

**ATTACHMENT F-4**

**O'HARE MODERNIZATION EIS**

**HIGHWAY NOISE TECHNICAL REPORT**

**(10/2004)**

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**O'Hare Modernization EIS  
Highway Noise Technical Report**

**October 2004**

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# Table of Contents

|  |     |
|--|-----|
| Table of Contents .....  | 2   |
| I. Introduction.....   | 3   |
| A. Project Description.....  | 3   |
| 1. O’Hare Modernization .....  | 3   |
| 2. Existing Conditions – Irving Park Road .....  | 3   |
| 2. Proposed Alignment – Irving Park Road .....   | 3   |
| B. Highway Noise Fundamentals .....  | 4   |
| Figure 1 Existing and Proposed Relocated Irving Park Road.....                               | 5   |
| Figure 2 Sound Measurement and TNM Receptor Locations .....                                  | 6   |
| C. Noise Abatement Criteria .....  | 7   |
| Table 1 FHWA Noise Abatement Criteria (Hourly A-Weighted Sound Level<br>Decibels (dBA))..... | 7   |
| II. Existing Noise Environment.....  | 8   |
| A. Study Area Description.....   | 8   |
| B. Ambient Noise Level Measurement Methodology.....  | 8   |
| C. Locations of Ambient Noise Measurement Sites.....   | 9   |
| D. Summary of Measured Noise Levels .....  | 12  |
| Table 2 Summary of Existing Noise Measurement Sites and Levels.....                          | 12  |
| E. Calibration of the FHWA Traffic Noise Model.....  | 13  |
| III. Predicted Noise Levels .....  | 13  |
| A. Prediction Methodology.....   | 13  |
| B. Prediction Results .....  | 13  |
| Table 3 Summary of TNM Calibration.....  | 14  |
| Table 4: Summary of Modeled Existing and Projected Noise Levels .....                        | 15  |
| IV. Impact Assessment.....   | 15  |
| A. Impact Analysis and Mitigation.....   | 15  |
| B. Construction Impacts .....  | 15  |
| Table 7 Construction Equipment Sound Levels .....  | 16  |
| APPENDIX A Completed Field Data Collection Forms.....  | A-1 |
| APPENDIX B Traffic Data .....  | B-1 |

# **I. Introduction**

This Highway Noise Technical Report describes the analysis and evaluation of the traffic noise in the area of the proposed Relocated Irving Park Road, that is planned as part of Alternative C. The results of this analysis will be included in the main body of this Environmental Impact Statement (EIS). The noise analysis has been performed in accordance with Federal Highway Administration (FHWA) Federal Aid Policy Guide, Subchapter H, Part 772, *Procedures for Abatement of Highway Traffic Noise and Construction Noise*, and the Illinois Department of Transportation (IDOT) guidelines contained in BDE Procedure Memorandum Number 18-00, dated April 3, 2000.

## **A. Project Description**

### **1. Alternative C**

Alternative C is a plan to reconfigure the airfield and develop terminal and roadway access facilities on the west side of the Airport. The reconfiguration of the airfield would improve the operational efficiency of the airfield under existing operational demands, and allow the Airport to meet aviation demands for the foreseeable future and accommodate New Large Aircraft.

The reconfiguration of the airfield would expand the airport to the southwest, which requires the relocation of the existing BNSF railroad tracks and existing Irving Park Road. The section of Irving Park Road that would be relocated extends from the intersection of Irving Park Road and York Road to the US Postal Service Building.

### **2. Existing Conditions – Irving Park Road**

Irving Park Road is an arterial that runs generally east-west along the southern boundary of O'Hare Airport, as shown in Figure 1. It has two lanes in each direction and had a speed limit of 55 mph. The 2002 average daily traffic (ADT) volume along the existing road is 45,800 vehicles per day.

The land use adjacent to Irving Park Road is also shown in Figure 1. North of the road is the airport property. South of the eastern part of the road is industrial and commercial use, and south of the western part of the road is residential land use.

### **2. Proposed Alignment – Irving Park Road**

The proposed alignment for Relocated Irving Park Road is being designed by BPC. The noise model used in this analysis, as well as Figures 1 and 2, were prepared from AutoCAD files provided by BPC. The proposed alignment would relocate the section of the road between York Road and the US Postal Service Building to the south, as shown in Figure 1. At the west end of the relocation, Irving Park Road would curve to the north and intersect with York Road at the same location as the current intersection, although the plans call for a new grade-separated intersection. The grade separation is part of a separate project and is not part of the Alternative C.

The relocated Irving Park Road would not increase in lanes or capacity compared to the existing road. It would have two lanes in each direction and a speed limit of 55 mph. The

ADT and is projected to reach 70,300 vehicles per day in the year 2018 with Alternative C in place, an increase of approximately 53% over 2002.

The land use on the south side of the relocated Irving Park Road would be different than that of the existing Irving Park Road. On the east end of the relocation, the land use would remain commercial, as it is currently. This area is labeled “Warehouses,” on Figure 1. However, on the west end and in the middle section of the relocation, the land use would change due to the relocation of the road and the acquisition of property by the airport. The airport proposes to acquire all of the land inside the Proposed Airport Boundary shown on Figure 1. Currently, the land use south of Irving Park Road is residential on the west end, and commercial/industrial in the middle section. All of the property south of the west end and middle section of the proposed Relocated Irving Park Road would be airport or rail yard.

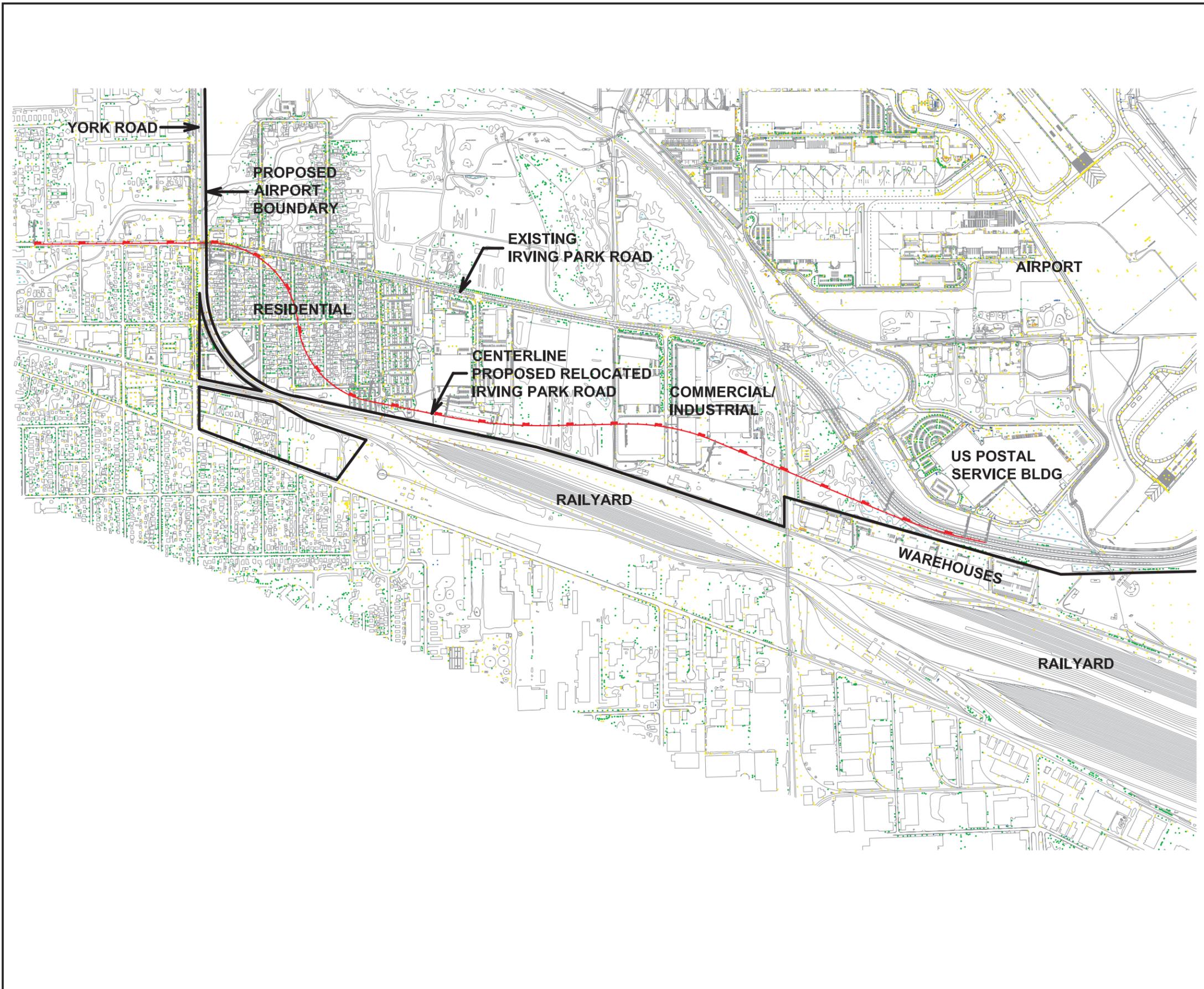
## ***B. Highway Noise Fundamentals***

Traffic noise is measured in this analysis, per FHWA policy, using the A-weighted equivalent sound level,  $Leq$ , in units of dBA. This metric considers three factors of the sound measured: magnitude, frequency, and time variance.

Sound magnitude relates to the sound pressure displacement created by the acoustic energy of the source. This displacement is quantified through the use of a logarithmic ratio, Sound Pressure Level, expressed in units of decibels (abbreviated dB).

Since human ears respond not only to sound magnitude, but also to frequency, an A-weighting curve is applied to the sound measurement, which changes the units to dBA. The A-weighting curve emphasizes the frequency ranges that humans hear best and de-emphasizes those we can't hear as well.

The A-weighted decibel describes the magnitude of a sound, emphasizing the frequencies best heard by humans, but only at one instant in time. Energy equivalent sound levels,  $Leq$ , are employed to add a temporal aspect to the measurement.  $Leq$  is the equivalent mean steady noise level containing the same acoustic energy as the actual time-varying noise level during a time period (usually one hour).  $Leq$  is determined by averaging the acoustic energy of a number of instantaneous measurements.



Chicago  
O'Hare  
International  
Airport

**O'Hare Modernization  
Environmental Impact Statement**

- Proposed Relocation of Irving Park Road
- Existing Roads



**Existing and Proposed  
Relocated Irving Park Road**

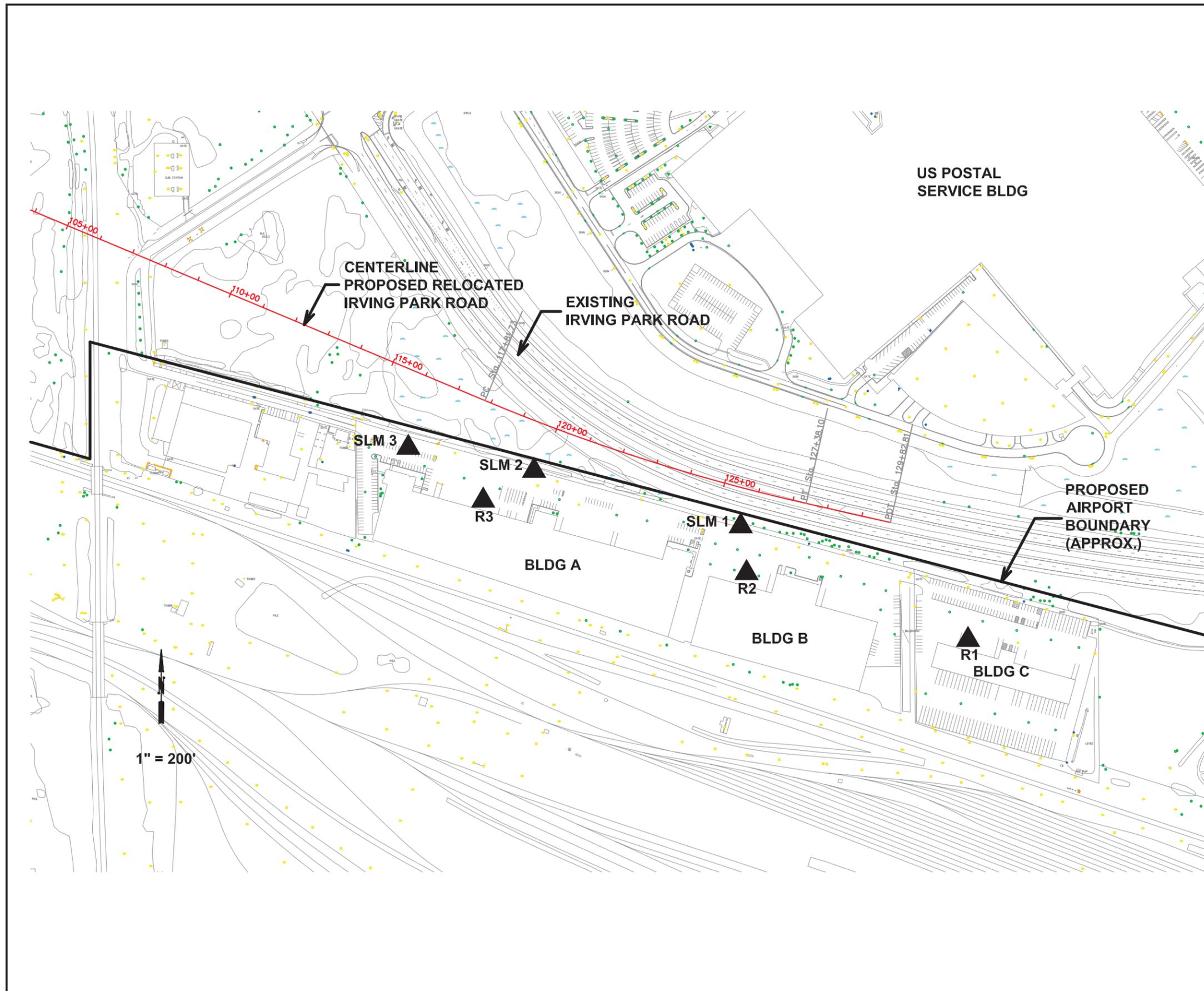
► **Figure 1**



**O'Hare Modernization  
Environmental Impact Statement**

-  Proposed Relocation of Irving Park Road
-  Existing Roads

SLM = Sound Level Meter Location Number  
RX = TNM Receptor Location Number



**Sound Measurement  
and TNM Receptor Locations**

► **Figure 2**

### C. Noise Abatement Criteria

Requirements for traffic noise analysis and abatement are defined by the FHWA and IDOT in their documents referenced above. The FHWA defines Noise Abatement Criteria (NAC) for various land uses, as shown in Table 1. Each activity category has an NAC level, which is used to determine noise impacts. The activity categories analyzed in this project are in Category C, with NAC of 72 dBA.

Table 1 FHWA Noise Abatement Criteria (Hourly A-Weighted Sound Level Decibels (dBA))

| Activity Category | L <sub>eq</sub> (h) | Description of Activity Category   |
|-------------------|---------------------|--|
| A                 | 57<br>(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<br>(Exterior)    | Picnic areas, recreation areas, playgrounds, active sports areas, parks, residences, motels, hotels, schools, churches, libraries, and hospitals.  |
| C                 | 72<br>(Exterior)    | Developed lands, properties, or activities not included in Categories A or B above.  |
| D                 | --                  | Undeveloped lands.   |
| E                 | 52<br>(Interior)    | Residences, motels, hotels, public meeting rooms, schools, churches, libraries, hospitals, and auditoriums.  |

Source: *Procedures for Abatement of Highway Traffic Noise and Construction Noise, 23 Code of Federal Regulations (CFR) Part 772*; Dec 1991.

The FHWA’s 23 CFR, Part 772, defines a traffic noise impact as a condition in which “the predicted traffic noise levels approach or exceed the noise abatement criteria (NAC), or when the predicted traffic noise levels substantially exceed the existing noise levels.” IDOT’s BDE Procedure Memorandum Number 18-00 includes the interpretation that *approach* means “within one decibel,” and *substantially exceed* means “are at least 14 decibels greater than.”

Therefore, for a commercial warehouse, which falls in category C with NAC level of 72 dBA, an impact would occur if the predicted noise level is 71 decibels or more, or if the predicted noise level is 14 decibels or more greater than existing noise levels.

## **II. Existing Noise Environment**

### **A. Study Area Description**

Existing land use in the study area is airport, residential, rail yard, and commercial/industrial, as shown in Figure 1. The future land use adjacent to the Relocated Irving Park Road would be almost entirely airport and rail yard, with some commercial remaining at the east end. The airport and rail yard land uses are not analyzed in the study as they are not considered to be noise-sensitive land uses. But the commercial warehouses on the east end of Relocated Irving Park Road fit into NAC Category C, and are analyzed for noise impacts in this study. Three warehouse buildings, labeled A, B, and C on Figure 2, are included in the study.

At the west end of Relocated Irving Park Road, the planned intersection of Irving Park and York Roads would have a grade separation, with Irving Park in a depression going under York and the railroad tracks. This grade separation is a separate project and is not part of Alternative C, and it is expected that the environmental documentation of the grade separation project would include a detailed noise analysis. At this time, the engineering of the grade separation has not progressed far enough to include it in this noise analysis.

However, it should be noted that the western end of Relocated Irving Park Road is fairly near to the residences on the west side of York Road. The relocation of Irving Park Road is not expected to increase the noise levels at these houses for three reasons:

1. The Relocated Irving Park Road would not be substantially closer to the houses than existing Irving Park Road,
2. The traffic noise from York Road would dominate any noise from Irving Park Road because it is much closer to the houses, and
3. The Proposed Irving Park Road would be depressed below grade, which would reduce the Irving Park Road contribution to the traffic noise at the houses.

### **B. Ambient Noise Level Measurement Methodology**

Existing ambient noise levels were measured using a Bruel & Kjaer model 2239 Sound Level Meter. The noise measurements were made on August 14, 2003. The temperature ranged from 80 °F to 91 °F and winds were light and variable, having little effect on sound propagation over moderate distances. Sound levels were measured in 15-minute durations and average (Leq) and peak sound levels were recorded for each measurement. The Sound Level Meter was calibrated before each sampling to ensure consistent results.

During the measurements at Sites SLM1 and 2, traffic counts were conducted on Irving Park Road and on the road leading to the warehouses, called the Warehouse Driveway. At Site 3, traffic counts were not done because Irving Park Road is not visible from Site 3.

### **C. Locations of Ambient Noise Measurement Sites**

Noise measurements were made with a Sound Level Meter (SLM) at three locations, shown as Sites SLM1, SLM2, and SLM3 on Figure 2. The locations are in the parking lot between the warehouses and Irving Park Road, but far enough away from the warehouses to avoid capturing warehouses noise. The following photographs show each location and the setup of the SLM.

**Site Number: 1**

**Land Use: Commercial**

**Predominant Existing Noise Source: Irving Park Road**



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**Site Number: 2**

**Land Use: Commercial**

**Predominant Existing Noise Source: Irving Park Road**



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**Site Number: 3**

**Land Use: Commercial**

**Predominant Existing Noise Source: Irving Park Road**



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**D. Summary of Measured Noise Levels**

Table 2 contains the measured noise levels at the SLM (Sound Level Meter) sites shown in Figure 2. The completed field data collection forms are in Appendix A.

Table 2 Summary of Existing Noise Measurement Sites and Levels

| Site | Location              | Date      | Start Time | Measured Existing Noise Level Leq (dBA) |
|------|-----------------------|-----------|------------|---|
| 1    | Warehouse parking lot | 8/14/2003 | 9:59 AM    | 72.0                                    |
| 1    | Warehouse parking lot | 8/14/2003 | 10:23 AM   | 71.2                                    |
| 2    | Warehouse parking lot | 8/14/2003 | 2:28 PM    | 69.6                                    |
| 3    | Warehouse parking lot | 8/14/2003 | 1:16 PM    | 68.8                                    |
| 3    | Warehouse parking lot | 8/14/2003 | 1:34 PM    | 65.7                                    |

## ***E. Calibration of the FHWA Traffic Noise Model***

Traffic noise predictions for this analysis were prepared using FHWA's Traffic Noise Model (TNM) software. TNM was used to create 3-dimensional computer models of specific sites considering such features as topography, roadway geometry, traffic volumes and speeds, ground surfaces, and existing walls and buildings. The software predicts traffic noise levels at receptor locations specified by the user.

Models of the measurement sites were created using the traffic counted during the noise measurement and calibrated with the measured existing noise levels. The models were calibrated so that the calculated noise levels were within 2 dBA of the measured levels. Table 3 shows the data used in the calibration models and the calibration results for this analysis. The models for Sites 1 and 2 are calibrated within 2 dBA of the measured noise levels. Site 3 was not modeled because it was not possible to collect the necessary traffic counts during the noise measurement at that site. The noise measurements at Site 3 are for information only and are not used in the analysis.

## **III. Predicted Noise Levels**

### ***A. Prediction Methodology***

In accordance with FHWA policy, FHWA's Traffic Noise Model Version 2.5 (TNM) software was used to model noise levels for existing (2002) conditions, the Design Year (2018) No Action scenario, and the Design Year (2018) With Project scenario.

Existing and projected traffic volumes for the noise analysis were obtained from the traffic data prepared by Kimley-Horn and Associates for the EIS. The existing peak hour volumes on Irving Park Road are 1,900 eastbound vehicles per hour (vph) and 1,470 westbound vph. In the 2018 No Action scenario, the peak hour is expected to have 1,990 eastbound vph and 1,530 westbound vph, and the 2018 With Project scenario would have 2,710 eastbound vph and 2,460 westbound vph. These volumes represent the highest noise period of the facility and were input into a TNM model of the proposed Relocated Irving Park Road. The traffic volumes used in the analysis are included in Appendix B.

### ***B. Prediction Results***

Three receptor locations were modeled for existing and design year noise levels, labels R1, R2, and R3 in Figure 2. These receptor were located in the parking lots, about 30 – 40 feet away from the warehouse buildings. Table 4 is a summary of the predicted noise levels for receptors R1, R2, and R3.

A model of existing noise levels was created using existing roadway geometry and traffic volumes. The existing traffic volumes were from the data provided by Kimley-Horn and Associates, and are not the same volumes that were used in the calibration models. The calibration models are intended to represent one specific time period during which noise measurements were made, while the existing conditions model represents a theoretical 'typical' existing time period.

Table 3 Summary of TNM Calibration

| Site <sup>(1)</sup> | Date      | Start Time | Roadway             | Offset Distance (ft) <sup>(2)</sup> | Estimated Average Speed During Measurement Period (mph) | Hourly Traffic Based on Concurrent Traffic Counts <sup>(3)</sup> |                   |                   |     | TNM <sup>(5)</sup> Model Calibration<br>All noise levels are Leq in dBA <sup>(6)</sup> |                         |                          |                           |     |
|---------------------|-----------|------------|---------------------|-------------------------------------|---|--|-------------------|-------------------|-----|--|-------------------------|--------------------------|---------------------------|-----|
|                     |           |            |                     |                                     |   | Auto   | MT <sup>(4)</sup> | HT <sup>(4)</sup> | Bus | MC <sup>(4)</sup>  | Modeled L <sub>eq</sub> | Measured L <sub>eq</sub> | Difference <sup>(6)</sup> |     |
| SLM1                | 8/14/2003 | 9:59 AM    | Irving Park Road EB | 76                                  | 55  | 784  | 84                | 108               | 0   | 4  | 72.5                    | 72.0                     | 0.5                       |     |
|                     |           |            | Irving Park Road WB | 146                                 | 55  | 616  | 72                | 88                | 0   | 8  |                         |                          |                           |     |
|                     |           |            | Warehouse Driveway  | 15                                  | 25  | 20   | 12                | 28                | 0   | 0  |                         |                          |                           |     |
| SLM1                | 8/14/2003 | 10:23 AM   | Irving Park Road EB | 76                                  | 55  | 708  | 116               | 100               | 0   | 4  | 72.2                    | 71.2                     | 1.0                       |     |
|                     |           |            | Irving Park Road WB | 146                                 | 55  | 472  | 60                | 56                | 0   | 8  |                         |                          |                           |     |
|                     |           |            | Warehouse Driveway  | 15                                  | 25  | 28   | 16                | 32                | 0   | 0  |                         |                          |                           |     |
| SLM2                | 8/14/2003 | 2:28 PM    | Irving Park Road EB | 188                                 | 55  | 1,140  | 52                | 76                | 0   | 16   | 71.1                    | 69.6                     | 1.5                       |     |
|                     |           |            | Irving Park Road WB | 258                                 | 55  | 1,456  | 88                | 68                | 0   | 0  |                         |                          |                           |     |
|                     |           |            | Warehouse Driveway  | 15                                  | 25  | 84   | 20                | 36                | 0   | 0  |                         |                          |                           |     |
| SLM3 <sup>(7)</sup> | 8/14/2003 | 1:16 PM    | Irving Park Road EB | 372                                 | 55  | N/A  | N/A               | N/A               | N/A | N/A  | N/A                     | 68.8                     | N/A                       |     |
|                     |           |            | Irving Park Road WB | 442                                 | 55  | N/A  | N/A               | N/A               | N/A | N/A  | N/A                     | N/A                      | N/A                       | N/A |
|                     |           |            | Warehouse Driveway  | 15                                  | 25  | N/A  | N/A               | N/A               | N/A | N/A  | N/A                     | N/A                      | N/A                       | N/A |
| SLM3 <sup>(7)</sup> | 8/14/2003 | 1:34 PM    | Irving Park Road EB | 372                                 | 55  | N/A  | N/A               | N/A               | N/A | N/A  | N/A                     | 65.7                     | N/A                       |     |
|                     |           |            | Irving Park Road WB | 442                                 | 55  | N/A  | N/A               | N/A               | N/A | N/A  | N/A                     | N/A                      | N/A                       | N/A |
|                     |           |            | Warehouse Driveway  | 15                                  | 25  | N/A  | N/A               | N/A               | N/A | N/A  | N/A                     | N/A                      | N/A                       | N/A |

(1) Locations are shown on Figure 2.

(2) The perpendicular distance from the centerline of the designated roadway.

(3) Traffic counts taken during the measurement were adjusted to represent a full hour of traffic movements.

(4) MT = medium truck, HT = heavy truck, MC = motorcycle.

(5) TNM = FHWA Traffic Noise Model.

(6) The model is considered to be calibrated if the modeled noise level is within 2 dBA of the measured noise level.

(7) The measurements for Site 3 were not used in the analysis - they are for information only. Since Irving Park Road cannot be seen from Site 3, the traffic could not be counted during the measurement, and the site could not be modeled without traffic data.

Table 4: Summary of Modeled Existing and Projected Noise Levels

| Receiver | Modeled Existing Noise Level Leq | Modeled 2018 NA Noise Level Leq | 2018 NA Minus Existing Leq | Modeled 2018 WP Noise Level Leq | 2018 WP Minus NA Leq | 2018 WP Minus Existing Leq |
|----------|----------------------------------|---------------------------------|----------------------------|---------------------------------|----------------------|----------------------------|
| R1       | 61                               | 61                              | 0                          | 64                              | 3                    | 3                          |
| R2       | 63                               | 63                              | 0                          | 66                              | 3                    | 3                          |
| R3       | 61                               | 61                              | 0                          | 65                              | 4                    | 4                          |

All noise levels are in dBA.

WP = With Project

NA = No Action

Existing noise levels range from 61 dBA to 63 dBA. In the 2018 No Action scenario, the noise levels stay essentially the same, but in the 2018 With Project scenario, they increase by 3 – 4 dBA over existing levels. None of the receptors would experience noise impacts, as defined by the Noise Abatement Criteria in Section I-C of this report.

## IV. Impact Assessment

### A. Impact Analysis and Mitigation

None of the receptors are predicted to experience highway noise impacts due to Alternative C. No highway noise mitigation is recommended for this project.

### B. Construction Impacts

The major construction elements of this project are expected to be earth removal, hauling, grading, paving, bridge demolition, and bridge construction. General construction noise impacts, such as temporary speech interference for passerby and those individuals working near the project, can be expected, particularly from earth moving equipment during grading operations, paving operations, and pile driving. Table 7 lists some typical peak operating noise levels of construction equipment at a distance of 50 feet.

Considering the relatively short-term nature of construction noise, impacts are not expected to be substantial. At the time of construction, the land uses surrounding the Proposed Relocated Irving Park Road would be airport, rail yard, and commercial, and would not be adversely affected by temporary construction noise. Construction noise mitigation is not recommended for this project.

Table 7 Construction Equipment Sound Levels

| Equipment         | Typical Noise Level (dBA) 50ft from Source |
|-------------------|--|
| Air Compressor    | 81   |
| Backhoe           | 80   |
| Concrete Mixer    | 85   |
| Concrete Pump     | 82   |
| Concrete Vibrator | 76   |
| Crane, Derrick    | 88   |
| Crane Mobile      | 83   |
| Dozer             | 85   |
| Generator         | 81   |
| Grader            | 85   |
| Jack hammer       | 88   |
| Loader            | 85   |
| Paver             | 89   |
| Pile Driver       | 101  |
| Pneumatic Tool    | 85   |
| Pump              | 76   |
| Rock Drill        | 98   |
| Roller            | 74   |
| Saw               | 76   |
| Scraper           | 89   |
| Shovel            | 82   |
| Truck             | 88   |

SOURCE: U.S. Federal Transit Administration, "Transit Noise and Vibration Impact Assessment," April 1995, based on data from: U.S. Environmental Protection Agency,

“Noise from Construction Equipment and Operations, Building Equipment and Home Appliances,” NTID300.1, December 31, 1971.

## **APPENDIX A Completed Field Data Collection Forms**

## **APPENDIX B Traffic Data**

**Appendix B: Traffic Data for TNM Models**

| Scenario      | Roadway            | Vehicle Type | Peak Hour Volume | Speed (mph) | Data Source  |
|---------------|--------------------|--------------|------------------|-------------|--|
| 2002 Existing | Irving Park EB     | Auto         | 1,787            | 55          | Evaluation Measures, 2002 Base Year, Exhibits 3 and 8.             |
|               |                    | Medium Truck | 19               | 55          |  |
|               |                    | Heavy Truck  | 75               | 55          |  |
|               |                    | Bus          | 6                | 55          |  |
|               |                    | Motorecycle  | 11               | 55          |  |
|               | Irving Park WB     | Auto         | 1,385            | 55          | Evaluation Measures, 2002 Base Year, Exhibits 3 and 8.             |
|               |                    | Medium Truck | 15               | 55          |  |
|               |                    | Heavy Truck  | 58               | 55          |  |
|               |                    | Bus          | 4                | 55          |  |
|               |                    | Motorecycle  | 8                | 55          |  |
|               | Warehouse Driveway | Auto         | 84               | 25          | Traffic counts during noise measurements, by Jacobs Civil, 8/14/03 |
|               |                    | Medium Truck | 20               | 25          |  |
|               |                    | Heavy Truck  | 36               | 25          |  |
|               |                    | Bus          | 0                | 25          |  |
|               |                    | Motorecycle  | 0                | 25          |  |
| 2018 No-Build | Irving Park EB     | Auto         | 1,873            | 55          | Evaluation Measures, 2018 No Action, Exhibits 3 and 8.             |
|               |                    | Medium Truck | 20               | 55          |  |
|               |                    | Heavy Truck  | 79               | 55          |  |
|               |                    | Bus          | 6                | 55          |  |
|               |                    | Motorecycle  | 11               | 55          |  |
|               | Irving Park WB     | Auto         | 1,445            | 55          | Evaluation Measures, 2018 No Action, Exhibits 3 and 8.             |
|               |                    | Medium Truck | 16               | 55          |  |
|               |                    | Heavy Truck  | 61               | 55          |  |
|               |                    | Bus          | 4                | 55          |  |
|               |                    | Motorecycle  | 9                | 55          |  |
|               | Warehouse Driveway | Auto         | 84               | 25          | Traffic counts during noise measurements, by Jacobs Civil, 8/14/03 |
|               |                    | Medium Truck | 20               | 25          |  |
|               |                    | Heavy Truck  | 36               | 25          |  |
|               |                    | Bus          | 0                | 25          |  |

|            |                    |              |       |    |  |
|------------|--------------------|--------------|-------|----|--|
|            |                    | Motorcycle   | 0     | 25 |  |
| 2018 Build | Irving Park EB     | Auto         | 2,551 | 55 | Evaluation Measures, 2018 With Project, Exhibits 3 and 8.          |
|            |                    | Medium Truck | 28    | 55 |  |
|            |                    | Heavy Truck  | 107   | 55 |  |
|            |                    | Bus          | 8     | 55 |  |
|            |                    | Motorcycle   | 15    | 55 |  |
|            | Irving Park WB     | Auto         | 2,318 | 55 | Evaluation Measures, 2018 With Project, Exhibits 3 and 8.          |
|            |                    | Medium Truck | 25    | 55 |  |
|            |                    | Heavy Truck  | 97    | 55 |  |
|            |                    | Bus          | 7     | 55 |  |
|            |                    | Motorcycle   | 14    | 55 |  |
|            | Warehouse Driveway | Auto         | 84    | 25 | Traffic counts during noise measurements, by Jacobs Civil, 8/14/03 |
|            |                    | Medium Truck | 20    | 25 |  |
|            |                    | Heavy Truck  | 36    | 25 |  |
|            |                    | Bus          | 0     | 25 |  |
|            |                    | Motorcycle   | 0     | 25 |  |

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