**Instructions for using this template**

The text provided is suggested, not mandatory. As long as the information in your submittal is clear, accurate, and compliant with NCDOT Noise Policy and Manual, you can opt to use your own language. However, your TNM Validation Submittal does need to contain all the pertinent information listed herein, and in the order provided in this Template.

**HIGHLIGHT LEGEND:**

Yellow highlighted text should be replaced with project-specific text.

*Blue highlighted text* is instructional; follow its guidance, but delete it from your TNM Validation Submittal.

Green highlighted sections serve as example text – delete these from your TNM Validation Submittal, but use them as appropriate to craft the appropriate text for your memo.

This memorandum should be prepared by a traffic noise analyst prequalified with NCDOT to prepare Traffic Noise Reports (TNRs) and/or Design Noise Reports (DNRs).

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Provide the following in a memorandum format using firm letterhead:

* To and from whom the memo is being sent. All memoranda should be addressed to Tracy Roberts, AICP, NCDOT Traffic Noise and Air Quality Group Leader.
* Firm contact information (name, phone number, and email)
* Date
* Subject (including the project STIP number)

Firm Name prepared the following Noise Model Validation Memorandum to meet requirements of the 2016 or 2022 [select one and delete the other] NCDOT Traffic Noise Manual. This memorandum includes a description of the short‐term and long-term noise measurement site/s, as well as a summary of the methodology and results of the ambient noise data collection and traffic noise model validation efforts using Version 2.5 of the Federal Highway Administration (FHWA) Traffic Noise Model® (TNM) for the [enter STIP number] Traffic Noise Report / Design Noise Report [select the appropriate report type and delete the other].

**Project Description**

[Provide brief project description including location, proposed improvements, number of alternatives. project length, existing (base) year, design year, design speed, and any additional relevant project information. Indicate the type of environmental document being prepared if TNR, or the type of environmental document and date of approval if DNR.] Indicate if environmental document is federal or state.

The criteria, procedures and methodology employed for this traffic noise analysis are in accordance with the NCDOT 2022 Traffic Noise Manual (effective October 12, 2022) and the NCDOT 2021 Traffic Noise Policy (effective November 29, 2021). If a different policy/manual is applicable, cite it instead.

**Existing Noise Measurements**

The project’s Noise Analysis Work Plan was approved by the North Carolina Department of Transportation (NCDOT) on [enter date]. The work plan proposed [enter number] [enter duration(s)] short-term noise measurement locations, in an array of [enter number] sound level meters at each location, generally representing the first, second, and third row of receptors (if applicable), for TNM model validation. The work plan also proposed [enter number] [enter duration(s)] long-term noise measurements to establish existing ambient noise levels in areas where traffic noise is not dominant.

Ambient noise measurements were performed on [enter date(s)], including [enter number] [enter duration(s)] short-term measurements, in an array of [enter number] sound level meters at each location, and [enter number] [enter duration(s)] long-term measurements. If the number of ambient noise measurements performed differs from the number proposed in the work plan, provide a brief explanation on why they differ. All ambient noise measurement locations are shown on Figures #-##. The sound level metrics data for these measurements was collected in increments of one minute (i.e. a 20-minute short-term noise measurement session was comprised of 20 data points; a 24-hour long-term noise measurement session was comprised of 1,440 data points). [Provide a brief description of how concurrent, bi-directional traffic counts, vehicle classifications, and travel speeds were collected during the noise measurements.]

During the ambient noise measurements, weather conditions were collected with [Provide a brief description of how concurrent weather data were collected during the noise measurements]. Pavement conditions were dry. Refer to Table 1 for a summary of the weather data during the noise measurements.

The noise levels obtained during the ambient noise measurement process are shown below in Table 2, ranging from approximately [XX] dB(A) Leq to [XX] dB(A) Leq.

**Validation Models**

In accordance with the NCDOT 2022 Traffic Noise Manual (If a different policy/manual is applicable, cite it instead), computer models using the FHWA TNM 2.5® were created to predict traffic noise in the project study area, and these models have been validated to local conditions through comparison between measured and predicted noise levels. For each measurement location where the predicted noise level is within ±3 dB(A) of the measured noise level, that measurement site is considered validated. Refer to Table 2 for a summary of the TNM validation results.

[If any assumptions were made while building the TNM validation models based on field observations, provide brief description(s). These may include, but are not limited to, corridor speeds, terrain lines, tree zones, ground zones, etc.]

**Table 1: Ambient Noise Measurement Weather Summary**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Measurement Site** | **Temp. (°F)** | **Cloud Cover** | **Wind Direction** | **Wind Speed (mph)** | **Relative Humidity (%)** |
| 1 | 62 | Clear/  Partly/  Mostly/  Overcast | NW/  NNW/  etc. | 5 | 50 |
| 2 | 66 | Clear/  Partly/  Mostly/  Overcast | NW/  NNW/  etc. | 5 | 50 |

Source: [provide source of weather data]

Note: Pavement conditions must be dry during validation measurements. Precipitation is not included in the weather table since it will always be zero inches. Do not collect short-term measurements if there is precipitation.

**Table 2: TNM Validation Table**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Measurement Site** | **Measurement No.** | **Measured Leq, dB(A)1** | **TNM-Predicted Leq(h), dB(A) 1** | **Validation Delta (Pred-Meas), dB(A) 1** |
| 1 | M1-1 | 67.5 | 63.5 | **-4.02** |
| M1-2 | 57.2 | 57.4 | **0.2** |
| M1-3 | 54.9 | 56.2 | **1.3** |
| 2 | M2-1 | 52.0 | 54.2 | **2.2** |
| M2-2 | 53.0 | 55.0 | **2.0** |
| M2-3 | 52.8 | 53.0 | **0.2** |
|  | | | | |
| **Measurement Site Validated** | | | **Measurement Site Not Validated** | |
|  | | | | |

1. Hourly equivalent noise levels, Leq(h), are expressed to the nearest one-tenth decibels to ensure that TNM-predicted noise levels validate to within ± 3.0 dB(A) of measured noise levels without the benefits of rounding.

2. [Include reason(s) why site did not validate.]

**Long Term Measurement Data**

Describe location(s) of long-term measurements and the rolling loudest hourly Leq for each measurement. Describe which NSAs the loudest hourly measurement(s) will apply to. Long-term measurements are usually needed only for new location projects or widening projects that have new location components. If no long-term measurements were conducted, state so. Although long-term measurements are not needed for model validation, it is important to establish the existing loudest hour early in the process to avoid rework during the subsequent TNR or DNR analyses. A sample table is below:

Table

Description automatically generated

**The following items should be included at the end of this document:**

* Project Mapping, including:
  + Aerial photography basemap
  + Project mapping representing entire project (study area) on one image (Vicinity Map)
  + All project maps shall include a title block, legend (as applicable), properly oriented north arrow, logical scale (or denoted as being not to scale), and map creation date.
  + Proposed spatial limits of traffic noise study area that generally follow guidance from Table 7.1 of the 2022 NCDOT Traffic Noise Manual (may need to be expanded following the initial noise modeling effort if the outer limit of predicted traffic noise impacts and/or benefits is not defined).
  + Noise Study Area boundaries shown
  + Include local road names and interstate and/or US/NC route designations
  + Receptors indicating field measurement locations shall be shown with a solid white circle.
  + Include all proposed analysis (receptor) locations and the associated noise abatement criteria (NAC) activity category for each location. - black dots for NAC F or other Non-Noise Sensitive (NNS) land uses.
  + (For DNR only). New development permitted after the DOPK is clearly identified and labeled.
  + Work plan figures can be repurposed and used for the Noise Model Validation Memorandum. If applicable, field measurement locations should be updated where they differ from the proposed locations in the work plan. These figures can ultimately be used as the figures for the traffic noise report. Suggest orienting the figures the same way that the roadway plans follow the alignments. Limit overlapping and duplicating receptors on multiple figures. Match lines are encouraged.
  + Label schools, places of worship, parks, apartment complex and subdivision names, large businesses, lakes, rivers, railroads, airports, etc.
  + If design files are available, please show the proposed design. At a minimum, show centerline along Y and L lines.
  + If design files are available, reference in -L-line, Y-line and Ramp (as applicable) alignments and station labels for all project roadways, with an entry in the legend, for Detailed Study Area Maps.
* Noise measurement field data sheets and unusual event logs for each noise measurement site (see attached template). For all traffic noise measurements:
  + Sound level meters shall be set to the slow response setting.
  + Sound level meters shall be set to collect A-weighted sound levels.
  + Observed travel speeds shall be collected for use in TNM validation models.
* Photographs of sound level meter setups at each noise measurement location. Include as many photographs as necessary to provide sufficient detail that another person can return to the site and set up at the same spot (at least one photograph per sound level meter setup).
* Equipment summary for each sound level meter setup (see attached template)
* Acoustical calibrator and sound level meter calibration certificates
* Noise measurement data (submitted in spreadsheet form as a separate electronic file). This data shall include the following sound level metrics in increments of one minute (i.e. a 20-minute short-term noise measurement session shall be comprised of 20 data points; a 24-hour long-term noise measurement session shall be comprised of 1,440 data points). Do not collect one second data for NCDOT traffic noise studies.
  + Leq and Lmax (at minimum)
  + L10 and L90 (if possible)Include the calculation of equivalent noise level (Leq) for each short-term ambient noise measurement location, including any appropriate despiking of aberrant noise events from data sets (if applicable). Provide an explanation of despiking due to aberrant noise events, if known (e.g. jet plane flyover, lawnmower, car horn, emergency vehicle siren, etc.)
  + Include calculation of the loudest hour equivalent noise level [Leq(h)], using the “rolling hour” method, for any long-term ambient noise measurement site where traffic noise is not dominant.
* TNM 2.5 files for all short-term noise measurement locations (submitted electronically)