I-290

Phase I Study

West of US 45 (Mannheim Road) to Racine Avenue

Existing vs. Proposed Ramp Noise Sensitivity Analysis Harlem Avenue Interchange

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Technical Memorandum

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Introduction

An I-290 (Eisenhower Expressway) Environmental Impact Statement (EIS) is being prepared to identify transportation improvements needed between west of US 45 (Mannheim Road) and Racine Avenue in Cook County, IL.

Four build alternatives have been identified for further evaluation in the Draft EIS. Impacted noise receptors will be identified for the four build alternatives, along with the noise levels for the No Build Alternative, which will be documented in the Draft EIS. The traffic noise analysis will identify traffic noise impacts due to the proposed project and recommend abatement for the Preferred Alternative where it is found to be reasonable and feasible.

At Harlem Avenue in Oak Park, the proposed alternatives include a reconfiguration of the existing left side exit/entrance ramps to conventional, right side ramps to address design, safety, facility access consistency, and driver expectation issues.

To understand how the proposed ramp configuration could affect the noise levels in the vicinity of the interchange, noise sensitivity tests were completed to compare the relative noise levels between the proposed ramp configuration and the existing ramp configuration. This study was not intended to identify traffic noise impacts, because as stated above, traffic noise impacts will be identified as part of the traffic noise analysis for this project.

Methods and Assumptions

The existing I-290 interchange at Harlem Avenue (Forest Park/Oak Park) has existing ramps that are proposed to be modified as part of the Eisenhower Expressway Reconstruction project. In the proposed build condition, the interchanges would become a modified Single Point Urban Interchange (SPUI) that uses right side exit and entrance ramps that converge to a single intersection at the center of the cross road bridge over I-290.

The following figures illustrate the existing roadway configurations for Harlem Avenue (Figure 1), as well as the proposed Build condition (Figure 2).

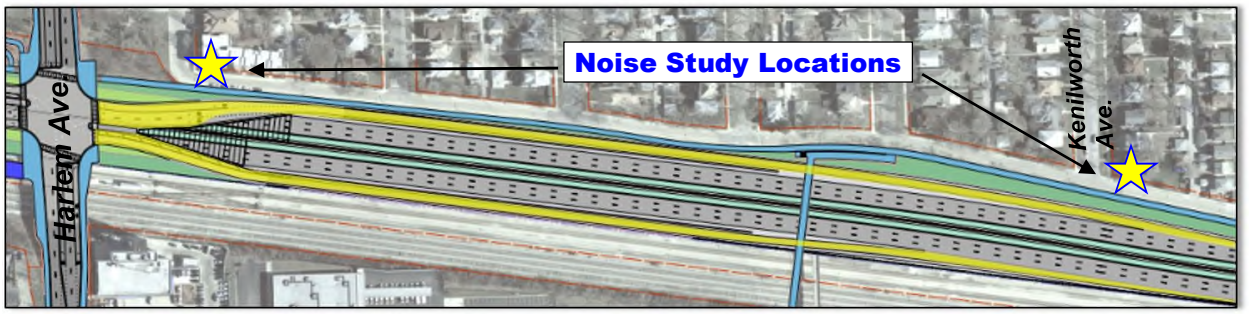
Figures 1 and 2 also show the noise locations modeled for this evaluation, which include:

- The noise study location for Harlem is a three-story condominium building located in the northeast quadrant of the interchange, with street addresses of 1118, 1122, 1124, and 1126 Harrison Street. This location was chosen due to its proximity to the proposed design and is assumed to represent the worst-case noise level in the Harlem interchange area. Noise levels were predicted for all three floors of this building.
- Additionally, a receptor was added at a home at Kenilworth Avenue, on the north side of I-290 approximately 2400’ east of Harlem, in order to assess the Harlem ramps when they are nearer/at the mainline.

Figure 1 – Existing Harlem Avenue Roadway Geometry

The existing roadway geometry in this area includes three mainline lanes (in each direction).

Figure 2 – Proposed Harlem Avenue Roadway Geometry



The design of the Harlem Avenue ramps of the proposed Build Alternative includes a retaining wall along the north side of the facility that supports the relocated ramp and follows along the edge of I-290.

The sensitivity analysis was completed using FHWA's Traffic Noise Model (TNM) 2.5. Noise modeling scenarios were created for peak traffic volumes. The same traffic volumes were assumed for the various modeling scenarios to isolate roadway geometry as the only variable. Existing condition traffic volumes were used for all models, as the analysis measured relative changes. Traffic noise abatement was not considered in this analysis. Traffic noise levels will be reported and abatement will be studied in the traffic noise analysis for this project.

It should be noted the CTA and CSX rail lines extend along the southern edge of I-290. TNM does not predict rail noise and therefore this sensitivity analysis does not account for the rail facilities.

Two ramp configurations were evaluated using existing peak hour traffic volumes to test the effect of moving the ramp geometry at the Harlem interchange:

1. Existing ramp configuration
2. Proposed ramp configuration

The relative noise level changes due to the proposed ramp geometry are reported both by the change in decibels and a description of how the human ear would perceive that level of noise

change. Commonly accepted principles regarding perception of noise level changes, as cited in the Illinois DOT Traffic Noise Assessment Manual, include:

± 10 dB(A) a doubling or halving of perceived noise level

± 5 dB(A) readily perceptible

± 3 dB(A) barely perceptible

± 1 dB(A) less than a barely perceptible

It should be noted that the models present a conservative (higher) noise prediction than would likely occur in the real world, as TNM is not capable of modeling the horizontal, overhead noise shielding that would occur to some degree with any of the proposed interchange designs, as portions of the mainline would be covered by the proposed interchange ramp configurations.

Overall Noise Sensitivity Test – Combined Mainline and Ramp Traffic

The following tables summarize the results of the noise sensitivity analysis of the proposed ramp compared to the existing ramp (Table 1). Results from the AM peak period were found to be the worst case and are used for comparison.

Table 1
Mainline & Ramp Traffic – Existing Ramp vs. Proposed Ramp

Noise Study Location *(listed by location in building)*		**Ramp & Mainline Traffic AM Peak**	
		Proposed Design Ramp	
		Δ dB(A)	**Perceptibility**
1st Floor	**West Side**	-6	Readily
	Center	-7	Readily
	East Side	-7	Readily
2nd Floor	**West Side**	-4	Barely
	Center	-4	Barely
	East Side	-3	Barely
3rd Floor	**West Side**	-1	Not perceptible
	Center	-2	Not perceptible
	East Side	-1	Not perceptible
Kenilworth		0	Not perceptible

Existing ramp vs. proposed ramp (Table 1):

The results indicate that compared to the existing ramp configuration, the proposed ramp configuration would result in overall noise changes ranging from -1 dB(A) up to a -7 dB(A) reduction at the condominium building. A barely perceptible to a readily perceptible reduction of overall noise levels would be experienced for the first and second floors ranging from -3 to -7 dB(A). The majority of the noise reduction is due to the shielding provided by the proposed retaining wall along the outside of the proposed ramp.

The third floor locations would also receive a reduction, but not a perceptible reduction. This is because the noise shielding effect of the retaining wall diminishes as the condo floors rise higher above the mainline.

There is no difference in noise levels between the existing and proposed ramp conditions for the Kenilworth receptor (where the ramp is near the mainline). This is because mainline I-290 traffic is the primary traffic noise generator in this area, and traffic noise from the ramps (which have a much smaller traffic volume than the mainline) do not influence the overall noise levels.

Additional noise benefits

Additional reductions in noise level may be achieved for the proposed ramp configuration due to the partial "capping" of the mainline as the ramps and Harlem Avenue cross over the mainline to connect to Harlem Avenue. However, the horizontal shielding (due to the partial

"cap") cannot be captured in TNM, the FHWA traffic noise modeling software used to calculate noise level projections for FHWA projects, due to how the model was developed (as discussed in the Methods and Assumptions section above).

Summary

Harlem Interchange Summary

The sensitivity analysis indicated that the proposed Build interchange configuration at Harlem would result in an a noise level decrease to the Harrison Street noise study location, and would provide noise reduction benefits by delivering perceptible noise reductions up to –7 dB(A), as compared to the existing ramps.

It was found that the primary noise contributor to the modeled locations for Harlem is the I-290 mainline traffic, and not the ramp traffic. The primary geometric feature affecting the noise level at the Harlem noise study location is the vertical retaining walls needed to support the ramps that act as a barrier between the mainline traffic and the Harlem noise study location. Other factors contributing to a predicted noise reduction at Harlem is the additional separation of the eastbound entrance ramp from the noise study location and the presence of a Jersey barrier along the edge of the ramp that faces the building.

Additionally, relative noise changes were studied for a receptor north of I-290 at Kenilworth Avenue. This location is near where the proposed ramp would diverge from the mainline. There is no change in noise at Kenilworth when comparing the existing and proposed ramp conditions, as mainline I-290 traffic is the primary traffic noise generator in this location, and the proposed ramp is partially shielded by a proposed retaining wall. See Figures 3 through 6 for cross-section views at each noise study area.

The introduction of the proposed ramp retaining walls at Harlem Avenue introduces a readily perceptible change in the existing noise environment by providing noise shielding to the study locations where none currently exists.

It was found that the primary noise contributor near Harlem Avenue is the I-290 mainline traffic, and not ramp traffic. The primary geometric features affecting the noise levels at the study locations are the proposed retaining walls and the lowering of the mainline profile.

Figure 3
Existing Condition Cross-Section View at Condominium Building

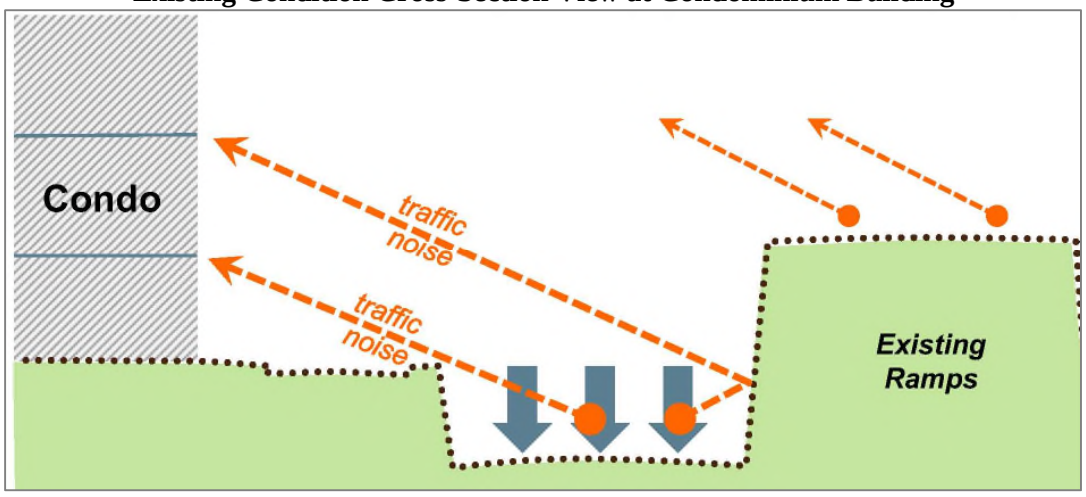


Figure 4
Proposed Condition Cross-Section View at Condominium Building

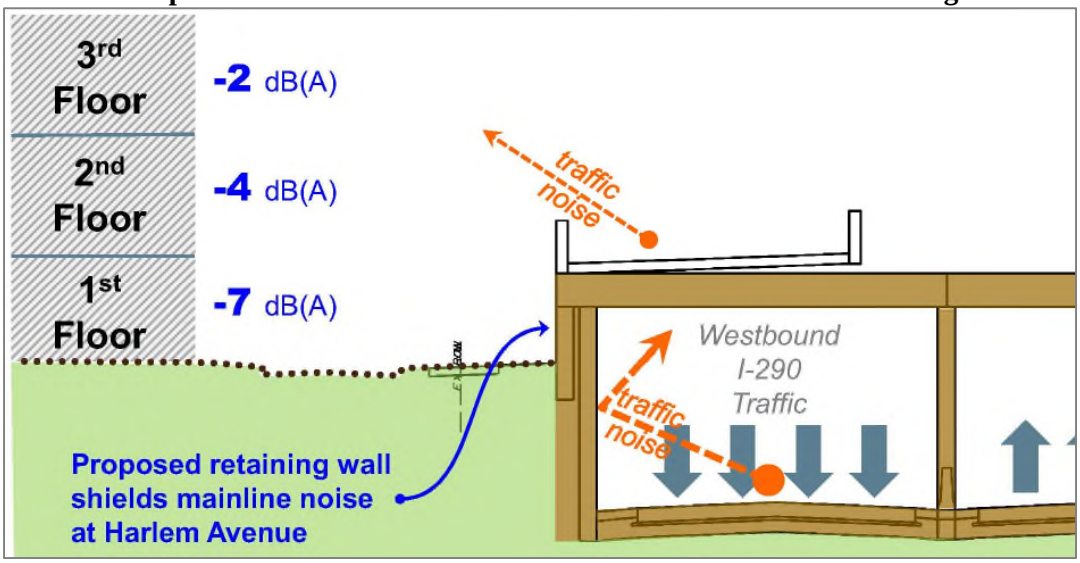


Figure 5
Existing Condition Cross-Section View at Kenilworth Avenue

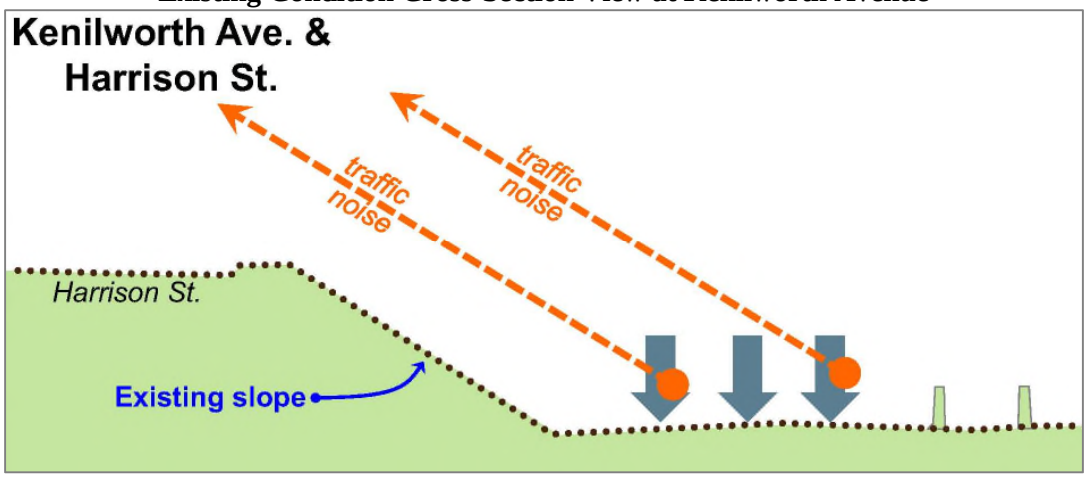


Figure 6
Proposed Condition Cross-Section View at Kenilworth Avenue