Arizona Department of Transportation

Environmental Planning

Final Noise Analysis Technical Report

I-10, SR 85 to Verrado Way

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ADOT Federal Aid No.: 010-A(232)T
ADOT Project No.: 010 MA 112 F0119 01C

Submittal Date
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Noise Analysis Technical Report
FOR
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EXECUTIVE SUMMARY

The Arizona Department of Transportation (ADOT) is proposing a roadway widening project. The project is located on Interstate 10 (I-10) from milepost (MP) 111.7 near the State Route (SR) 85/I-10 system interchange to MP 122.8 near Perryville Road in the City of Buckeye, City of Goodyear, and Maricopa County, Arizona.

The recommended improvements are designed to reduce congestion, improve traffic operations and enhance regional mobility by increasing the capacity of I-10, the traffic interchange (TI) ramps, and the arterial cross-streets. This segment of I-10 from SR 85 to Verrado Way is programmed to be widened to provide one additional general-purpose lane in both directions. Access control along I-10 will remain as it currently exists within the project limits. Improvements being contemplated at the Watson Road and Miller Road TIs include signalization (Miller Road TI only), additional turn lanes, increased storage, and potentially converting the existing compact diamond interchange (CDI) configuration to an improved CDI configuration or to a diverging diamond interchange (DDI) configuration. This Noise Analysis Technical Report presents the peak hour traffic noise level analysis results.

ADOT considers mitigation for noise sensitive areas predicted to be impacted by highway traffic noise levels from ADOT's transportation improvement projects. The noise level impact determination used in this analysis is based on the ADOT Noise Abatement Requirements (NAR), dated May 2017. Table 1 below shows the summary of this noise analysis.

TABLE 1
SUMMARY OF NOISE ANALYSIS
I-10, SR 85 TO VERRADO WAY

Parameters	2040 No-Build	2040 Build Alternative
No. of Modeled Receivers	231	231
No. of Representative Receptors	599	599
Range of Noise Levels, dBA	54-77	56-76
No. of Barriers Needed for Mitigation	N/A	2
Cost of Mitigation[1]	N/A	$4,001,608

1. Mitigation cost is based on $35/ft^2 for new construction; $22.50/linear foot for demolition

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1.0 PROJECT INTRODUCTION

The Arizona Department of Transportation (ADOT), in partnership with the Federal Highway Administration (FHWA), has completed the Initial Design Concept Report and environmental studies to evaluate proposed improvements to Interstate 10 (I-10) in Maricopa County, Arizona. The project is located on Interstate 10 (I-10) from milepost (MP) 111.7 near the State Route (SR) 85/I-10 system interchange to MP 122.8 near Perryville Road in the City of Buckeye, City of Goodyear, and Maricopa County, Arizona. The scope of work for this project includes:

- Construct a single general-purpose lane in the median of I-10 in the eastbound (EB) and westbound (WB) travel directions from just west of the SR 85/I-10 system interchange to just east of Verrado Way
- Install asphalt rubber-asphaltic concrete friction course (AR-ACFC) on I-10 mainline roadway from just west of the SR 85/I-10 system interchange to just east of Verrado Way
- Construct a median barrier in I-10 median from just west of the SR 85/I-10 system interchange to just east of Verrado Way
- Remove and reconstruct the existing traffic interchanges (TIs) and bridges at Watson Road and Miller Road
- Reconstruct and widen Watson Road and Miller Road to provide a minimum of two lanes in each direction and turn lanes at each TI
- Remove existing access on Yuma Road
- Construct temporary roadways within the existing I-10 median or along the existing on- and offramps to shift I-10 traffic as needed to accommodate new bridge construction at each TI
- Remove the above-mentioned temporary roadways prior to the end of construction
- Remove and reconstruct roadside barriers as needed
- Construct noise barriers along I-10 mainline, per recommendations from this noise analysis
- Construct interim roadway improvements at Jackrabbit Trail TI as needed
- Obliterate roadway striping and restripe roadway
- Obtain right-of-way, easements, and temporary construction easements as needed

The project location and project study area are shown in **Figure 1** and **Figure 2**, respectively.

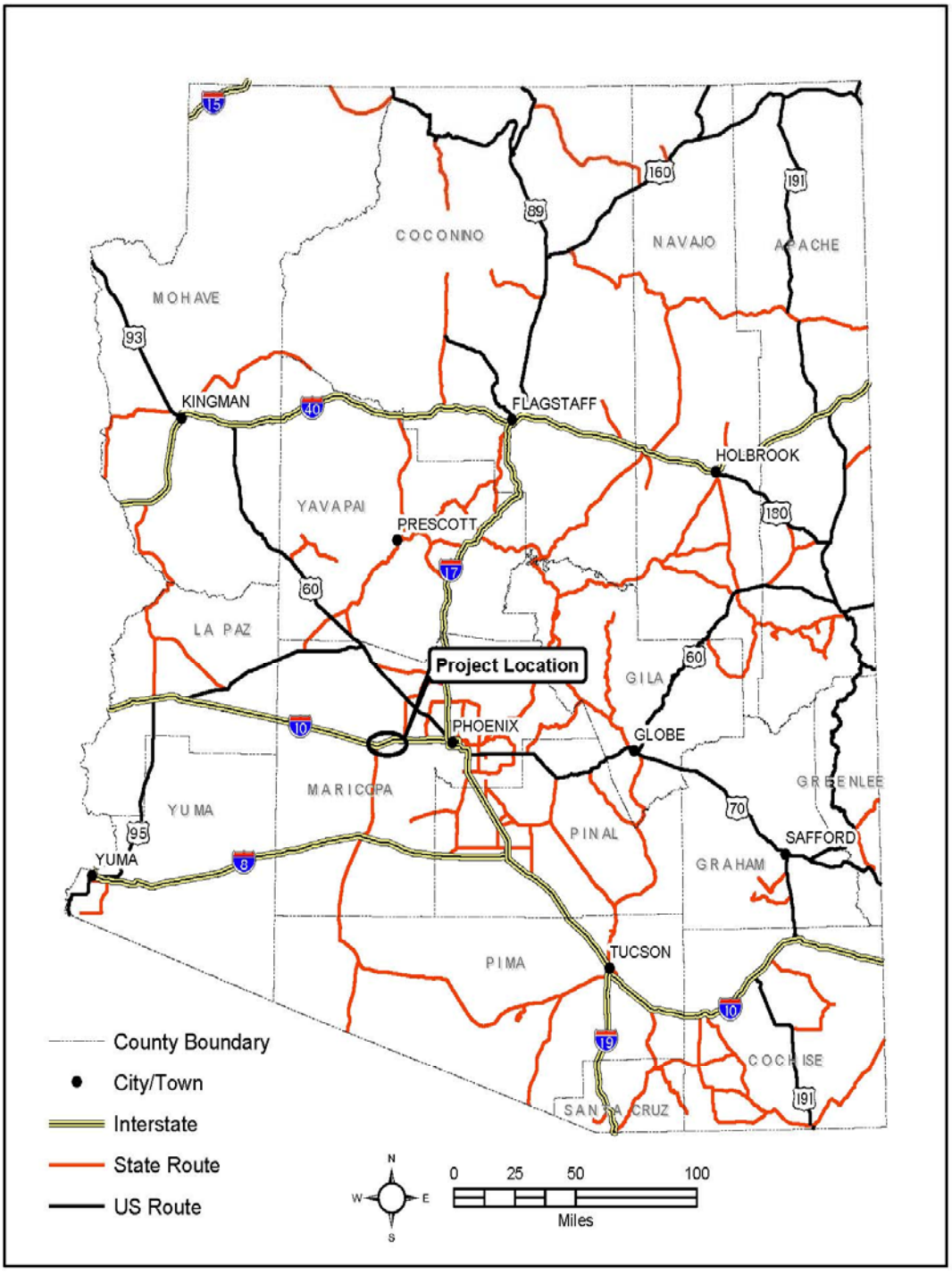

Figure 1. Project Location
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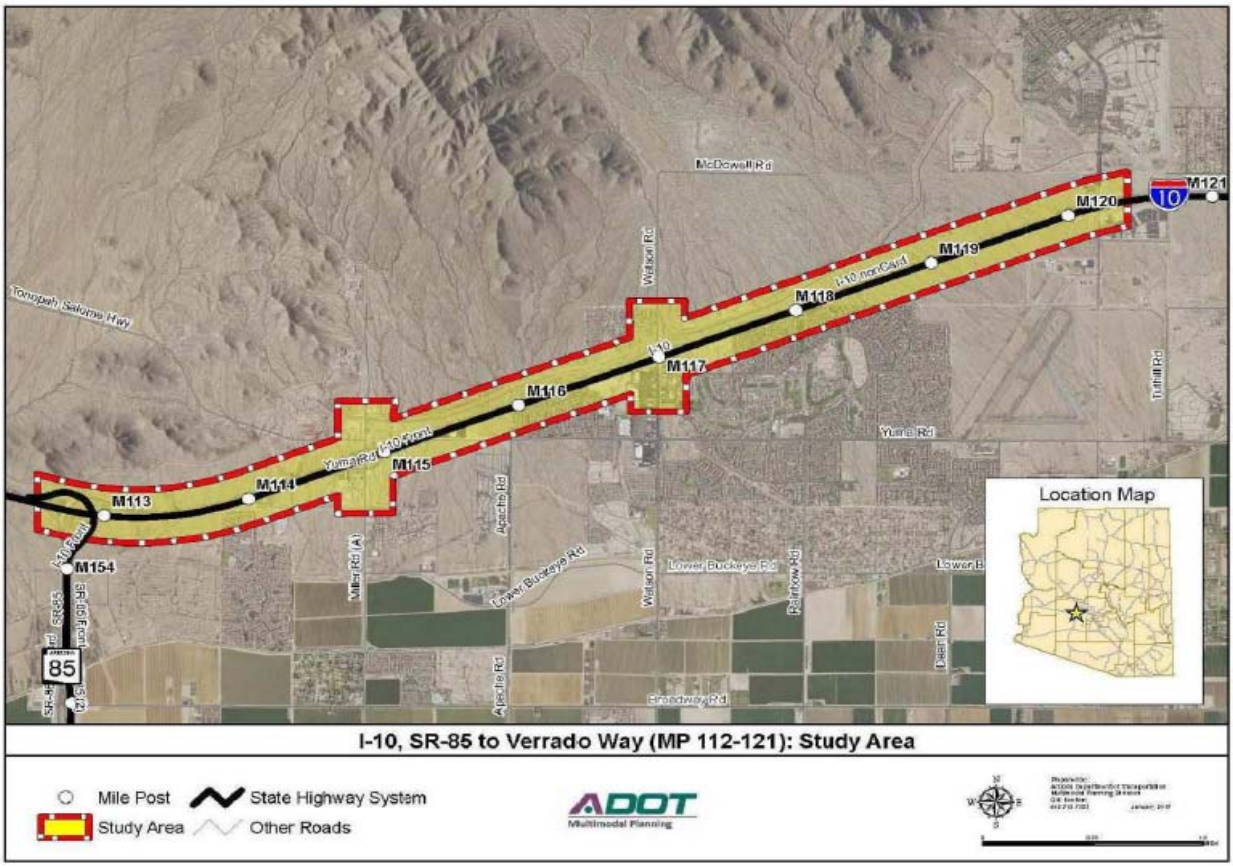
010 MA 112 F0119 01C
SR 85 to Verrado Way (I-10)

Figure 2. Project Study Area



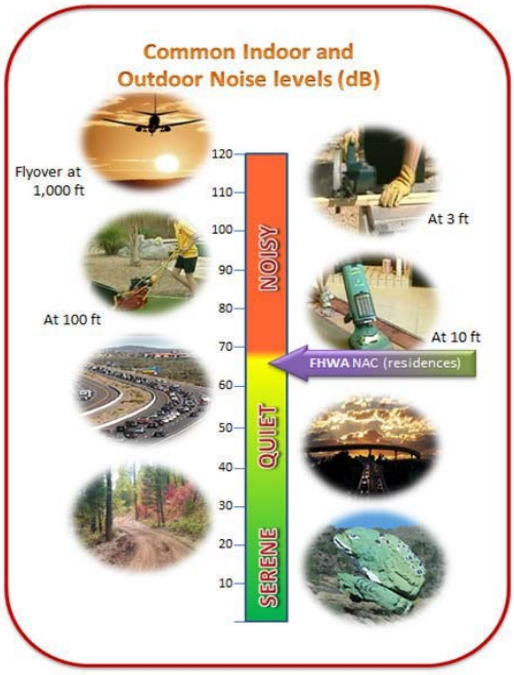
2.0 NOISE STUDY PROCEDURES

This noise study procedure, as specified by 23 C.F.R. § 772, follows a six-step process:

1. Identify noise-sensitive land uses,
2. Determine existing noise levels,
3. Predict future (Design Year) noise levels,
4. Determine traffic noise impacts at the noise-sensitive receptors by comparing future (Design Year) noise levels of the Proposed Alternatives with the existing noise levels,
5. Identify any noise impacts resulting from project construction activities, and
6. Provide and evaluate information from local land use planning agencies regarding predicted future (Design Year) noise levels for use in land development decisions.

3.0 FUNDAMENTALS OF TRAFFIC NOISE

Sound is the sensation produced by stimulation of the hearing organs produced by continuous and regular vibrations of a longitudinal pressure wave that travels through an elastic medium (air, water, metal, wood) and can be heard when they reach a person's or animal's ear. When sound travels through air, the atmospheric pressure wave variations occur periodically. It travels in air at a speed of approximately 1087 feet per second at sea level and temperature of 32 °F. Noise is usually defined as any "unwanted sound," and consists of sounds that are perceived as interfering with communication, work, rest, and recreation. It is characterized as a non-harmonious or discordant group of sounds.



Sound Pressure Levels, Decibels, Frequencies and A-Weighted Decibels-dBA

Noise can be measured in Pa (Pascal). A healthy human ear can detect a pressure variation of 20 µPa and it is referred to as threshold of hearing. Logarithmic scale is useful for handling numbers on a wide scale, but for a smaller span, the decibel or (dB) scale is used. Sound pressure level (SPL) is calculated is using measured sound level and the hearing threshold of 20 µPa or 20 x 10-6 Pa as the reference level, this level can also be defined as 0 dB. The decibel alone is insufficient to describe how human ear responds to sound pressures at all frequencies. The human ear has peak response in the range of 2,500 to 3,000 Hz and has a somewhat low response at low or even high frequencies. In response to the human ear sensitivity, the A-weighted noise level, referenced in units of dBA, was determined to better resemble people's perception of sound levels. This dBA unit of measurement is used in noise studies and reporting. Changes in sound level under 3 dBA are not noticed by human ear, while the human ear perceives a 10 dBA increase in sound level to be a doubling of sound

Noise Descriptors

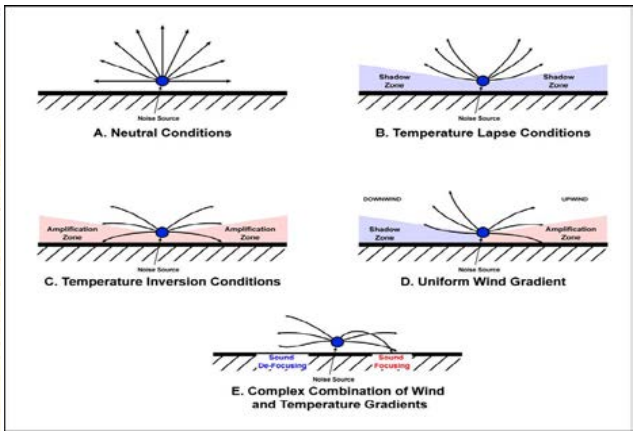
The most commonly used noise descriptor in traffic noise analysis is Equivalent Sound Level (Leq). Leq represents an average of the sound energy occurring over a specified period. In effect, Leq is the steady-state sound level containing the same acoustical energy as the time-varying sound that actually occurs during the same period. The 1-hour A-weighted equivalent sound level [LAeq(h)] is the energy average of A-weighted sound levels occurring during a one-hour period, and is the basis for noise criteria used by ADOT.

What are source, receiver, receptor, and path when talking about traffic noise?

Traffic noise is a combination of the noises produced by vehicle engines, exhaust, and tires. The source of highway traffic comes from vehicles traveling on highways. The noise level at the Source depends on pavement type, number of heavy trucks, traffic volumes, and traffic speeds. The

predominant noise sources in vehicles at speeds less than 30 mph are engine and exhaust. At speeds greater than 30 mph, tire noise becomes the dominant noise source.

In the illustration below, the Receptor is any location where people are affected by the traffic noise. It can be residence, park, school, playground and any other place where frequent human use occurs. An area between the source and the receptor (receiver represents a receptor(s) when modeled in FHWA Traffic Noise Model) is considered a path. Depending on the path surface, propagation of sound may be reduced; such is the case for the soft ground and fresh snow. Doubling the distance between the source and receptor reduces noise by three dBA depending on the ground.



Air changes its density due to variation of humidity and temperature, and wind influences refraction of sound waves. Wind, humidity, and temperature may have a significant impact, but only influences the receptors located a long distance away from source. As residents are usually much closer to the noise source, any atmospheric conditions are insignificant for consideration.

For more information on noise, please visit ADOT Environmental Planning Noise webpage.

4.0 NOISE IMPACT CRITERIA

The ADOT NAR provides the guidelines used to assess the potential negative impacts from highway traffic noise levels and determines the need for noise abatement. The noise level impact methodology used for this analysis is based on the current ADOT NAR. The Federal Highway Administration (FHWA) has established Noise Abatement Criteria (NAC) and procedures to be used in the planning and design of highways. A summary of the NAC for various land uses is presented in Table 2.

The ADOT NAR is based on the noise levels approaching the FHWA NAC. ADOT defines "approaching" as within 1 dBA of the FHWA NAC for Activity Categories A, B, C, D, and E. There are no noise impact thresholds for Activity Category F or G. The ADOT NAR determines highway traffic noise level impacts and considers mitigation for residential land uses when the predicted noise level is equal to or greater than the noise impact threshold of 66 dBA. ADOT also indicated that noise levels should be rounded to the nearest integer prior to impact determination and in project reports.

TABLE 2
FHWA NOISE ABATEMENT CRITERIA[1]

Activity Category	dBA, L_{Aeq1h}[2]	Activity Description
A	57 (exterior)	Land 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	67 (exterior)	Residential.
C	67 (exterior)	Active sports 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 structures, recording studios, schools, and television studios.
E	72 (exterior)	Hotels, motels, offices, restaurants/bars, and other developed lands, properties or activities not included in categories 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. Sources: Federal Highway Administration (2011); 23 Code of Federal Regulations § 772.
2. The 1-hour equivalent loudness in A-weighted decibels, which is the logarithmic average of noise over a 1-hour period.

5.0 NOISE SENSITIVE LAND USES

The project area is comprised of Category B (residential), Category C (schools), Category E (hotels), and Category G (undeveloped lands). This analysis focuses on representative noise sensitive receptors in Categories B, C, and E. Below is a brief description of the noise-sensitive land uses examined for this study.

North of I-10 - Noise-sensitive land uses in this area include single-family residences in the Sundance Subdivision (Sierra & Highland).

South of I-10 - Noise-sensitive land uses in this area include single-family residences in the Westpark, Acacia Crossing, and Sundance Cove Subdivisions; Sundance Golf Club; Buckeye and Sundance Elementary Schools, Holiday Inn and Days Inn hotels; and several restaurants.

6.0 EXISTING NOISE ENVIRONMENT

Short-term noise level monitoring was conducted within the project limits on May 1, 2018 to describe the existing noise environment. Five measurement locations were chosen to represent noise sensitive receptors in residential communities along the project corridor.

Three 15-minute interval equivalent noise level measurements (Leq) were conducted at each site. Noise level monitoring helps describe the existing noise environment throughout the project area and capture the contribution of traffic noise from surrounding roadways. Measured noise levels may include contributions from other noise sources, including but not limited to, airplanes, wind, birds, insects, landscaping equipment, etc.

The equipment used for the noise level monitoring was a Larson Davis Model LXT Class 1 integrating sound level meter (SLM). The SLM was calibrated in the field before each measurement using a Larson Davis Model CAL200. Existing noise measurements were collected under meteorologically acceptable conditions when the pavement was dry and winds were calm or light. Additional data collected at each monitoring location included atmospheric conditions such as general wind speed and direction, humidity, dewpoint, barometric pressure, and ambient temperature. Measurements were collected based on the acceptable collection of existing noise level readings per FHWA Report number FHWA-PD-96-046, and “Measurement of Highway Related Noise.”

The measured noise level ranged from 59 dBA to 70 dBA. Appendix A shows the location of the noise level monitoring sites, and Table 3 shows the summary of the noise level measurements. Appendix B shows the measured noise level data.

TABLE 3
SUMMARY OF SOUND LEVEL MEASUREMENTS
MAY 1, 2018

Site Number	Description	15-Minute Interval Measured Noise Levels (Leq), dBA		
		Interval 1	Interval 2	Interval 3
MON 1	Near Westpark Subdivision	60	60	59
MON 2	Days Inn Pool Area	65	65	64
MON 3	Near Acacia Crossing Subdivision	69	69	69
MON 4	Near Sundance Subdivision	61	70	61
MON 5	Sundance Golf Club	69	69	69

7.0 NOISE MODELING METHODOLOGY AND TNM 2.5 VARIABLES

The FHWA-approved Traffic Noise Model version 2.5 (TNM 2.5) is the computer noise model used for the prediction of highway and roadway traffic noise levels. The output of the model is dependent upon variables, which include atmospheric conditions, roadway geometries, topographic data, ground types, noise receiver locations, traffic volumes, vehicle speed, and vehicle mix.

Atmospheric Conditions

Noise level is affected by temperature and humidity. Temperature gradients cause refraction effects. For example, in the morning, when the ground is still cool from the night before but the upper air is warming due to the sun, noise can bounce between the gradient and the ground, forming regions of higher and lower noise intensity. Noise attenuation is also affected by humidity. Dry air absorbs more acoustical energy than moist air because dry air has a higher density than moist air at a given temperature. For noise modeling purposes, FHWA recommends the default values of 68 degrees Fahrenheit for the temperature and 50 percent humidity.

Roadway Geometry & Topographic Data and Ground Type

The roadway geometries and topographic data for the project were based on preliminary design plans provided by the design engineer (Kimley-Horn). Loose soil was used to approximate the ground type between the roadway and receptors.

Receptor and Receiver Locations

The ADOT NAR defines a “receptor” as a discrete or representative location of a noise sensitive area(s) for any of the land uses listed in Table 2 on page 7. A “Receiver” is defined as a location used in noise modeling to represent the measured and predicted noise level at a particular point. The noise-sensitive receptors are located in the backyard or common outdoor areas of use.

Traffic Volumes

The ADOT NAR provides guidelines on the traffic volumes for use in the noise model, in which a “worst-case” approach should be used. In general, this should reflect Level of Service (LOS) C traffic conditions during the peak hour, with traffic moving at 5 miles per hour (mph) above the posted speed limit. Also, if the future traffic volumes are less than the maximum LOS C volumes, then the future traffic volumes will be utilized. If no other traffic information is available, the peak

hourly volume should be 10 percent of the annual average daily traffic (AADT) volume. Traffic information was provided by Kimley-Horn in the "I-10, SR 85 to Verrado Way Initial Traffic Report" and supplemental data was provided by the Maricopa Association of Governments (MAG). The No-Build and Build Conditions were modeled with LOS C hourly volumes on all roadways except the ramps which were modeled with the peak-hour traffic volumes. These volumes are shown in Appendix C.

Vehicle Speed

The posted speed limit on I-10 within the project limits is 65 miles per hour (mph) east of Verrado Way and 75 mph west of Verrado Way. For the No-Build and Build Conditions, the freeway mainline modeled vehicle speed for autos and medium trucks was 80 mph, heavy trucks at 75 mph, and ramps at 50 mph for all vehicle types.

Vehicle Mix

The percentages of vehicles by type (vehicle mix) is an important input for the noise model, because different vehicle types exhibit different base or reference noise emission levels, such as with trucks that produce higher reference levels than cars, and larger trucks that produce higher reference levels than smaller trucks. Vehicle types are defined as follows:

- Cars (Auto): All vehicles with two axles and four wheels designed primarily for passenger transportation or cargo (light trucks). Generally, the gross vehicle weight is less than 10,000 pounds.
- Medium Trucks: All vehicles having two axles and six wheels designed for the transportation of cargo. Generally, the gross vehicle weight is greater than 10,000 pounds but less than 26,400 pounds.
- Heavy Trucks: All vehicles having three or more axles and designed for the transportation of cargo. Generally, the gross weight is greater than 26,400 pounds.

This noise analysis focuses on automobile, medium truck, and heavy truck usage on the roadways. The vehicle mix used in this analysis is shown in Appendix C.

8.0 FUTURE NOISE ENVIRONMENT AND IMPACT DETERMINATION

Tables 4 through 9 show the results of the predicted traffic noise levels, based on the TNM 2.5 input assumptions described in the preceding section.

Section 1: SR 85 to Miller Road - North

A total of 16 receivers were modeled to represent 16 receptors north of I-10 between SR 85 and Miller Road. Table 4 shows the No-Build and Build modeled noise levels.

TABLE 4
Modeled Noise Level Results
SR 85 to Miller Road - North

Receiver ID	NAC Category	No of Dwelling Units	Description of Receiver	No-Build 2040 (dBA)	Build (2040) dBA
W1	G	1	Vacant Lands	65	68
W2	G	1	Vacant Lands	67	70
W3	G	1	Vacant Lands	69	71
W4	G	1	Vacant Lands	68	70
W5	G	1	Vacant Lands	65	67
W6	G	1	Vacant Lands	61	63
W7	G	1	Vacant Lands	61	63
W8	G	1	Vacant Lands	68	71
W9	G	1	Vacant Lands	69	72
W10	G	1	Vacant Lands	69	72
W11	G	1	Vacant Lands	69	72
W12	G	1	Vacant Lands	62	65
W13	G	1	Vacant Lands	62	65
W14	G	1	Vacant Lands	64	67
W15	G	1	Vacant Lands	70	73
W16	G	1	Vacant Lands	67	70

The modeled noise levels range from 61 to 70 dBA for the No-Build Condition and from 63 dBA to 73 dBA for the Build Alternatives. Mitigation evaluation is not required for Category G land use. Appendix A shows the locations of the modeled noise receivers from Table 4.

Section 1: SR 85 to Miller Road – South

A total of 43 receivers were modeled to represent 197 receptors south of I-10 between SR 85 and Miller Road. Table 5 shows the No-Build and Build modeled noise levels.

TABLE 5
Modeled Noise Level Results
Section 2: SR 85 to Miller Road - South

Receiver ID	NAC Category	No of Dwelling Units	Description of Receiver	No-Build 2040 (dBA)	Build (2040) dBA
E1	G	1	Vacant Lands	65	67
E2	G	1	Vacant Lands	67	69
E3	G	1	Vacant Lands	68	70
E4	G	1	Vacant Lands	67	68

TABLE 5
Modeled Noise Level Results
Section 2: SR 85 to Miller Road - South

Receiver ID	NAC Category	No of Dwelling Units	Description of Receiver	No-Build 2040 (dBA)	Build (2040) dBA
E5	G	1	Vacant Lands	61	64
E6	G	1	Vacant Lands	64	66
E7	G	1	Vacant Lands	67	68
E8	G	1	Vacant Lands	67	70
E9	G	1	Vacant Lands	67	70
E10	G	1	Vacant Lands	67	70
E11	B	2	Westpark Subdivision	**67**	**70**
E12	B	4	Westpark Subdivision	**66**	**68**
E13	B	2	Westpark Subdivision	**68**	**70**
E14	B	6	Westpark Subdivision	**67**	**69**
E15	B	3	Westpark Subdivision	**66**	**68**
E16	B	6	Westpark Subdivision	**67**	**69**
E17	B	3	Westpark Subdivision	**68**	**70**
E18	B	5	Westpark Subdivision	**67**	**69**
E19	B	3	Westpark Subdivision	65	**68**
E20	B	3	Westpark Subdivision	65	**67**
E21	B	3	Westpark Subdivision	64	**66**
E22	B	6	Westpark Subdivision	65	**67**
E23	B	3	Westpark Subdivision	64	**66**
E24	B	4	Westpark Subdivision	64	**67**
E25	B	2	Westpark Subdivision	61	64
E26	B	2	Westpark Subdivision	63	**66**
E27	B	2	Westpark Subdivision	63	**66**
E28	E	1	Empire Rental	68	**71**
E29	C	12	Buckeye Elementary School (890 students, 50 teachers	61	64
E29A	C	12	Buckeye Elementary School	61	64
E29B	C	12	Buckeye Elementary School	61	64
E29C	C	12	Buckeye Elementary School	60	63
E29D	C	12	Buckeye Elementary School	61	64
E29E	C	12	Buckeye Elementary School	60	63
E29F	C	12	Buckeye Elementary School	60	63
E29G	C	12	Buckeye Elementary School	60	63
E29H	C	12	Buckeye Elementary School	60	63
E29I	C	12	Buckeye Elementary School	60	63
E30	G	1	Vacant Lands	68	70
E31	G	1	Vacant Lands	69	70
E32	E	3	Days Inn Buckeye - Pool Area	65	67
E33	E	1	Love's Travel Stop	67	69
E34	E	1	Burger King	68	70

Note: **Bolded** values are equal to or greater than ADOT NAR noise impact threshold of **66** dBA for Categories B and C; and **71** dBA for Category E.

The modeled noise levels range from 60 to 69 dBA for the No-Build Condition and from 63 dBA to 71 dBA for the Build Alternatives. The modeled noise levels for the Build Alternatives are equal to or greater than the ADOT NAR noise impact threshold of 66 dBA for Category B and 71 dBA for Category E. Therefore, mitigation evaluation is required for this area. Appendix A shows the locations of the modeled noise receivers from Table 5.

Section 2: Miller Road to Watson Road - North

A total of 26 receivers were modeled to represent 47 receptors north of I-10 between Miller Road and Watson Road. Table 6 shows the No-Build and Build modeled noise levels.

TABLE 6
Modeled Noise Level Results
Section 2: Miller Road to Watson Road - North

Receiver ID	NAC Category	No of Dwelling Units	Description of Receiver	No-Build 2040 (dBA)	Build (2040) dBA
W17	G	1	Vacant Lands	68	71
W18	G	1	Vacant Lands	69	72
W19	G	1	Vacant Lands	69	72
W20	G	1	Vacant Lands	69	72
W21	G	1	Vacant Lands	69	72
W22	G	1	Vacant Lands	68	72
W23	G	1	Vacant Lands	69	72
W24	G	1	Vacant Lands	68	71
W25	B	3	Sundance Subdivision	56	59
W26	B	3	Sundance Subdivision	57	60
W27	B	2	Sundance Subdivision	57	59
W28	B	3	Sundance Subdivision	58	60
W29	B	2	Sundance Subdivision	56	58
W30	B	2	Sundance Subdivision	54	57
W31	B	2	Sundance Subdivision	55	57
W32	G	1	Vacant Lands	68	71
W33	B	2	Sundance Subdivision	55	58
W34	B	3	Sundance Subdivision	54	56
W35	B	2	Sundance Subdivision	55	57
W36	G	1	Vacant Lands	68	70
W37	B	2	Sundance Subdivision	56	59
W38	B	2	Sundance Subdivision	58	60
W39	B	3	Sundance Subdivision	59	61
W40	B	2	Sundance Subdivision	62	64
W41	B	1	Sundance Subdivision	61	64
W42	B	3	Sundance Subdivision	58	60

The modeled noise levels range from 54 to 69 dBA for the No-Build Condition and from 56 dBA to 72 dBA for the Build Alternatives. The modeled noise levels for the Build Alternatives are not equal to or greater than the ADOT NAR noise impact threshold of 66 dBA for any of the Category B receivers. Therefore, mitigation evaluation is not required for this area. Appendix A shows the locations of the modeled noise receivers from Table 6.

Section 2: Miller Road to Watson Road - South

A total of 52 receivers were modeled to represent 123 receptors south of I-10 between Miller Road and Watson Road. Table 7 shows the No-Build and Build modeled noise levels.

TABLE 7
Modeled Noise Level Results
Section 2: Miller Road to Watson Road - South

Receiver ID	NAC Category	No of Dwelling Units	Description of Receiver	No-Build 2040 (dBA)	Build (2040) dBA
E35	G	1	Vacant Lands	65	66
E36	E	1	Store-All America	66	69
E37	G	1	Vacant Lands	69	71
E38	E	1	Jones Ford Buckeye	**74**	**74**
E39	E	1	Jones Ford Buckeye	**77**	**76**
E40	G	1	Vacant Lands	67	69
E41	G	1	Vacant Lands	67	69
E42	B	2	Acacia Crossing Subdivision	63	**69**
E43	B	2	Acacia Crossing Subdivision	**66**	**74**
E44	B	3	Acacia Crossing Subdivision	65	**73**
E45	B	4	Acacia Crossing Subdivision	64	**71**
E46	B	3	Acacia Crossing Subdivision	64	**72**
E47	B	2	Acacia Crossing Subdivision	64	**73**
E48	B	3	Acacia Crossing Subdivision	63	**70**
E49	B	2	Acacia Crossing Subdivision	64	**72**
E50	B	3	Acacia Crossing Subdivision	63	**70**
E51	B	3	Acacia Crossing Subdivision	64	**70**
E52	B	3	Acacia Crossing Subdivision	63	**69**
E53	B	2	Acacia Crossing Subdivision	65	**74**
E54	B	3	Acacia Crossing Subdivision	65	**75**
E55	B	3	Acacia Crossing Subdivision	62	**67**
E56	B	3	Acacia Crossing Subdivision	65	**75**
E57	B	4	Acacia Crossing Subdivision	60	**66**
E58	B	2	Acacia Crossing Subdivision	63	**72**
E59	B	3	Acacia Crossing Subdivision	65	**75**
E60	B	2	Acacia Crossing Subdivision	64	**75**
E61	B	4	Acacia Crossing Subdivision	60	**66**
E62	B	3	Acacia Crossing Subdivision	65	**75**
E63	B	3	Acacia Crossing Subdivision	59	**66**
E64	B	3	Acacia Crossing Subdivision	64	**75**
E65	B	4	Acacia Crossing Subdivision	59	**66**
E66	B	3	Acacia Crossing Subdivision	64	**75**
E67	B	2	Acacia Crossing Subdivision	64	**74**
E68	B	4	Acacia Crossing Subdivision	59	65
E69	B	3	Acacia Crossing Subdivision	64	**74**
E70	B	3	Acacia Crossing Subdivision	57	63
E71	B	3	Acacia Crossing Subdivision	64	**74**
E72	B	3	Acacia Crossing Subdivision	57	63
E73	B	4	Acacia Crossing Subdivision	64	**75**
E74	B	2	Acacia Crossing Subdivision	59	**66**
E75	B	2	Acacia Crossing Subdivision	65	**75**
E76	B	3	Acacia Crossing Subdivision	59	64
E77	B	2	Acacia Crossing Subdivision	65	**75**
E78	B	2	Acacia Crossing Subdivision	63	**69**

TABLE 7
Modeled Noise Level Results
Section 2: Miller Road to Watson Road - South

Receiver ID	NAC Category	No of Dwelling Units	Description of Receiver	No-Build 2040 (dBA)	Build (2040) dBA
E79	B	2	Acacia Crossing Subdivision	64	**72**
E80	B	2	Acacia Crossing Subdivision	64	**71**
E81	B	2	Acacia Crossing Subdivision	63	**69**
E82	C	1	Sundance Elementary School	62	**66**
E83	G	1	Vacant Lands	66	69
E84	G	1	Vacant Lands	67	68
E85	F	1	PetSmart	70	73
E86	E	1	Carl's Jr	70	**72**

Note: Bolded values are equal to or greater than ADOT NAR noise impact threshold of 66 dBA for Categories B and C; and 71 dBA for Category E.

The modeled noise levels range from 57 to 77 dBA for the No-Build Condition and from 63 dBA to 76 dBA for the Build Alternatives. The modeled noise levels for the Build Alternatives are equal to or greater than the ADOT NAR noise impact threshold of 66 dBA for Categories B and C and 71 dBA for Category E. Therefore, mitigation evaluation is required for this area. Appendix A shows the locations of the modeled noise receivers from Table 7.

Section 3: Watson Road to Jackrabbit Trail - North

A total of 24 receivers were modeled to represent 24 receptors north of I-10 between Watson Road and Jackrabbit Trail. Table 8 shows the No-Build and Build modeled noise levels.

TABLE 8
Modeled Noise Level Results
Section 3: Watson Road to Jackrabbit Trail - North

Receiver ID	NAC Category	No of Dwelling Units	Description of Receiver	No-Build 2040 (dBA)	Build (2040) dBA
R107N	Category G	1	Vacant Land	67	70
R108N	Category G	1	Vacant Land	70	72
R109N	Category G	1	Vacant Land	66	69
R110N	Category G	1	Vacant Land	66	68
R111N	Category G	1	Vacant Land	68	70
R112N	Category G	1	Vacant Land	65	68
R113N	Category G	1	Vacant Land	63	66
R114N	Category G	1	Vacant Land	63	66
R115N	Category G	1	Vacant Land	62	64
R116N	Category G	1	Vacant Land	70	72
R117N	Category G	1	Vacant Land	66	68
R118N	Category G	1	Vacant Land	68	71
R119N	Category G	1	Vacant Land	55	58
R120N	Category G	1	Vacant Land	65	67
R121N	Category G	1	Vacant Land	65	68
R122N	Category G	1	Vacant Land	56	58
R123N	Category G	1	Vacant Land	62	64
R124N	Category G	1	Vacant Land	64	67
R125N	Category G	1	Vacant Land	64	67
R126N	Category G	1	Vacant Land	64	67
R127N	Category G	1	Vacant Land	64	67

TABLE 8
Modeled Noise Level Results
Section 3: Watson Road to Jackrabbit Trail - North

Receiver ID	NAC Category	No of Dwelling Units	Description of Receiver	No-Build 2040 (dBA)	Build (2040) dBA
R128N	Category G	1	Vacant Land	65	68
R129N	Category G	1	Vacant Land	62	65
R130N	Category G	1	Vacant Land	64	67

The modeled noise levels range from 55 to 70 dBA for the No-Build Condition and from 58 dBA to 72 dBA for the Build Alternatives. Mitigation evaluation is not required for Category G land use. Appendix A shows the locations of the modeled noise receivers from Table 8.

Section 3: Watson Road to Jackrabbit Trail - South

A total of 70 receivers were modeled to represent 192 receptors south of I-10 between Watson Road and Jackrabbit Trail. Table 9 shows the No-Build and Build modeled noise levels.

TABLE 9
Modeled Noise Level Results
Section 3: Watson Road to Jackrabbit Trail - South

Receiver ID	NAC Category	No of Dwelling Units	Description of Receiver	No-Build 2040 (dBA)	Build (2040) dBA
E87	F	1	Discount Tire Store	69	72
E88	E	1	Holiday Inn Express & Suites	69	70
E89	G	1	Vacant Lands	69	71
E90	G	1	Future Sundance Cove II Subdivision	66	68
E91	G	1	Future Sundance Cove II Subdivision	70	72
E92	G	1	Future Sundance Cove II Subdivision	67	69
E93	G	1	Future Sundance Cove II Subdivision	66	68
E94	G	2	Future Sundance Cove II Subdivision	71	72
E95	G	2	Future Sundance Cove II Subdivision	69	72
E96	G	3	Future Sundance Cove II Subdivision	69	72
E97	G	4	Future Sundance Cove II Subdivision	72	72
E98	G	3	Future Sundance Cove II Subdivision	68	71
E99	G	2	Future Sundance Cove II Subdivision	67	70
E100	G	3	Future Sundance Cove II Subdivision	66	69
E101	B	2	Sundance Subdivision	64	**70**
E102	B	3	Sundance Subdivision	65	**72**
E103	B	3	Sundance Subdivision	64	**70**
E104	B	3	Sundance Subdivision	63	**71**
E105	B	2	Sundance Subdivision	64	**72**
E106	B	3	Sundance Subdivision	64	**72**
E107	B	3	Sundance Subdivision	65	**72**
E108	B	3	Sundance Subdivision	64	**73**
E109	B	4	Sundance Subdivision	65	**73**
E110	B	2	Sundance Subdivision	64	**71**
E111	B	3	Sundance Subdivision	64	**72**
E112	B	2	Sundance Subdivision	64	**72**
E113	B	4	Sundance Subdivision	62	**71**
E114	B	3	Sundance Subdivision	61	**68**
E115	B	3	Sundance Subdivision	62	**71**
E116	B	3	Sundance Subdivision	64	**70**
E117	B	4	Sundance Subdivision	63	**72**
E118	B	3	Sundance Subdivision	62	**70**
E119	B	2	Sundance Subdivision	61	**69**

TABLE 9
Modeled Noise Level Results
Section 3: Watson Road to Jackrabbit Trail - South

Receiver ID	NAC Category	No of Dwelling Units	Description of Receiver	No-Build 2040 (dBA)	Build (2040) dBA
E120	B	4	Sundance Subdivision	64	**71**
E121	B	3	Sundance Subdivision	61	**68**
E122	B	3	Sundance Subdivision	64	**71**
E123	B	3	Sundance Subdivision	64	**71**
E124	B	3	Sundance Subdivision	64	**71**
E125	B	4	Sundance Subdivision	64	**73**
E126	B	2	Sundance Subdivision	63	**69**
E127	B	2	Sundance Subdivision	65	**76**
E128	B	3	Sundance Subdivision	65	**72**
E129	B	2	Sundance Subdivision	63	65
E130	B	2	Sundance Subdivision	65	**67**
E130A	C	2	Sundance Golf Club	**72**	**74**
E131	B	2	Sundance Subdivision	65	**68**
E132	B	2	Sundance Subdivision	**66**	**68**
E133	B	1	Sundance Subdivision	65	**67**
E134	B	1	Sundance Subdivision	62	64
E134A	C	1	Sundance Golf Club	**67**	**70**
E135	B	1	Sundance Subdivision	64	**67**
E136	B	1	Sundance Subdivision	63	65
E137	B	1	Sundance Subdivision	64	**66**
E138	B	1	Sundance Subdivision	62	65
E139	G	1	Vacant Lands	68	70
E140	G	1	Vacant Lands	66	68
E141	G	1	Vacant Lands	67	69
E142	G	1	Vacant Lands	67	70
E143	G	2	Vacant Lands	67	70
E144	G	2	Vacant Lands	67	70
E145	G	3	Vacant Lands	67	70
E146	G	4	Vacant Lands	67	70
E147	G	3	Vacant Lands	65	68
E148	G	2	Future Buckeye Parkway Center	66	69
E149	G	3	Future Buckeye Parkway Center	68	70
E150	G	2	Vacant Lands	67	68
E151	G	3	Vacant Lands	67	68
E152	G	3	Vacant Lands	67	68
E153	G	3	Vacant Lands	67	68
E154	G	2	Vacant Lands	66	67

Note: **Bolded** values are equal to or greater than ADOT NAR noise impact threshold of **66** dBA for Categories B and C; and **71** dBA for Category E.

The modeled noise levels range from 61 to 72 dBA for the No-Build Condition and from 64 dBA to 76 dBA for the Build Alternatives. The modeled noise levels for the Build Alternatives are equal to or greater than the ADOT NAR noise impact threshold of 66 dBA for Categories B and C. Therefore, mitigation evaluation is required for this area. Appendix A shows the locations of the modeled noise receivers from Table 9.

9.0 MITIGATION ANALYSIS

The ADOT NAR provides guidelines for noise abatement analysis. These guidelines have two components, feasibility and reasonableness. The feasibility components consist of the engineering and acoustic features which address safety, barrier height, topography, drainage, utilities, maintenance requirements, property access and overall project purpose, and encompasses the constructability of the noise abatement. To be acoustically feasible, the noise abatement must achieve at least a 5-dBA reduction at 50 percent of the impacted receptors.

There are three factors that must be met for a noise abatement action to be considered reasonable. The first factor is based on the viewpoints or preferences of the property owners and residents. The viewpoints of the property owners and residents shall be taken into account when determining whether the barrier should be constructed or not. The second is based on the noise reduction design goal; the ADOT NAR states that the noise barrier should be designed to reduce the projected unmitigated noise levels by at least 7 dBA for 50 percent of the benefited receptors closest to the transportation facility. The third factor is based on the cost effectiveness of the noise abatement. The maximum reasonable cost of abatement is $49,000 per benefited receptor (cost-per-benefited-receptor) with barrier costs calculated at $35 per square foot, $85 per square foot if constructed on a structure.

The ADOT NAR defines “benefited receptor” as the recipient of an abatement measure that receives a noise reduction of at least 5 dBA and does not exceed the ADOT’s reasonableness design goal. This would allow a receptor that is not impacted to be considered as a “benefited receptor” if it receives a noise reduction of at least 5 dBA from the noise abatement. The “benefited receptor” would be included in the determination of the cost of the noise abatement.

Lands and proposed residential developments permitted after the Date of Public Knowledge for this project will not be eligible for abatement (noise barriers). The Date of Public Knowledge is the date of approval of the National Environmental Policy Act (NEPA) document for this project, as defined in the ADOT NAR. Permitted is defined as a definite commitment to develop land with an approved specific design of land use activities as evidenced by the issuance of a building permit. Below is the summary for the noise mitigation analysis by section.

Section 1 Mitigation: SR 85 to Miller Road

Mitigation was evaluated south of I-10 between SR 85 and Miller Road. Table 10 shows the results of the noise level mitigation analysis.

TABLE 10
Noise Mitigation
Section 1: SR 85 to Miller Road

Receiver ID	No of Dwelling Units	Build 2040 (dBA)	Mitigated dBA	Insertion Loss, dBA	Mitigation
South of I-10					
E11	2	**70**	63	7	Barrier E1 is Recommended, See Barrier Analysis Summary Table 13
E12	4	**68**	61	7	
E13	2	**70**	63	7	
E14	6	**69**	62	7	
E15	3	**68**	63	5	
E16	6	**69**	62	7	
E17	3	**70**	63	7	
E18	5	**69**	61	8	
E19	3	**68**	61	7	
E20	3	**67**	60	7	
E21	3	**66**	60	6	
E22	6	**67**	60	7	
E23	3	**66**	61	5	
E24	4	**67**	60	7	
E25	2	64	59	5	
E26	2	**66**	59	7	
E27	2	**66**	60	6	
E28	1	**71**	64	7	Barrier E2 NOT Recommended

Note: **Bolded** values are equal to or greater than ADOT NAR noise impact threshold of **66** dBA for Categories B and **71** dBA for Category E.

Section 2 Mitigation: Miller Road to Watson Road

Mitigation was evaluated south of I-10 between Miller Road and Watson Road. Table 11 shows the results of the noise level mitigation analysis.

TABLE 11
Noise Mitigation
Section 2: Miller Road to Watson Road

Receiver ID	No of Dwelling Units	Build 2040 (dBA)	Mitigated dBA	Insertion Loss, dBA	Mitigation
South of I-10					
E38	1	**74**	60	6	Barrier E3 is NOT Recommended, See Barrier Analysis Summary Table 13
E39	1	**76**	64	7	
E42	2	**69**	**66**	3	Existing Barrier E4 meets the ADOT NAR and does not need any modification
E43	2	**74**	**68**	6	
E44	3	**73**	**67**	6	
E45	4	**71**	**66**	5	
E46	3	**72**	**67**	5	
E47	2	**73**	**66**	7	
E48	3	**70**	65	5	
E49	2	**72**	**67**	5	
E50	3	**70**	65	5	
E51	3	**70**	**66**	4	
E52	3	**69**	65	4	
E53	2	**74**	**68**	6	
E54	3	**75**	**67**	8	
E55	3	**67**	65	2	
E56	3	**75**	**67**	8	
E57	4	**66**	62	4	
E58	2	**72**	**66**	6	
E59	3	**75**	**67**	8	
E60	2	**75**	**67**	8	
E61	4	**66**	62	4	
E62	3	**75**	**67**	8	
E63	3	**66**	61	5	
E64	3	**75**	**67**	8	
E65	4	**66**	62	4	
E66	3	**75**	**66**	9	
E67	2	**74**	**66**	8	
E68	4	65	61	4	
E69	3	**74**	**66**	8	
E70	3	63	60	3	
E71	3	**74**	**66**	8	
E72	3	63	60	3	
E73	4	**75**	**66**	9	
E74	2	**66**	61	5	
E75	2	**75**	**67**	8	
E76	3	64	61	3	
E77	2	**75**	**68**	7	
E78	2	**69**	65	4	
E79	2	**72**	**67**	5	
E80	2	**71**	**66**	5	
E81	2	**69**	**66**	3	
E86	1	**72**	65	7	Barrier E5 NOT Recommended

Note: **Bolded** values are equal to or greater than ADOT NAR noise impact threshold of 66 dBA for Category B and 71 dBA for Category E.

Section 3 Mitigation: Watson Road to Jackrabbit Trail

Mitigation was evaluated south of I-10 between Watson Road and Jackrabbit Trail. Table 12 shows the results of the noise level mitigation analysis.

TABLE 12
Noise Mitigation
Section 3: Watson Road to Jackrabbit Trail

Receiver ID	No of Dwelling Units	Build 2040 (dBA)	Mitigated dBA	Insertion Loss, dBA	Mitigation
South of I-10					
E90	3	68	64	4	Barrier E6 is Not Recommended, there are no active building permits, See Appendix D (City of Buckeye Building Permit Data)
E91	3	72	65	7	
E92	3	69	65	4	
E93	4	68	63	5	
E94	5	72	65	7	
E95	4	72	64	8	
E96	6	72	65	7	
E97	4	72	65	7	
E98	4	71	65	6	
E99	4	70	65	5	
E100	4	69	64	5	
E101	2	**70**	**66**	4	Existing Barrier E7 does not meet the ADOT NAR and requires modification. Barrier E8 is Recommended, See Barrier Analysis Summary Table 13
E102	2	**72**	**66**	6	
E103	1	**70**	65	5	
E104	4	**71**	64	7	
E105	3	**72**	65	7	
E106	4	**72**	**66**	6	
E107	3	**72**	**66**	6	
E108	6	**73**	**66**	7	
E109	2	**73**	**66**	7	
E110	8	**71**	65	6	
E111	3	**72**	65	7	
E112	2	**72**	65	7	
E113	3	**71**	64	7	
E114	2	**68**	62	6	
E115	2	**71**	64	7	
E116	3	**70**	65	5	
E117	4	**72**	64	8	
E118	6	**70**	63	7	
E119	6	**69**	63	6	
E120	2	**71**	65	6	
E121	6	**68**	62	6	
E122	2	**71**	65	6	
E123	2	**71**	65	6	
E124	3	**71**	65	6	
E125	3	**73**	65	8	
E126	2	**69**	63	6	
E127	2	**76**	**66**	10	
E128	2	**72**	65	7	
E129	3	**66**	63	3	
E130	3	**68**	64	4	

TABLE 12
Noise Mitigation
Section 3: Watson Road to Jackrabbit Trail

Receiver ID	No of Dwelling Units	Build 2040 (dBA)	Mitigated dBA	Insertion Loss, dBA	Mitigation
E130A	7	**74**	**67**	7	
E131	3	**68**	65	3	
E132	3	**68**	65	3	
E133	3	**67**	65	2	
E134	3	64	62	2	
E134A	4	**70**	**66**	4	
E135	2	**67**	64	3	
E136	2	65	62	3	
E137	3	**66**	64	2	
E138	3	65	64	1	

Note: **Bolded** values are equal to or greater than ADOT NAR noise impact threshold of 66 dBA for Category B.

Summary of Evaluated Noise Barriers

The following Table 13 summarizes the evaluated noise barriers in Sections 1 through 3.

TABLE 13
I-10, SR 85 to Verrado Way
Noise Barrier Summary

Noise Barrier ID	Noise Barrier Description	Barrier Height Range, ft	Length, ft	Area, ft^2	Cost	Number of Benefited Receptors	Cost per Benefited Receptor
E1	Between SR 85 and Miller Rd; south of I-10 (Sta 5996+26 to 6019+84)	18 - 20	2,400	44,398	$1,553,930	54	$28,776
E2	Between SR 85 and Miller Rd; south of I-10 (Sta 6010+21 to Sta 6027+84)	18	1,800	32,399	$1,277,965	1	$1,277,965
E3	Between Miller Rd and Apache Rd; south of I-10 (Sta 6087+58 to Sta 6097+58)	14	1,000	13,999	$489,965	2	$244,983
E4	Existing Barrier between Apache Rd and Watson Rd; south of I-10 (Sta 6112+58 to Sta 6144+68)	11	3,213	35,343	$1,237,005	37	$33,433
E5	Over Watson Rd TI; south of I-10 (Sta 6162+00 to Sta 6180+00)	16	1,800	28,802	$1,144,070	1	$1,144,070
E6	Between Watson Rd and 230th Ln; south of I-10 (Sta 6179+82 to Sta 6199+74)	14	2,000	27,999	$979,965	34	$28,823
E7	Existing Barrier between 230th Ln and 226th Ln; south of I-10 (Sta 6198+69 to Sta 6224+59)	12	2,591	31,088	$1,088,080	72	$15,112
E8	Between 230th Ln and 226th Ln; south of I-10 (Sta 6198+69 to Sta 6244+59)	14 - 16	4,591	68,268	$2,447,678[1]	86	$28,461

1. Mitigation cost is based on $35/$ft^2$ for new construction; $22.50/linear foot for demolition

- Barrier E1 meets the ADOT NAR and is recommended.
- Barrier E2 does not meet the ADOT NAR cost criteria and is not recommended.
- Barrier E3 does not meet the ADOT NAR cost criteria and is not recommended.

- Existing Barrier E4 meets the ADOT NAR; no additional retrofitting is necessary.
- Barrier E5 does not meet the ADOT NAR cost criteria and is not recommended.
- Barrier E6 meets the ADOT NAR but is not recommended at this time because there are no active building permits.
- Existing Barrier E7 does not meet the ADOT NAR because only 12% of the 1st row receptors achieve a 7-dBA reduction, therefore; E7 was redesigned and evaluated as Barrier E8.
- Barrier E8 meets the ADOT NAR including a demolition cost of $22.50/linear foot (Total Demolition Cost = $58,298) and is recommended.

10.0 CONSTRUCTION NOISE

Construction noise is anticipated for roadway improvement projects and lasts for the duration of the construction. Construction activities are generally of a short-term nature. Depending on the nature of construction operations, the duration of the noise could last from seconds (e.g., a truck passing a customer) to months (e.g., constructing a bridge). Construction noise is also intermittent and depends on the type of operation, location, and function of the equipment and the equipment usage cycle. Table 19 shows the overall predicted maximum noise level (L_{max}) of the construction equipment at 50 feet for different phases of roadway construction.

TABLE 14
CONSTRUCTION EQUIPMENT NOISE[1]

Phase	Equipment	Noise Limit (L_{max}) At 50 feet, dBA
Site Clearing	Dozer	85
	Backhoe	80
Grading & Earthwork	Scraper	85
	Grader	85
Foundation	Backhoe	80
	Front Loader	80
Base Preparation	Compressor (air)	80
	Dozer	85

1. Source- FHWA Highway Construction Noise Handbook, page 3; August 2006

ADOT has set forth guidelines for construction noise in the Standard Specifications for Road and Bridge Construction, 2008. Per ADOT specifications 104.08, Prevention of Air and Noise Pollution:

"The contractor shall comply with all local sound control and noise rules, regulations and ordinances which apply to any work pursuant to the contract.

Each internal combustion engine used for any purpose on the work or related to the work shall be equipped with a muffler or a type recommended by the manufacturer. No internal combustion engine shall be operated on the work without its muffler being in good working condition."

Ground vibration and ground-born noise can also be a source of annoyance to individuals who live or work close to vibration-generating activities. Pile driving, demolition activity, blasting, and crack-and-seat operations are the primary sources of vibration, while the impact pile driving can

be the most significant source of vibration at construction sites. It is recommended to apply methods that may be practical and appropriate in specific situations, to reduce vibration to an acceptable level.

11.0 STATEMENT OF LIKELIHOOD

The FHWA-approved TNM2.5 was used to evaluate traffic noise for the 2040 No-Build and Build Conditions. Noise impacts occurred at receptors north and south of I-10 from SR 85 to Jackrabbit Trail. Table 15 shows the recommended noise barrier details. A final determination of noise abatement measures will be made upon completion of the project design, the public involvement process, concurrence with the ADOT NAR, and FHWA approval.

TABLE 15
I-10, SR 85 to Verrado Way
Recommended Noise Barriers

Noise Barrier Description	Barrier Height Range, ft	Length, ft	Area, ft^2	Cost	Number of Benefited Receptors	Cost per Benefited Receptor
Barrier E1 (Sta 5996+26 to Sta 6019+84)	18-20	2,400	44,398	$1,553,930	54	$28,776
Percentage of First Row Receptors with 7+ dBA noise reduction: 51.9% Percentage of Impacted Receptors with 5+ dBA noise reduction: 100.0%						
Barrier E8 (Sta 6198+69 to Sta 6244+59)	14-16	4,591	68,268	$2,447,678	86	$28,461
Percentage of First Row Receptors with 7+ dBA noise reduction: 58.7% Percentage of Impacted Receptors with 5+ dBA noise reduction: 78.5%						

APPENDIX A – RECEIVER, MONITORING, AND BARRIER LOCATIONS

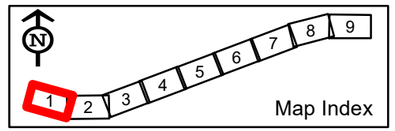
Legend

Noise Receivers
Noise Monitoring Sites
Recommended Barrier
Evaluated Barrier
R/W

0 200 400
FEET

Revised: 6/18/2018
SOURCE: World Imagery; Kimley Horn (2018)

newton
Environmental Consulting, LLC



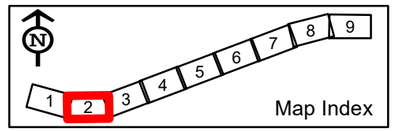
Legend

Noise Receivers
Noise Monitoring Sites
Recommended Barrier
Evaluated Barrier
R/W

0 200 400
FEET

Revised: 6/18/2018
SOURCE: World Imagery; Kimley Horn (2018)

newton
Environmental Consulting, LLC



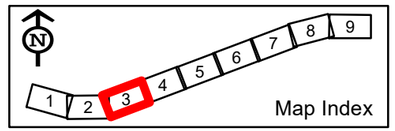
Legend

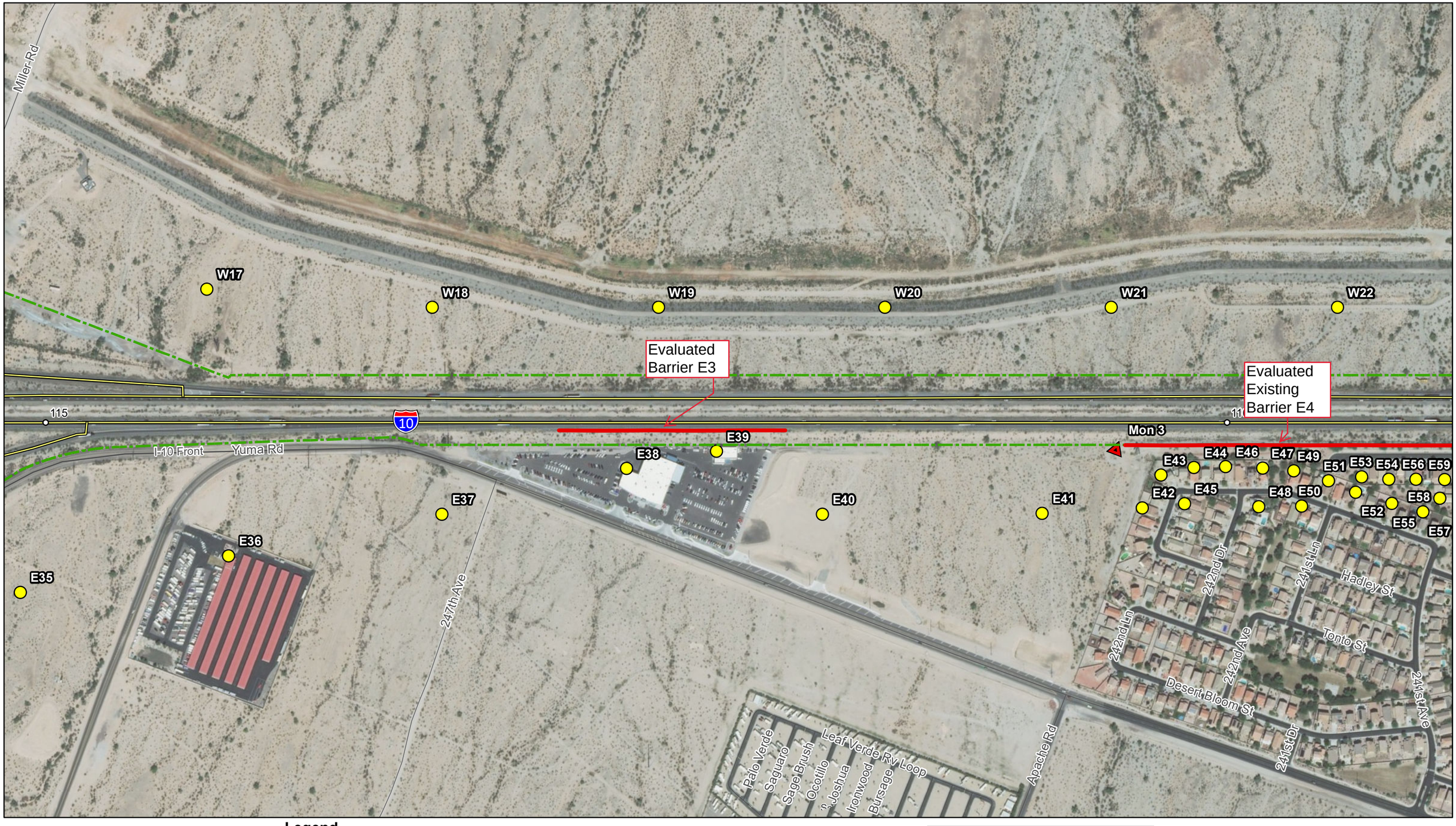
- Noise Receivers
- Noise Monitoring Sites
- Recommended Barrier
- Evaluated Barrier
- R/W

0 200 400 FEET

Revised: 6/18/2018
SOURCE: World Imagery; Kimley Horn (2018)

newton Environmental Consulting, LLC





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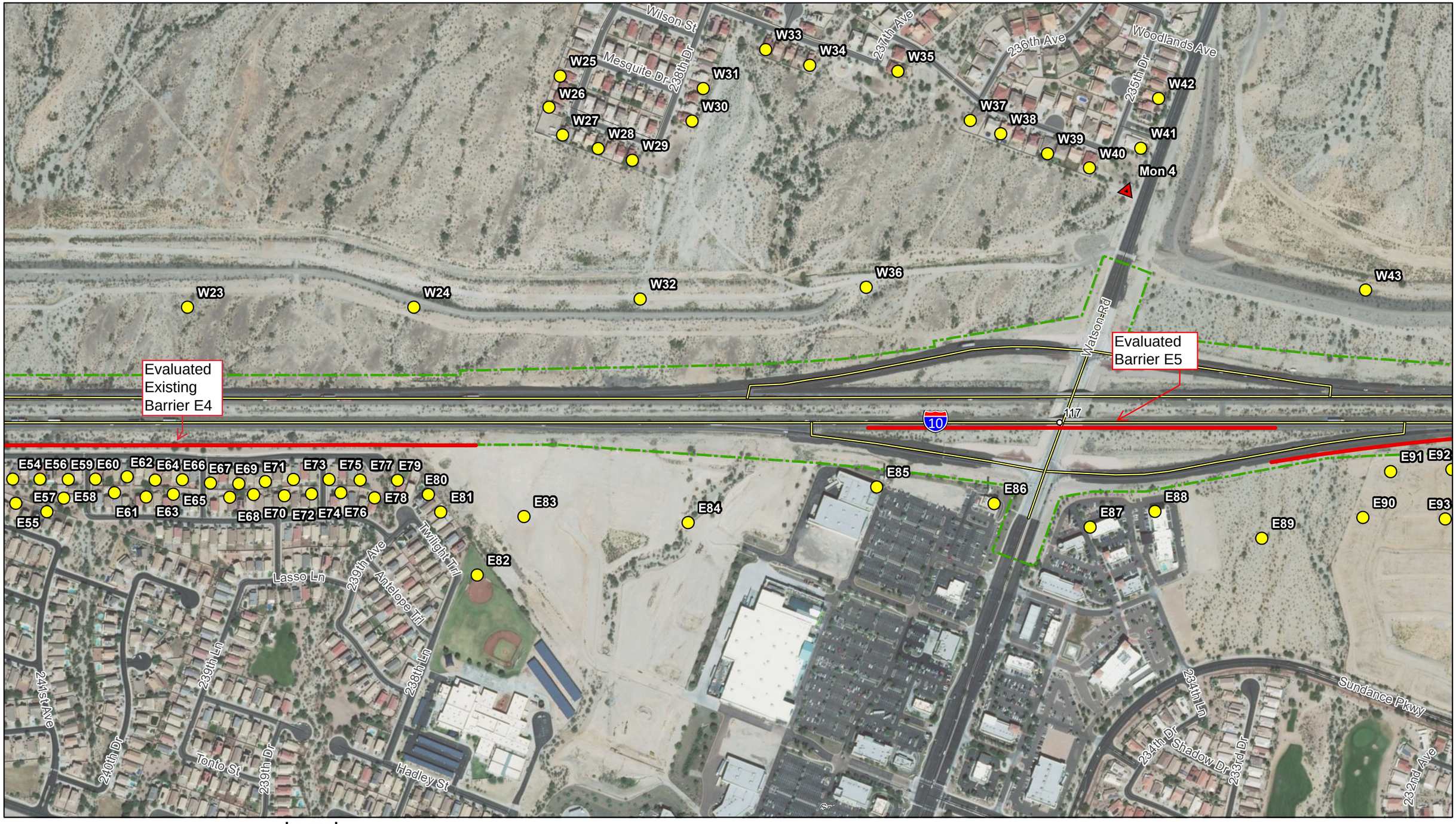
Noise Receivers
Noise Monitoring Sites
Recommended Barrier
Evaluated Barrier
R/W

0 200 400
FEET

Revised: 6/18/2018
SOURCE: World Imagery; Kimley Horn (2018)

newton
Environmental Consulting, LLC

Map Index: 1 2 3 4 5 6 7 8 9



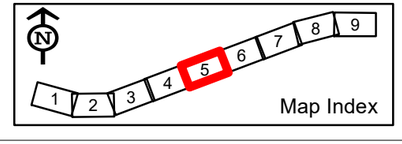
Legend

Noise Receivers
Noise Monitoring Sites
Recommended Barrier
Evaluated Barrier
R/W

0 200 400
FEET

Revised: 6/18/2018
SOURCE: World Imagery; Kimley Horn (2018)

newton
Environmental Consulting, LLC



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Noise Receivers
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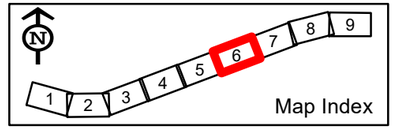
R/W

0 200 400 FEET

Revised: 6/18/2018
SOURCE: World Imagery; Kimley Horn (2018)

newton Environmental Consulting, LLC



Legend

Noise Receivers
Noise Monitoring Sites
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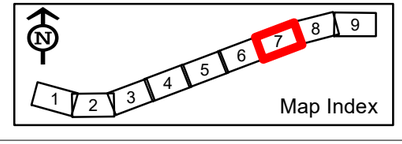
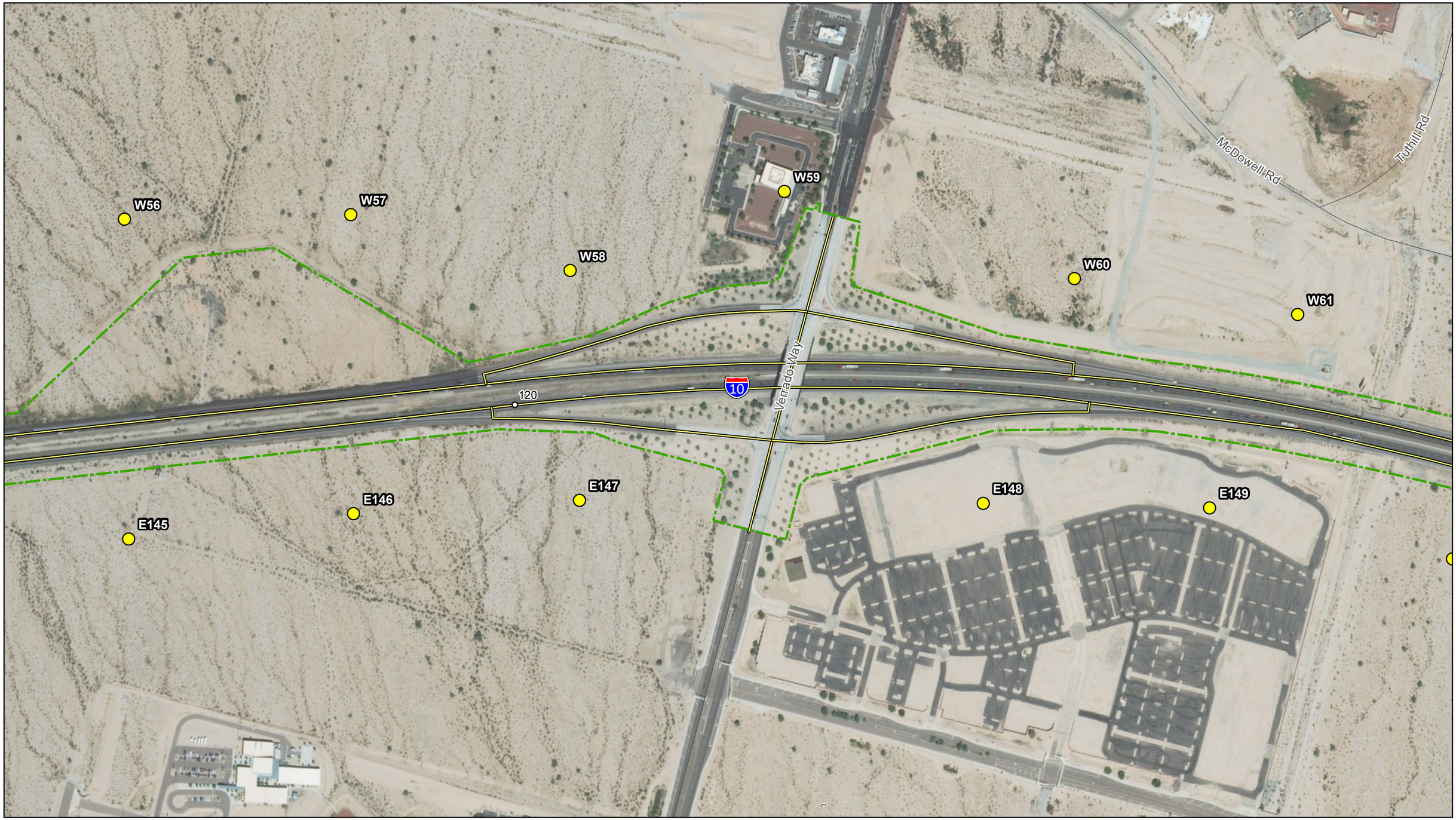
Environmental Consulting, LLC





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Noise Receivers
Noise Monitoring Sites
Recommended Barrier
Evaluated Barrier
R/W

0 200 400
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Revised: 6/18/2018
SOURCE: World Imagery; Kimley Horn (2018)

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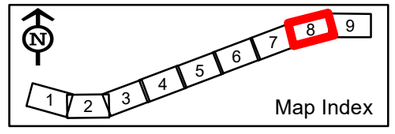
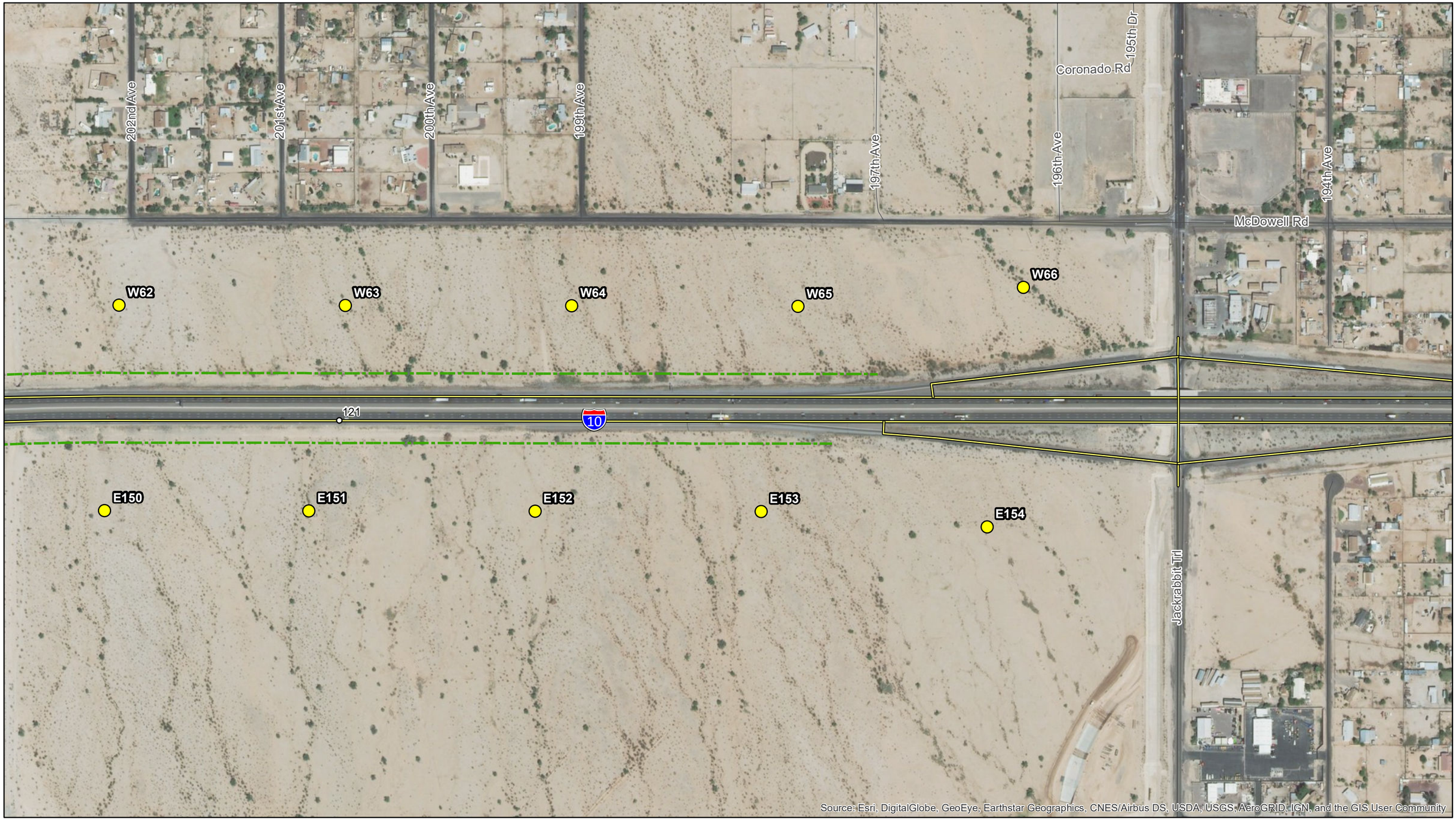
Environmental Consulting, LLC





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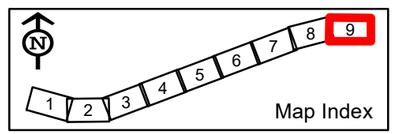
Revised: 6/18/2018
SOURCE: World Imagery; Kimley Horn (2018)

Legend

Noise Receivers
Noise Monitoring Sites
Recommended Barrier
Evaluated Barrier
R/W

newton
Environmental Consulting, LLC



APPENDIX B – NOISE MEASUREMENT DATA

			Automobiles	Medium trucks	Heavy trucks	Buses	Motorcycles						
			vehicles with two axles and four tires	-all cargo vehicles with two axles and six tires;	-all cargo vehicles with three or more axles;	all vehicles designed to carry more than nine passengers; and	all vehicles with two or three tires and an open-air driver/passenger compartment		Leq	Lmin	Lmax	N	W
MON 1	Reading 1	EB	212	10	80	1	0		59.7	39.7	72.5	33°25'37.97"N	112°36'28.91"W
		WB	222	10	67	8	0						
	Reading 2	EB	181	12	89	5	1		59.8	43.3	76.6		
		WB	194	11	55	7	0						
	Reading 3	EB	199	11	83	3	1		59.1	39.8	71.9		
		WB	205	10	76	6	1						
MON 2	Reading 1	EB	201	8	89	2	1		65.3	58.8	76.4	33°25'54.44"N	112°35'36.82"W
		WB	195	4	95	4	2						
	Reading 2	EB	203	7	105	13	3		64.5	53.2	77.6		
		WB	210	10	111	10	3						
	Reading 3	EB	206	4	98	5	1		63.8	53.3	76.4		
		WB	221	12	107	17	2						
MON 3	Reading 1	EB	273	9	97	7	0		68.9	47.7	80.4	33°26'18.52"N	112°34'27.22"W
		WB	274	19	122	13	0						
	Reading 2	EB	279	20	99	13	1		69.3	52.1	82.2		
		WB	250	17	121	14	3						
	Reading 3	EB	295	17	100	12	1		68.9	54.2	80.3		
		WB	265	20	109	15	0						
MON 4	Reading 1	EB	245	7	66	12	2		60.8	50.7	74	33°26'50.88"N	112°33'24.60"W
		WB	226	18	56	7	2						
	Reading 2	EB	283	5	88	5	3		70.4	50.1	99.7		
		WB	262	22	77	18	5						
	Reading 3	EB	263	10	80	5	0		60.6	50.2	76.5		
		WB	271	13	67	11	2						
MON 5	Reading 1	EB	423	15	87	10	1		69	54.3	80.3	33°26'59.74"N	112°32'19.63"W
		WB	354	33	89	11	2						
	Reading 2	EB	448	20	82	12	8		68.7	54.6	82.4		
		WB	385	21	100	6	1						
	Reading 3	EB	390	26	82	9	6		68.9	48.4	82.4		
		WB	385	24	96	14	6						

APPENDIX C – TNM 2.5 TRAFFIC VOLUMES

2040 Build Condition

I-10 Segment	Direction	Total AADT	Auto AADT	MT AADT	HT AADT	K Factor	Peak Hour Auto Volume	Peak Hour MT Volume	Peak Hour HT Volume	Number of Through Lanes	LOS C Volumes	TNM Modeled Hourly Volumes	TNM Modeled Hourly Auto	TNM Modeled Hourly MT	TNM Modeled Hourly HT
Over SR85 TI	EB	43,046	32,000	2,195	8,851	8	2,560	176	708	3	4,800	3,444	2,560	176	708
SR 85 - Miller Rd	EB	58,874	47,120	2,694	9,060	9	4,241	242	815	3	4,800	4,800	3,841	220	739
Over Miller Rd TI	EB	52,556	40,951	2,593	9,012	9	3,686	233	811	3	4,800	4,730	3,686	233	811
Miller Rd Off-Ramp	EB	6,317	6,168	101	48	9	555	9	4	1	1,200	569	556	9	4
Miller Rd On-Ramp	EB	7,843	7,601	185	57	9	684	17	5	1	1,200	706	684	17	5
Miller Rd - Watson Rd	EB	60,400	48,552	2,778	9,070	9	4,370	250	816	3	4,800	4,800	3,858	221	721
Over Watson Rd TI	EB	56,989	45,198	2,734	9,057	9	4,068	246	815	3	4,800	4,800	3,807	230	763
Watson Rd Off-Ramp	EB	3,410	3,353	44	13	9	302	4	1	1	1,200	307	302	4	1
Watson Rd On-Ramp	EB	13,327	12,809	355	163	9	1,153	32	15	2	2,400	1,199	1,152	32	15
Watson Rd - Verrado Way	EB	70,317	58,008	3,089	9,220	9	5,221	278	830	3	4,800	4,800	3,960	211	629
Over Verrado Way TI	EB	66,096	53,843	3,042	9,211	9	4,846	274	829	3	4,800	4,800	3,910	221	669
Verrado Way Off-Ramp	EB	4,221	4,166	46	9	9	375	4	1	1	1,200	380	375	4	1
Verrado Wa On-Ramp	EB	13,673	13,303	293	77	9	1,197	26	7	2	2,400	1,231	1,198	26	7
Verrado Way - Jackrabbit Trail	EB	79,769	67,146	3,335	9,288	8	5,372	267	743	3	4,800	4,800	4,040	201	559
Over SR85 TI	WB	48,213	32,467	2,449	13,297	8	2,597	196	1,064	3	4,800	3,857	2,597	196	1,064
SR 85 - Miller Rd	WB	62,863	46,488	2,899	13,476	9	4,184	261	1,213	3	4,800	4,800	3,550	221	1,029
Over Miller Rd TI	WB	55,909	39,777	2,771	13,361	9	3,580	249	1,202	3	4,800	4,800	3,415	238	1,147
Miller Rd On-Ramp	WB	6,954	6,712	128	114	9	604	12	10	1	1,200	626	604	12	10
Miller Rd Off-Ramp	WB	7,282	7,054	175	53	9	635	16	5	1	1,200	655	634	16	5
Miller Rd - Watson Rd	WB	63,191	46,831	2,946	13,414	9	4,215	265	1,207	3	4,800	4,800	3,557	224	1,019
Over Watson Rd TI	WB	60,464	44,146	2,912	13,406	9	3,973	262	1,207	3	4,800	4,800	3,505	231	1,064
Watson Rd On-Ramp	WB	2,727	2,686	34	7	9	242	3	1	2	2,400	245	241	3	1
Watson Rd Off-Ramp	WB	12,690	12,191	341	158	9	1,097	31	14	1	1,200	1,142	1,097	31	14
Watson Rd - Verrado Way	WB	73,155	56,337	3,253	13,565	9	5,070	293	1,221	3	4,800	4,800	3,697	213	890
Over Verrado Way TI	WB	68,957	52,195	3,207	13,555	9	4,698	289	1,220	3	4,800	4,800	3,633	223	944
Verrado Way On-Ramp	WB	4,197	4,142	46	9	9	373	4	1	2	2,400	378	373	4	1
Verrado Way Off-Ramp	WB	14,338	13,972	289	77	9	1,257	26	7	1	1,200	1,200	1,170	24	6
Verrado Way - Jackrabbit Trail	WB	83,295	66,167	3,496	13,632	8	5,293	280	1,091	3	4,800	4,800	3,813	201	786

AADT Vols and Factors

Mainline I-10 AADT

I-10 Segment	2017 AADT (TDMS)	2040 No-Build AADT (MAG)	K Factor	D Factor	T Factor
Palo Verde Road/Sun Valley Parkway - SR 85/Oglesby Road	35,994	124,525	8	50	24
SR 85/Oglesby Road - Miller Road	45,399	128,341	9	56	10
Miller Road - Watson Road	52,272	131,681	9	58	10
Watson Road - Verrado Way	72,809	156,024	9	57	10
Verrado Way - Jackrabbit Trail	96,322	191,595	8	52	17

2040 No-Build Condition

I-10 Segment	Direction	Total AADT	Auto AADT	MT AADT	HT AADT	K Factor	Peak Hour Auto Volume	Peak Hour MT Volume	Peak Hour HT Volume	Number of Through Lanes	LOS C Volumes	TNM Modeled Hourly Volumes	TNM Modeled Hourly Auto	TNM Modeled Hourly MT	TNM Modeled Hourly HT
Over SR85 TI	EB	50,175	40,142	2,101	7,932	8	3,211	168	635	2	3,200	3,200	2,560	134	506
SR 85 - Miller Rd	EB	63,147	51,965	2,667	8,515	9	4,677	240	766	2	3,200	3,200	2,633	135	432
Over Miller Rd TI	EB	53,658	42,671	2,531	8,456	9	3,840	228	761	2	3,200	3,200	2,545	151	504
Miller Rd Off-Ramp	EB	9,488	9,293	136	59	9	836	12	5	1	1,200	854	837	12	5
Miller Rd On-Ramp	EB	11,426	11,101	233	92	9	999	21	8	1	1,200	1,028	999	21	8
Miller Rd - Watson Rd	EB	65,084	53,771	2,764	8,549	9	4,839	249	769	2	3,200	3,200	2,644	136	420
Over Watson Rd TI	EB	61,340	50,085	2,718	8,537	9	4,508	245	768	2	3,200	3,200	2,613	142	445
Watson Rd Off-Ramp	EB	3,743	3,685	46	12	9	332	4	1	1	1,200	337	332	4	1
Watson Rd On-Ramp	EB	15,790	15,131	434	225	9	1,362	39	20	2	2,400	1,421	1,362	39	20
Watson Rd - Verrado Way	EB	77,131	65,215	3,153	8,763	9	5,869	284	789	2	3,200	3,200	2,705	131	364
Over Verrado Way TI	EB	73,248	61,380	3,114	8,754	9	5,524	280	788	2	3,200	3,200	2,682	136	382
Verrado Way Off-Ramp	EB	3,882	3,836	38	8	9	345	3	1	1	1,200	349	345	3	1
Verrado Wa On-Ramp	EB	22,046	21,479	434	133	9	1,933	39	12	2	2,400	1,984	1,933	39	12
Verrado Way - Jackrabbit Trail	EB	95,294	82,859	3,548	8,887	8	6,629	284	711	3	4,800	4,800	4,173	179	448
Over SR85 TI	WB	52,859	40,434	2,208	10,217	8	3,235	177	817	2	3,200	3,200	2,447	134	619
SR 85 - Miller Rd	WB	69,193	55,691	2,748	10,754	9	5,012	247	968	2	3,200	3,200	2,576	127	497
Over Miller Rd TI	WB	55,617	42,316	2,606	10,695	9	3,808	235	963	2	3,200	3,200	2,435	150	615
Miller Rd On-Ramp	WB	9,576	9,376	141	59	9	844	13	5	1	1,200	862	844	13	5
Miller Rd Off-Ramp	WB	10,979	10,658	229	92	9	959	21	8	1	1,200	988	959	21	8
Miller Rd - Watson Rd	WB	66,596	52,973	2,836	10,787	9	4,768	255	971	2	3,200	3,200	2,546	136	518
Over Watson Rd TI	WB	63,141	49,576	2,791	10,774	9	4,462	251	970	2	3,200	3,200	2,513	141	546
Watson Rd On-Ramp	WB	3,455	3,399	44	12	9	306	4	1	2	2,400	311	306	4	1
Watson Rd Off-Ramp	WB	15,751	15,098	430	223	9	1,359	39	20	1	1,200	1,200	1,150	33	17
Watson Rd - Verrado Way	WB	78,892	64,672	3,222	10,998	9	5,820	290	990	2	3,200	3,200	2,623	131	446
Over Verrado Way TI	WB	74,976	60,805	3,182	10,989	9	5,472	286	989	2	3,200	3,200	2,595	136	469
Verrado Way On-Ramp	WB	3,916	3,868	39	9	9	348	4	1	2	2,400	352	347	4	1
Verrado Way Off-Ramp	WB	21,322	20,797	403	122	9	1,872	36	11	1	1,200	1,200	1,170	23	7
Verrado Way - Jackrabbit Trail	WB	96,298	81,602	3,585	11,111	8	6,528	287	889	3	4,800	4,800	4,067	179	554

APPENDIX D – CITY OF BUCKEYE BUILDING PERMIT DATA

Permit #	Site Address	Type	Project	Project Description	Status	Issued	Submitted
BLD-15-01757	445 S WATSON RD	BLD-SIP	SUNDANCE HOLIDAY INN & SUITES SIGN	INSTALL THREE (3) SETS, PAN CHANNEL LETTER WITH LOGO TO READ HOLIDAY INN EXPRESS & SUITES ON WEST, NORTH AND EAST ELEVATION PER APPROVED PLAN	FINALED - CLOSED	11/24/2015	11/12/2015
PLM-15-00188	445 S WATSON RD	PLM-COMM-NEW	SUNDANCE HOLIDAY INN & SUITES GASLINE	INSTALLATION OF GASLINE FROM PROPANE TANKS TO BUILDING PER APPROVED PLANS.	ISSUED	2/16/2016	10/28/2015
PLM-15-00160	445 S WATSON RD	PLM-COMM-NEW	SUNDANCE HOLIDAY INN & SUITES 2" BYPASS WATER METER	INSTALLATION OF A 2" BY PASS WATER METER.	ISSUED	9/22/2015	9/22/2015
BLD-15-01409	445 S WATSON RD	BLD-COMM-MISC	SUNDANCE HOLIDAY INN & SUITES POOL & SPA	INSTALLATION OF A SEMI-PUBLIC POOL & SPA WITH CONCRETE DECK AND WHITE PLASTER INTERIOR FINISH PER APPROVED PLANS. ** SEPARATE PERMIT IS REQUIRED BY MARICOPA COUNTY** EQUIPTMENT ROOM AND RESTROOM BUILDING IS ON PERMIT BLD-15-00115**	ISSUED	10/15/2015	9/10/2015
BLD-15-01323	445 S WATSON RD	BLD-COMM-WALL	SUNDANCE HOLIDAY INN & SUITES RETAINING WALL	INSTALLATION OF 440 LF OF RETAINING WALL PER APPROVED PLANS.	ISSUED	9/8/2015	8/27/2015
BLD-15-01119	445 S WATSON RD	BLD-COMM-TRUSS	SUNDANCE HOLIDAY INN & SUITES TRUSSES	DEFERRED TRUSS, JOIST SUBMITTAL PER APPROVED PLANS	ISSUED	12/10/2015	7/27/2015
FDP-15-00134	445 S WATSON RD	FDP-TANK	SUNDANCE HOLIDAY INN PROPANE TANKS	INSTALLATION OF (2) 1000 GALLON UNDERGROUND PROPANE TANKS AND FOUR 17LB ANODE BAGS WITH SANF BACKFILL PER APPROVED PLANS	FINALED - CLOSED	8/24/2015	7/22/2015
FDP-15-00129	445 S WATSON RD	FDP-FSPRINK	SUNDANCE HOLIDAY INN & SUITES FIRE SPRINKLERS	INSTALLATION OF AUTOMATIC FIRE SPRINKLER SYSTEM FOR (4) FOUR STORY BUILDING WITH STANDPIPES IN STAIRWELLS PER APPROVED PLANS	FINALED - CLOSED	10/7/2015	7/14/2015
FDP-15-00124	445 S WATSON RD	FDP-FIRE ALARM	SUNDANCE HOLIDAY INN & SUITES FIRE ALARM	INSTALLATION OF FIRE ALARM SYSTEM PER APPROVED PLANS.	FINALED - CLOSED	8/13/2015	7/2/2015
ELE-15-00563	445 S WATSON RD	ELE-SITE LIGHT	SUNDANCE HOLIDAY INN & SUITES SITE LIGHTING	INSTALLATION OF SITE LIGHTING & PHOTOMETRIC PER APPROVED PLANS.	ISSUED	9/8/2015	6/29/2015
ELE-15-00517	445 S WATSON RD	ELE-TEMP OVHD SVCS	SUNDANCE HOLIDAY INN & SUITES TEMP POWER	TEMPORARY POWER POLE FOR TEMP POWER TO CONSTRUCTION TRAILER PER APPROVED PLANS.	ISSUED	6/17/2015	6/4/2015
BLD-15-00780	445 S WATSON RD	BLD-O/S DIRT HAUL	SUNDANCE HOLIDAY INN EXPRESS DIRT HAUL	DIRT HAUL PERMIT TO HAUL 780 CY OF MATERIAL TO THE SW CORNER OF 103RD AVE & MCDOWELL ON 6/4/15 FROM 5:30 AM TO 4:00 PM	ISSUED	6/3/2015	6/3/2015
FDP-15-00028	445 S WATSON RD	FDP-FLOW	SUNDANCE HOLIDAY INN FLOW TEST	HYDRANT FLOW TEST.	ISSUED	2/25/2015	2/25/2015
BLD-15-00118	445 SOUTH WATSON LN	BLD-LAND	HOLIDAY INN EXPRESS SUITES	LANDSCAPE PER APPROVED PLAN	ISSUED	2/16/2016	1/29/2015
ENG-15-00028	445 S WATSON RD	ENG-CONSTRUCTION	HOLIDAY INN EXPRESS & SUITES PHOENIX WEST ONSITE IMPROVEMENT PLANS	INSTALLATION OF ONSITE CIVIL IMPROVEMENTS PER APPROVED PLANS	ISSUED	5/18/2015	1/28/2015
BLD-15-00115	445 S WATSON RD	BLD-COMM-NEW	SUNDANCE HOLIDAY INN & SUITES	CONSTRUCTION OF 55,000 SQ FT NEW HOTEL PER APPROVED PLANS.**SITE LIGHTING & PHOTOMETRIC, FIRE SPRINKLER, FIRE ALARM, SIGNAGE, RACKING, WALLS, PROPANE TANKS WILL REQUIRE SEPARATE PERMITS**6/15/15 REVISION TO ADD GREASE TRAP**	FINALED - CLOSED	6/23/2015	1/28/2015
PLZ-18-00043		PLZ-PAC	SUNDANCE COVE II PAC	SUNDANCE COVE II PAC	CLOSED		3/22/2018

Certificate Of Completion

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Document Pages: 45
Signatures: 1
Certificate Pages: 2
Initials: 0
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EnvelopeId Stamping: Disabled
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Envelope Originator:
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206 S 17th Ave
Phoenix, AZ 85007
IRacic@azdot.gov
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Holder: Ivan Racic
IRacic@azdot.gov
Location: DocuSign

Signer Events	Signature	Timestamp
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Editor Delivery Events	**Status**	**Timestamp**
Agent Delivery Events	**Status**	**Timestamp**
Intermediary Delivery Events	**Status**	**Timestamp**
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Carbon Copy Events	**Status**	**Timestamp**
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Jennifer Simpkins Jennifer.Simpkins@kimley-horn.com Security Level: Email, Account Authentication (None) **Electronic Record and Signature Disclosure:** Not Offered via DocuSign	COPIED	Sent: 8/8/2018 4:57:19 PM Viewed: 8/8/2018 5:09:45 PM

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Notary Events	Signature	Timestamp

Envelope Summary Events	Status	Timestamps
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