for Soundwalls on HDC: Freeway/Expressway Alternative - HDC Main Alignment Segment 1 (Between SR-14 and 100th St.) Variation A

Soundwall No.	Design Year (2035) Noise Level dBA Leq(h)	Noise Increase (dBA)	Height (Feet)	Approxi-mate Length (Feet)	Noise Attenu-ation (dBA)	Number of Benefited Receivers	Reasonable Allowance Per Benefited Receiver	Total Reasonable Allowance Per Barrier
SW-106	68	15	8	1594	3	0	$71,000	$0
			10		8	14	$71,000	$994,000
			12		9	14	$71,000	$994,000
			14		10	14	$71,000	$994,000
			16		11	14	$71,000	$994,000
SW-107	67	19	8	3000	5	1	$71,000	$71,000
			10		6	1	$71,000	$71,000
			12		8	1	$71,000	$71,000
			14		9	1	$71,000	$71,000
			16		9	1	$71,000	$71,000
SW-109	71	22	8	2800	6	11	$71,000	$781,000
			10		7	11	$71,000	$781,000
			12		7	22	$71,000	$1,562,000
			14		8	22	$71,000	$1,562,000
			16		8	22	$71,000	$1,562,000

Feasibility Requirement: Soundwall must provide at least 5 dB noise reduction at impacted receiver

Reasonableness Requirement: Soundwall must provide at least 7 dB noise reduction at one or more benefited receptors

Table 7-17 Summary of Reasonableness Determination Data for Soundwalls on HDC: Freeway/Expressway Alternative - HDC Main Alignment - Segment 2 (Between 100th St. and LA/SB County Line)

Soundwall No.	Design Year (2035) Noise Level dBA Leq(h)	Noise Increase (dBA)	Height (Feet)	Approxi-mate Length (Feet)	Noise Attenu-ation (dBA)	Number of Benefited Receivers	Reasonable Allowance Per Benefited Receiver	Total Reasonable Allowance Per Barrier
SW-111	63	18	8	4290	5	2	$71,000	$142,000
			10		5	2	$71,000	$142,000
			12		7	2	$71,000	$142,000
			14		7	2	$71,000	$142,000
			16		8	2	$71,000	$142,000
SW-112	68	22	8	2000	3	0	$71,000	$0
			10		4	0	$71,000	$0
			12		6	1	$71,000	$71,000
			14		7	1	$71,000	$71,000
			16		7	1	$71,000	$71,000
SW-113	67	21	8	4500	5	1	$71,000	$71,000
			10		5	2	$71,000	$142,000
			12		8	2	$71,000	$142,000
			14		8	2	$71,000	$142,000
			16		9	2	$71,000	$142,000

Feasibility Requirement: Soundwall must provide at least 5 dB noise reduction at impacted receiver

Reasonableness Requirement: Soundwall must provide at least 7 dB noise reduction at one or more benefited receptors

Table 7-18 Summary of Reasonableness Determination Data for Soundwalls on HDC: Freeway/Expressway Alternative - HDC Main Alignment - Segment 2 (Between 100th St. and LA/SB County Line) Variation D

Soundwall No.	Design Year (2035) Noise Level dBA Leq(h)	Noise Increase (dBA)	Height (Feet)	Approxi-mate Length (Feet)	Noise Attenu-ation (dBA)	Number of Benefited Receivers	Reasonable Allowance Per Benefited Receiver	Total Reasonable Allowance Per Barrier
SW-111	63	18	8	4290	5	2	$71,000	$142,000
			10		5	2	$71,000	$142,000
			12		7	2	$71,000	$142,000
			14		7	2	$71,000	$142,000
			16		8	2	$71,000	$142,000
SW-112	68	22	8	2000	3	0	$71,000	$0
			10		4	0	$71,000	$0
			12		6	1	$71,000	$71,000
			14		7	1	$71,000	$71,000
			16		7	1	$71,000	$71,000
SW-113	67	21	8	4500	5	1	$71,000	$71,000
			10		5	2	$71,000	$142,000
			12		8	2	$71,000	$142,000
			14		8	2	$71,000	$142,000
			16		9	2	$71,000	$142,000

Feasibility Requirement: Soundwall must provide at least 5 dB noise reduction at impacted receiver

Reasonableness Requirement: Soundwall must provide at least 7 dB noise reduction at one or more benefited receptors

Table 7-19 Summary of Reasonableness Determination Data for Soundwalls on HDC: Freeway/Expressway Alternative - Main Alignment (Expressway)

Soundwall No.	Design Year (2035) Noise Level dBA Leq(h)	Noise Increase (dBA)	Height (Feet)	Approxi-mate Length (Feet)	Noise Attenu-ation (dBA)	Number of Benefited Receivers	Reasonable Allowance Per Benefited Receiver	Total Reasonable Allowance Per Barrier
SW-114	63	17	8	2000	4	0	$71,000	$0
			10		4	0	$71,000	$0
			12		7	1	$71,000	$71,000
			14		8	1	$71,000	$71,000
			16		9	1	$71,000	$71,000

Feasibility Requirement: Soundwall must provide at least 5 dB noise reduction at impacted receiver

Reasonableness Requirement: Soundwall must provide at least 7 dB noise reduction at one or more benefited receptors

7.4. Future High-Speed Rail Noise Environment and Impacts

Per methodology discussed in Section 5.5, future HSR operation noise levels were predicted following FRA guidelines and procedures as set forth in the FRA High-Speed Ground Transportation Noise and Vibration Impact Assessment manual.

As shown in Tables 7-20 through 7-24, results of the train noise analysis indicate that there would be no impact expected as a result of the high-speed train operation along segments where the HSR would co-exist with the freeway under the alternatives with the HSR component. Results also indicated that the train noise contribution to the overall project noise levels would be insignificant throughout the entire project corridor. The primary reason that the HSR operation noise is not anticipated to have a significant effect on the overall noise level is due to the continuous dominant noise effect of freeway vehicular traffic, compared to the relatively infrequent HSR operations. When the acoustical energy of the relatively low train noise is combined with that of the much higher vehicular traffic noise, the effect of the train noise component on the overall noise is mostly negligible. The traffic noise component is the more dominant noise source. In addition, there are no other noise sources associated with the HSR system found to be potentially affecting the overall noise environment.

Tables 7-20 through 7-24 present the results of the train noise impact analysis, as well as the combined project noise effects along the segment where HSR and freeway/ expressway co-exist. As shown in the tables, the increase in future noise levels as a result of the train operations is negligible. It is also shown that all potential project impacts are due to the traffic noise generated by the freeway component of the project. Therefore, all abatement measures considered for the highway noise discussed above would be valid for the overall project impact as well.

7.5. Future High-Speed Rail Vibration and Impacts

Per methodology discussed in Section 5.6, future HSR operation vibration levels were assessed following FRA guidelines and procedures as set forth in the FRA High-Speed Ground Transportation Noise and Vibration Impact Assessment manual. The ground vibration related to the HSR pass-bys were estimated and assessed at locations of various distances from the track centerline. The distance from the track centerline to the vibration impact line for each of the FRA land-use categories is summarized below.

As shown below, the FRA limits for ground-borne vibration related to train pass-by for this project would be 65, 75, and 78 VdB for Categories 1, 2, and 3 land uses,

respectively. Assuming that the HSR would be operating at a maximum operating speed of 125 mph throughout the entire length of the project corridor for worst-case analysis, unless there are Category 1 land uses located within 300 feet of the nearest track centerline, Category 2 land uses (i.e., homes) located within 100 feet of the track centerline, or Category 3 land uses (i.e., institutional land uses with primarily daytime use) located within 75 feet of the nearest track centerline, there would be no anticipated vibration impact due to HSR operation.

FRA Land-Use Category	Groundborne Vibration Impact Levels (dB ref. 1 micro-inch/sec)	Distance to Impact Level Line, ft
Category 1: Buildings where low ambient vibration is essential for interior operations.	65 VdB	300
Category 2: Residences and buildings where people normally sleep.	75 VdB	100
Category 3: Institutional land uses with primarily daytime use.	78 VdB	75

Category 1 land uses are for buildings where low ambient vibration is essential for interior operations. The Air Force Plant 42 facilities located near the project corridor in Palmdale would be considered Category 1 to account for the vibration-sensitive operations inside the buildings. The nearest Air Force Plant 42 building is estimated to be approximately 700 feet from the nearest track centerline. Thus, no impact at Air Force Plant 42 is anticipated. The estimated vibration level at Air Force Plant 42 would be approximately 53 VdB. In fact, no vibration impact is expected to occur along the entire length of the project corridor as a result of the HSR operation.

Table 7-20. Predicted Train and Overall Noise Levels - HDC Freeway/Expressway Alternative with HSR - Main Alignment Segment 1 (Between SR-14 and 100th St.)

Receiver	Direction	Location	Land Use	FHWA Noise Abatement Criteria (dBA)	Existing Noise Level. dBA	TRAFFIC NOISE		TRAIN NOISE			TRAFFIC + TRAIN NOISE	
						Future Worst-Hour Traffic Noise Level, Leq, dBA	FHWA/ Caltrans Impact Type (Appoach/ Exceed, Substantial)	Future Peak Hour Train Noise Level, Leq, dBA	FRA Noise Impact Criteria (Moderate/ Severe), dBA	FRA Train Noise impact Type (None, Moderate, Severe)	Future Peak Hour Overall Project Noise Level, Leq, dBA	Increase of Future Noise Level Due to Train Operations
B0	WB	1018 E. Ave. P5, Palmdale	R	B (67)	49	68	A/E	47	58 / 64	None	68	0
BM0	WB	1045 E. Ave. P5, Palmdale	R	B (67)	49	68	A/E	49	58 / 64	None	68	0
B1	EB	38902 25th St., Palmdale	R	B (67)	58	60	None	40	62 / 67	None	60	0
B5	EB	39149 8th St., Palmdale	CH	B (67)	48	66	A/E	43	58 / 64	None	66	0
B6	WB	39315 Carolside Ave., Palmdale	R	B (67)	53	68	A/E	37	59 / 65	None	68	0

Land Use:
R = Residential
CH = Church

Table 7-21. Predicted Train and Overall Noise Levels - HDC Freeway/Expressway Alternative with HSR - Main Alignment Segment 2 (Between 100th St. and LA/SB County Line)

Receiver	Direction	Location	Land Use	FHWA Noise Abatement Criteria (dBA)	Existing Noise Level. dBA	TRAFFIC NOISE		TRAIN NOISE			TRAFFIC + TRAIN NOISE	
						Future Worst-Hour Traffic Noise Level, Leq, dBA	FHWA/ Caltrans Impact Type (Appoach/ Exceed, Substantial)	Future Peak Hour Train Noise Level, Leq, dBA	FRA Noise Impact Criteria (Moderate/ Severe), dBA	FRA Train Noise impact Type (None, Moderate, Severe)	Future Peak Hour Overall Project Noise Level, Leq, dBA	Increase of Future Noise Level Due to Train Operations
1	EB	13400 E Ave R, Palmdale	R	B (67)	44	55	A/E	41	57 / 64	None	55	0
2	WB	14660 E Palmdale Blvd., Palmdale	R	B (67)	45	63	S	46	57 / 64	None	63	0
3	EB	14745 E Ave Q14, Palmdale	R	B (67)	46	68	A/E	49	57 / 64	None	68	0
4	WB	15366 Palmdale Blvd., Palmdale	R	B (67)	46	62	S	45	57 / 64	None	62	0
M4	WB	15616 E Palmdale Blvd, Palmdale	R	B (67)	46	67	A/E	49	57 / 64	None	67	0
9	WB	20150 Palmdale Blvd., Lancaster	R	B (67)	55	59	None	46	60 / 66	None	59	0
M9	WB	38250 200th St. E, Lancaster	R	B (67)	55	63	None	46	60 / 66	None	63	0
10	EB	20539 Ave R, Palmdale	R	B (67)	57	57	None	42	61 / 67	None	57	0
M10	EB	20847 Ave R, Palmdale	R	B (67)	57	58	None	44	61 / 67	None	58	0
M11	WB	22210 E Palmdale Blvd., +C54Lake Los Angeles	R	B (67)	55	62	None	45	60 / 66	None	62	0

Land Use:
R = Residential

Table 7-22. Predicted Train and Overall Noise Levels - HDC Freeway/Expressway Alternative with HSR - Main Alignment Segment 2 (Between 100th St. and LA/SB County Line), Variation D

Receiver	Direction	Location	Land Use	FHWA Noise Abatement Criteria (dBA)	Existing Noise Level. dBA	TRAFFIC NOISE		TRAIN NOISE			TRAFFIC + TRAIN NOISE	
						Future Worst-Hour Traffic Noise Level, Leq, dBA	FHWA/ Caltrans Impact Type (Appoach/ Exceed, Substantial)	Future Peak Hour Train Noise Level, Leq, dBA	FRA Noise Impact Criteria (Moderate/ Severe), dBA	FRA Train Noise impact Type (None, Moderate, Severe)	Future Peak Hour Overall Project Noise Level, Leq, dBA	Increase of Future Noise Level Due to Train Operations
10	WB	20539 Ave R, Palmdale	R	B (67)	57	65	None	47	61 / 67	None	65	0
M10	WB	20847 Ave R, Palmdale	R	B (67)	57	60	None	44	61 / 67	None	60	0

Land Use:
R = Residential

Table 7-12. Predicted Train and Overall Noise Levels - HDC Freeway/Expressway Alternative with HSR - Main Alignment Segment 3

Receiver	Direction	Location	Land Use	FHWA Noise Abatement Criteria (dBA)	Existing Noise Level. dBA	TRAFFIC NOISE		TRAIN NOISE			TRAFFIC + TRAIN NOISE	
						Future Worst-Hour Traffic Noise Level, Leq, dBA	FHWA/ Caltrans Impact Type (Appoach/ Exceed, Substantial)	Future Peak Hour Train Noise Level, Leq, dBA	FRA Noise Impact Criteria (Moderate/ Severe), dBA	FRA Train Noise impact Type (None, Moderate, Severe)	Future Peak Hour Overall Project Noise Level, Leq, dBA	Increase of Future Noise Level Due to Train Operations
15		17713 Stevens St., Adelanto	R	B (67)	56	56	None	42	61 / 67	None	56	0
16		11301 Air Expressway, Adlanto	R	B (67)	52	63	None	47	59 / 65	None	63	0
M1-17		Richardson Park, Adelanto	R	B (67)	57	58	None	40	61 / 69	None	58	0
M2-17	WB	Adelanto School District Office	C	E (72)	56	56	None	41	61 / 67	None	56	0
18	EB	12200 Hibiscus Rd., Adelanto	R	B (67)	59	60	None	44	62 / 68	None	60	0
19		15059 Turner Rd. , Victorville	R	B (67)	49	58	None	47	58 / 65	None	59	1
20		18003 Westwind Rd., Victorville	G	B (67)	64	64	None	44	65 / 70	None	64	0
20a	WB	Rockview Park, Victorville	P	B (67)	42	52	None	49	57 / 62	None	53	1
21		17442 D St., Victorville	R	B (67)	63	63	None	49	65 / 70	None	63	0
22e		17284 Dante St., Victorville	R	B (67)	48	59	None	43	58 / 64	None	59	0
M22e	EB	Near 17284 Dante St. Victorville	R	B (67)	57	59	None	44	61 / 67	None	59	0

Land Use:
R = Residential
C = Commercial
P = Park
G = Golf Course

Table 7-24. Predicted Train and Overall Noise Levels - HDC Freeway/Expressway Alternative with HSR - Main Alignment Segment 3, Variation E

Receiver	Direction	Location	Land Use	FHWA Noise Abatement Criteria (dBA)	Existing Noise Level. dBA	TRAFFIC NOISE		TRAIN NOISE			TRAFFIC + TRAIN NOISE	
						Future Worst-Hour Traffic Noise Level, Leq, dBA	FHWA/ Caltrans Impact Type (Appoach/ Exceed, Substantial)	Future Peak Hour Train Noise Level, Leq, dBA	FRA Noise Impact Criteria (Moderate/ Severe), dBA	FRA Train Noise impact Type (None, Moderate, Severe)	Future Peak Hour Overall Project Noise Level, Leq, dBA	Increase of Future Noise Level Due to Train Operations
C	EB	16924 Jurassic Pl., Victorville	R	B (67)	48	54	None	47	58 / 64	None	54	0
M1C	EB	16982 Manning St., Victorville	R	B (67)	48	57	None	52	58 / 64	None	58	1
M2C	EB	16988 Jurassic PL, Victorville	R	B (67)	48	59	None	42	58 / 64	None	59	0
M3C	EB	17092 Jurassic PL, Victorville	R	B (67)	48	60	None	40	58 / 64	None	60	0
M4C	EB	17139 Jurassic PL., Victorville	R	B (67)	48	61	None	39	58 / 64	None	61	0
M5C	EB	17047 Jurassic PL, Victorville	R	B (67)	48	56	None	42	58 / 64	None	56	0
M6C	EB	17103 Jurassic PL, Victorville	R	B (67)	48	57	None	40	58 / 64	None	57	0

Land Use:
R = Residential

Chapter 8. Construction Noise

23 CFR 772 requires that construction noise impacts be identified, but it does not specify specific methods or abatement criteria for evaluating construction noise; however, the FHWA Roadway Construction Noise Model (FHWA 2006) can be used to determine if construction would result in adverse construction noise impacts on land uses or activities in the project area.

During the construction phases of the project, noise from construction activities may intermittently dominate the noise environment in the immediate area of construction. Construction noise is regulated by Caltrans standard specifications, Section 7-1.01I, Sound Control Requirements. These requirements state that noise levels generated during construction shall comply with applicable local, state, and federal regulations.

Figure 8-1 summarizes typical noise levels produced by construction equipment commonly used on roadway construction projects. As indicated, equipment involved in construction is expected to generate noise levels ranging from 70 to 90 dBA at a distance of 50 feet. Noise produced by construction equipment would be reduced over distance at a rate of approximately 6 dBA per doubling of distance. Normally, construction noise levels should not exceed 86 dBA (L_{max}) at a distance of 50 feet. No adverse noise impacts from construction are anticipated because construction would be conducted in accordance with Caltrans standard specifications and would be short-term, intermittent, and dominated by local traffic noise. Implementing the following measures would minimize temporary construction noise impacts:

1. Equipment noise control is needed to reduce the noise emissions from construction sites by mandating specified noise levels for design of new equipment and updating old equipment with new noise control devices and techniques presented below:
    - Mufflers are very effective devices that reduce the noise emanating from the intake or exhaust of an engine, compressor, or pump. The fitting of effective mufflers on all new equipment and retrofitting of mufflers on existing equipment is necessary to yield an immediate noise reduction at all types of road construction sites.
    - Sealed and lubricated tracks for crawler-mounted equipment will lessen the sound radiated from the track assembly resulting from metal to soil and metal to metal contact. Contractors, site engineers, and inspectors should ensure

that the tracks are kept in excellent condition by periodic maintenance and lubrication.

- Lowering exhaust pipe exit height closer to the ground can result in an offsite noise reduction. Barriers are more effective in attenuating noise when the noise source is closer to ground level.
- General noise control technology can have substantially quieter construction equipment when manufacturers apply state-of-the-art technology to new equipment or repair old equipment to maintain original equipment noise levels.

2. In-use site noise control is necessary to prevent existing equipment from producing noise levels in excess of specified limits. Any equipment that produces noise levels less than the specified limits would not be affected; however, those exceeding the limit would be required to meet compliance by repair, retrofit, or replacement. New equipment with the latest noise sensitive components and noise control devices are generally quieter than older equipment, if properly maintained and inspected regularly. They should be repaired or replaced if necessary to maintain the in-use noise limit. All equipment applying the in-use noise limit would achieve an immediate noise reduction if properly enforced.

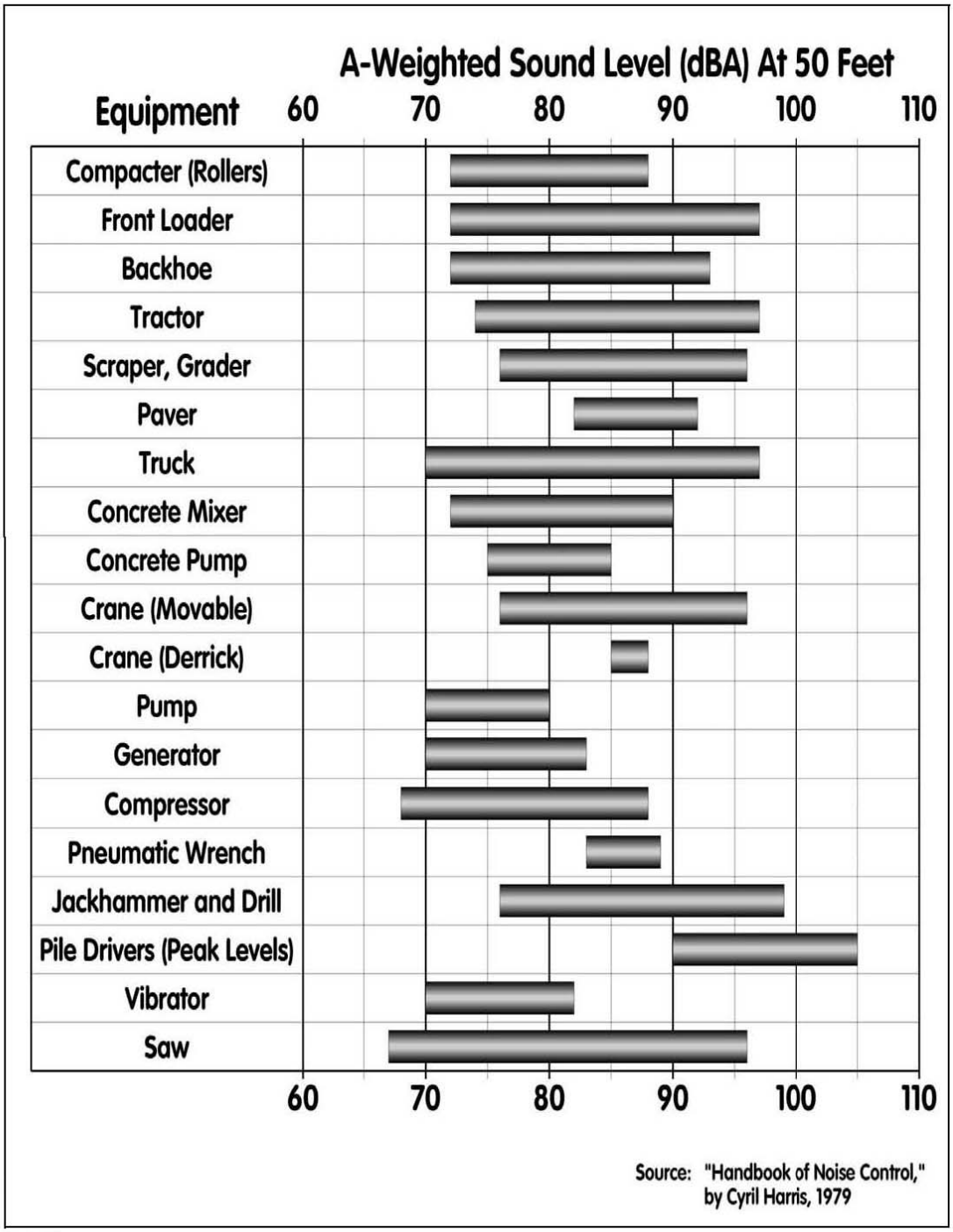
3. Site restrictions should be applied to achieve noise reduction through multiple methods that result in an immediate reduction of noise emitted to the community without requiring any modification to the source noise emissions. The methods include shielding with barriers for equipment and site, truck rerouting and traffic control, time scheduling, and equipment relocation. The effectiveness of each method depends on the type of construction involved and the site characteristics.
   - Shielding with barriers should be implemented at an early stage of a project to reduce construction equipment noise. The placement of barriers must be carefully considered to reduce limitation of site access. Barriers may be natural or man-made, such as excess land fill used as a temporary berm strategically placed to act as a barrier.
   - Efficient rerouting of trucks and control of traffic activity on construction site will reduce noise due to vehicle idling, gear shifting, and accelerating under load. Planning proper traffic control will result in efficient workflow and reduce noise levels. In addition, rerouting trucks does not reduce noise levels but transfers noise to other areas that are less sensitive to noise.
   - Time scheduling of activities should be implemented to minimize noise impact on exposed areas. Local activity patterns and surrounding land uses

must be considered in establishing site curfews; however, limiting working hours can decrease productivity. Sequencing the use of equipment with relatively low noise levels versus equipment with relatively high noise levels during noise sensitive periods is an effective noise control measure.

- Equipment location should be as far from noise sensitive land use areas as possible. The contractor should substitute quieter equipment or use quieter construction processes at or near noise sensitive areas.

4. Educate contractors and their employees to be sensitive to noise impact problems and noise control methods. This may be one of the most cost-effective ways to help operators and supervisors become more aware of the construction site noise problem and to implement the various methods of improving the conditions. A training program for equipment operators is recommended to instruct them in methods of operating their equipment to minimize environmental noise. Many training programs are presently given on the subject of job safety. This can be extended to include the impact due to noise and methods of abatement.

Figure 8-1. Construction Equipment Noise Levels



Chapter 9. References

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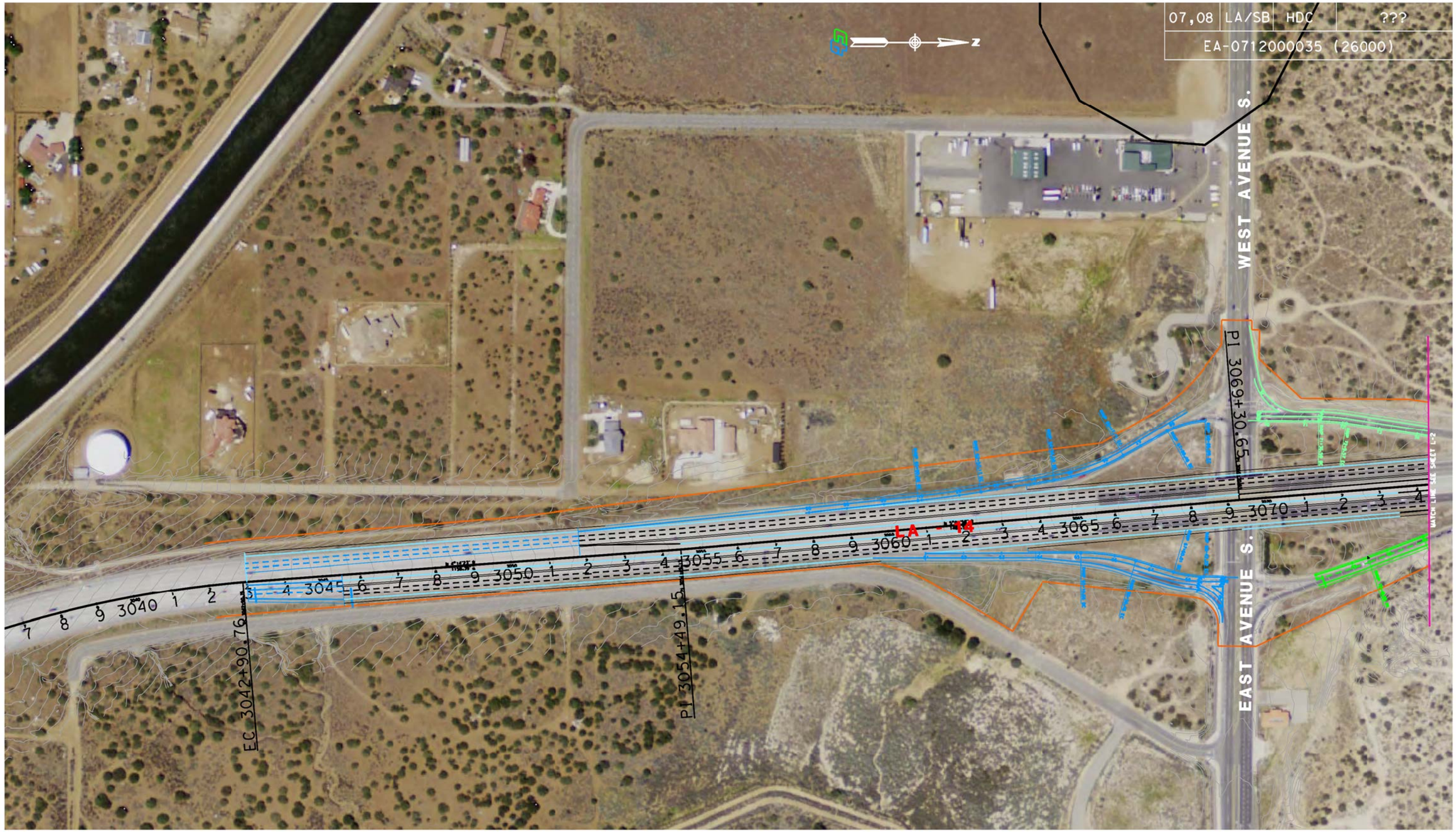
Appendix A

Noise Sensitive Receptor and Barrier Location



LEGEND

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- 24 HOURS NOISE SITE
- MODELED SITE

SFR - SINGLE FAMILY RESIDENCE
MFR - MULTI-FAMILY RESIDENCE
COMM - COMMERCIAL

- PROPOSED SOUNDWALL
- PRIVATE WALL

NOT TO SCALE

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FIGURE 1

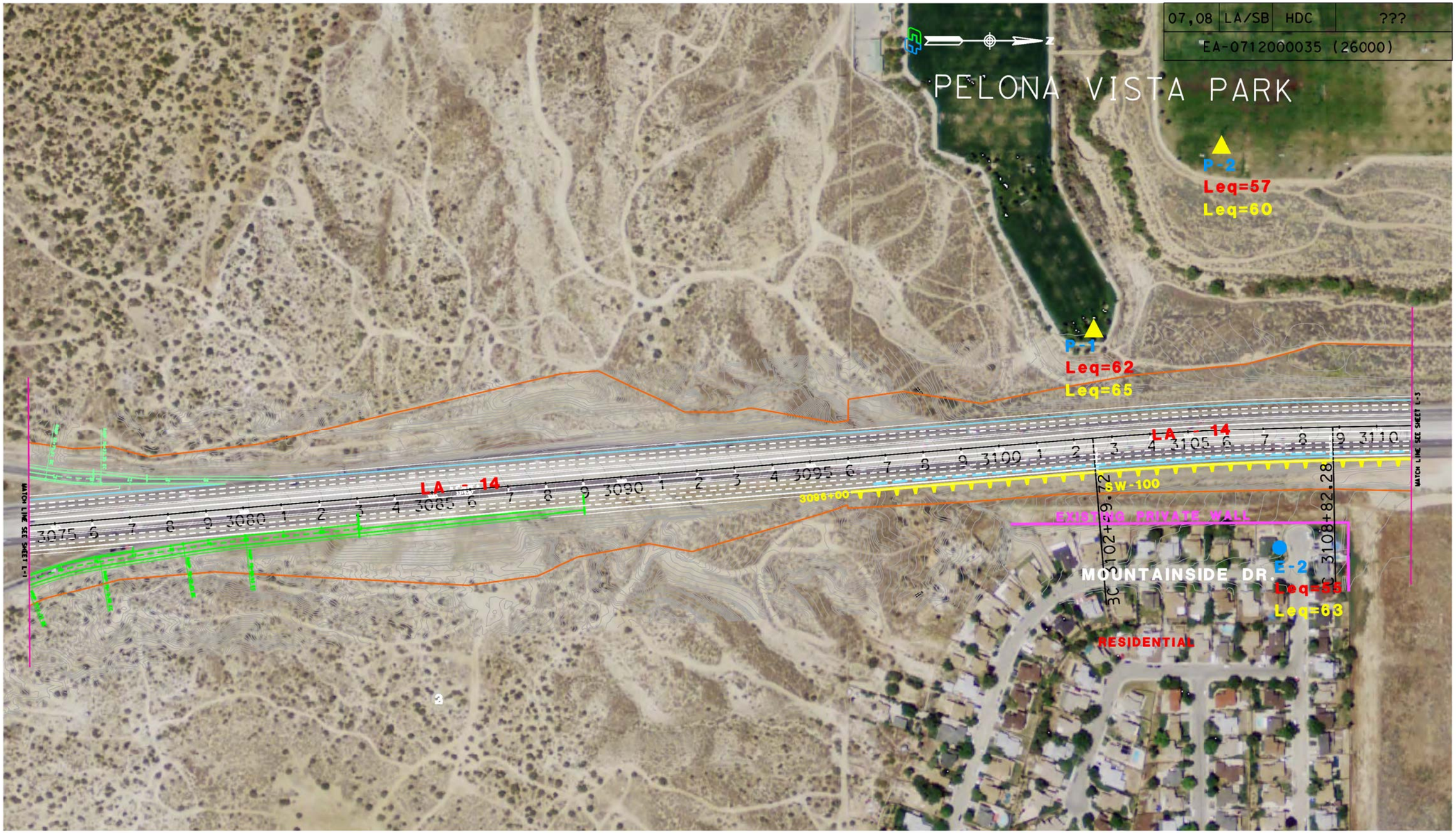

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FIGURE 2

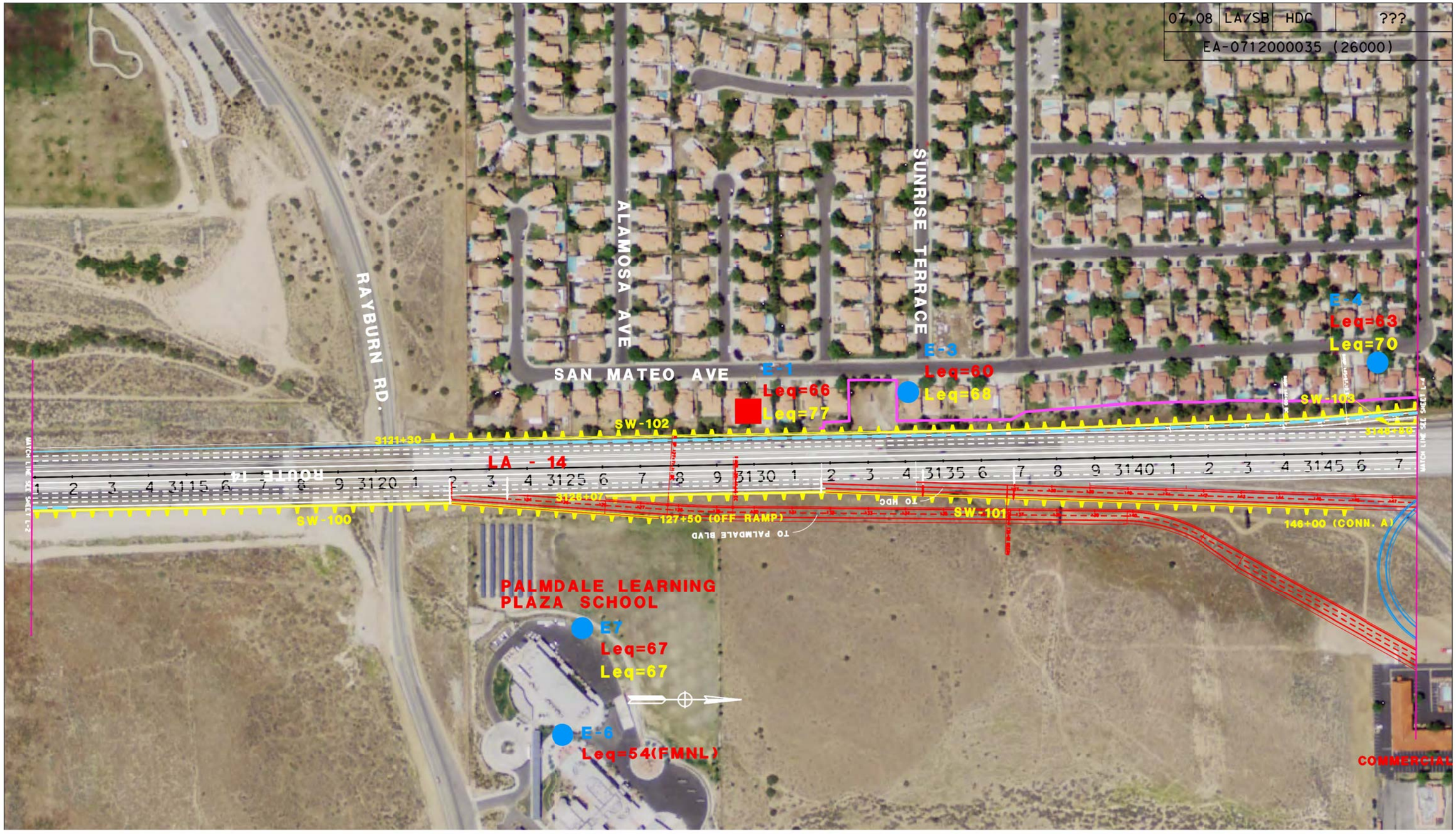

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FIGURE 3

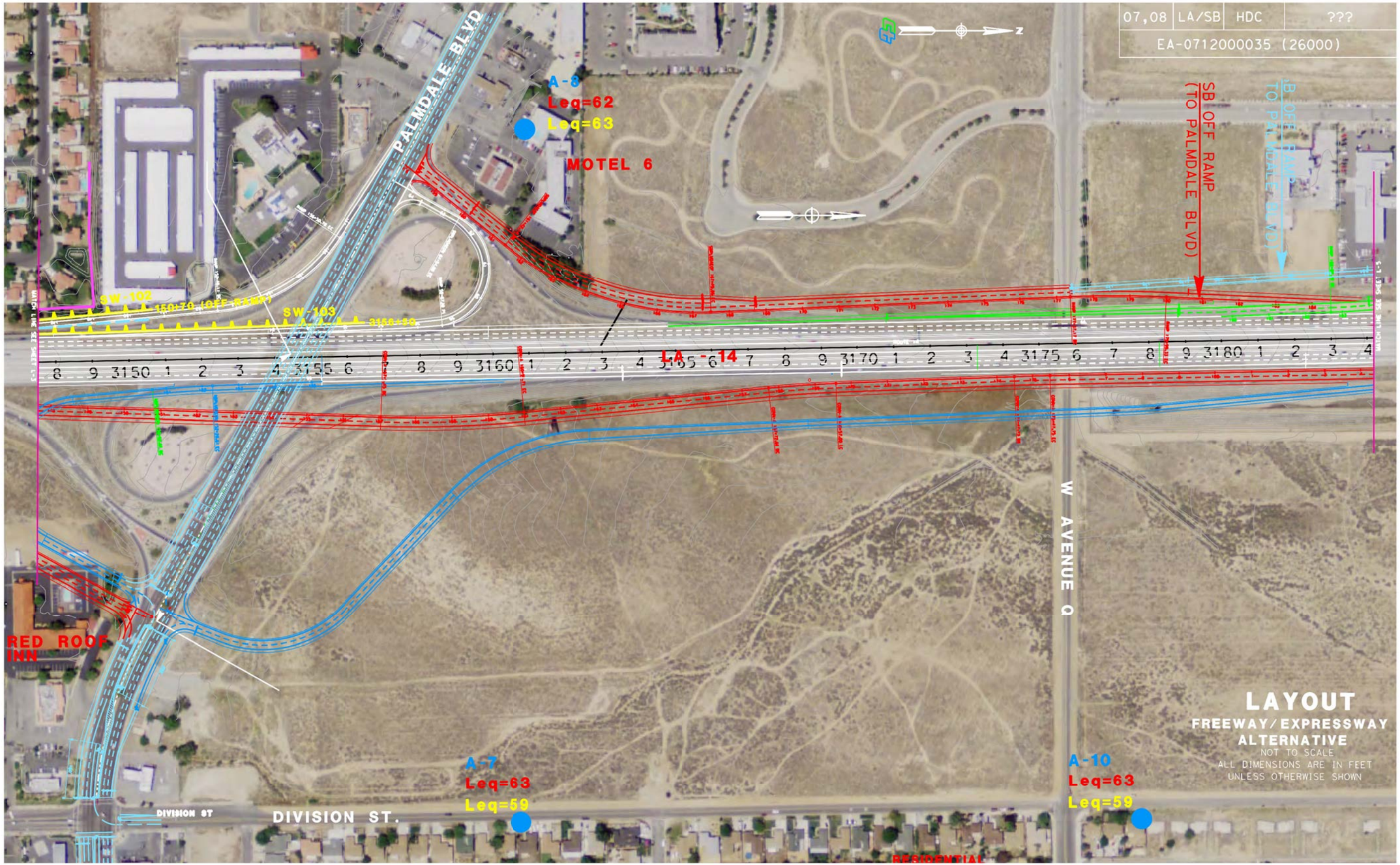

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FIGURE 4

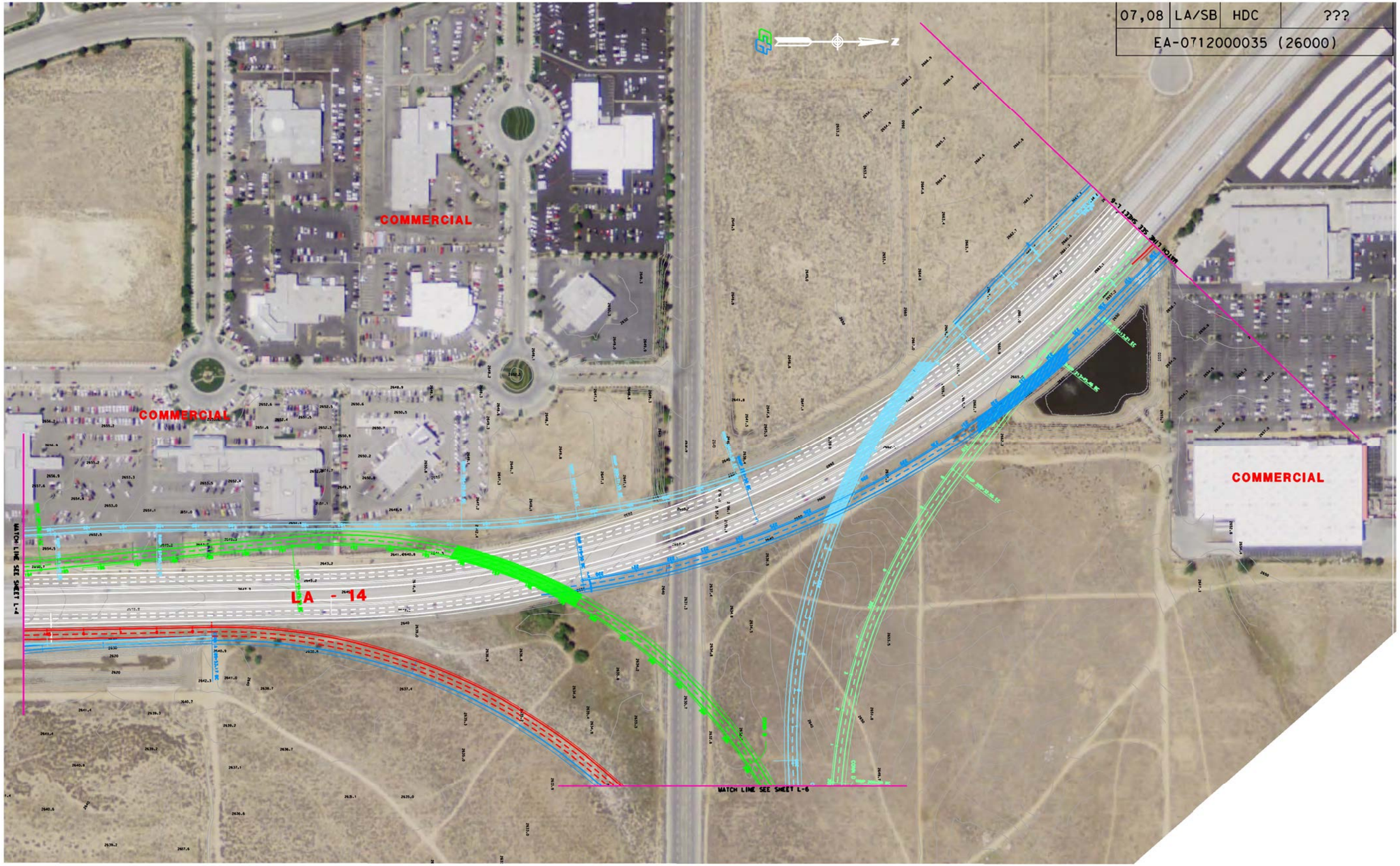

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FIGURE 5

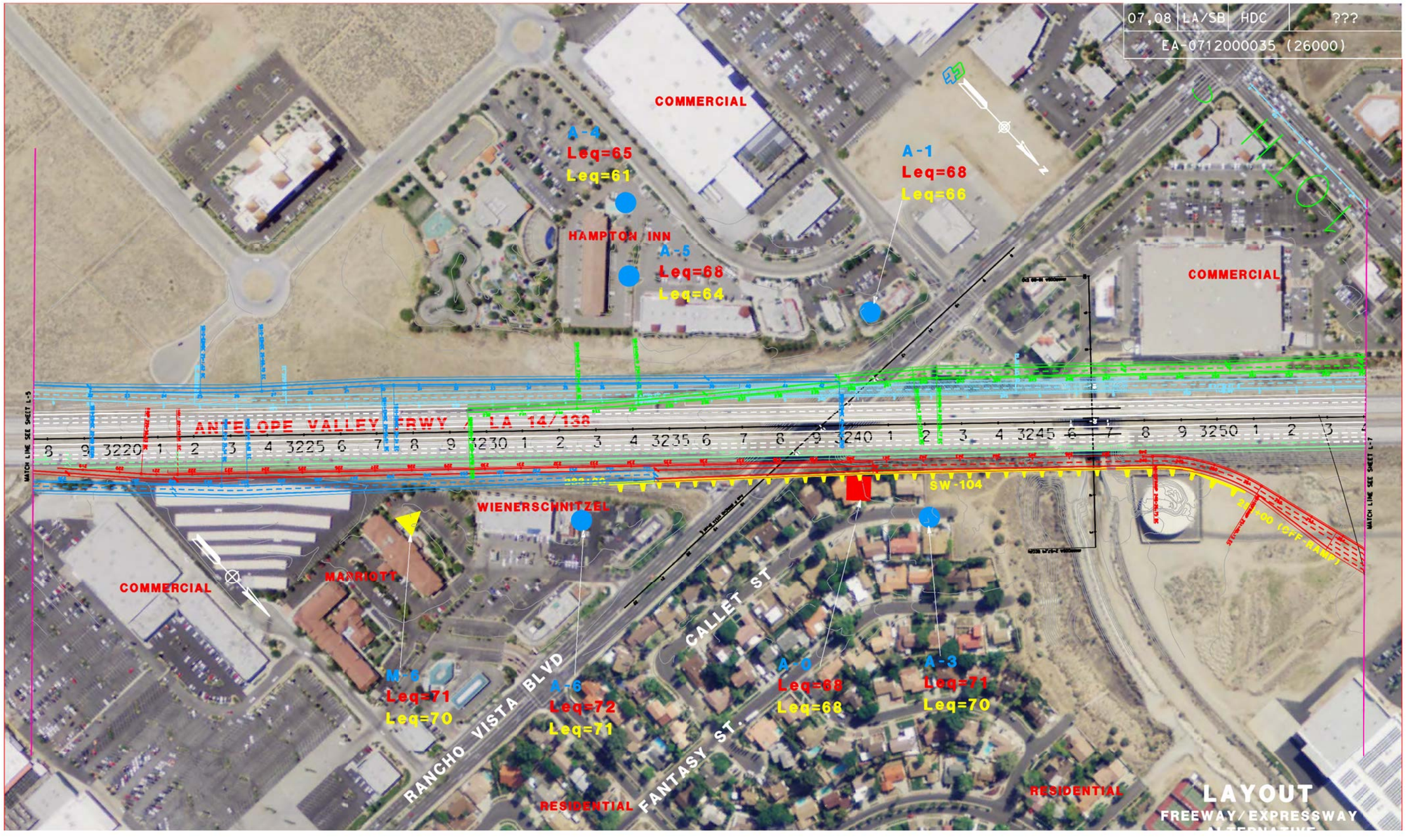

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FIGURE 6

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FIGURE 7

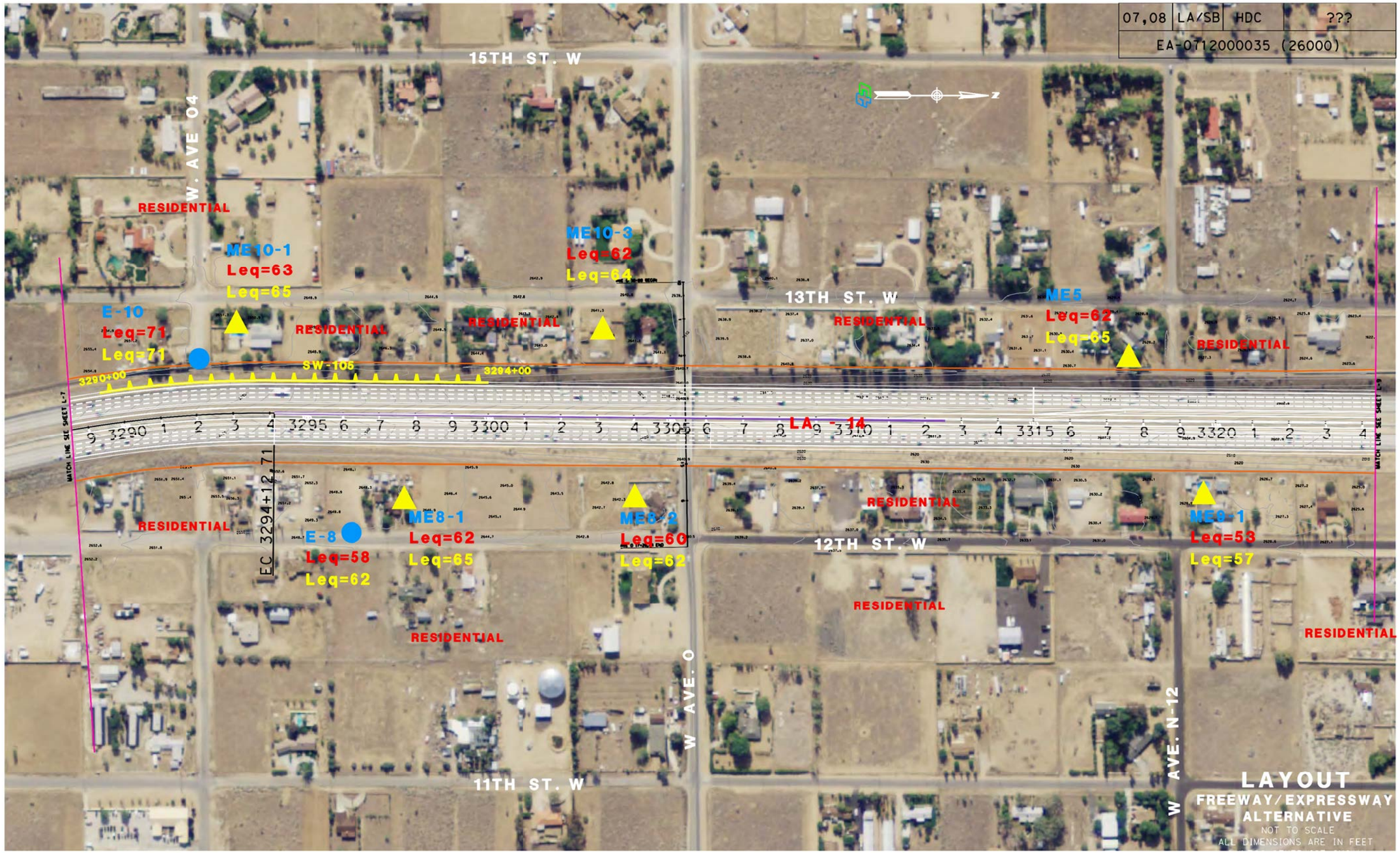

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FIGURE 8

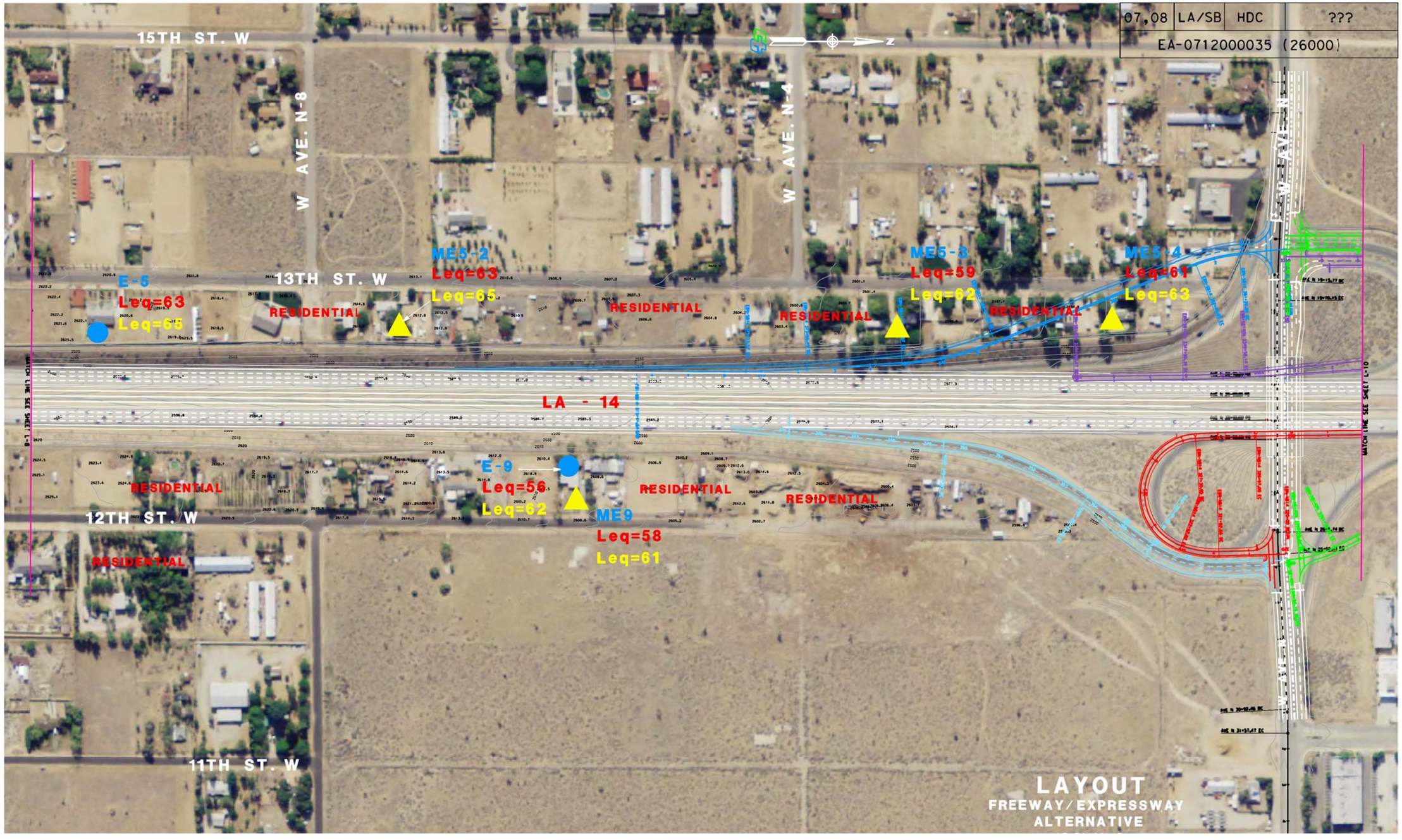

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FIGURE 9

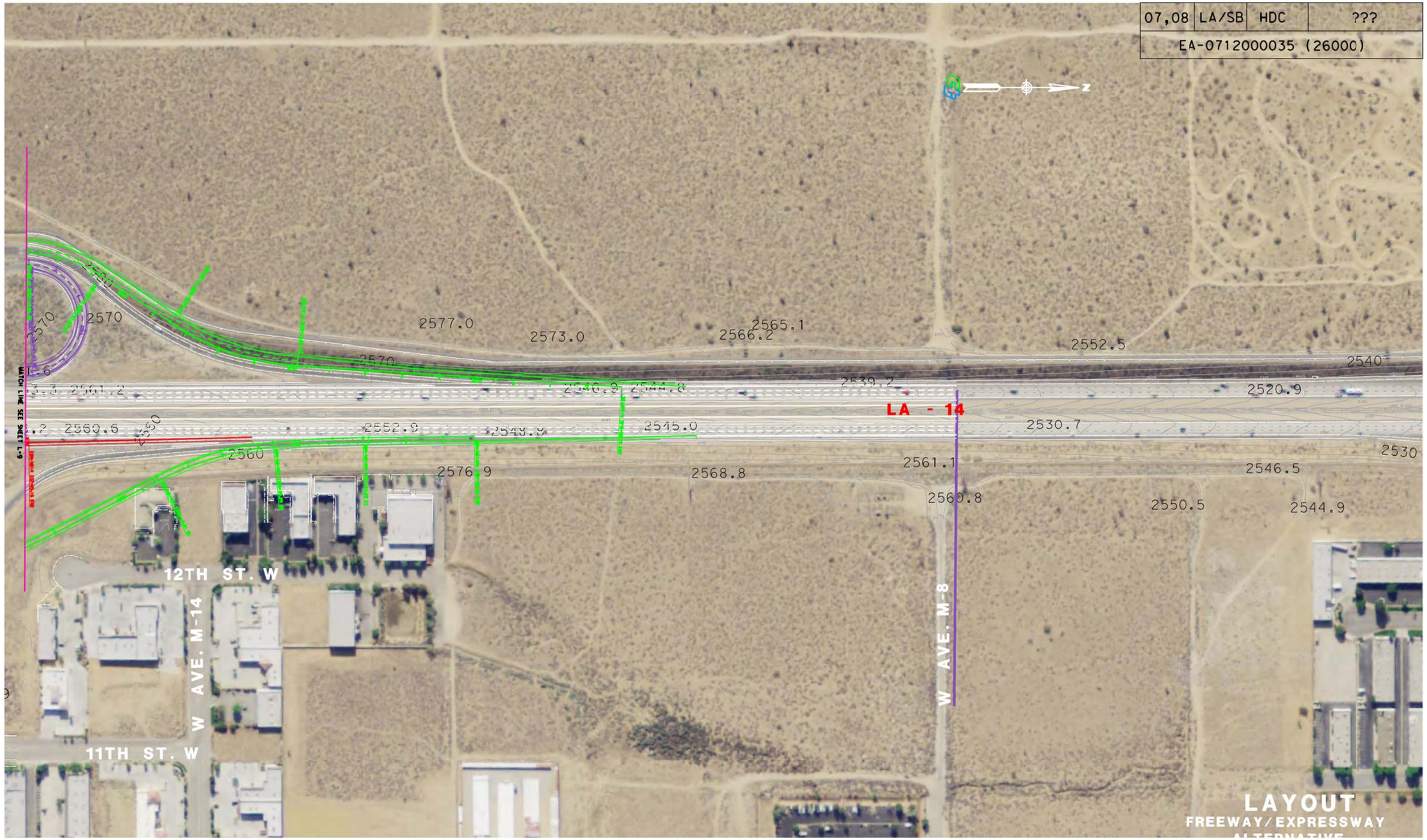

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FIGURE 10

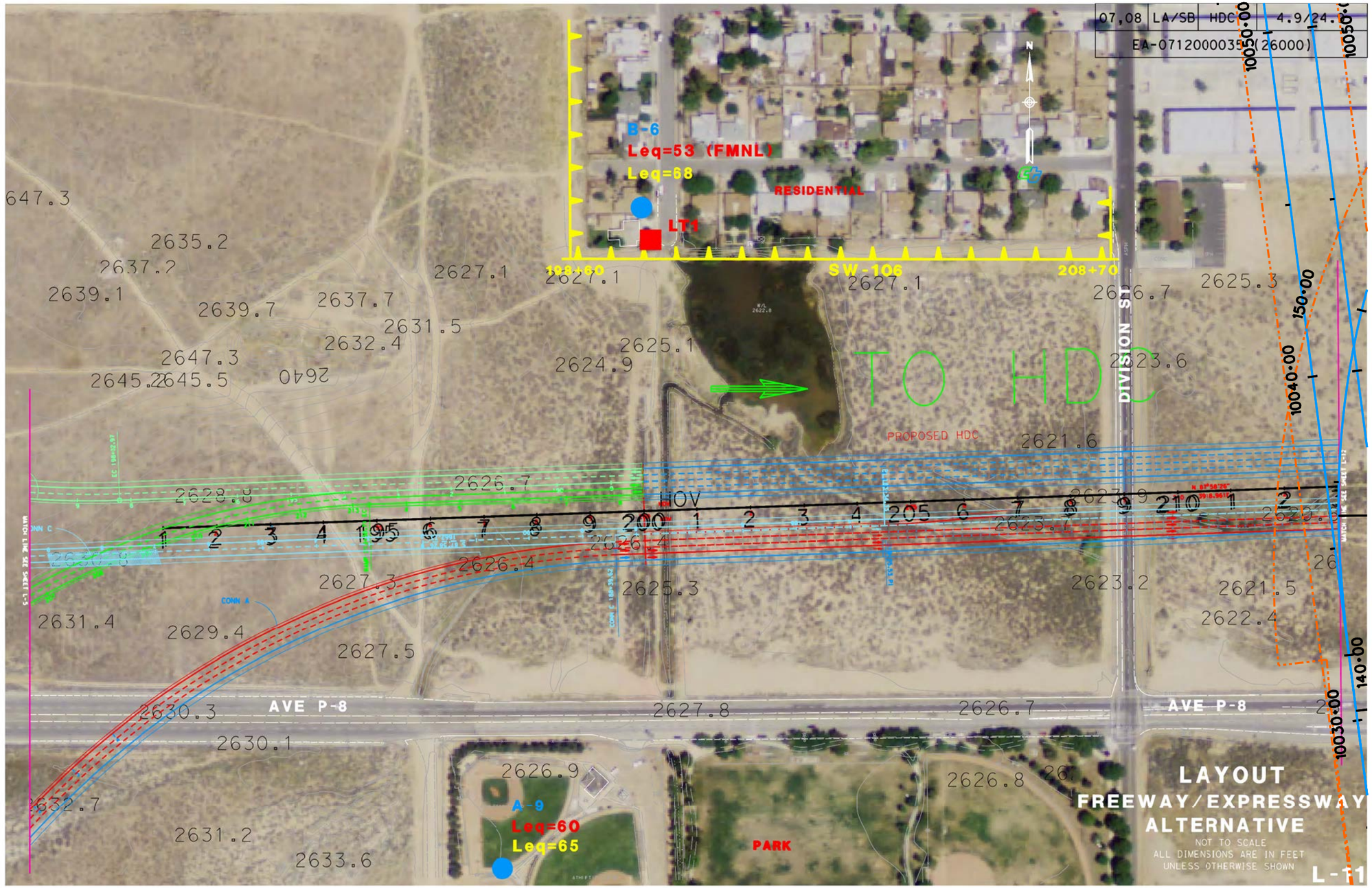

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FIGURE 11

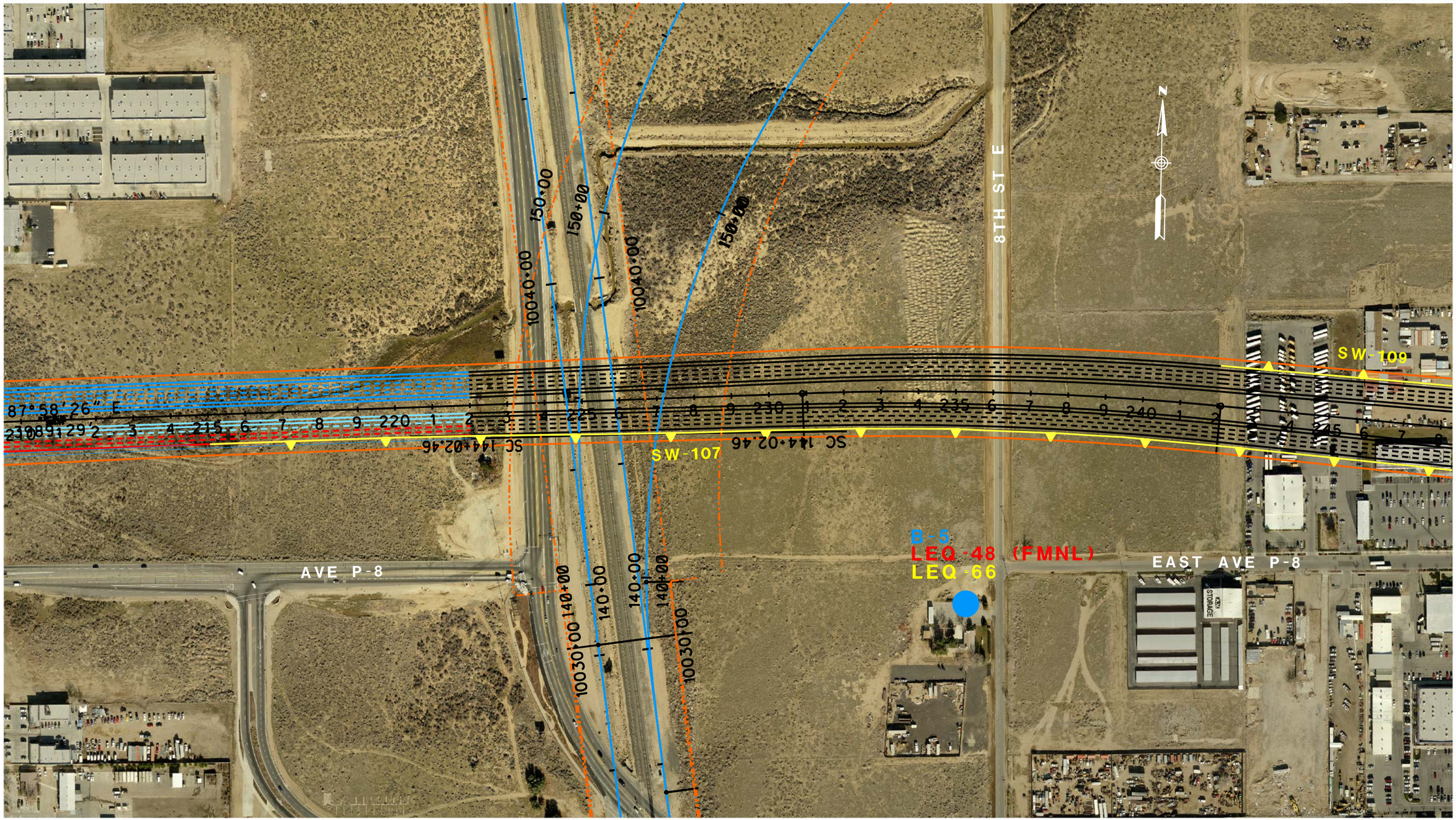

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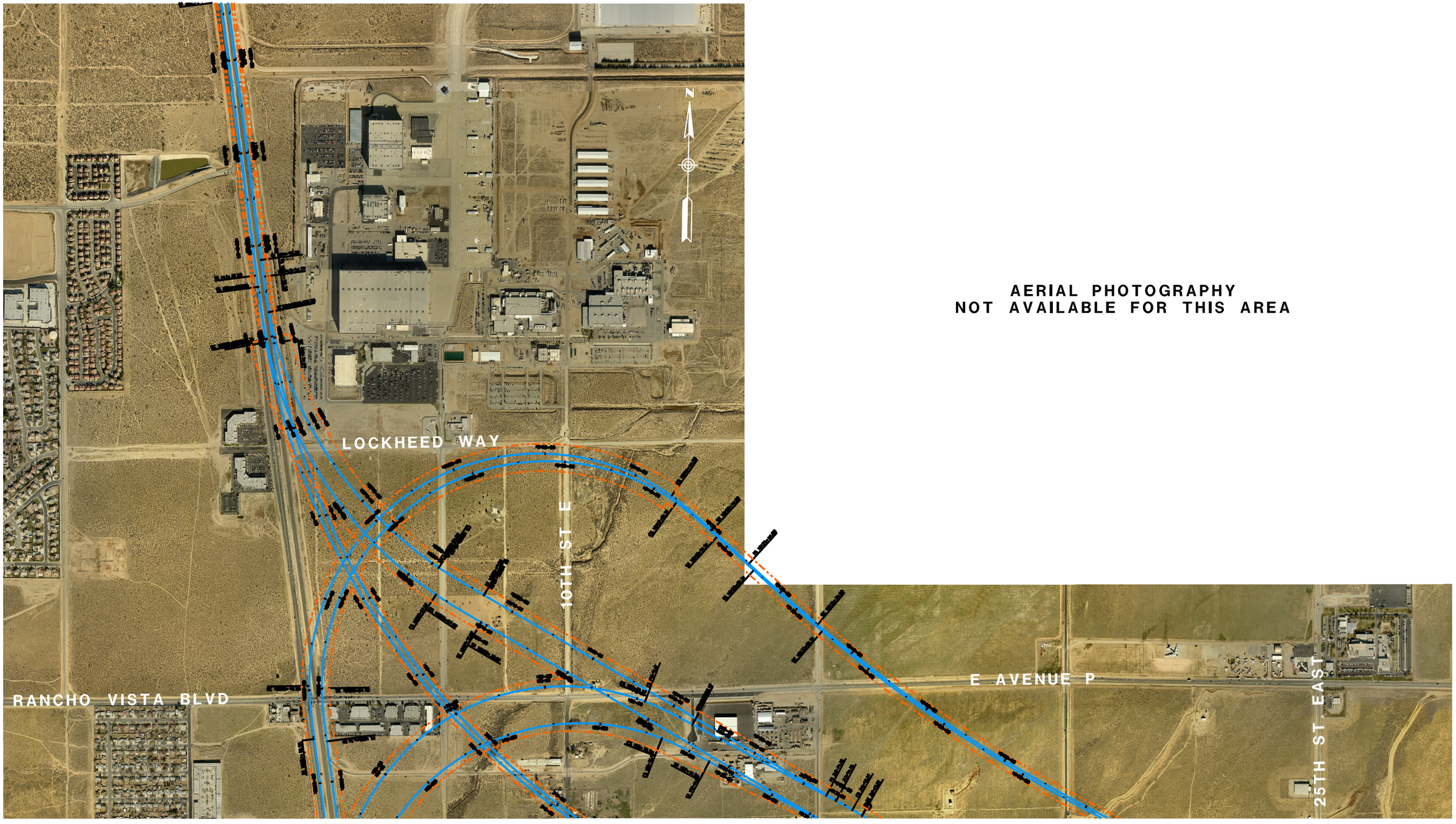
FIGURE 12



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NOT AVAILABLE FOR THIS AREA

LEGEND

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FIGURE 12A

LEGEND

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FIGURE 12B

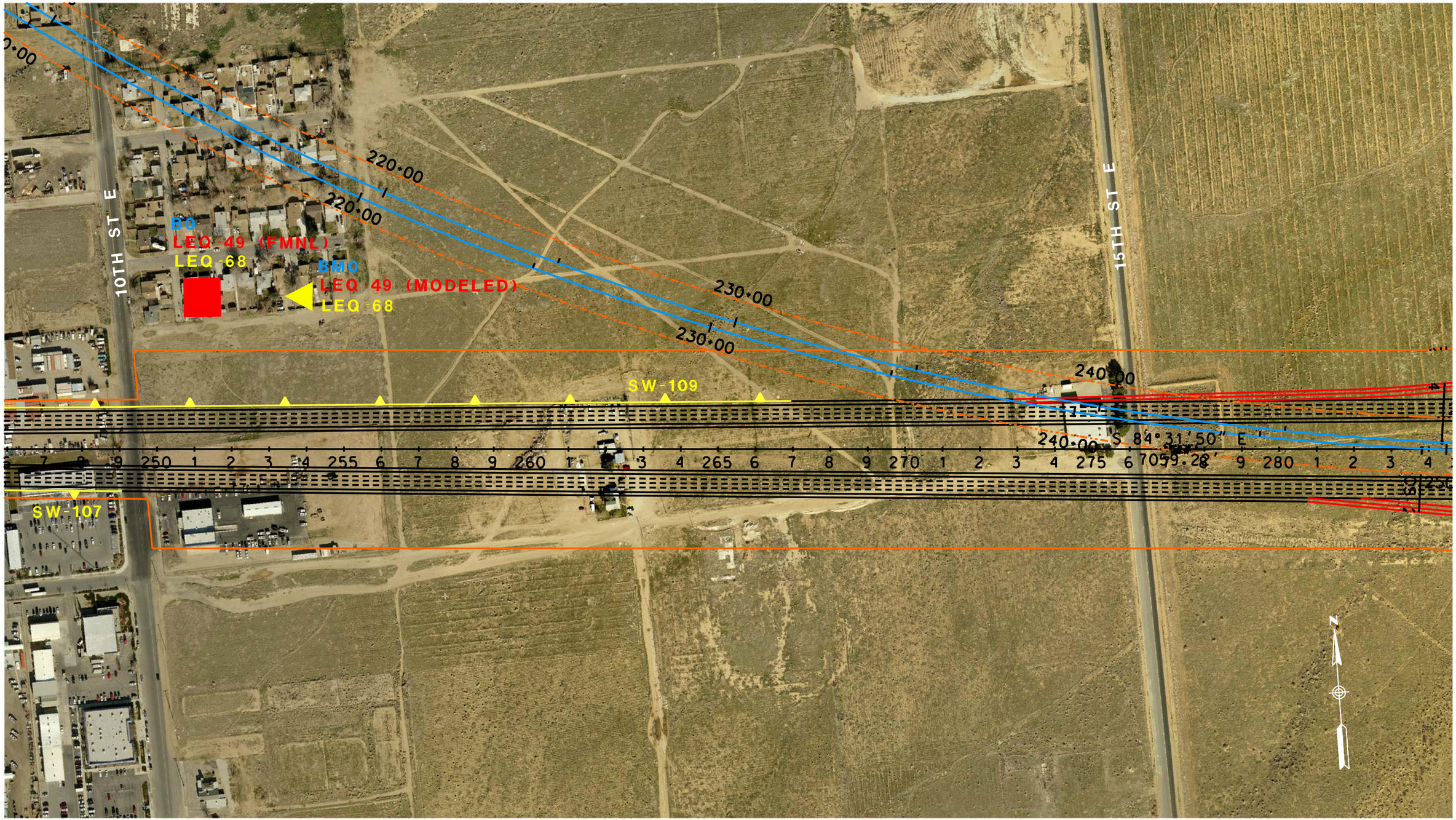

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FIGURE 13

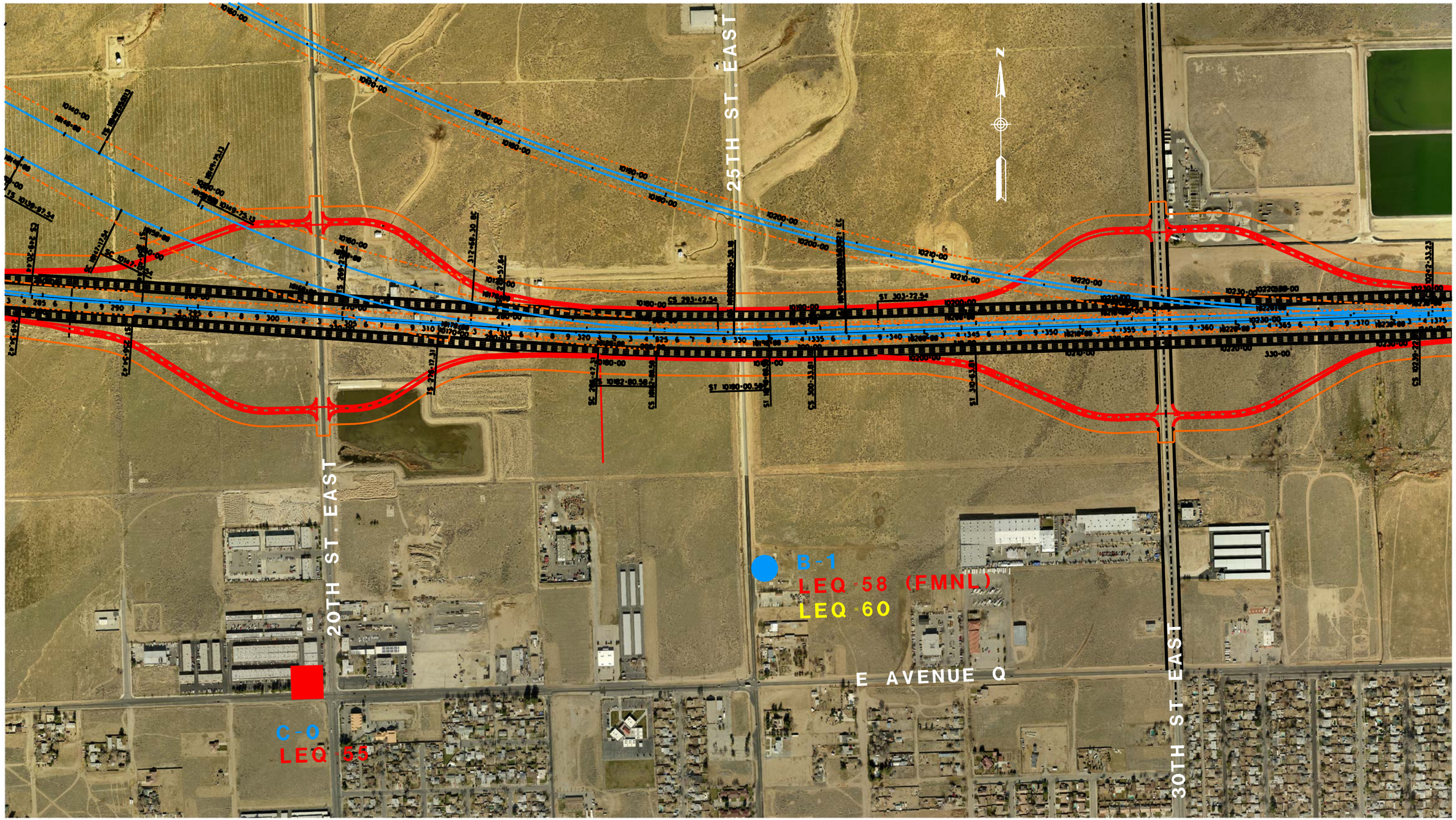

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FIGURE 14

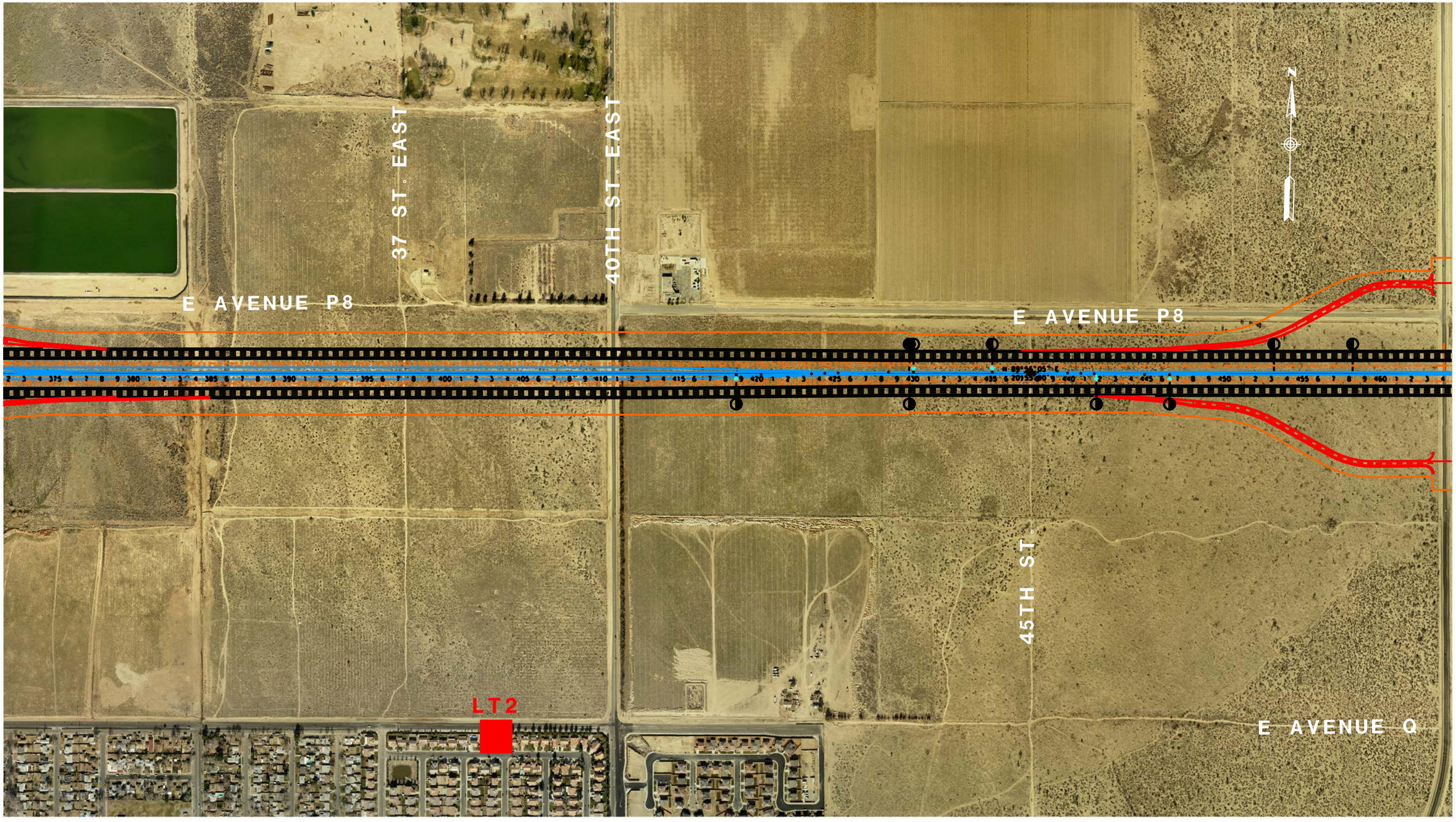

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FIGURE 15

LEGEND

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FIGURE 16

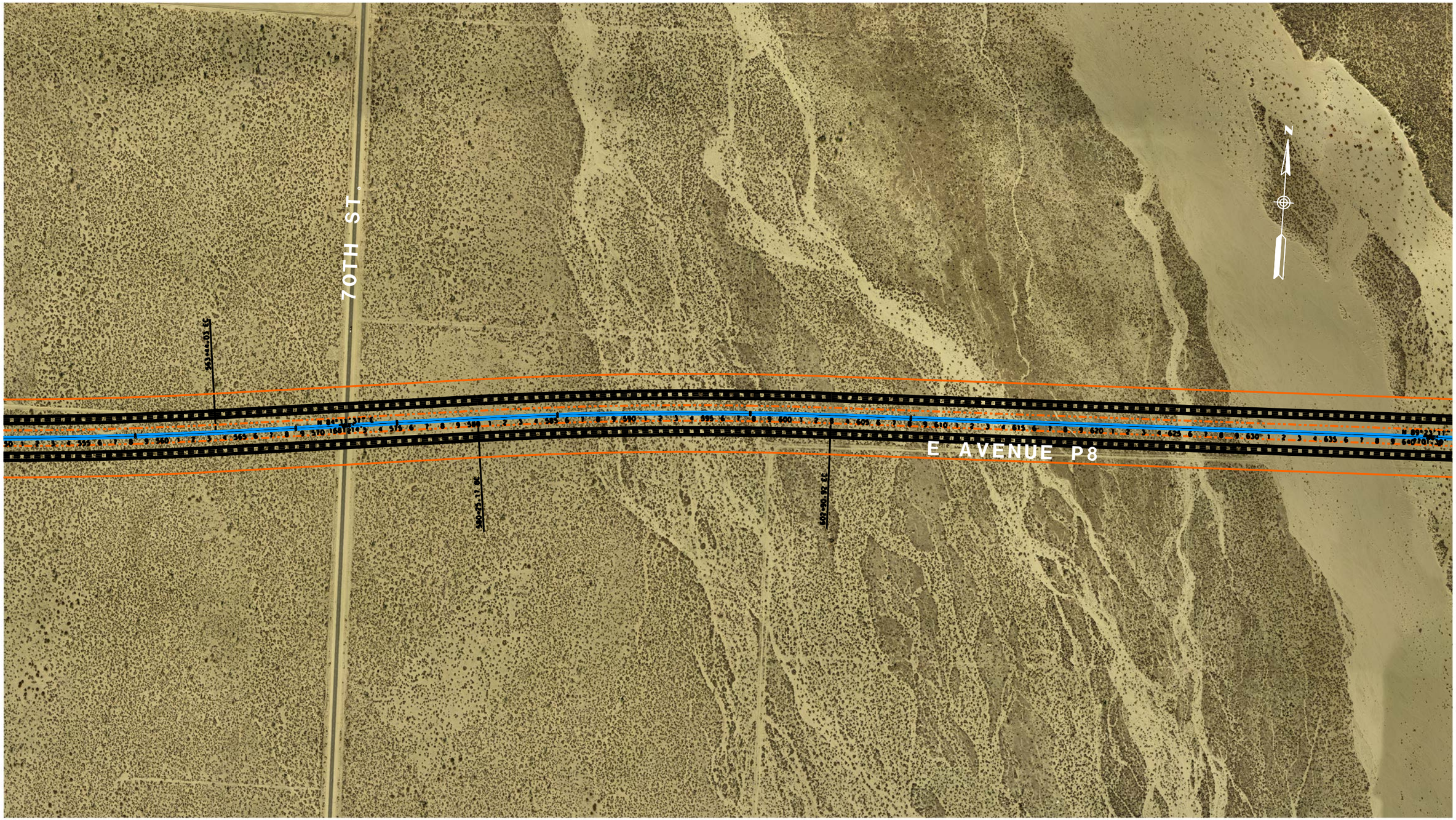

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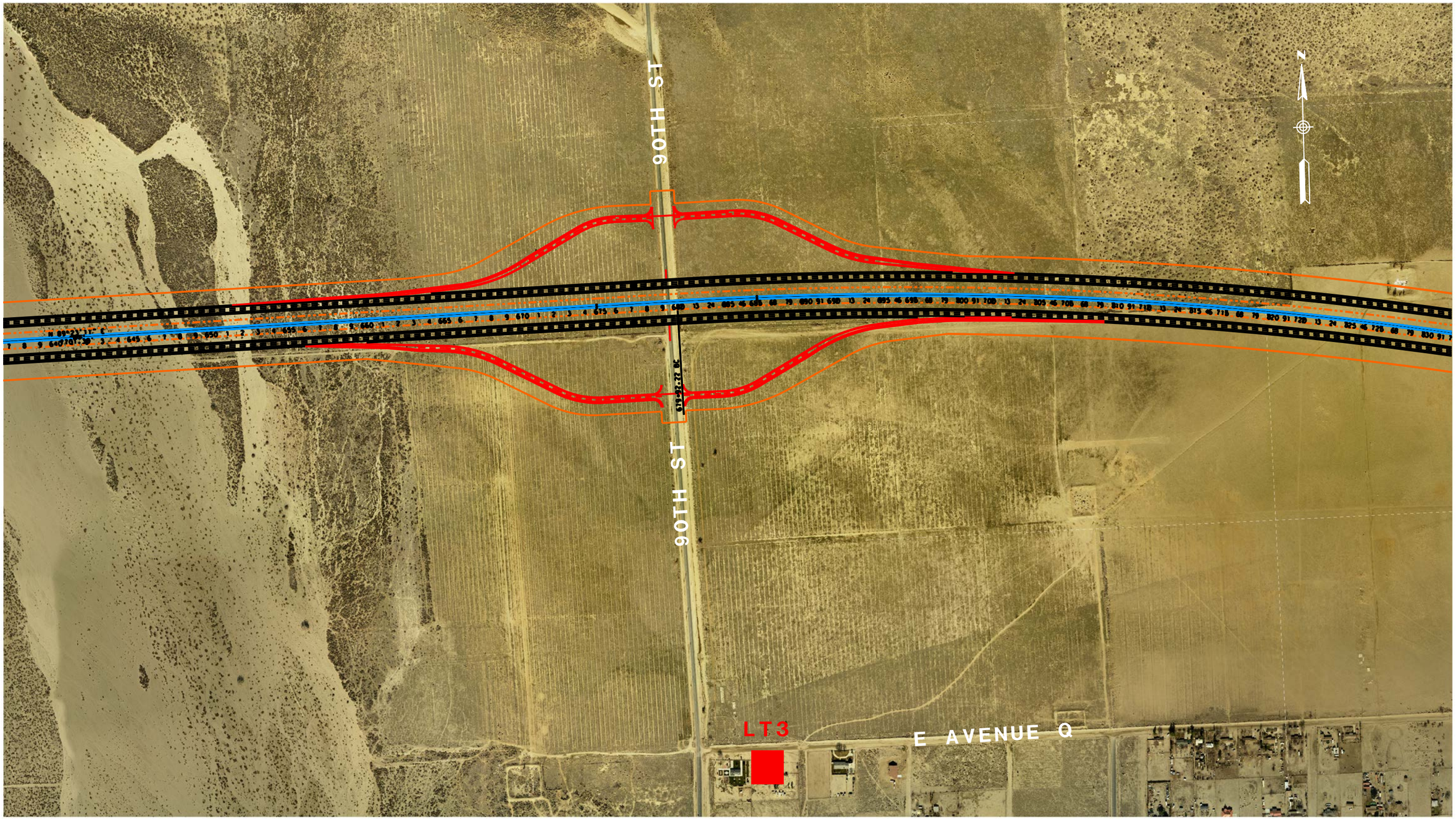
FIGURE 17



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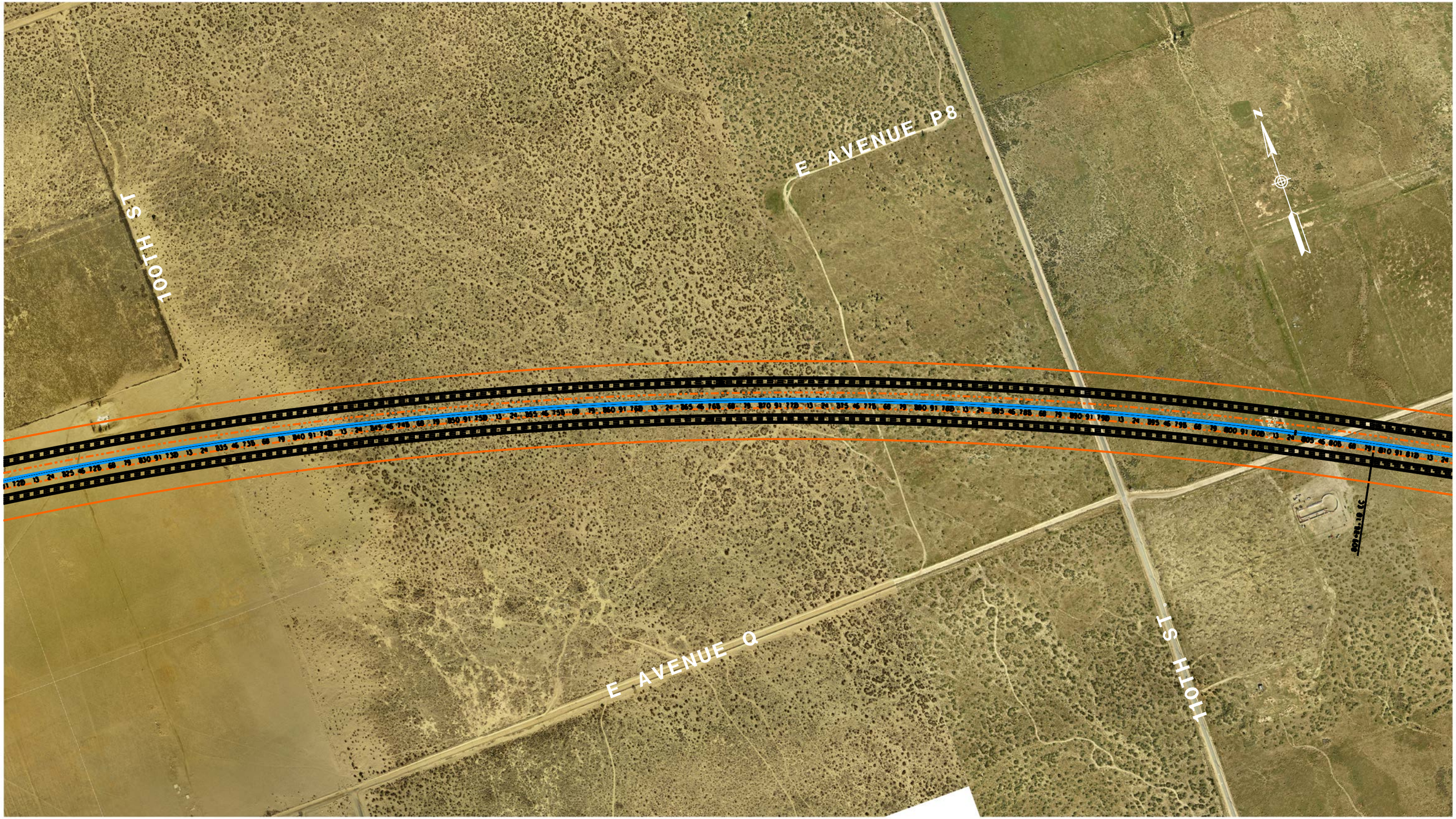

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FIGURE 19

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FIGURE 20

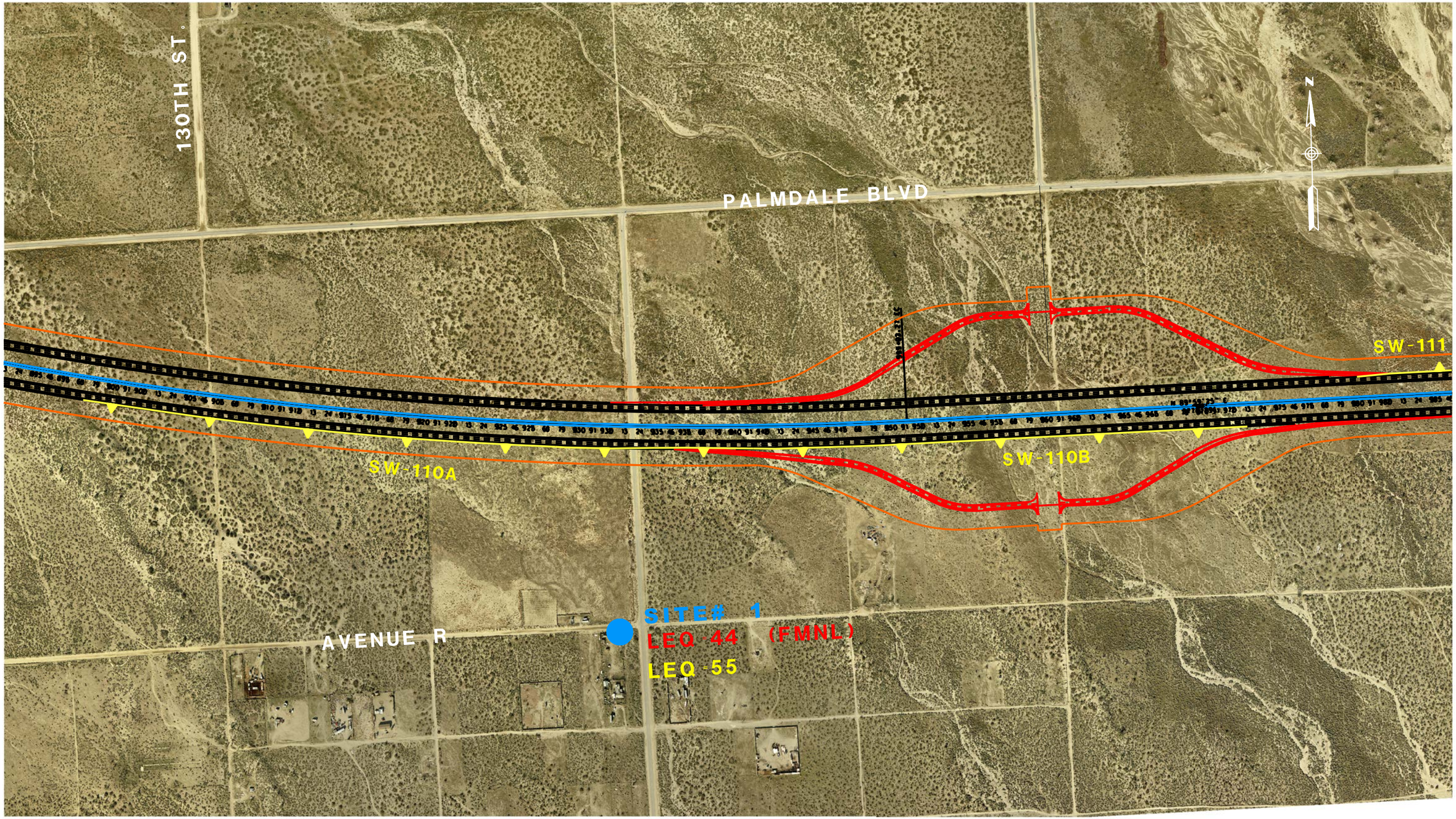

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FIGURE 21

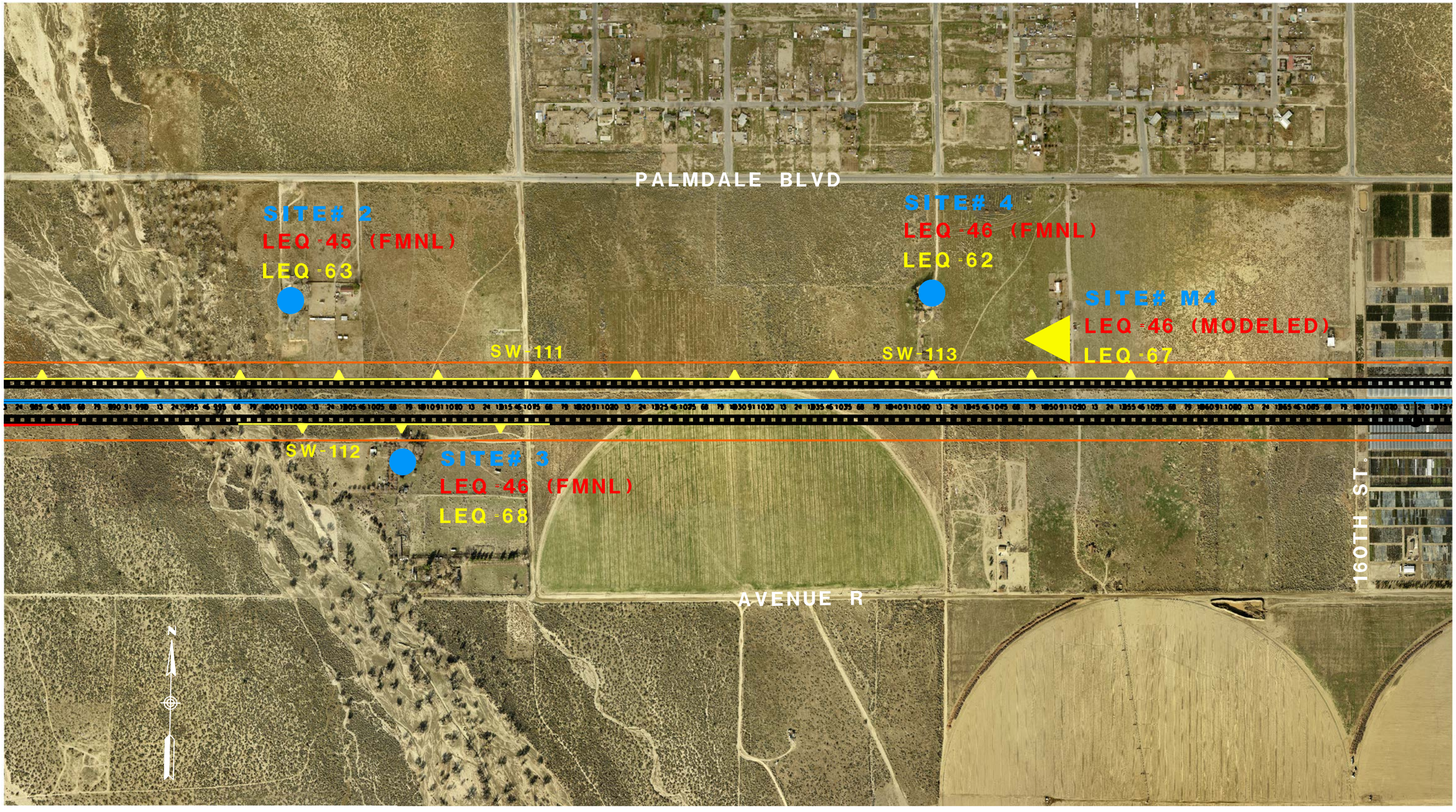

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FIGURE 22

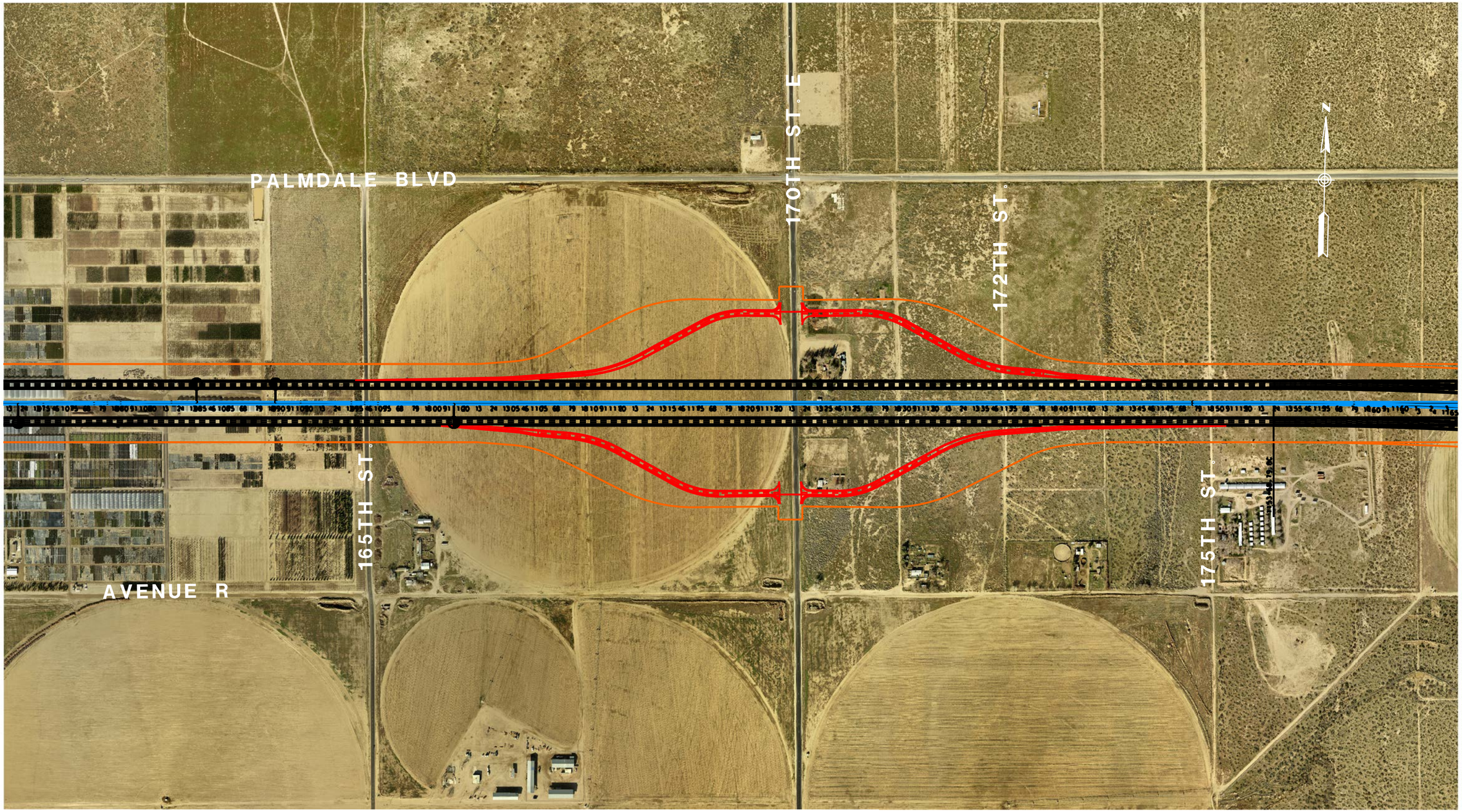

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FIGURE 23

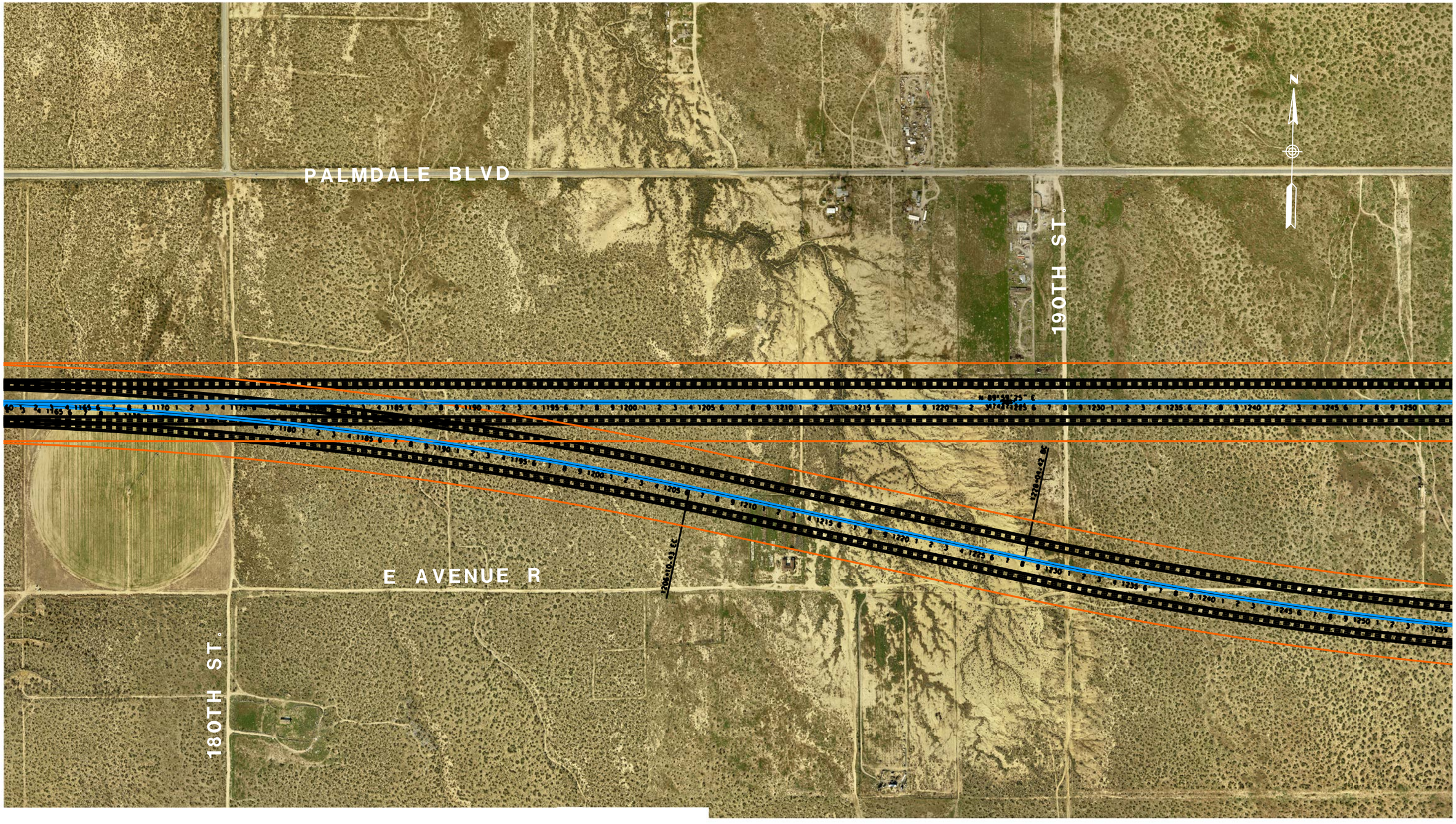

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FIGURE 24

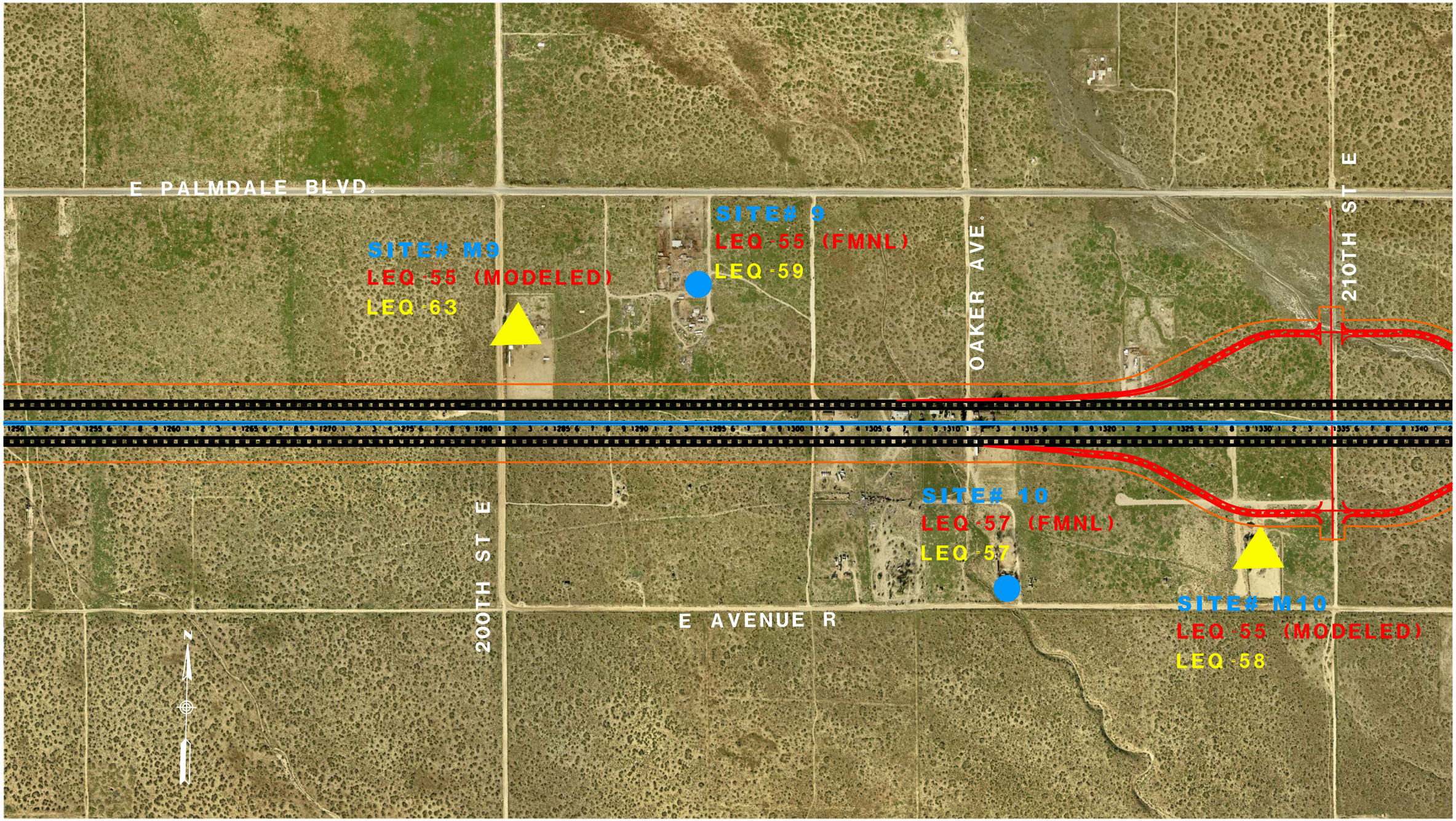

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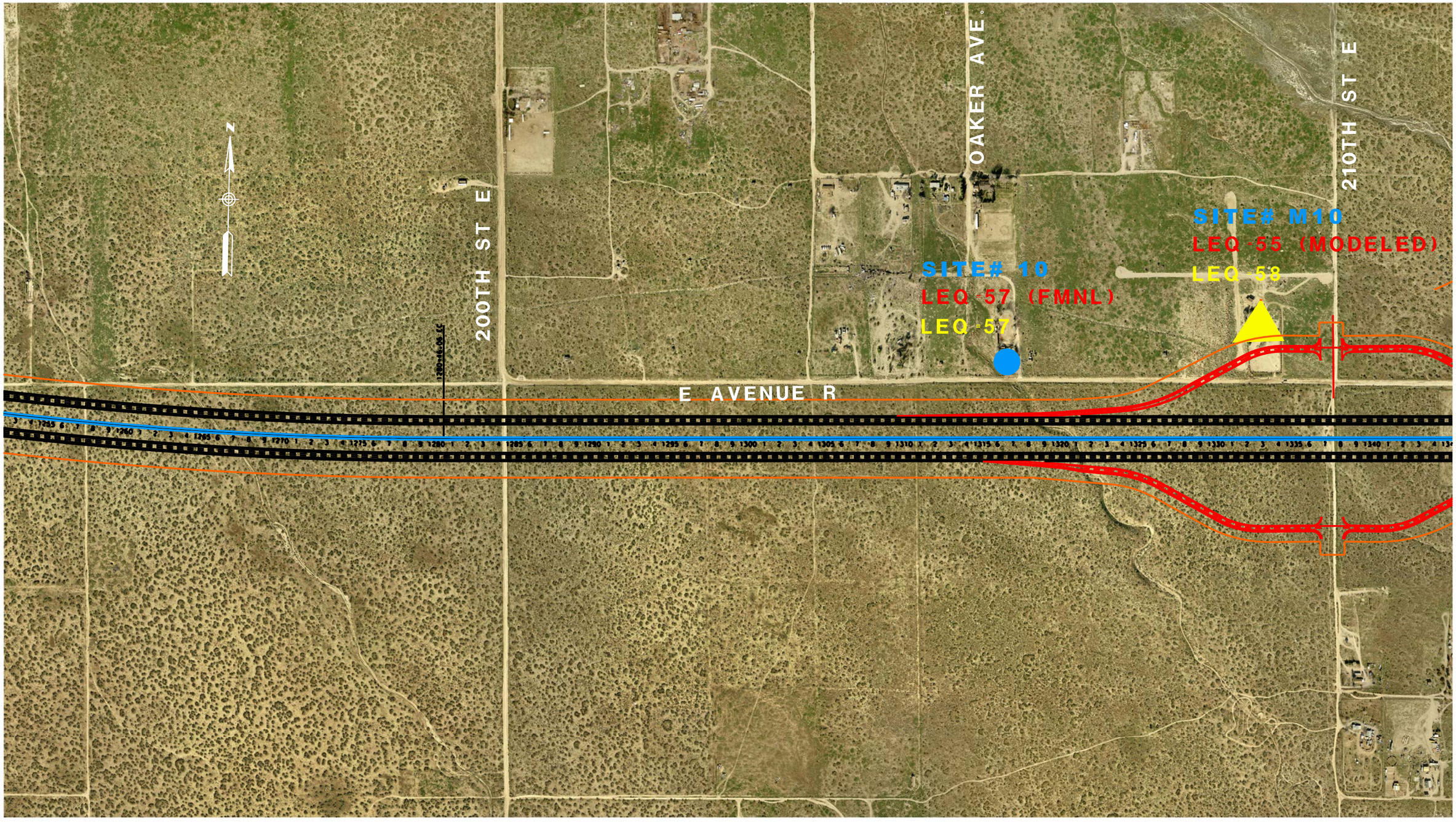
FIGURE 25



LEGEND

- 10 MINUTE NOISE SITE
- 24 HOURS NOISE SITE
- MODELED SITE

SFR - SINGLE FAMILY RESIDENCE
MFR - MULTI-FAMILY RESIDENCE
COMM - COMMERCIAL

- PROPOSED SOUNDWALL
- PRIVATE WALL

NOT TO SCALE

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THE HIGH DESERT CORRIDOR PROJECT
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VARATION D

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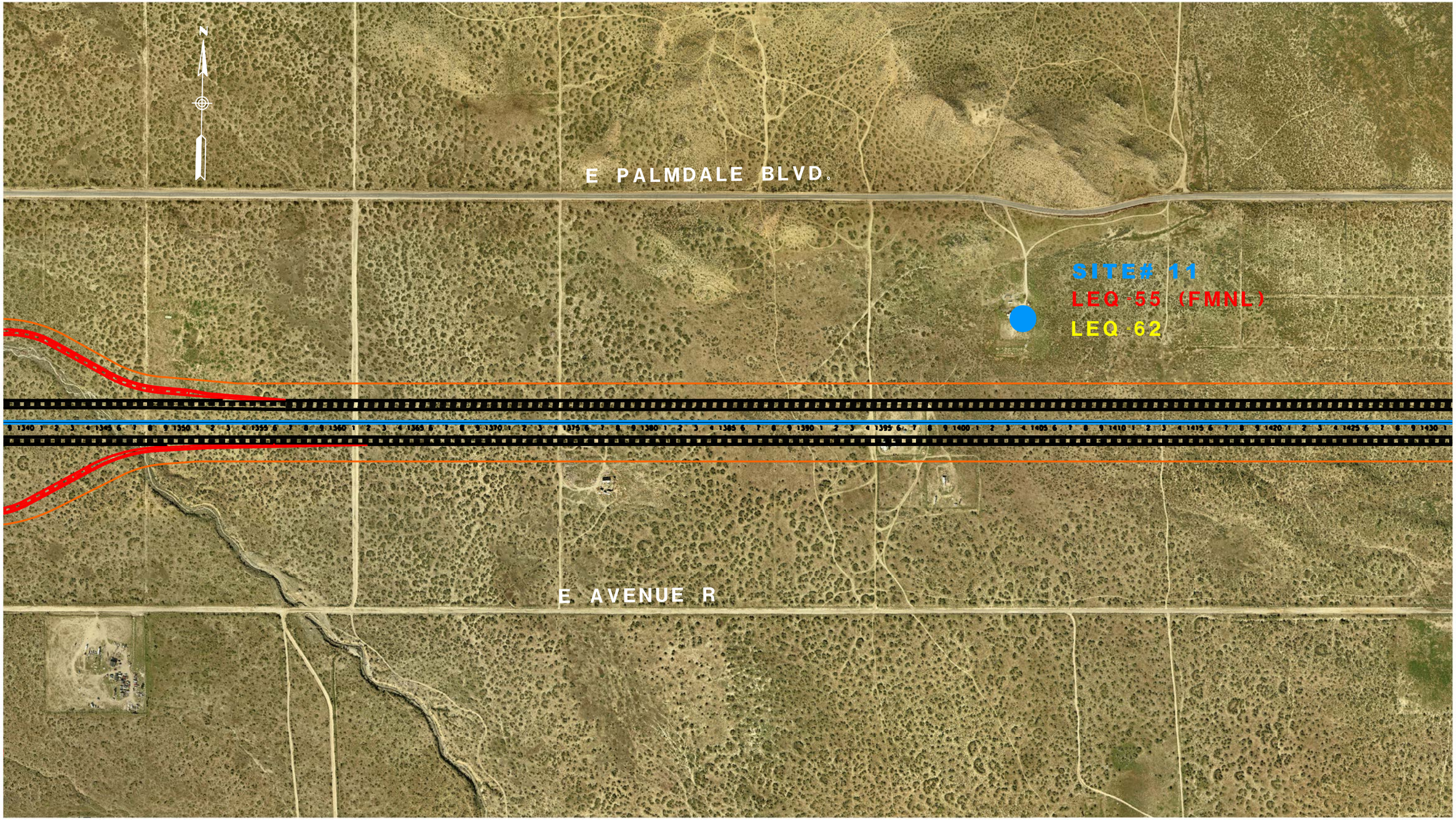
FIGURE 25A



LEGEND

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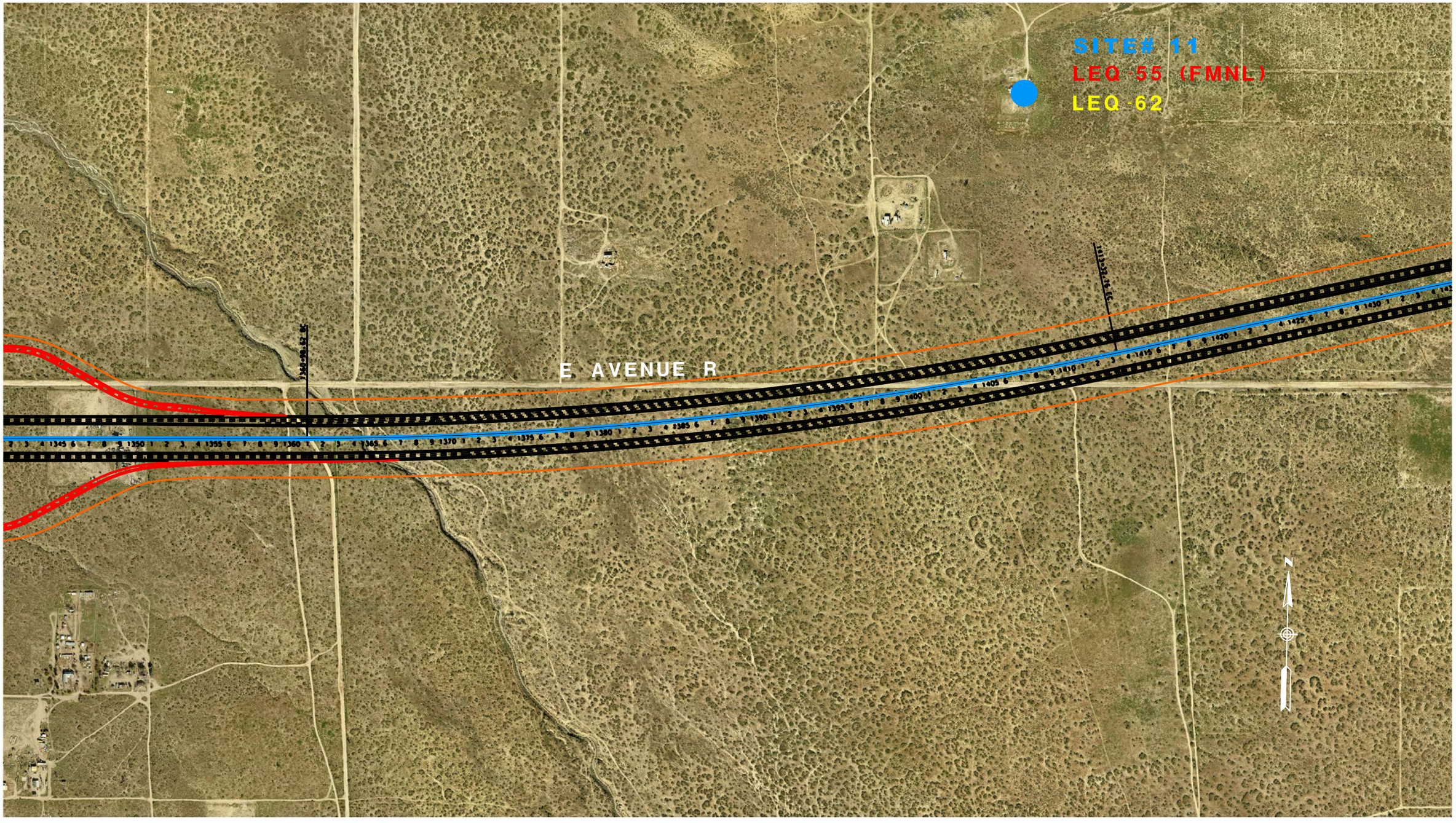
FIGURE 26



LEGEND

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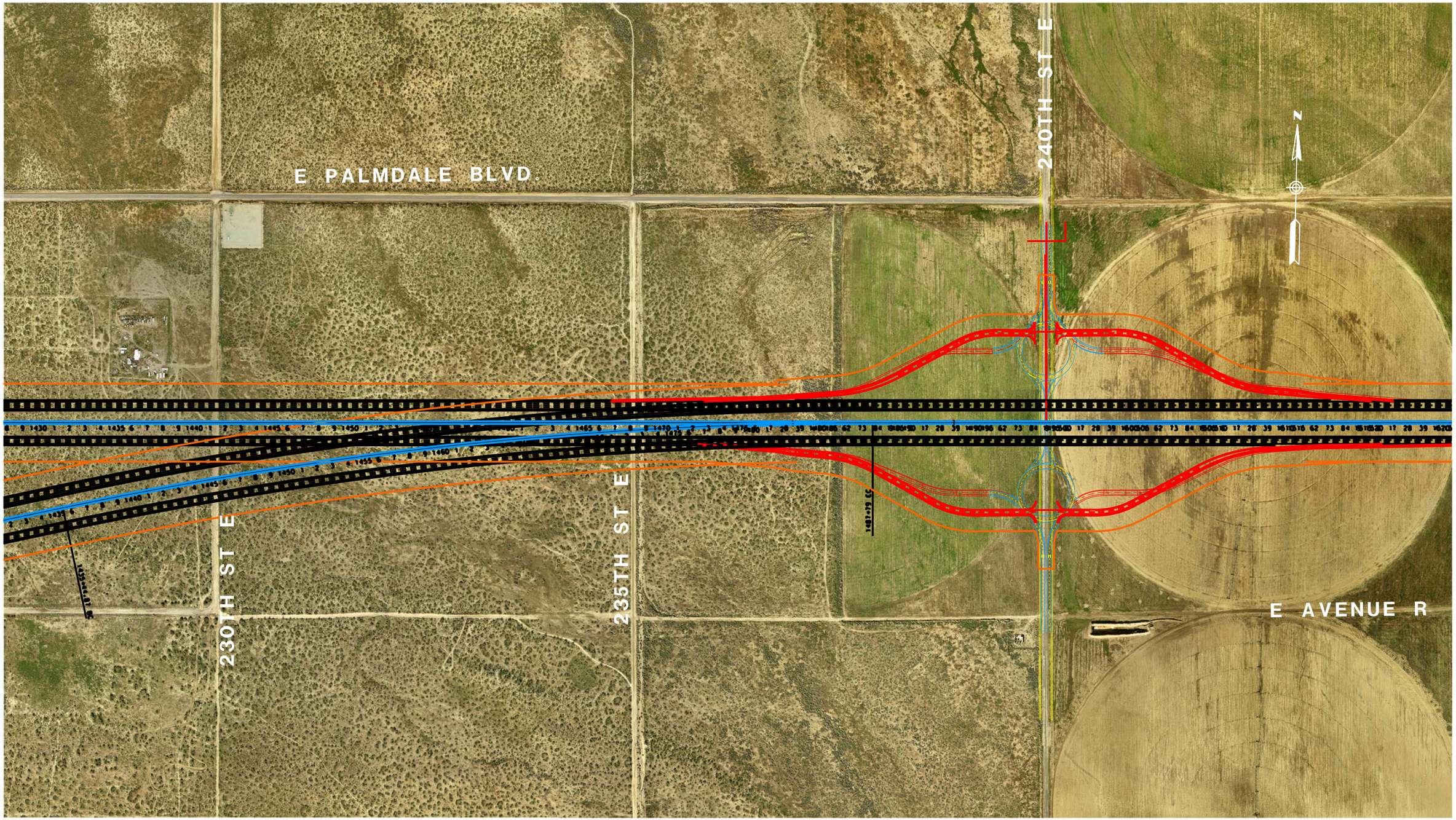
SEPTEMBER 25, 2014 | FIGURE 26A



LEGEND

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FIGURE 27

LEGEND

- 10 MINUTE NOISE SITE
- 24 HOURS NOISE SITE
- MODELED SITE

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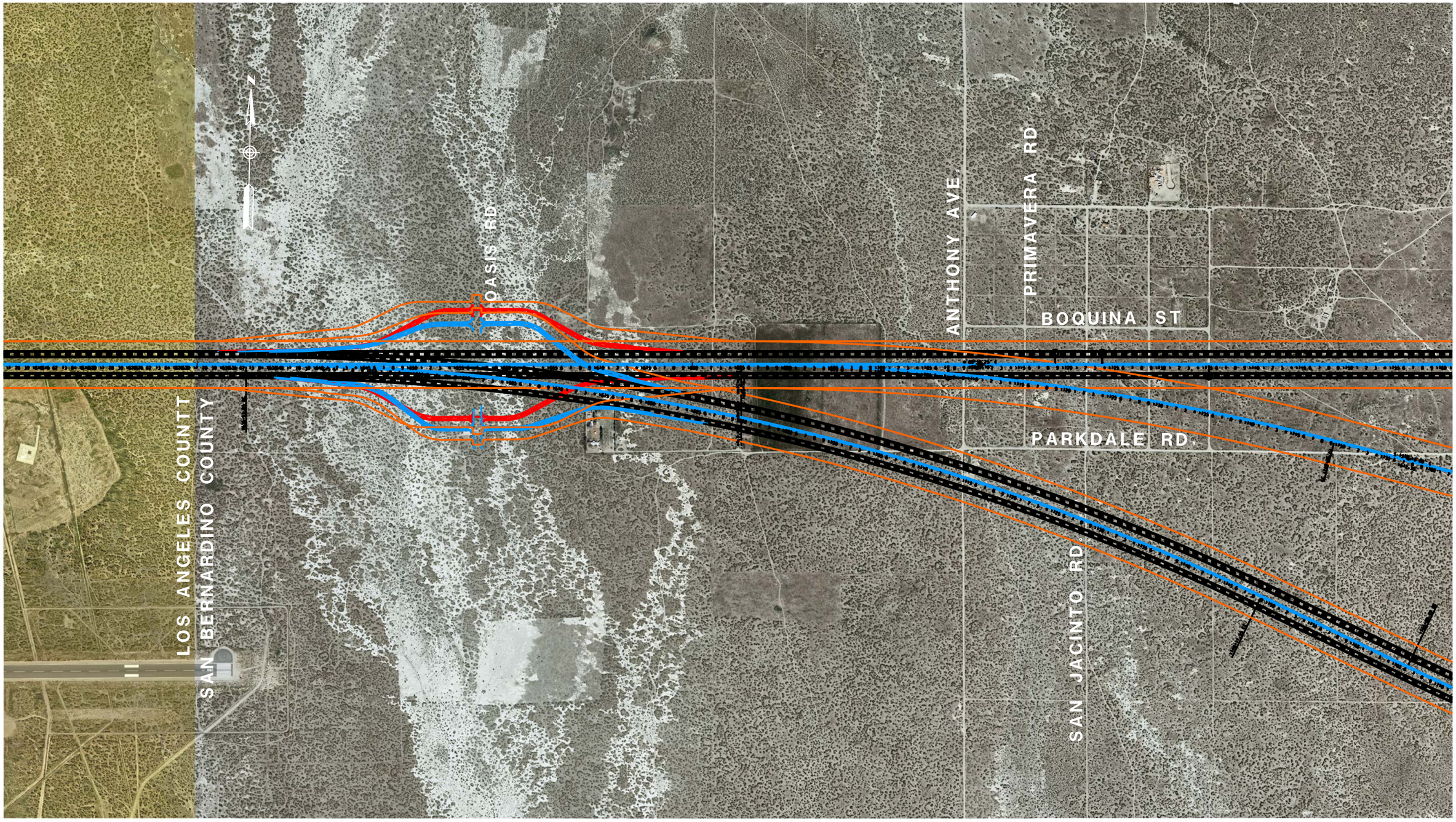
FIGURE 28



LEGEND

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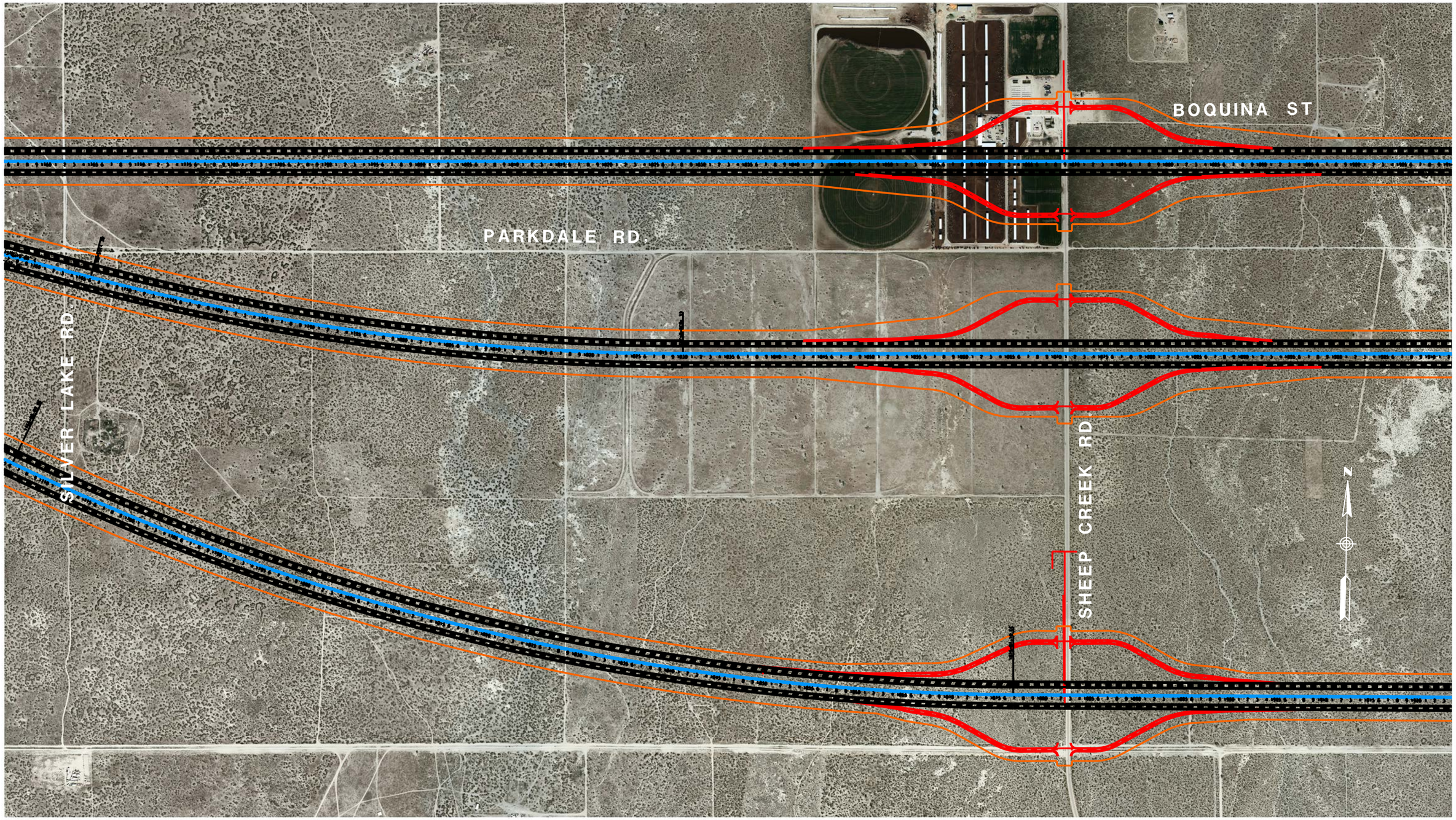
SEPTEMBER 25, 2014 | FIGURE 29



LEGEND

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LEGEND

- 10 MINUTE NOISE SITE
- 24 HOURS NOISE SITE
- MODELED SITE

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FIGURE 31

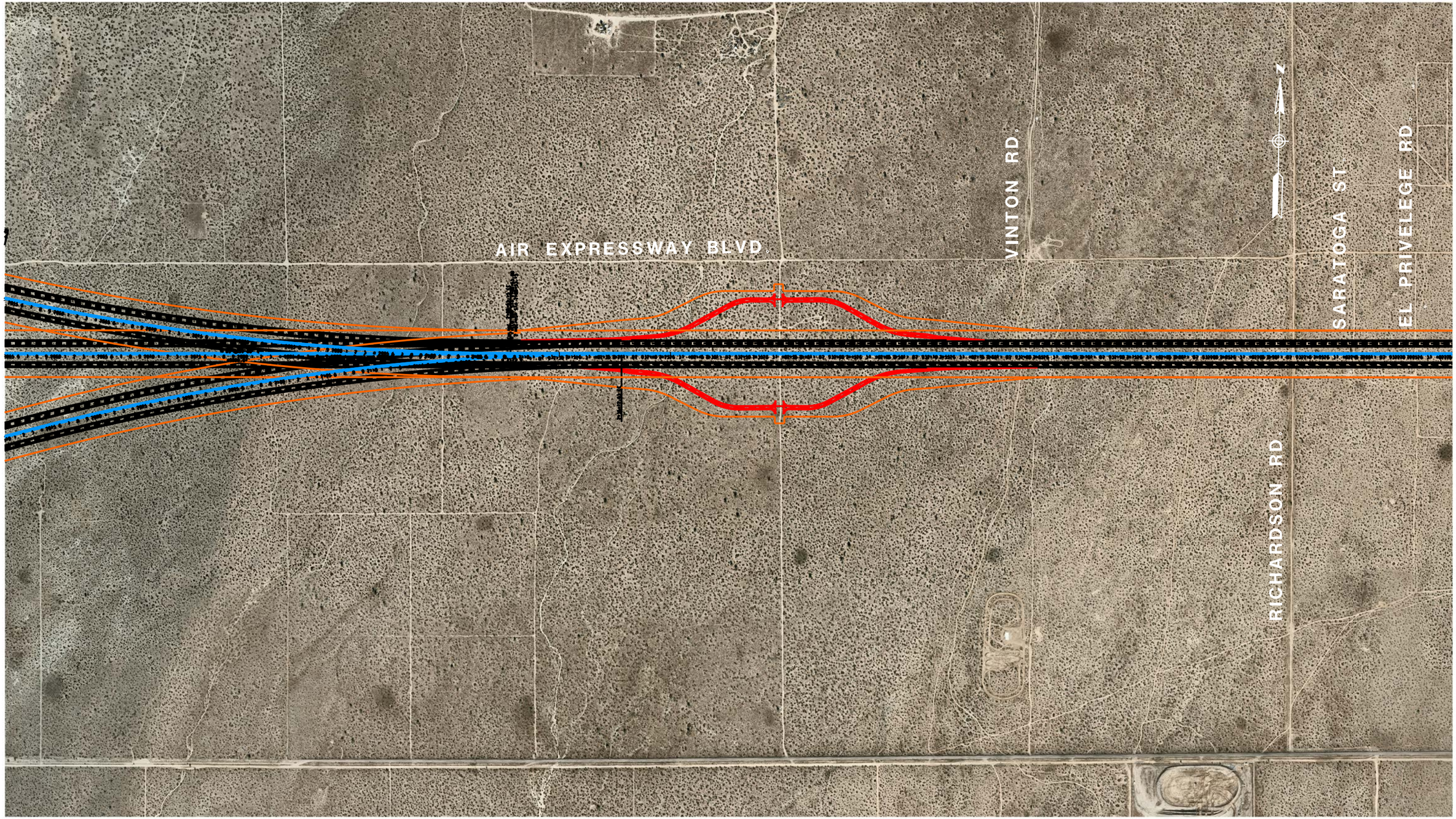

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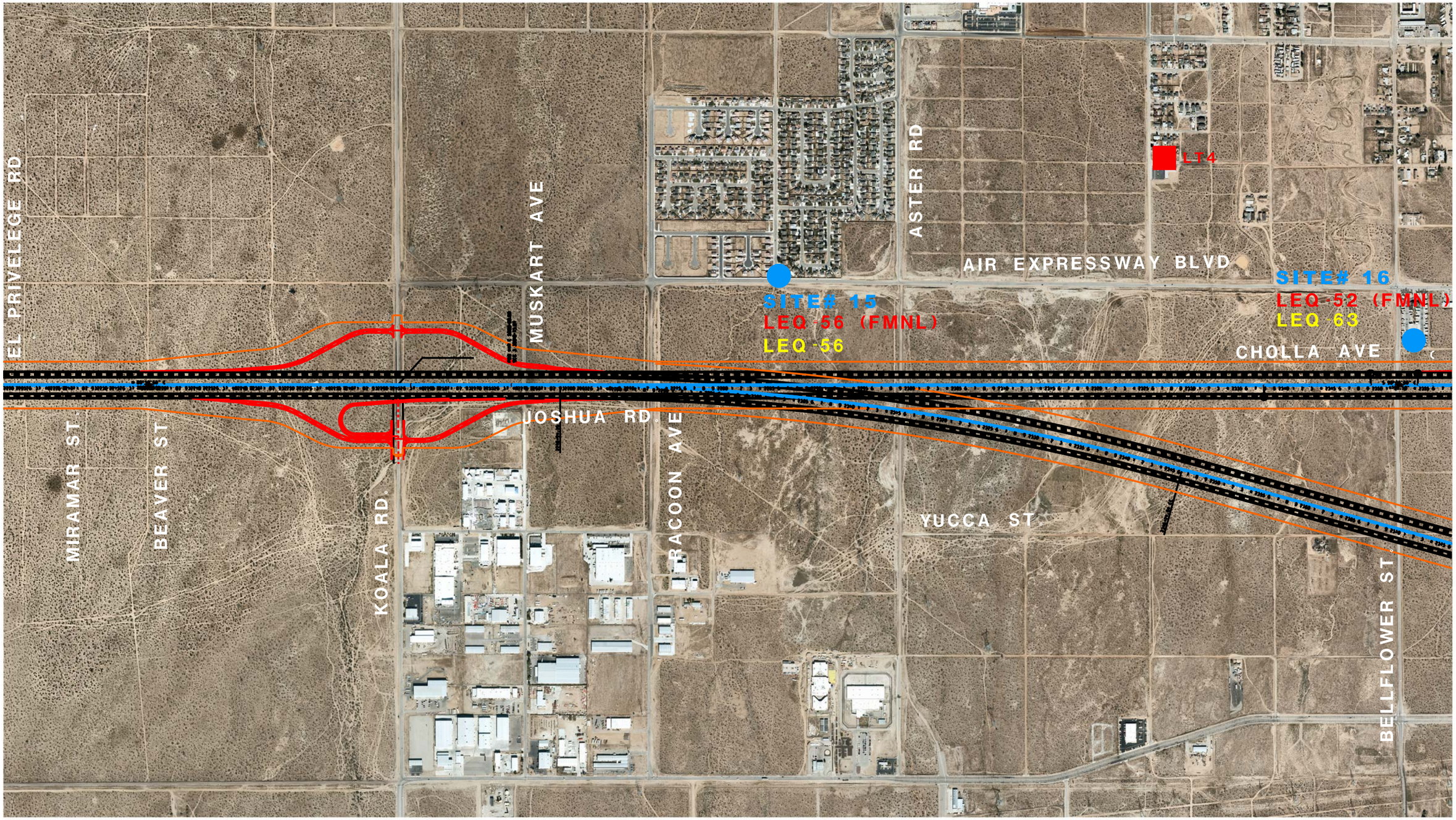
FIGURE 32



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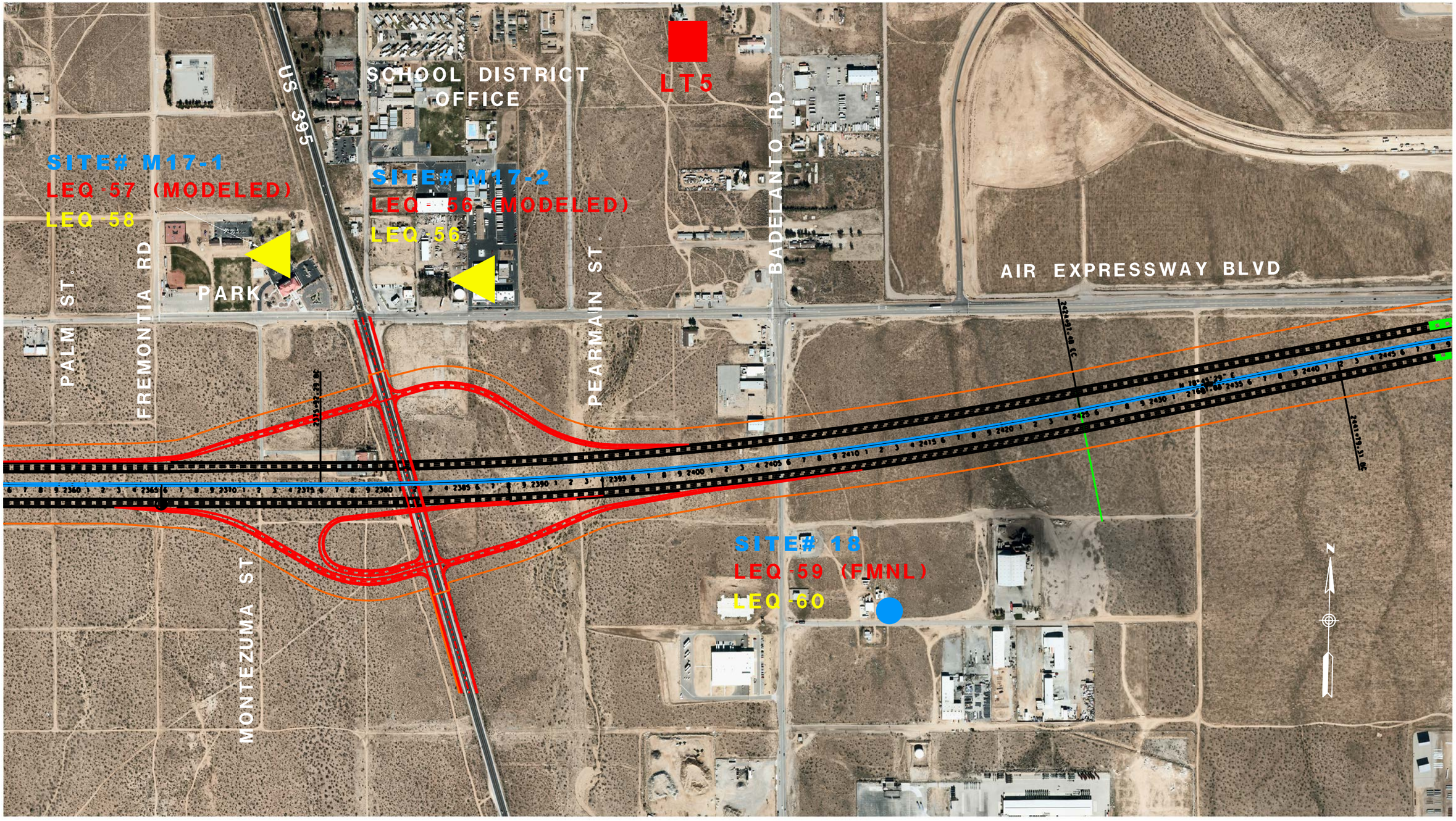

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FIGURE 34

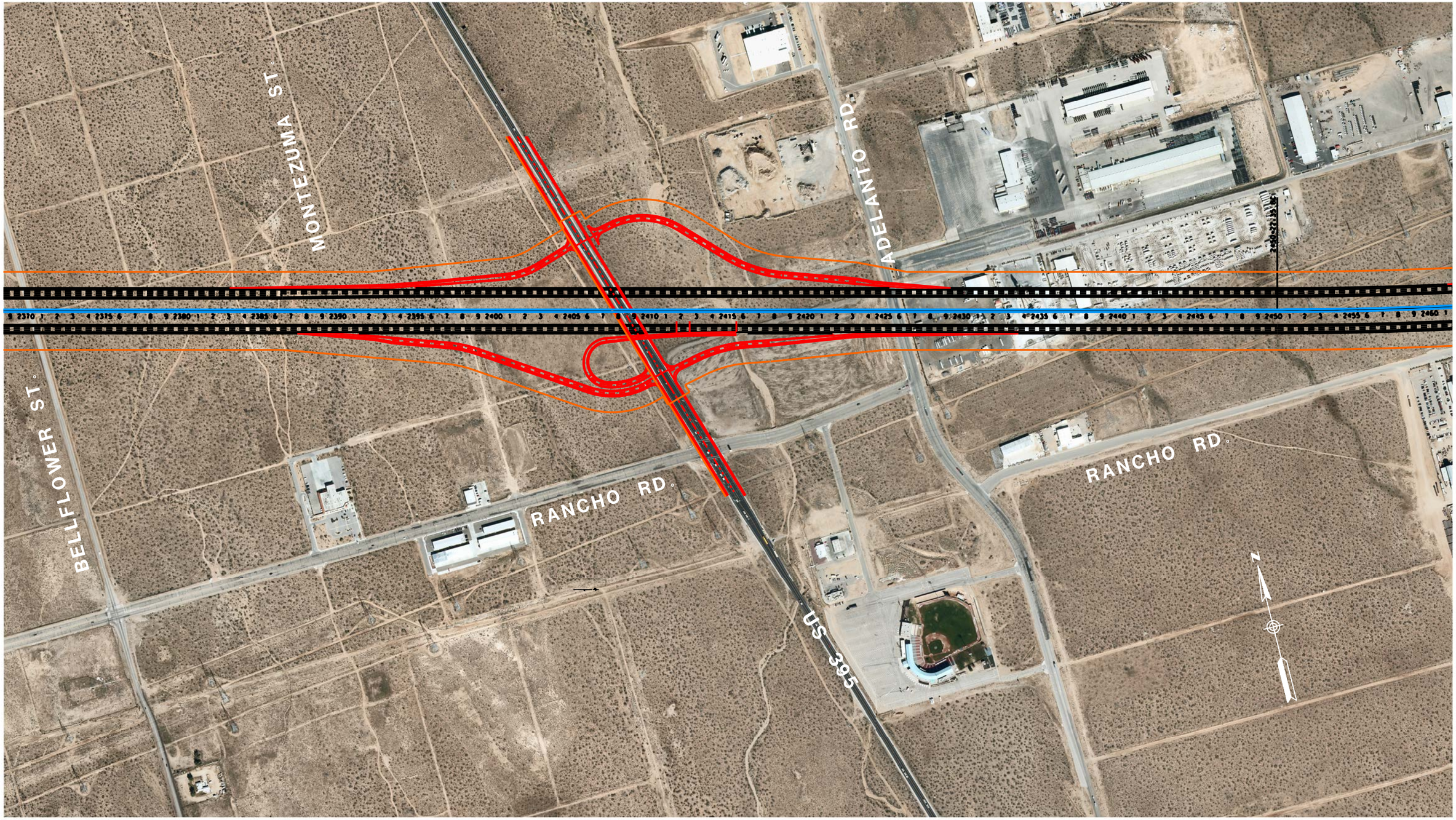

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FIGURE 34A

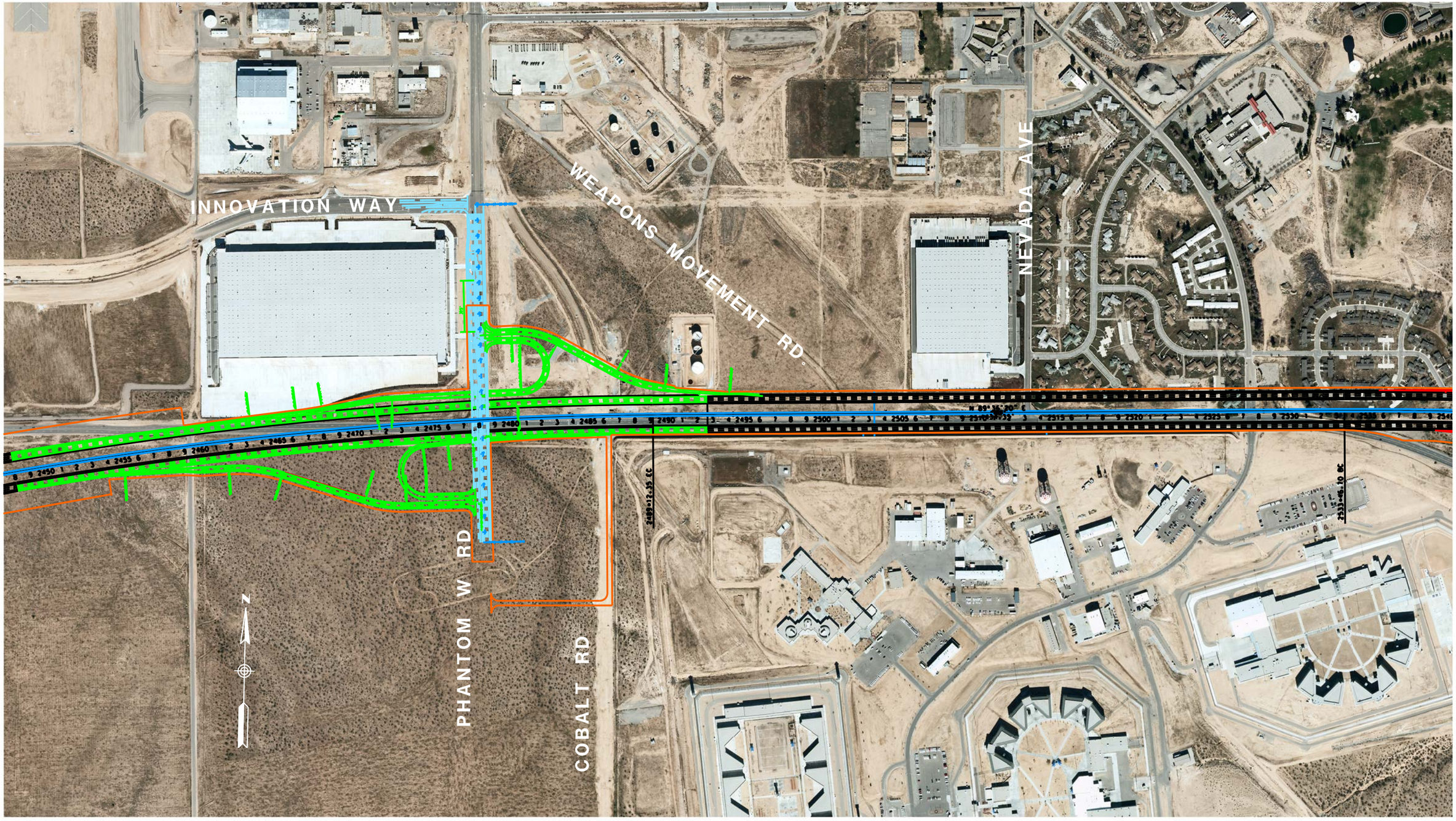

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FIGURE 35

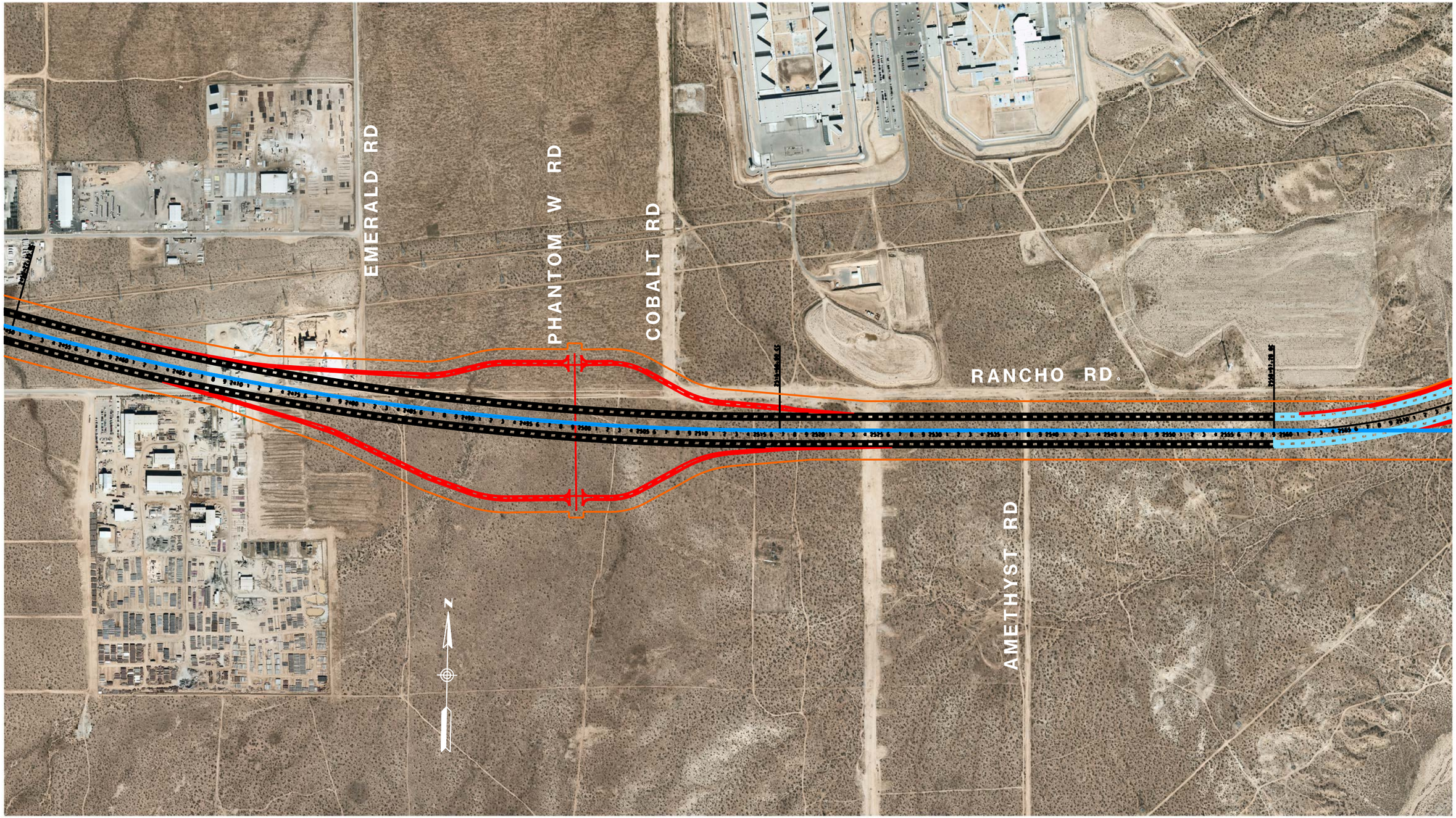

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FIGURE 35A

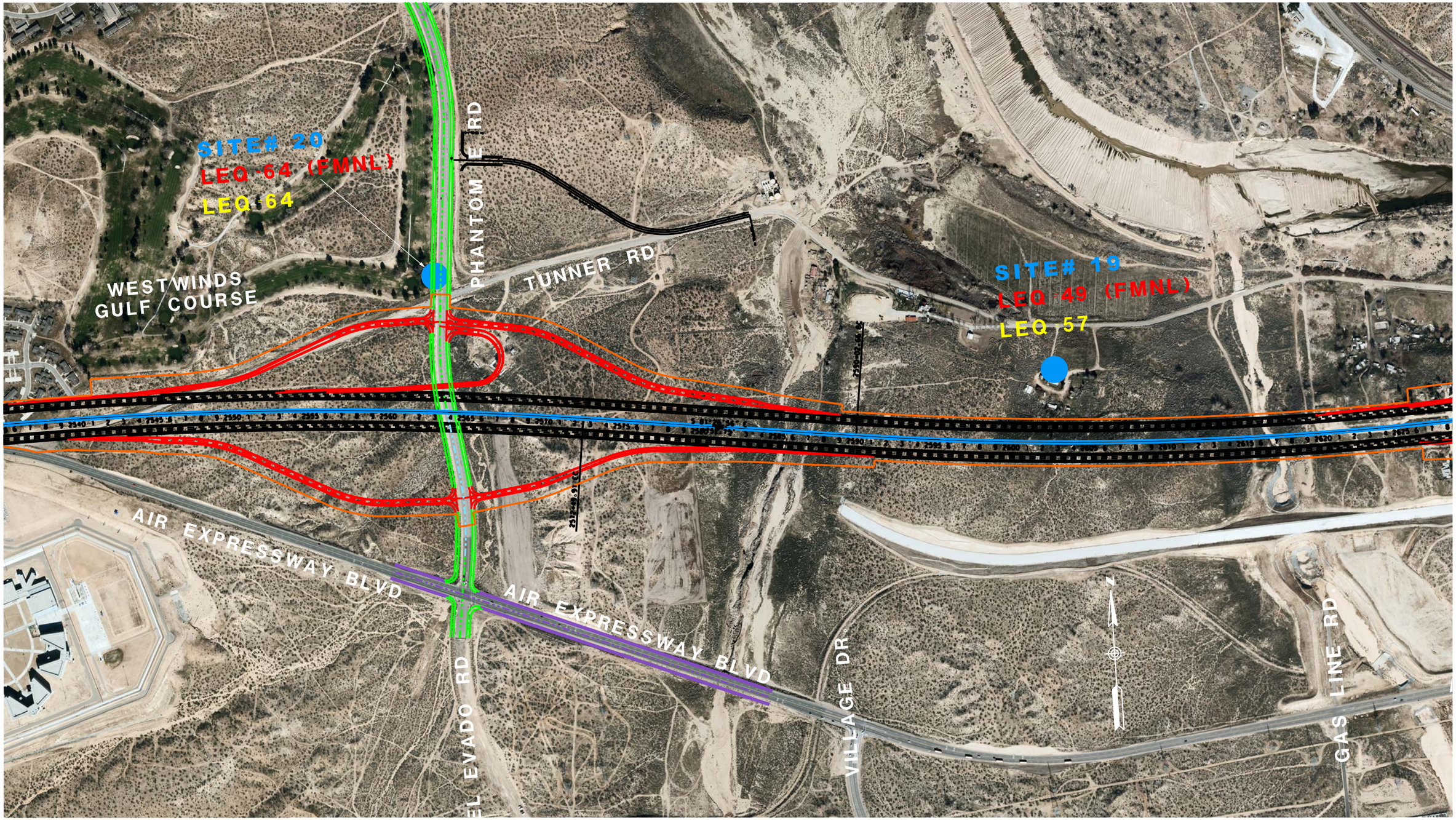

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FIGURE 36

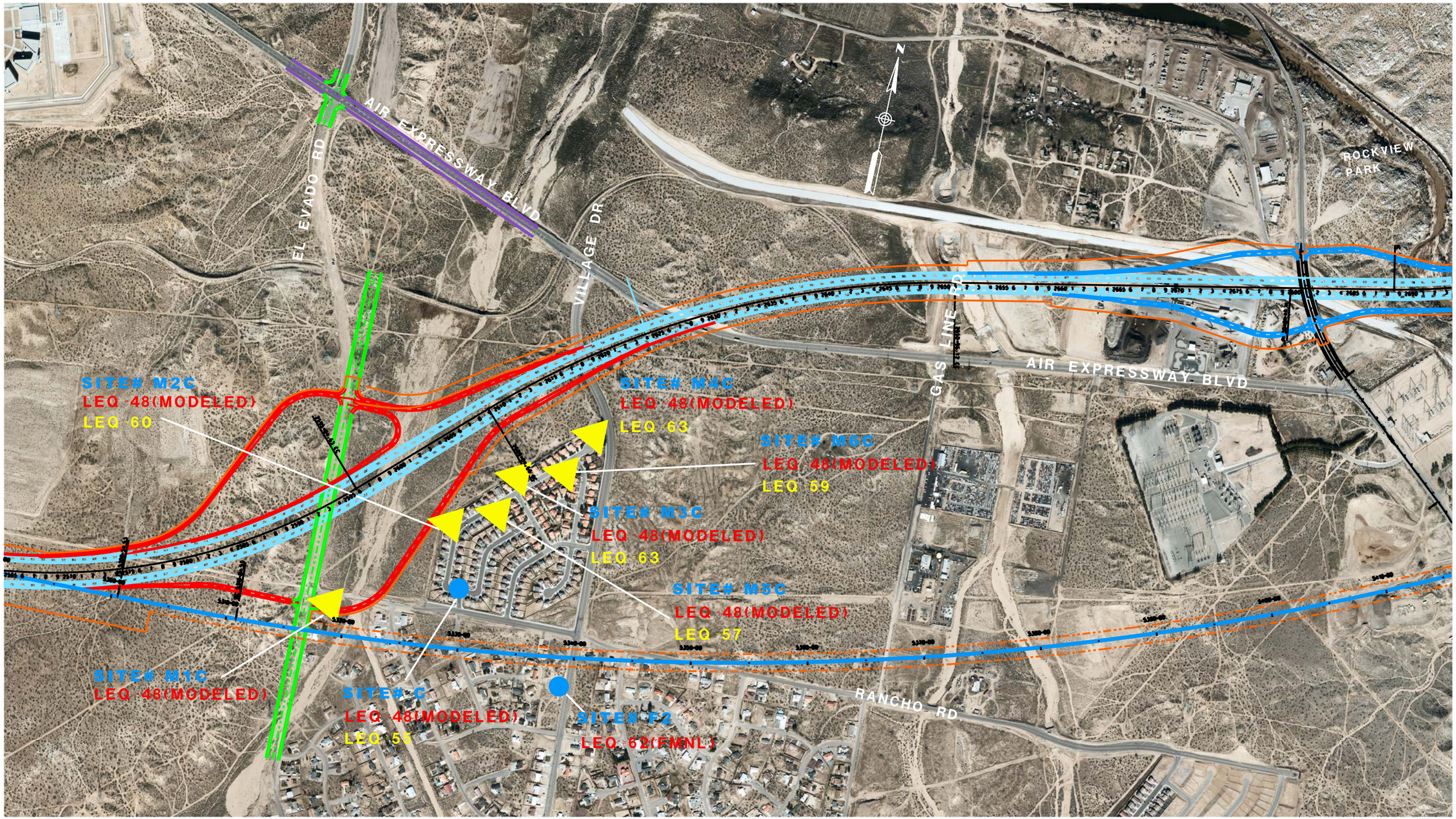

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FIGURE 36A

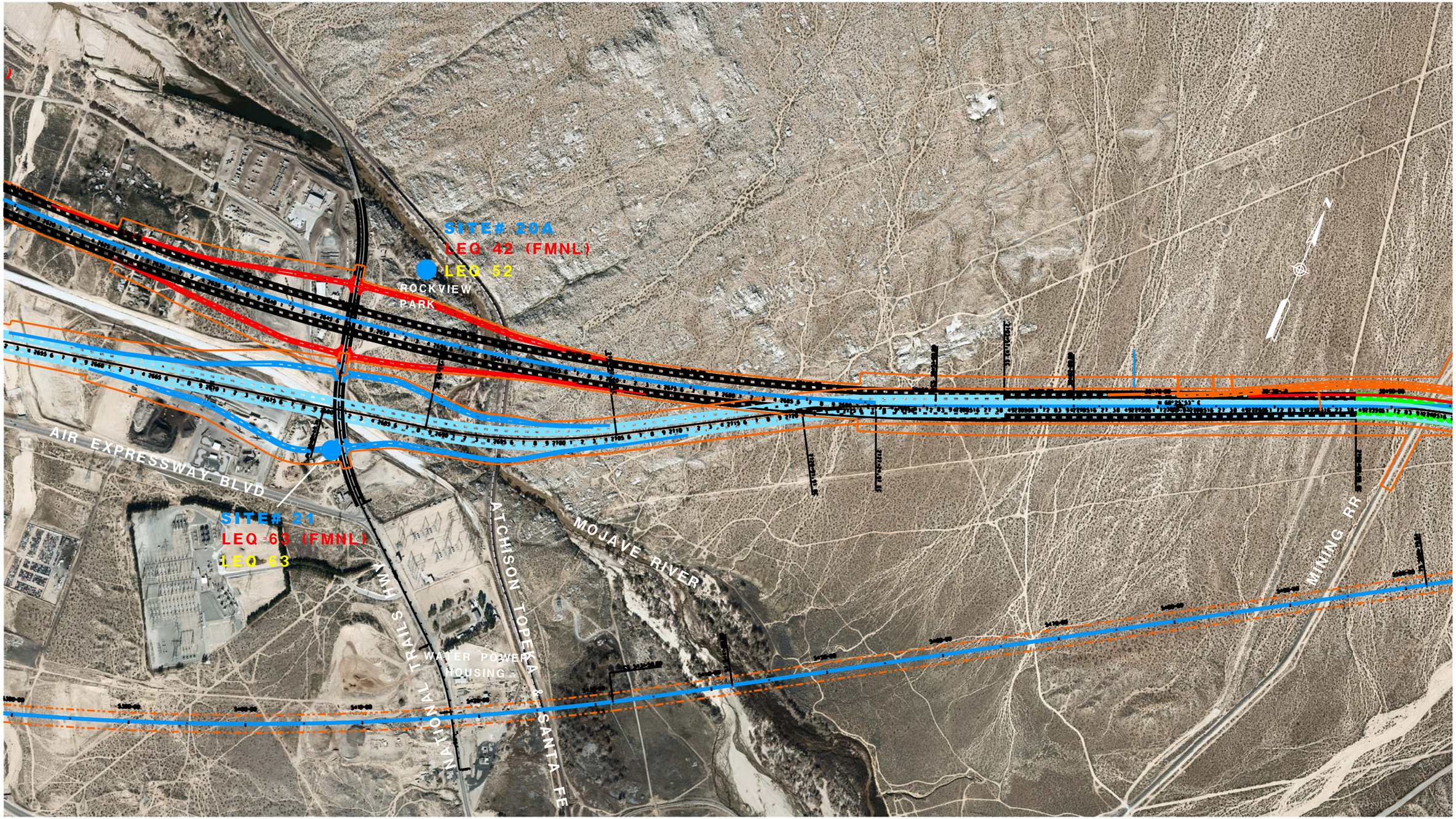

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FIGURE 37

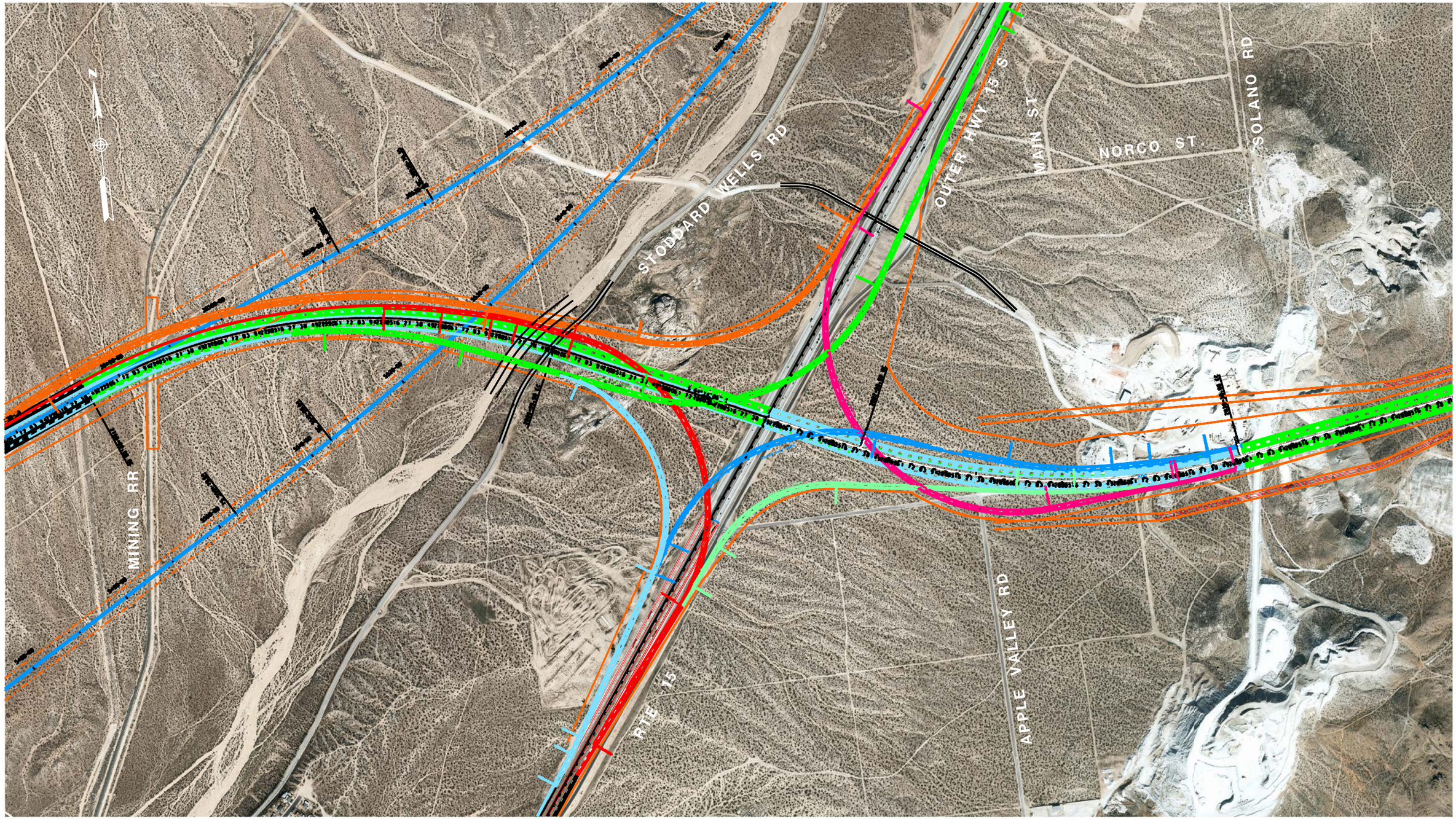

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FIGURE 38

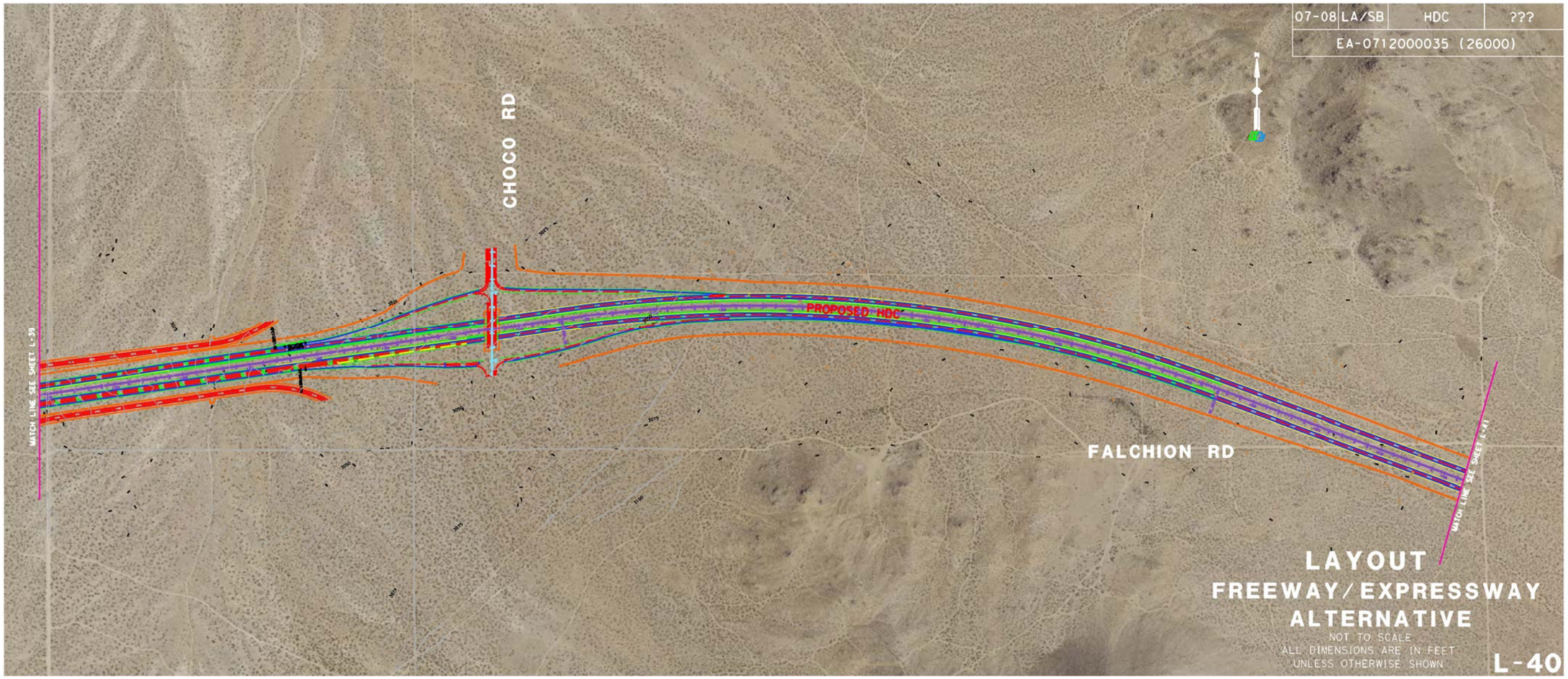

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FIGURE 39

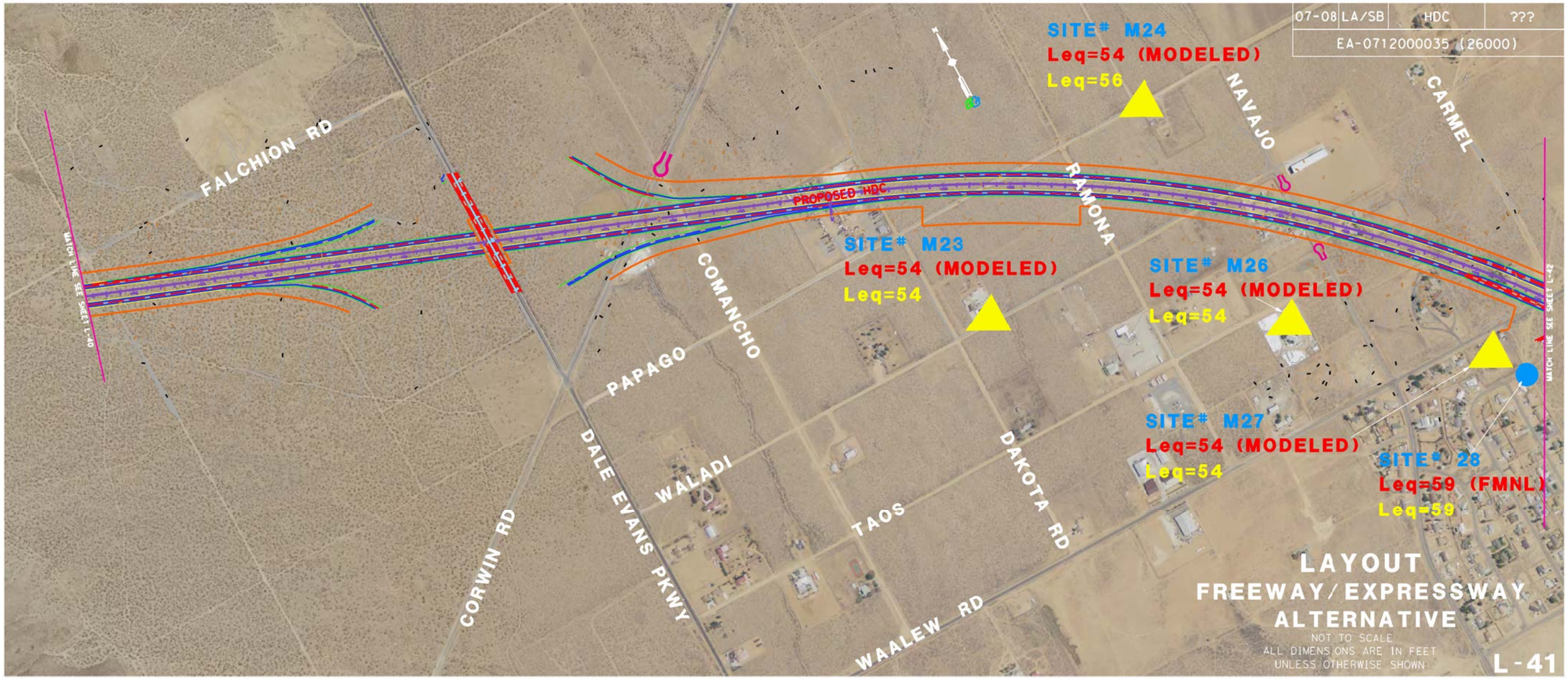

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FIGURE 40

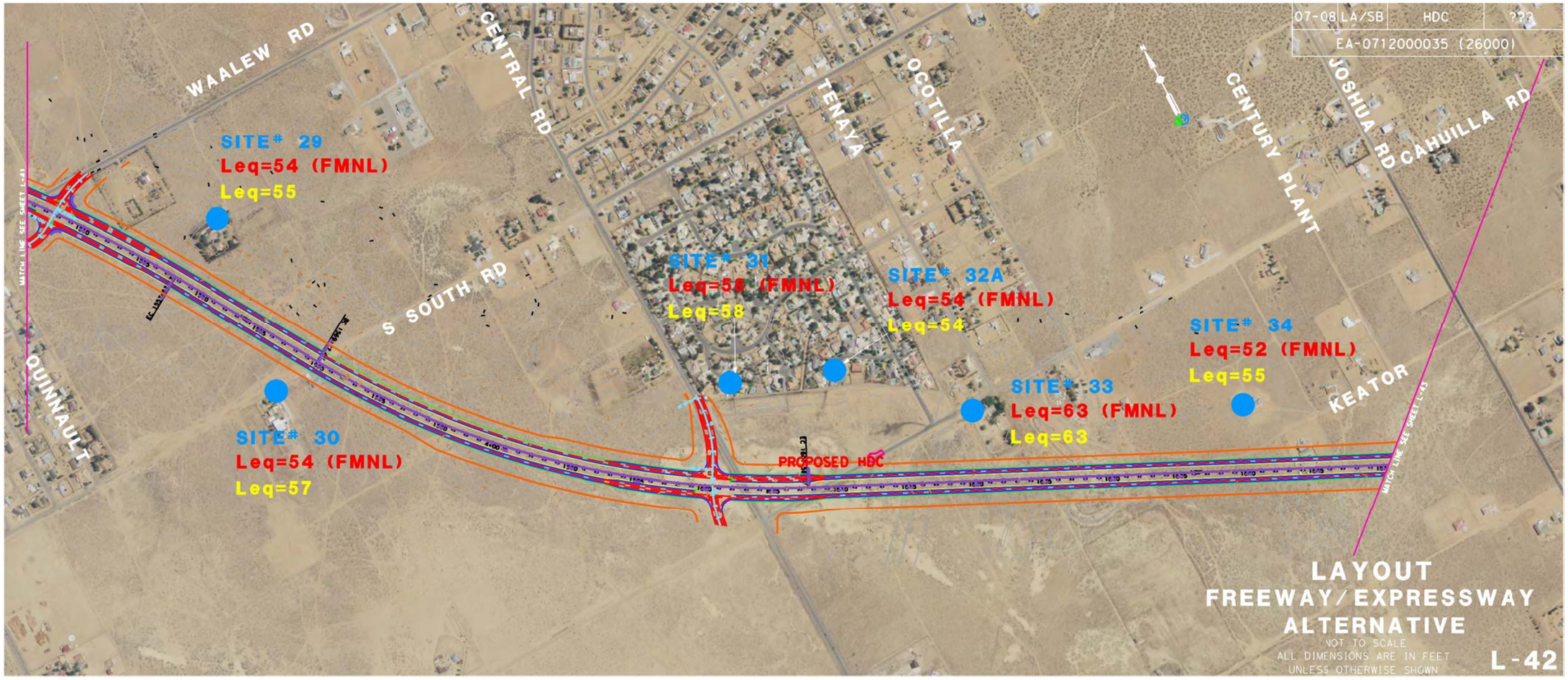

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FIGURE 41

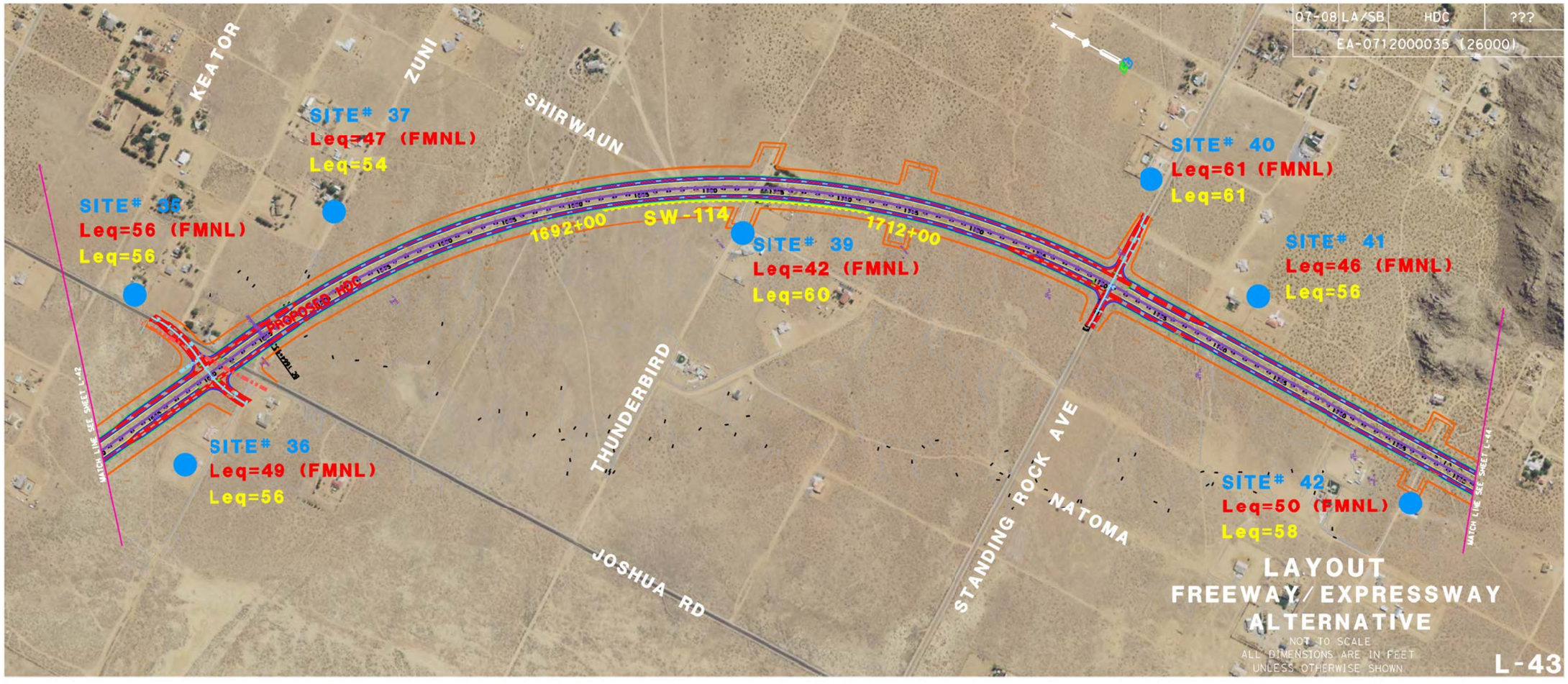

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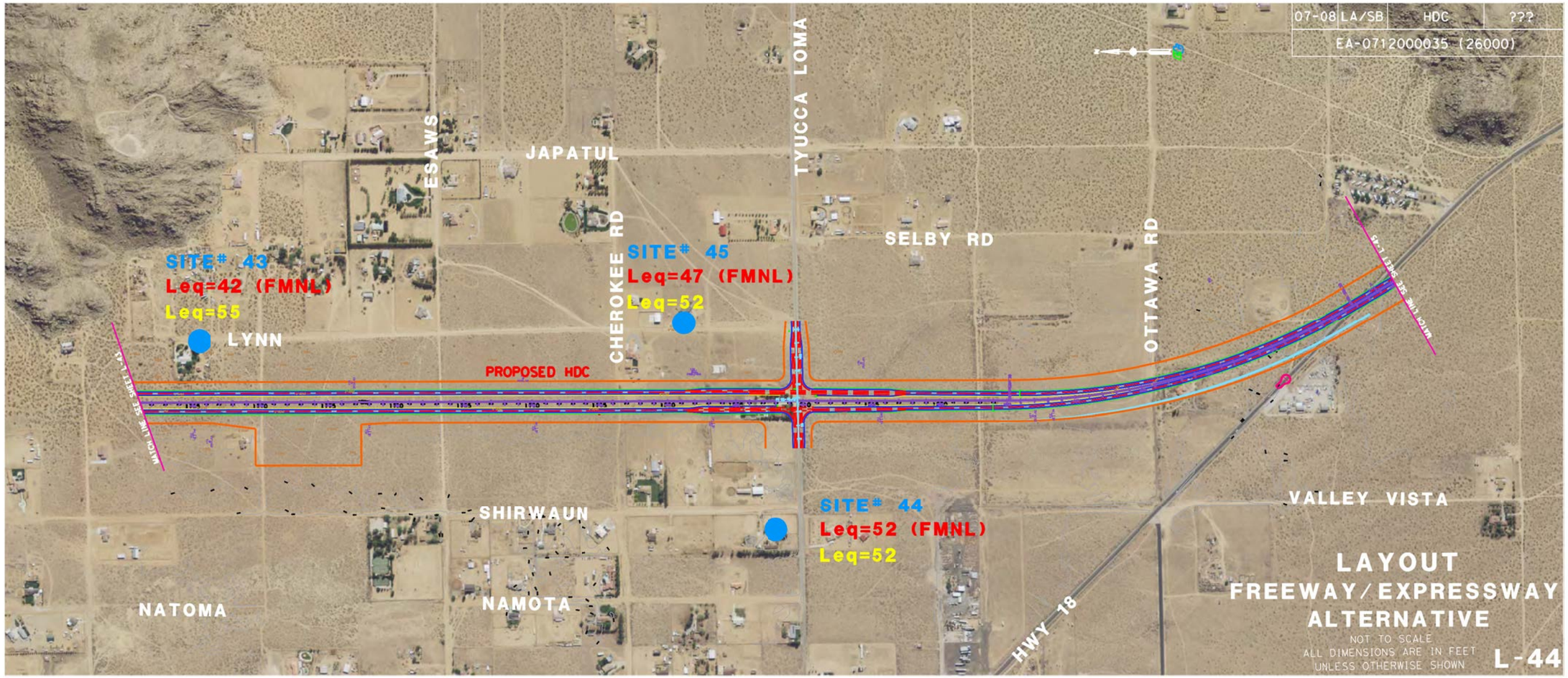
FIGURE 42



LEGEND

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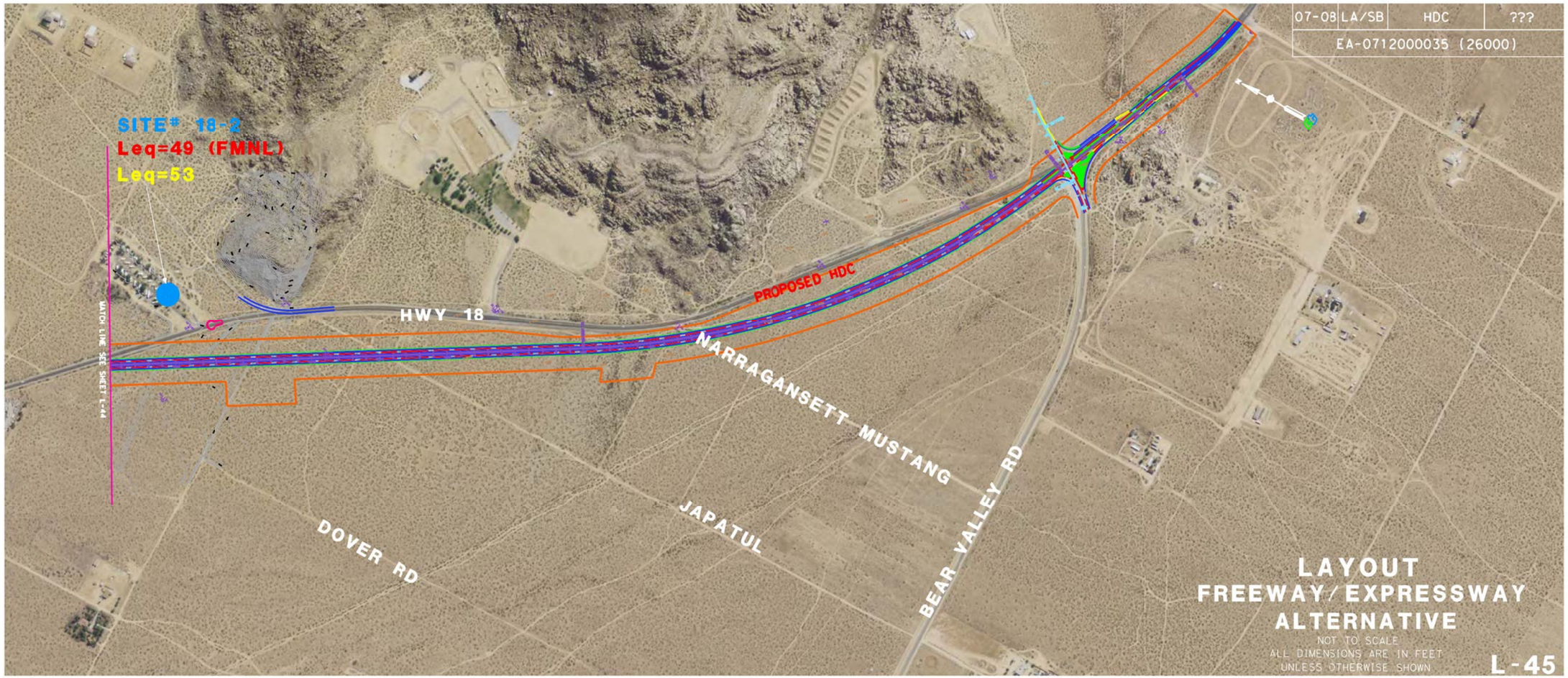
FIGURE 43



LEGEND

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FIGURE 44

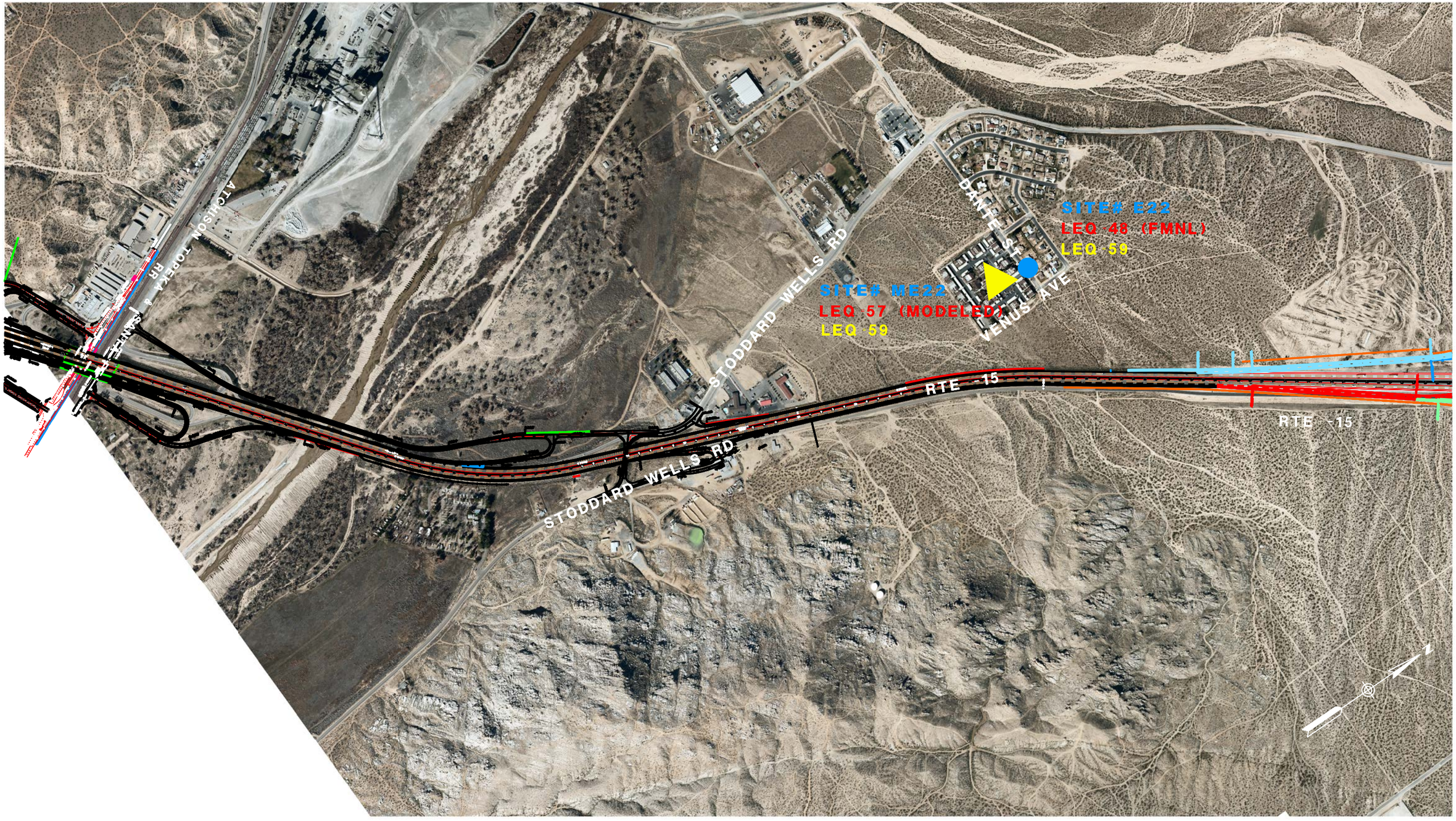

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FIGURE 45

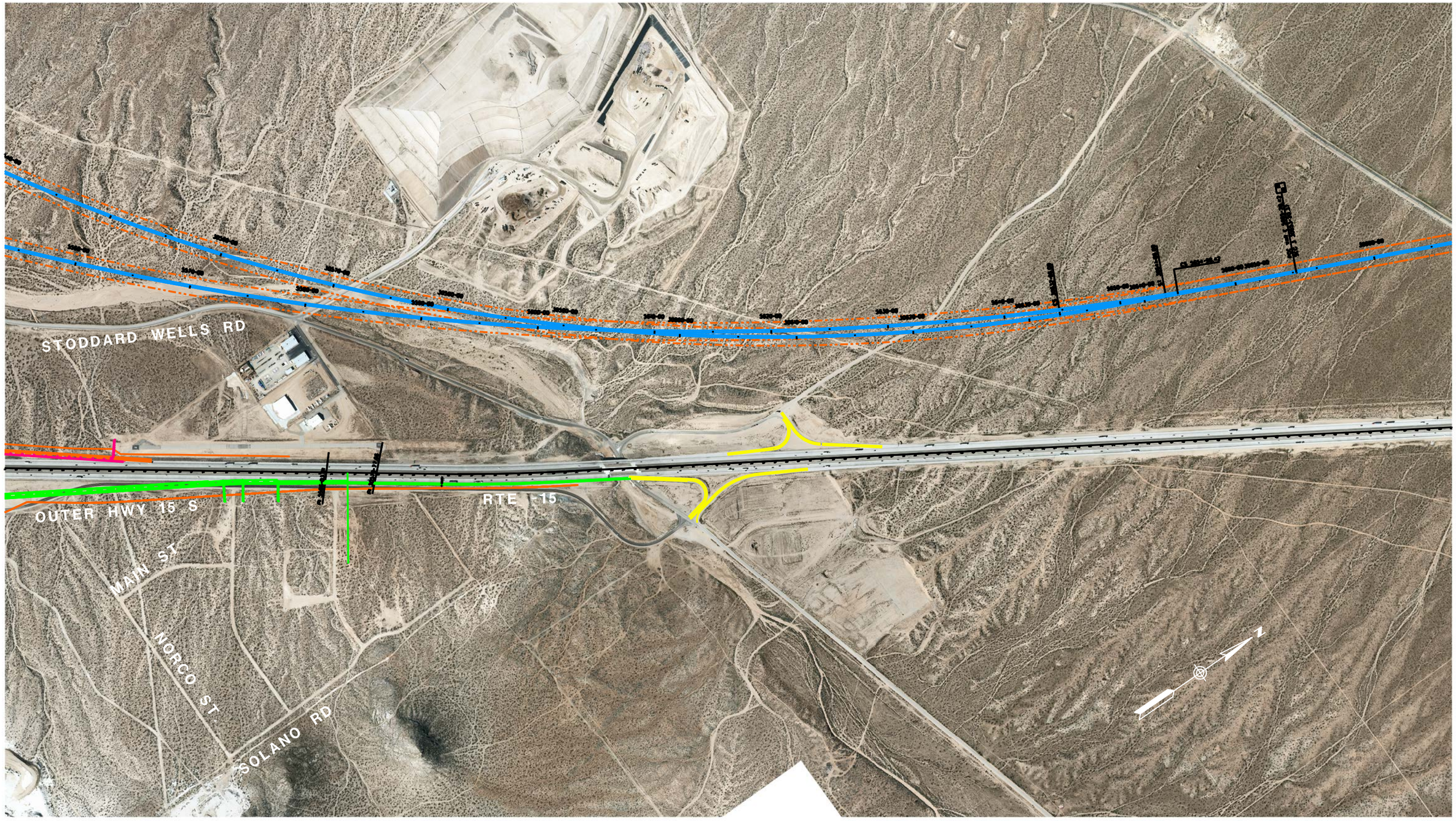

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FIGURE 46

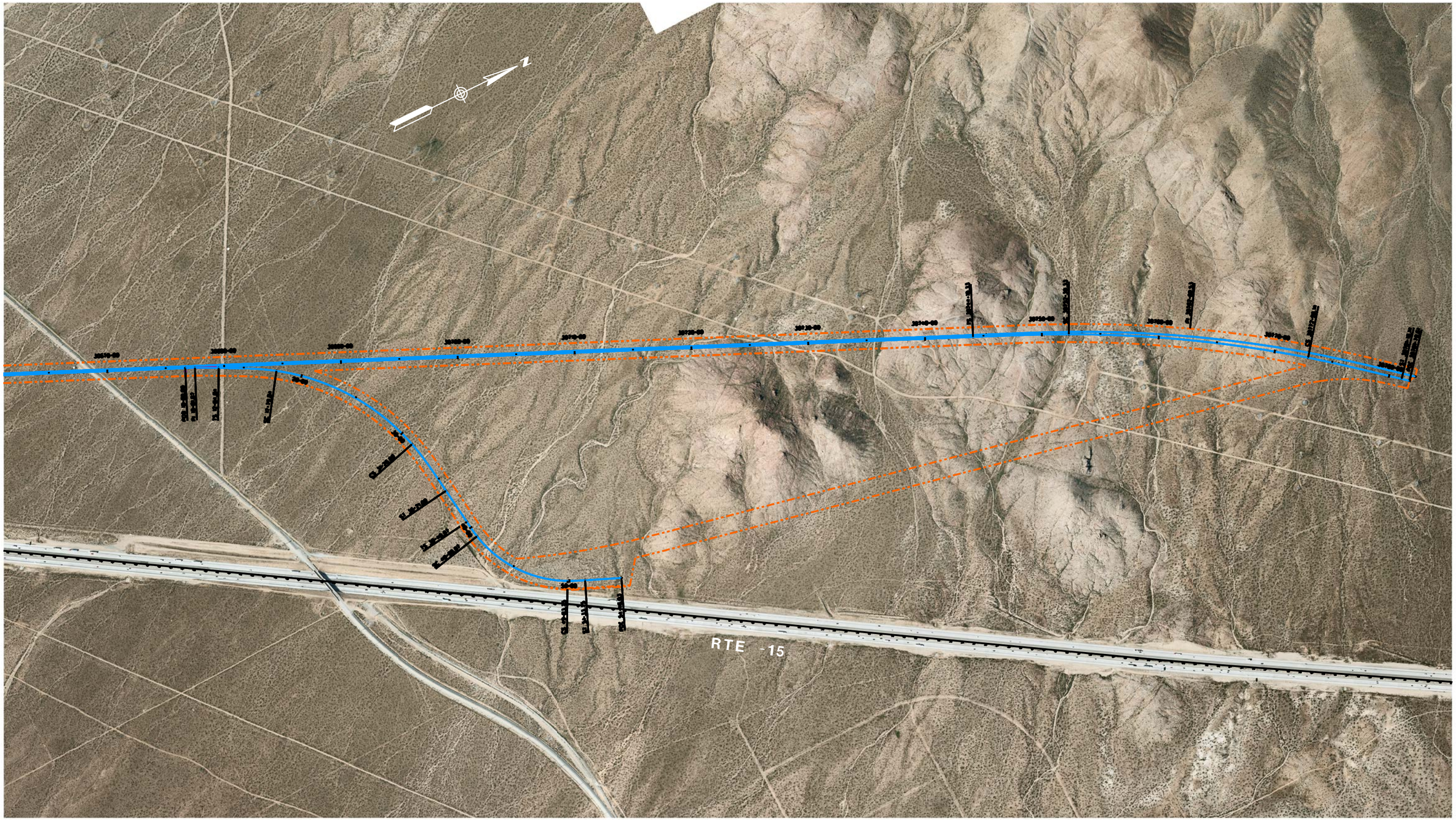

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FIGURE 47