CAMP CREEK TRUSS
BRIDGE REPLACEMENT/RELOCATION

PROCIOUS, CLAY COUNTY, WV

NOISE ANALYSIS (DRAFT)

West Virginia Department of Transportation
Division of Highways

STATE PROJECT: S208-4/5-2.95
FEDERAL PROJECT: BR-0045(036)D

DECEMBER, 2014

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1.0 INTRODUCTION

A qualitative noise analysis was undertaken to evaluate the replacement of the Camp Creek bridge in Procious. Figure 1 shows the project's WV location. Figure 2 shows the regional project location.

The preferred alternative is 2C. The existing bridge centerline is approximately 170 feet from the nearest house to the southwest (the direction that the bridge is being shifted toward). The proposed distance will be approximately 140 feet. A horizontal road change is considered to be significant enough to require a detailed noise analysis if, at a minimum, it reduces the distance to the nearest noise sensitive receptor by at least half of the current distance. Since the proposed distance is not 85 feet or less from the bridge, a detailed noise analysis is not required for that reason. The vertical profile is not expected to change by more than a few inches. However, the removal of the weight restriction may increase the number and type of heavy vehicles using the bridge. Therefore a noise analysis was performed.

2.0 SUMMARY OF RESULTS

The analysis was performed following the WVDOH 2011 Noise Policy guidelines as per 23 CFR 772. The land use immediately near the proposed project consists primarily of residential land use in addition to open land and the Elk River.

There were zero (0) noise impacts predicted as a result of the proposed improvement. The sound level changes were minimal (0-2 dBA) and were well below the noise impact criteria for residential homes (66 dBA). As a result of the analysis, abatement/mitigation measures were not required.

3.0 FUNDAMENTALS OF SOUND AND NOISE

Sound is the vibration of air molecules in waves similar to ripples on water. When these vibrations (or sound waves) reach our ears, we hear what we call sound. These sound waves are produced by objects which move back and forth very rapidly, such as vocal chords when we speak. The rate at which these objects move is called their frequency. Noise is defined as unwanted sound.

The intensity or loudness of sound is measured in units called decibels (dB). However, since the human ear does not hear sound waves of different frequencies at the same subjective loudness, an adjustment or weighting of the high-pitched and low-pitched sounds is often made to approximate average human perception. When such adjustments to the sound levels are made, they are called "A-weighted levels" and are labeled "dBA". Figure 3 illustrates some common A-weighted noise levels.

The dBA scale for measuring sound intensity is based on logarithmic or sound level pressure relative to a reference pressure. Logarithmic scales are based on powers of ten and are not linear (like a ruler). As a result, sound level additions are hard to define. For example, if a 60 dBA sound is added to another 60 dBA sound, the resulting sound is 63 dBA and not 120 dBA. Also, a 10 dBA sound level increase is equivalent to a person hearing a doubling of the sound level. This means that 60 dBA sounds twice as loud as 50 dBA. Figure 4 illustrates a typical person's sensitivity to sound level differences.

Additionally, the level of highway traffic noise is never constant; therefore, it is necessary to use a statistical descriptor to describe the varying traffic noise levels. The equivalent continuous sound level (L_{eq}) (h) dBA is the statistical descriptor used in this report. The L_{eq} sound level is the steady A-weighted sound energy which would produce the same A-weighted sound energy over a stated period of time (1-hour (h), in this case) as a specified time-varying sound.

Figure 1: Project Location Map (State)

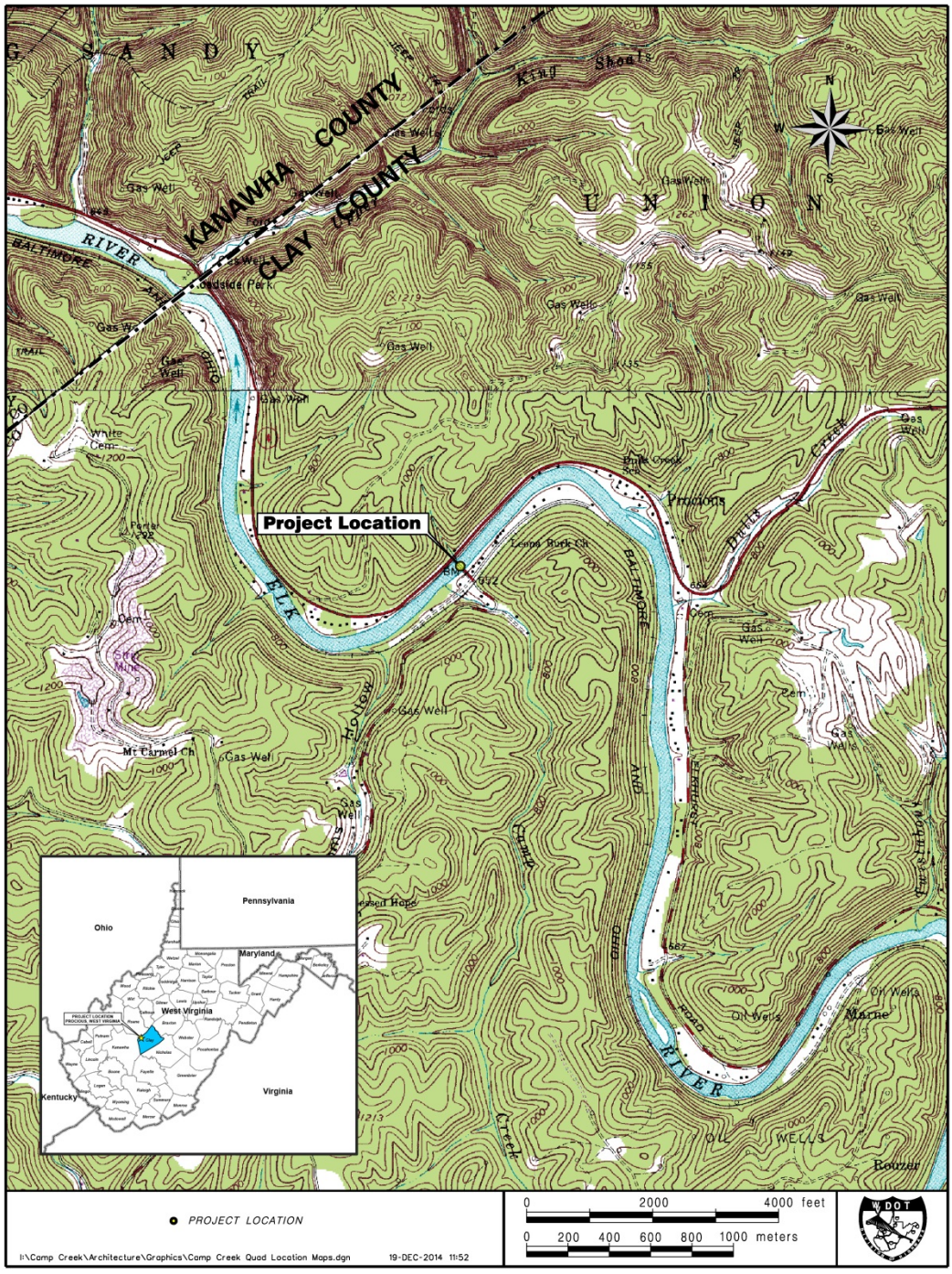

Figure 2: Project Location Map (Regional)

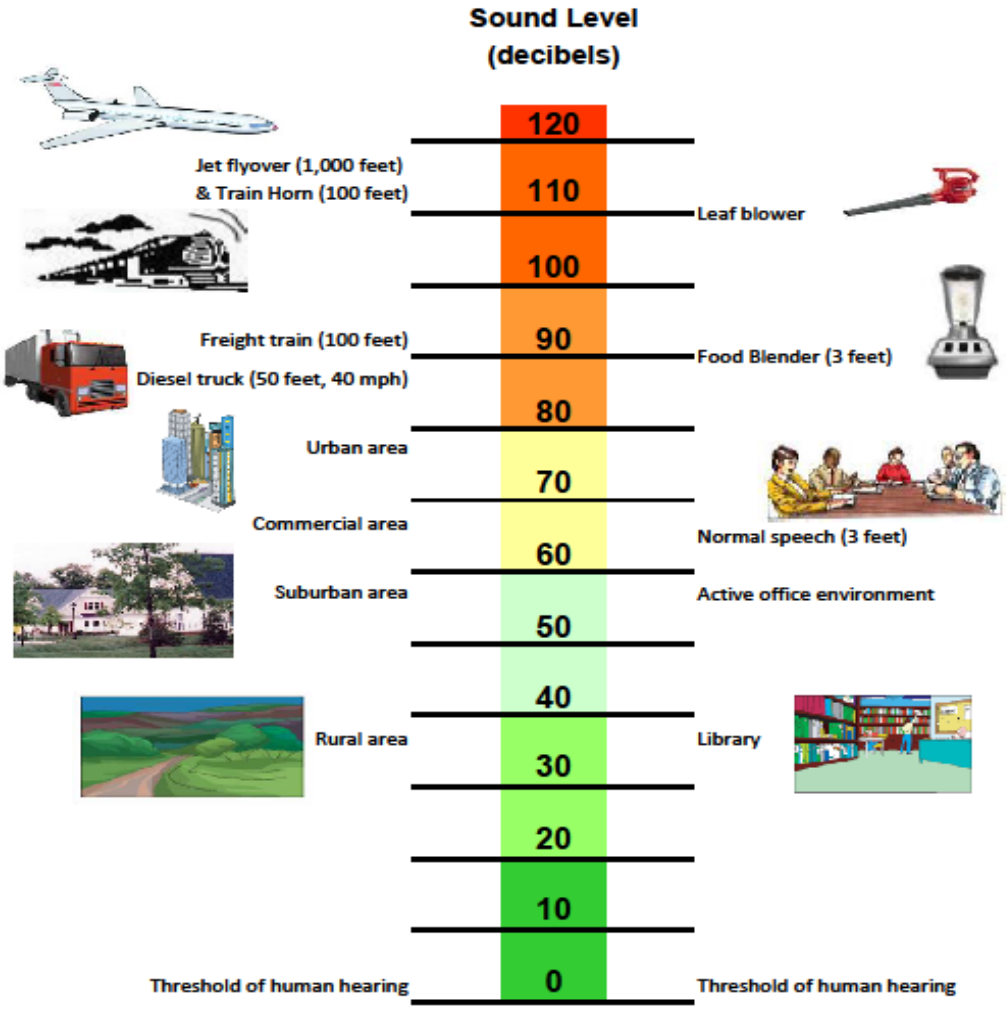

Figure 3: Common Outdoor and Indoor Sound Levels

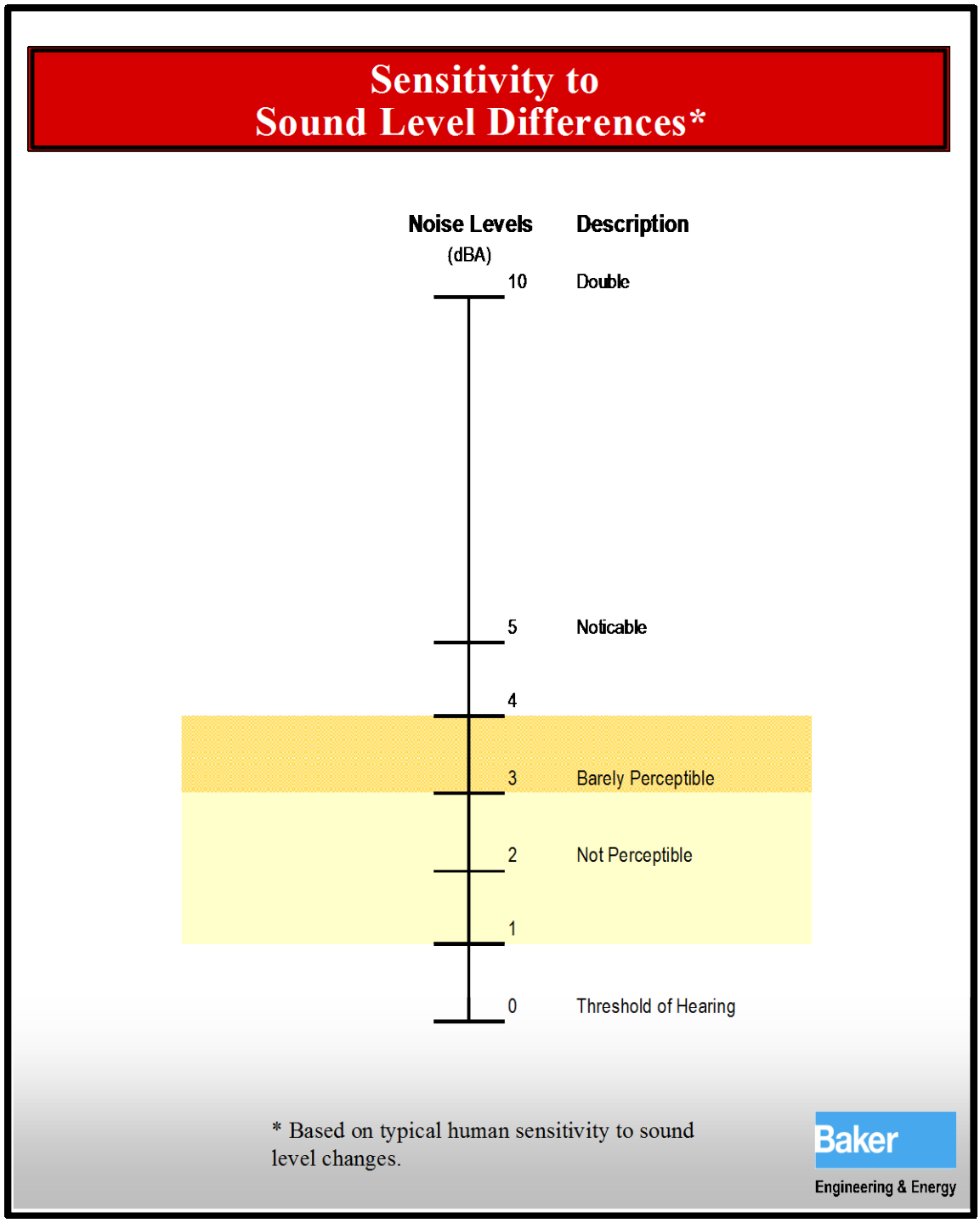

Figure 4: Typical Sensitivity to Sound Level Differences

4.0 NOISE IMPACT CRITERIA

A traffic noise impact occurs when the predicted levels approach the Noise Abatement Category criteria (NAC) or when predicted traffic noise levels substantially exceed the existing noise level, even though the predicted levels may not exceed the NAC. "Approach" shall mean within 1 dBA (Leq) of the NAC. Table 1 shows the noise abatement criteria. The term “substantially exceed the existing noise levels" is defined as an increase of 15 dBA or greater over the existing condition.

Table 1: Noise Abatement Criteria

ACTIVITY CATEGORY	L_{eq} (h) dBA	DESCRIPTION OF LAND USE CATEGORY
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	67 (exterior)	Residential.
C	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, B or C.
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.

Source: 23 CFR 772.

5.0 NOISE LEVEL MEASUREMENTS

One (1) field measurement was taken to validate the sound levels in the Noise Sensitive Area (NSA). The monitoring site was chosen as a representative of the residential noise-sensitive land use adjacent to the project alternative. The results of the measurement are shown in Table 1.

Table 2: Measured Ambient Sound Levels (dBA)

Site	Location	Land Use (NAC)	Field Measured Sound Levels		Difference (dBA)	Primary Noise Sources
			Measured	Validated		
1	Residence – 95 Camp Creek Road near Scenic River Road	B	48.0	48.3	+ 0.3	Camp Creek Road, Background (nature)

Source: Michael Baker International, LLC

6.0 NOISE LEVEL ESTIMATES

Estimates of the noise levels at sensitive receptors in the vicinity of the proposed project were based on the FHWA TNM2.5 computer model. Sound levels were modeled for the existing year, design year no-build, and design year build alternative. In making these estimates, the traffic volume, speed, fleet mix and elevation/terrain differences were considered.

7.0 TRAFFIC

Paragraph b, Section 772.17 of 23 CFR 772 says that, "in predicting noise levels and assessing noise impacts, traffic characteristics which will yield the worst hourly traffic noise impact on a regular basis for the design year shall be used." Since the level of highway traffic noise is normally related to the traffic volume, the traffic characteristics which will yield the worst hourly traffic noise impact on a regular basis for the design year will be the average daily peak hour traffic volumes. The traffic data used in the analysis was provided by WVDOH, including the ADT, the K factor and the fleet vehicle classification counts. Based on the road type on the south side of the bridge (local), it is highly unlikely that heavy trucks can navigate the narrow 1-1½ lane winding routes. However, heavy vehicles were assumed in order to provide a hypothetical worst-case condition.

8.0 EXISTING (2012) NOISE ENVIRONMENT

Two (2) receptor sites were analyzed in the immediate vicinity of the project, one on each side of the bridge representing sound levels as a result of the bridge shift both away from and towards the existing homes. Both are single-family residences. Table 3 shows the existing decibel levels, and Figure 5 shows the receptor locations. Please note that the decibel levels are rounded off.

9.0 DESIGN YEAR (2032) NO-BUILD ALTERNATIVE ENVIRONMENT

The year 2032 no-build alternative L_{eq} sound levels are predicted to generally increase by approximately 2 dBA (rounded) over the existing sound level environment. There were zero (0) receptors with predicted

design year no-build noise levels approaching or exceeding the criteria as shown in Table 3.

10.0 DESIGN YEAR (2032) BUILD ALTERNATIVE ENVIRONMENT

Table 3 shows the predicted design year build decibel levels. Table 4 shows a comparison of the predicted noise impacts by alternative.

There were zero (0) NAC criteria impacts and zero (0) substantial increase impacts. For the closest home potentially affected by the preferred alternative west of the bridge (bridge shifted closer), the design year build sound level was predicted to be 50 dBA (a 1 dBA increase). For the closest home potentially affected by the preferred alternative east of the bridge (bridge shifted farther away), the design year build sound level was predicted to be 53 dBA (a 1 dBA decrease). These sound levels are well below the 66 dBA criteria for residential homes. Generally, this was because of the relatively low traffic volumes.

Table 3: Predicted Sound Levels (dBA)

Receptor Number	Land Use & Location	NAC	Impact Criteria	Existing Year	2032 No-Build	Design Year Build 2032	
						Alt 2C	Impact?
1	Residence-Basil Hively Road	B	66	47	49	50	No
2	Residence-Camp Creek Road	B	66	52	54	53	No

Table 4: Comparison of Predicted Impacts by Alternative

Receptor (Land Use) Type	2012 Existing	2032 Design Year Noise Impacts	
		No-Build Alternative	Preferred Alternative 2C
Residences (Single Family)	0	0	0
Totals:	0	0	0

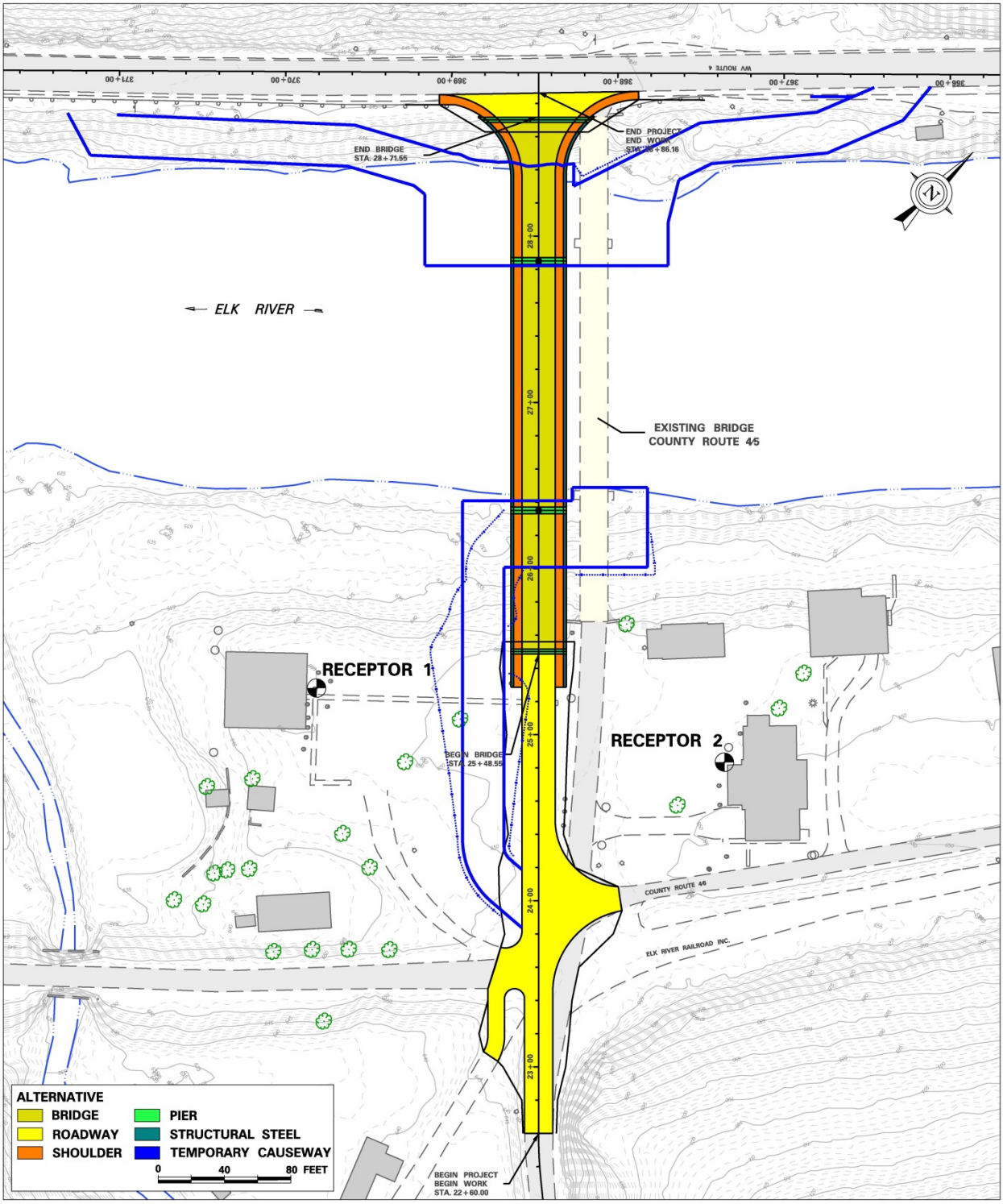

Figure 5: Alternative 2C Local Map with Receptors

11.0 TRAFFIC NOISE ABATEMENT

The FHWA and WVDOH specifies several types of mitigation to be studied for areas warranting noise abatement consideration such as traffic management measures, horizontal and vertical alignment changes, sound insulation for public institutions, additional acquisition for abatement features, and noise barriers.

As a result of the analysis, abatement/mitigation measures were not required since there were no predicted impacts. A final determination on noise abatement for the preferred alternative (if applicable) will be made during the final design phase of the project. If there are substantial modifications to the preferred alternative or another alternative is chosen, then the noise analysis may be revisited, as necessary. If, at that time, noise abatement is determined to be feasible and cost-effective, then it will be carried forward into the next phase of the design process.

12.0 CONSTRUCTION NOISE

Generally, the potential for temporary increases in the sound level environment as a result of construction activities may occur at any of the studied receptor sites. Therefore, control of construction noise will be governed by the Standard Specifications for Road and Bridge Construction and any additional abatement measures developed specifically for the action.

13.0 FHWA POLICY REGARDING LAND USE DEVELOPMENT AND FUTURE NOISE ABATEMENT

The Federal Highway Administration will not normally participate in noise abatement measures unless there is construction or reconstruction of a highway section (or portion thereof). However, the Federal Highway Administration may participate in noise abatement measures on an existing highway where land development or substantial construction predated the existence of any highway. The granting of a building permit, filing of a plat plan, or a similar action must have occurred prior to the right-of-way acquisition or construction approval for the original highway.

Typically, a rough straight-line estimate of the design year build scenario 66 and 71 dBA contours is provided for future planning purposes. The values shown below do not represent predicted levels at every location at a particular distance back from the roadway. Sound levels may vary with changes in terrain, other road noise sources, tree zones, buildings, any other shielding and/or any other noise generating sources. This information is being included to make local officials and planners aware of anticipated highway noise levels so that future development will be compatible with these levels. Roughly, because of the very low volumes, both contours were predicted to be within the pavement width of the road. Therefore:

- The 66 dBA contour is <1 foot from the edge of the nearest travel lane.
- The 71 dBA contour is <1 foot from the edge of the nearest travel lane.

14.0 COORDINATION WITH LOCAL OFFICIALS

The results of traffic noise analyses are available in environmental documents such as Environmental Impact Statements or Environmental Assessments, copies of which are routinely furnished to local government offices. The WVDOH encourages, but cannot mandate, local communities and developers to practice noise compatible development.

Highway traffic noise should be reduced through a program of shared responsibility. Local governments should use their power to regulate land development in such a way that noise sensitive land uses are either prohibited from being located adjacent to a highway or that the developments are planned, designed and constructed in such a way that noise impacts are minimized.