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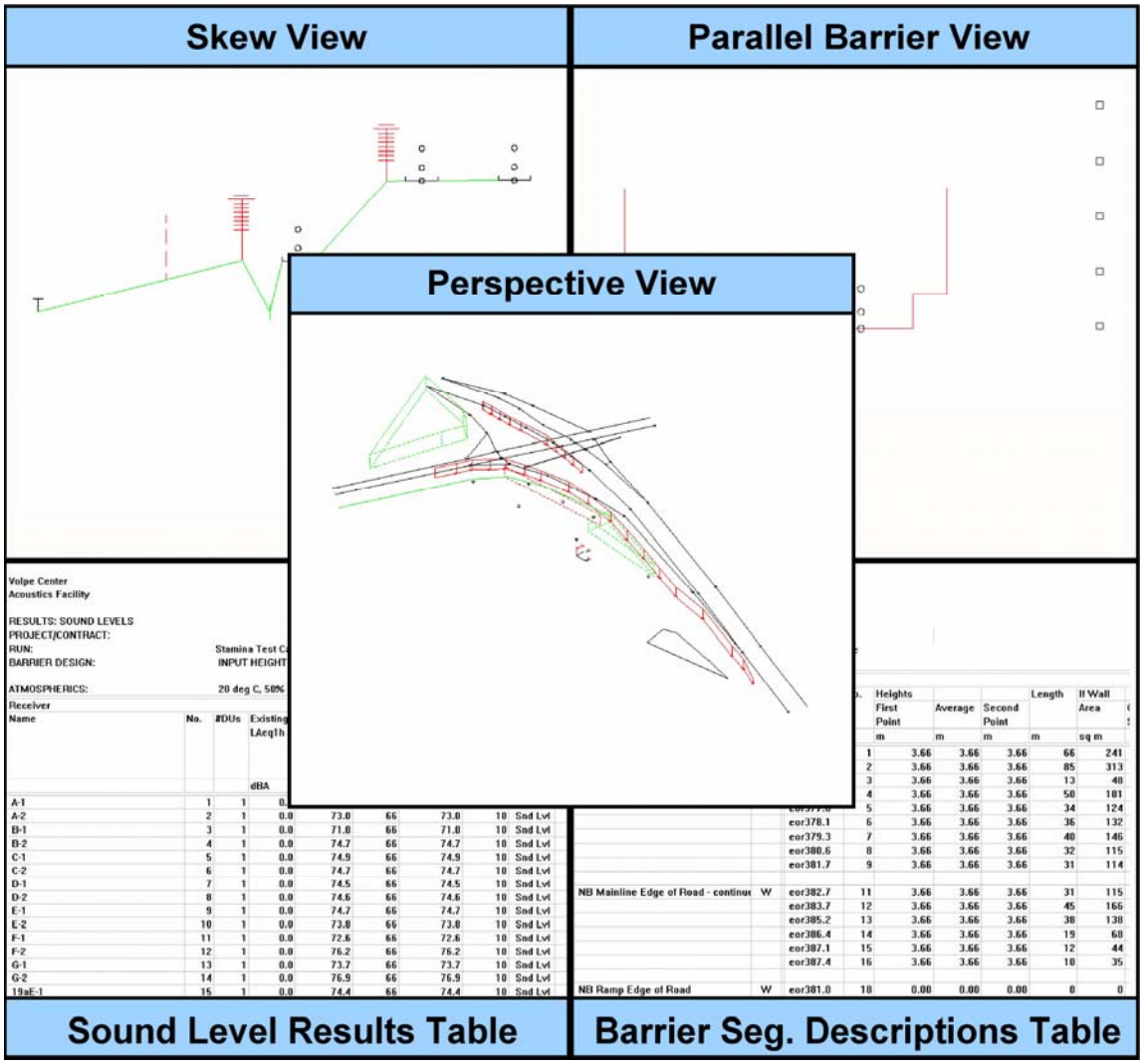
FHWA TRAFFIC NOISE MODEL®
USER'S GUIDE
(VERSION 2.0 ADDENDUM)

Final Report
May 2002



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Prepared by

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In March 1998, the Federal Highway Administration (FHWA) Office of Natural Environment, released the FHWA Traffic Noise Model® (FHWA TNM®) Version 1.0, a state-of-the-art computer program for highway traffic noise prediction and analysis. Since then, the FHWA, with assistance from the U.S. Department of Transportation's John A. Volpe National Transportation Systems Center (Volpe Center) and Foliage Software Systems (FSS), has released updates of TNM (Versions 1.0a, and 1.0b) in March 1999 and August 1999, respectively. In support of the FHWA and the California Department of Transportation, the Volpe Center and FSS released Version 1.1 in September 2000. Version 2.0 is the latest release of the TNM software. Two companion reports were released with TNM Version 1.0, a Technical Manual that describes the acoustics within TNM and a User's Guide. In addition, prior to TNM release, a data report was published that describes the vehicle noise-emissions data base within TNM.

The Version 2.0 User's Guide is an addendum to the FHWA TNM Version 1.0 User's Guide. It details the enhancements in the program up to and including Version 2.0.

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PREFACE

In March 1998, the Federal Highway Administration (FHWA) Office of Natural Environment, released the FHWA Traffic Noise Model® (FHWA TNM®) Version 1.0, a state-of-the-art computer program for highway traffic noise prediction and analysis. Since then, the FHWA, with assistance from the U.S. Department of Transportation's John A. Volpe National Transportation Systems Center (Volpe Center) and Foliage Software Systems (FSS), has released updates of TNM (Versions 1.0a, and 1.0b) in March 1999 and August 1999, respectively. In support of the FHWA and the California Department of Transportation, the Volpe Center and FSS released Version 1.1 in September 2000. Version 2.0 is the latest release of the TNM software. Two companion reports were released with TNM Version 1.0, a Technical Manual that describes the acoustics within TNM and a User's Guide.[1,2] In addition, prior to TNM release, a data report was published that describes the vehicle noise-emissions data base within TNM.[3]

The Version 2.0 User's Guide is an addendum to the FHWA TNM Version 1.0 User's Guide. It details the enhancements in the program up to and including Version 2.0.

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1. GETTING STARTED

This section lists TNM's hardware and software requirements and provides instructions on how to install TNM.

1.1 How to Use This User's Guide Addendum

This User's Guide Addendum is essential to both the experienced and inexperienced TNM user. It details the enhancements in the program up to and including Version 2.0. Use it in addition to the TNM 1.0 User's Guide, your main information source. New users should also use the "TNM Trainer," the interactive tutorial that is included in the TNM Version 1.0 package.[4] For quick reference help, users can select the Help menu while using TNM. In addition, TNM sometimes "pops up" brief help information during various operations (see Section 7.1 in the TNM 1.0 User's Guide).

The different typeface and icon conventions used in this User's Guide Addendum are as follows:

Bold Bold is used for emphasis and to introduce new terms, which are defined in Section 2, Terminology, of the TNM 1.0 User's Guide.

Underline Underline is used to denote an available shortcut key to invoke a menu or submenu item. For example, to invoke the Help menu while using TNM, press the Alt+H keys.

A light bulb icon points out helpful tips, suggestions, engineering hints, and shortcuts that may save you time.

A stop sign icon represents warnings and when you should pay special attention to what you're doing to avoid unexpected results.

A Department of Transportation icon points out when you should refer to Appendix A of the TNM 1.0 User's Guide for FHWA policies relating to a topic.

1.2 Contents of the TNM Version 2.0 Package

The TNM Version 2.0 package contains the following:

- The FHWA TNM Version 2.0 software; and
- This FHWA TNM User's Guide Addendum.

Note: TNM Version 2.0 is the latest upgrade to the TNM Version 1.0 release package. It is a complete release package. Existing owners of TNM may purchase the latest upgrade, TNM 2.0, for $495 -- almost 30 percent off the regular TNM price.

Information on how to purchase the TNM can be found on the McTrans website (http://www-mctrans.ce.ufl.edu) or by contacting McTrans at:

McTrans Center
University of Florida
2088 Northeast Waldo Road
Gainesville, FL 32609

Telephone: (352) 392-0378
Fax: (352) 392-3224

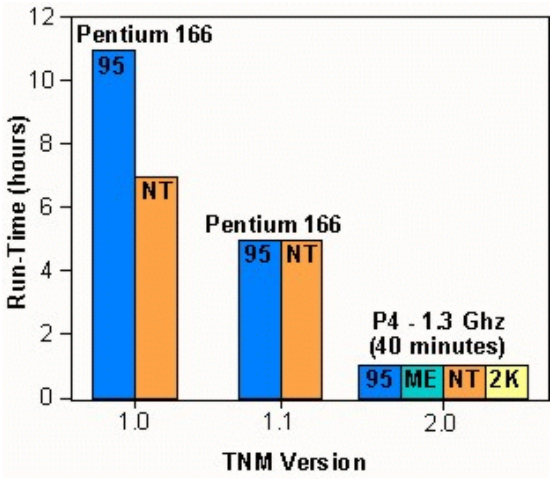
Additional information on TNM 2.0 can be found on the TNM website. The webpage contains this TNM Version 2.0 User's Guide Addendum in Adobe Acrobat PDF file format, as well as contact information for technical support.

1.3 Hardware and Software requirements

Beginning with the release of Version 1.1, TNM has been upgraded from a 16-bit Microsoft® Windows application to a 32-bit Windows application. This change effectively removes any platform dependence, allowing TNM to run more efficiently regardless of the Windows operating system (Windows 95, 98, NT, etc.). It should be noted that this change has also obviated TNM use on previous Windows operating systems (e.g., Windows 3.1, since 3.1 is a 16-bit platform).

Substantial improvements to computational run-time have been shown during testing between Versions 1.0b and 2.0, with most cases computing in approximately half the

time. Figure 1 shows a run-time comparison of the official TNM test case (see Section 3) for several combinations of hardware and operating systems. The test case consists of the following: 9 roadways, 1 barrier (with 3 perturbations up and down), 2 terrain lines, and 32 receivers.



The recommended computer system requirements for TNM Version 2.0 are:

- Computer: IBM-compatible PC;
- Processor: 500 MHZ Pentium (or faster);
- Memory: 32 MB (or more);
- Disk Drive: CD-ROM;
- Mouse input device;
- Monitor: Accelerated Super VGA (1024 x 768), 16 colors, configured with "small" fonts;
- Software: Microsoft® Windows 95 (or later) or Windows NT 4 (or later);
- 10 MB of hard-disk space for the TNM system (including sample runs); and
- Up to 1 MB of hard-disk space for each TNM run.

Although TNM may run on a less efficient computer than recommended above, some capabilities may be affected, including the graphical user interface or the speed of the noise calculations. For additional information, refer to Section 1.3 in the TNM 1.0 User's Guide.

1.4 Installation

To install TNM on your computer:

1. On the Windows taskbar, click [Start]. Select Run.
2. Click [Browse]. Navigate to your CD-ROM drive.
3. Double-click on **Setup.exe**. Click [OK].
4. When the Custom Installation box appears on your screen, select Set Location to tell the setup program where to locate TNM on your hard drive. Note that TNM 2.0 installation will not interfere with previous versions of TNM installed on your computer.
5. After the setup program is done, configure your computer display to work with TNM. For additional information, refer to Section 1.4 in the TNM 1.0 User's Guide.

1.5 Source Code Licensing Agreement

The FHWA TNM is a registered copyright and trademark, which encompasses the User's Guide, Technical Manual, and software source and executable codes. For developers interested in obtaining the software source code, acceptance of the TNM Source Code Licensing Agreement is a prerequisite. Under the terms of the Licensing Agreement, any modifications, enhancements, or derivatives of TNM, as well as distribution of the modified source code, which makes reference to the FHWA's trademarks, are strictly prohibited without the express written permission of the FHWA.

See Appendix A in the TNM 1.0 User's Guide for FHWA policy related to TNM Copyright and Trademark.

1.6 Technical Support

Services are available to help you with your questions. Registered owners are entitled to receive technical support and information on upgrades and supplementary guides.

- For installation and supplementary guide information, users may contact the Center for Microcomputers in Transportation (McTrans) at (352) 392-0378 or http://www-mctrans.ce.ufl.edu.
- For technical support, users may visit the TNM website where a comprehensive ***Frequently Asked Questions*** webpage is available . Users may also contact TNM technical support at the Volpe Center at (617) 494-2372 or via email (mailto:support@trafficnoisemodel.org).

2. WHAT'S NEW

This section discusses the enhancements that have occurred in TNM since Version 1.0. It includes changes implemented in Versions 1.0a, 1.0b, 1.1, and 2.0. The structure of this entire section is organized by TNM menu and function item to facilitate referencing within the TNM graphical user interface and this User's Guide Addendum.:

- File Menu: Section 2.1;
- Edit Menu: Section 2.2;
- Setup Menu: Section 2.3;
- View Menu: Section 2.4;
- Input Menu: Section 2.5;
- Calculate Menu: Section 2.6;
- Contours Menu: Section 2.7; and
- Tables Menu: Section 2.8.

Below is a summary table of TNM modifications that have been made since Version 1.0.

Table 1. TNM updates and improvements.

Menu	Menu Item	Modification	Implemented in TNM Version ...
- All -	-	Implemented/improved 32-bit coding architecture, effectively removing any platform dependence and substantially improving computational run-time.	1.1 and 2.0
File	New	Obviated eight-character run-name restriction.	1.1
	Open	Added "Convert Run" dialog. Runs created in previous versions can be backed-up, then converted for use in TNM 1.1/2.0.	1.1
	Import	Corrected import of Stamina shielding	

Table 1. TNM updates and improvements.

Menu	Menu Item	Modification	Implemented in TNM Version ...
	Stamina-2.0 Input File	factors.	1.1
	Import DXF File	Updated functionality to support compatibility with AutoCAD® 2000.	1.1 and 2.0
		Added “cancel” option to cancel deletion of unconverted DXF objects when prior to closing a run.	1.1
		Corrected scaling of metric DXF files.	2.0
	Cleanup Run	Added new menu item used to correct database errors, as necessary.	1.0b
Edit	-	Added ability to use the Snap tool in conjunction with Move.	1.1
Setup	General	Implemented invalidation of results with applied default ground type changes.	1.1
Input	-	For all input dialogs, changes to data in a dialog's spreadsheet area are reflected in RED until the user selects the Apply button to apply the changes.	1.1
		Corrected “paste” functionality in all dialogs.	2.0
	Roadway	Changed the weighting factor for Lden computation for consistency with state law in California.	1.0b
	Receiver	Implemented change to receiver input dialog such that all receivers are displayed on a single spreadsheet page.	1.1
		Added ability for users to “activate” or “deactivate” specific receivers to be calculated.	1.1

Table 1. TNM updates and improvements.

Menu	Menu Item	Modification	Implemented in TNM Version ...
		Corrected scroll buffer which caused problems in runs with many receivers.	2.0
		Corrected allowance of negative adjustment factors.	1.1
	Contour Zone	Modified functionality such that changes to contour zone input no longer invalidates results.	1.1
	Adjustment Factors	Corrected allowance of negative adjustment factors.	1.1
	Input Check	Added several new input checks.	1.1
Calculate	-	Implemented an error-catching mechanism to eliminate fatal crashes during computations.	1.0b
	Multiple Runs	Added ability to calculate sound levels in batch-mode for multiple runs.	1.1
Contours	-	Updated NMPlot to Version 3.06.	1.1
		Corrected linkage to NMPlot module.	2.0
Tables	-	Added display of the version of TNM used to compute the sound level results.	1.1
	Barrier Design	Added new output table.	1.1
	Print Tables	Added menu item which allows printing of multiple input/output tables at once.	1.1
		Corrected problems printing tables.	2.0

2.1 File Menu

2.1.1 New. When creating a new run in TNM Version 2.0 and Version 1.1, it is important to note that because TNM has been upgraded from a 16-bit Windows application to a 32-bit Windows application, the eight-character run-name restriction no longer exists. Extended run file names may be used for Windows 95 (or later) and NT Version 4.0 (or later).

It is also important to note that any run created using TNM Version 2.0 will not run in 16-bit versions of TNM (i.e., Versions 1.0, 1.0a, and 1.0b). However, runs created in previous versions of TNM will run in Version 2.0.

2.1.2 Open. Opening a Version 1.0, 1.0a, or 1.0b TNM run will display the **Convert Run** dialog (see Figure 2). Once the user selects OK, TNM will automatically convert and open the selected run into a Plan View. Note that if you ever want to use the original unconverted run, you must save a backup of the run before selecting the OK button in the Convert Run dialog. The "Save Backup of Run" checkbox in the dialog allows you to automatically save a copy of your run as "Backup of Run_Name" prior to TNM Version 2.0 conversion.

Save a backup of your runs: Always save a backup copy of your original TNM run prior to opening it in TNM 2.0. If you do not save a backup copy of the run, then once that run has been converted by TNM 2.0, it cannot be opened in previous versions of TNM (except Version 1.1).

2.1.3 Import a STAMINA 2.0/OPTIMA File. TNM allows you to import a STAMINA 2.0/OPTIMA file. Prior versions of TNM did not correctly import STAMINA shielding factors. This has since been corrected. To import shielding factors into TNM, be sure

to select the **Import Shielding Factors** check box in the **Import STAMINA 2.0 Input File** dialog window (see Section 4.7.1 in the TNM 1.0 User's Guide for more details).

Shielding factors and adjustment factors: TNM imports shielding factors from your STAMINA files as adjustment factors (see Section 8.4.4 in the TNM 1.0 User's Guide). Typically, shielding factors in STAMINA files were used to account for things such as building row and tree zone effects. However, in most cases, you should not import them, but rather model building rows and tree zones explicitly in TNM. An exception would be where STAMINA factors were developed from measured data. You may wish to input/edit TNM adjustment factors to account for parallel barrier degradations between receiver-roadway pairs and propagation effects not calculated by TNM – for example, wind effects.

2.1.4 Import a DXF File. TNM's DXF import functionality was substantially updated to support compatibility with AutoCAD® 2000 objects. The following table shows all the DXF objects available in AutoCAD® 2000 and indicates which items TNM Version 2.0 can and cannot import.

Table 2. DXF Import Items.

DXF Item	Import Object for Conversion	Import as Background
3DFace	No	Yes
3DSolid	No	No
ACAD_Proxy_Entity	No	No
Arc *	Yes	Yes
Arcaligned text **	No	Yes
Attdef	No	No
Attrib	No	No

Table 2. DXF Import Items.

DXF Item	Import Object for Conversion	Import as Background
Body	No	No
Circle *	Yes	Yes
Dimension **	Yes	Yes
Ellipse	Yes	Yes
Hatch	No	No
Image	No	No
Insert **	Yes	Yes
Leader	No	No
Line	Yes	Yes
LWPolyline	Yes	Yes
Mline	No	Yes
Mtext **	No	Yes
Oleframe	No	No
Ole2frame	No	No
Point	No	No
Polyline ***	Yes	Yes
Ray	No	No
Region	No	No
Rtext	No	No
Seqend	Yes	Yes
Shape	No	No

Table 2. DXF Import Items.

DXF Item	Import Object for Conversion	Import as Background
Solid	No	Yes
Spline	Yes	Yes
Text	No	No
Tolerance	No	No
Trace	No	Yes
Vertex	No	No
Viewport	No	No
Wipeout	No	No
Xline	No	No

* Arcs and circles are converted into a series of straight segments.

** When you import a DXF file for conversion into TNM, DXF labels and other text are placed in the DXF Background, which is not normally displayed by default. To view labels/text, you must select Show/Hide in the View menu, then check the "DXF Background" check box in the "Show Objects" column (see also Section 6.2 in the TNM 1.0 User's Guide).

*** Polylines are imported if the polyline or any of its vertices are complex, i.e., curve-fit, spline-fit, mesh, or polyface mesh.

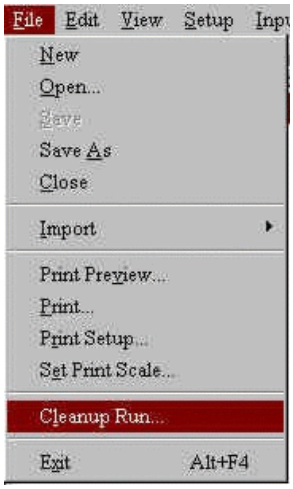
Importing DXF Point Objects: TNM does not import DXF points. As a work-around, the user may connect points with polylines in the CAD program prior to import, then after import, snap-digitize TNM receivers to the DXF points in the polylines.

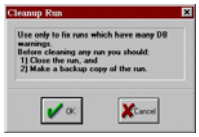
Unconverted DXF Objects: A Cancel option is available so that you may cancel closing the run before unconverted DXF objects are deleted.

2.1.5 Cleanup Run. A number of users had been experiencing "DB error" messages during computations. These DB (data base) errors were being caused by TNM's internal, third-party data base software. Sometimes, simply acknowledging **OK** at the prompt when TNM encountered these errors would allow the model to continue computations uninterrupted. However, occasionally, the errors were too numerous for TNM to continue. As a result, a function has been implemented for the more *severe* cases. This function is the menu item called, Cleanup Run, in the File menu.

To use Cleanup Run, select Cleanup Run in the File menu (see Figure 3). TNM will remind you to close your run and make a backup copy of it (see Figure 4).

TNM will then display a **Cleanup Run** dialog which allows you to select the run (subdirectory) with the DB errors to "clean" (see Figure 5).





2.2 Edit Menu

2.2.1 Move. As mentioned in the TNM 1.0 User's Guide, the Move capability is not a menu option; it is only available in the Plan View using the Ctrl key and a mouse. This selection is used to graphically relocate a selected object, or portions of an object, to a new location, i.e., change the XY coordinates. TNM has the added ability for the user to also use the Snap tool in conjunction with Move. This aids the user in moving objects or points of objects and "snapping" them to other objects, e.g., placing a barrier on structure or a wall on top of a berm for a combination barrier.

2.3 View Menu

2.3.1 Show/Hide. For all graphical views, any of TNM's input objects, as well as the aspects of those objects (e.g., point name and number), may be selected to be shown or hidden. This option is helpful in keeping complex cases from appearing cluttered and difficult to read. If point name/number text is not displayed after Show/Hide check boxes have been "checked," the TNM 1.0 User's Guide advises the user to first check their computer "TGLINK" settings. This was usually sufficient for most users - however, for some Windows NT Version 4.0 users, the following may also need to be checked:

1. Go to your computer's **Control Panel**.
2. Select and open the **System** icon.
3. When the **System Properties** dialog is displayed, select the **Environment** tab.
4. In the **Variable** field, type **TGLINK**.
5. In the **Value** field, type in your TNM program directory (e.g., **C:\TNM\PROGRAM**).
6. Click on the **Set** button and confirm that the settings that were just typed have been added to the **System Variables** and the **User Variables** window lists, respectively.
7. In the **System Variables** window, select **Path** in the **Variable** column. The path statement will then be highlighted and appear in the **Variable** and **Value** fields.
8. Click anywhere within the **Value** field. At the end of the text line, add your TNM directory (e.g., **;C:\TNM**.).
9. Click on the **Set** button. Click on the **OK** button to exit **System Properties**. Exit the **Control Panel**.

2.4 Setup Menu

2.4.1 General. General Input includes user preferences that affect TNM calculations. Most changes to TNM input will invalidate computed sound level results. TNM has been updated such that changes to the default ground type will invalidate results. **Use File, Save As to rename a run prior to making any changes, if you want to keep the original run with its already computed sound level results.**

Invalidating TNM results: If you inadvertently changed the default ground type, thus invalidating previously computed results, you may close the run without saving changes. You may then reopen your run with your previously computed results restored.

2.5 Input Menu

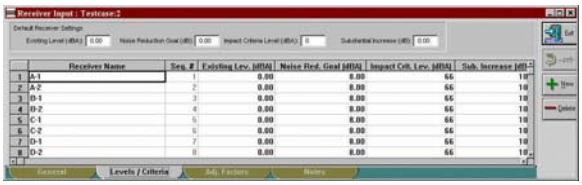
Input data changes: For all input dialogs, changes to data in a dialog's spreadsheet area are reflected in **RED** until the user selects the Apply button to apply the changes.

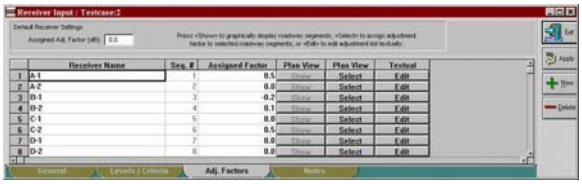
2.5.1 Roadway Input. In the computation of the community noise equivalent level (L_{den}), a 5-dB penalty is added to evening operations, which equates to a 3.16 weighting factor. For consistency with state law in California, the primary user of the L_{den} metric, the weighting factor has been changed to 3.00. For information on how to select L_{den} as your desired traffic entry type, refer to Section 7.2 in the TNM 1.0 User's Guide. For information on how to enter L_{den} traffic for roadways, refer to Section 8.3.4 in the TNM 1.0 User's Guide.

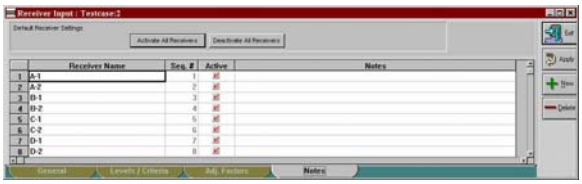
2.5.2 Receiver Input. The receiver input dialog has been changed such that information for all receivers are displayed on a single spreadsheet page (see Figures 6

through 9) rather than displaying information for a single receiver (i.e., one receiver at a time). This change allows for more efficient editing of receiver input information.

	Receiver Name	Seq. #	X [m]	Y [m]	Z [ground]	Dwelling Units	Height [m]
1	A-1	1	14127.78	3717.95	180.75	1	1.52
2	A-2	2	14127.78	3717.95	180.75	1	4.57
3	B-1	3	14129.00	3730.14	180.75	1	1.52
4	B-2	4	14129.00	3730.14	180.75	1	4.57
5	C-1	5	14146.68	3743.55	180.75	1	1.52
6	C-2	6	14146.68	3743.55	180.75	1	4.57
7	D-1	7	14159.48	3745.08	180.75	1	1.52
8	D-2	8	14159.48	3745.08	180.75	1	4.57



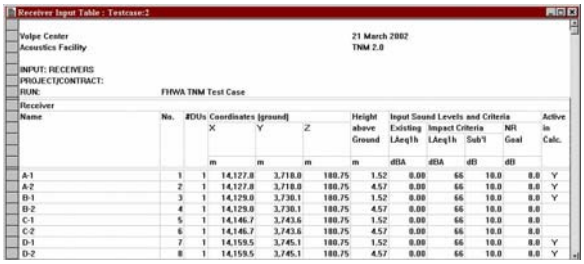


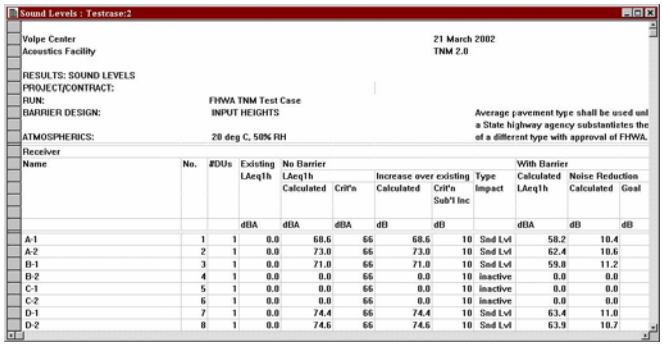


In the Notes tab shown in Figure 9 - users are able to **"activate"** or **"deactivate"** specific receivers for calculations by checking/unchecking boxes in the Active column. Two buttons are also available in the header area to activate and deactivate receivers. All receivers are active by default. Users can use this feature to:

- Compute a newly added receiver(s);
- Compute a specific receiver(s) to see how a small input change affects that receiver(s); and
- Compute a subset of receivers representing a portion of the study to save run-time.

Receiver active/inactive status is displayed in the receiver input table (see Figure 10) and is reflected in the sound level results tables, as well (see Figure 11).*





* Note: Results for a "deactivated" receiver will not be available in the sound level results table when a run is calculated with only the active receivers (see Section 2.6.2).

2.5.3 Contour Zone. TNM has been updated such that changes to contour zone input do not invalidate computed sound level results.

2.5.4 Adjustment Factors. Receiver adjustment factors are sound level adjustments in dB that are algebraically added to, not subtracted from, the sound levels calculated by TNM. TNM has been updated such that negative adjustment factors are allowed for input. See Section 8.4.4 in the TNM 1.0 User's Guide for more information.

See Appendix A in the TNM 1.0 User's Guide for FHWA policy related to adjustment factors.

2.5.5 Input Check. The following input checks have been implemented:

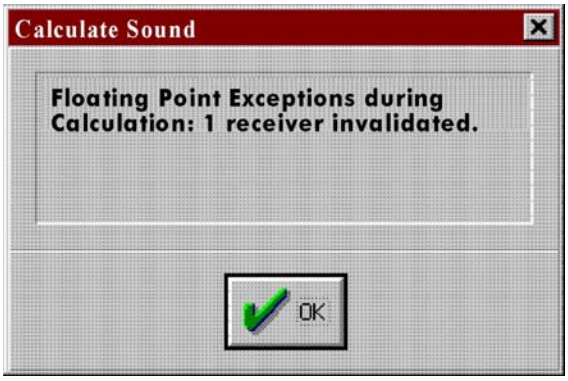
- Single point objects - TNM will display an input check error for objects that consist of only one point with the exception of receivers, and for zones that consist of only two points;
- Objects overlapping roadways - TNM will display an input check error for objects (with the exception of ground zones), which overlap a roadway including the roadway's width; and
- Receivers with zero coordinates - TNM will display an input check error for receivers with all zero (x, y, and z) coordinates.

2.5.6 User-Defined Vehicles. Users who would like to use the User-Defined Vehicles feature should contact TNM Technical Support (mailto:support@trafficnoisemodel.org) for additional guidance.

2.6 Calculate Menu

2.6.1 Error-Catching Mechanism.

Error-catching mechanisms have been implemented in TNM to eliminate any fatal crashes. As such, when TNM encounters a receiver error during computations, the program skips the problematic receiver and continues computations with the next receiver. At the end of computations, TNM will inform the user of receivers that were invalidated either via a pop-up dialog (see Figure 12) when computing a single run or in the error report generated when computing multiple runs (see Section 2.6.2). Any skipped receiver will be identified in TNM output tables as "invalid."



Runs with errors: Any runs with receivers invalidated should be sent to the Volpe Center Acoustics Facility for further testing and diagnosis. A run consists of an OBJECTS.DAT and an OBJECTS.IDX file. Also provide an indication of which receiver the error occurred on and a detailed description of the error message.

Volpe Center Acoustics Facility
55 Broadway, DTS-34
Cambridge, MA 02142

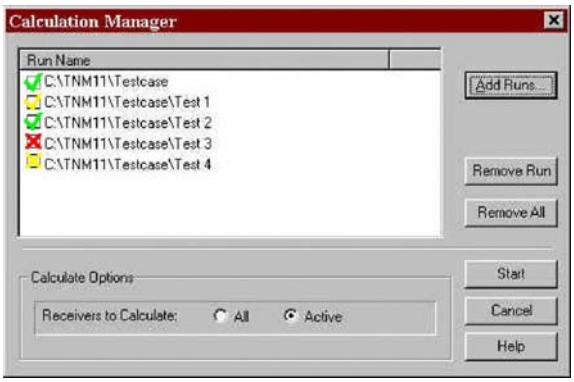
Telephone: (617) 494-2372
Email: support@trafficnoisemodel.org

2.6.2 Multiple Runs. When the user selects Calculate, two menu options are available (see Figure 13): calculate the sound levels for the Current Run; or calculate the sound levels in batch-mode for Multiple Runs.

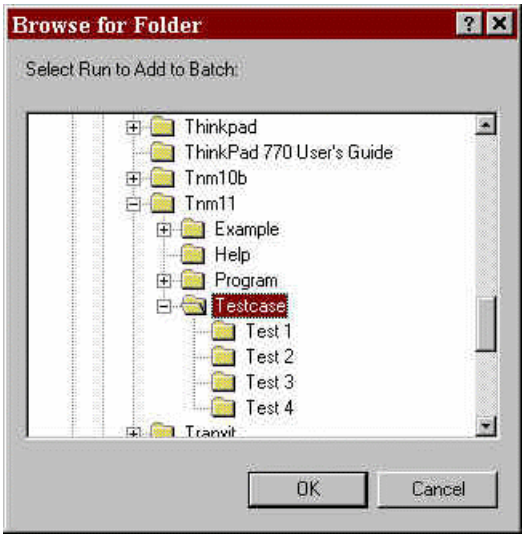
When calculating multiple runs, you must first close all open runs or else TNM will display a warning.

- When the user selects Current Run, two options are available: All Receivers and Active Receivers. Selecting All Receivers begins TNM computations immediately on the currently open run. Selecting Active Receivers begins TNM computations on the currently open run for only the receivers marked active in the Receiver Input dialog (see Section 2.4.1).
- When the user selects Multiple Runs, the **Calculation Manager** dialog is displayed.

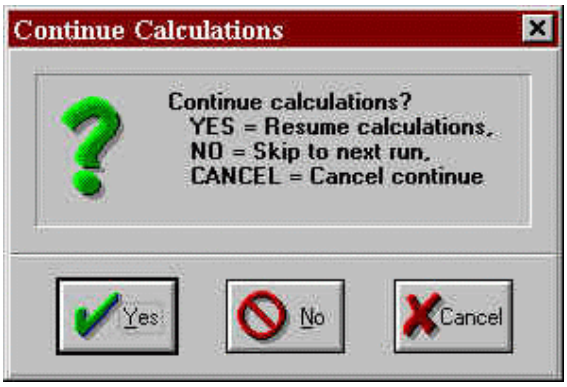
In the **Calculation Manager** dialog (see Figure 14), the *Run Name* area displays the list of selected runs. Runs are displayed with their full path name. The list will be automatically scrolled during the batch-mode calculations to ensure that the current run is visible in the list.



Buttons are provided on the right side of the **Calculation Manager** dialog for the following functions:



- ***Add Run*** - Displays the **Browse for Folder** dialog (see Figure 15) for adding runs to the list of runs to calculate;
- ***Remove Run*** - Removes a run selected in the **Run Name** list;
- ***Remove All*** - Clears the entire Run Name list;
- ***Start/Continue*** - Begins calculating runs. The button is greyed and un-selectable once calculations have started. If a calculation is cancelled, then this button will be changed to a ***Continue*** button, which when selected, will allow the interrupted calculation to continue (see Figure 16). If any changes are made to the **Calculation Manager** dialog, then this button will revert to a ***Start*** button to re-initiate calculations from the first run. Runs will be calculated in the order in which they were selected. As each run is calculated, a "gauge" dialog will be displayed to track the progress of that run (exactly as it does for a Current Run calculation);



- ***Cancel*** - Exits the **Calculation Manager** dialog without calculating further runs but will retain the results of any runs already calculated; and
- ***Help*** - Displays help information regarding the **Calculation Manager** dialog.

A column of icons will be displayed to the left of the list of runs to indicate the status of each run as follows:

Run not yet calculated;

Computations in progress;

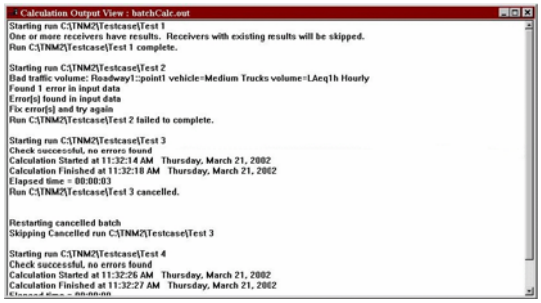
Computations finished;

Computations finished, but some receivers were invalidated (see Section 2.5.1);

Computations cancelled; and

Computations failed, errors were detected during input check that need fixing (see Appendix C of the TNM 1.0 User's Guide).

The status is also reported in an **Output Report** window which is generated during multiple-run calculations (see Figure 17). The window displays information from each run as the batch progresses, including the status of the run currently being calculated, the status of runs completed, and each run's total run-time. This report will also indicate if TNM encountered an error during computations, and, if so, how many receivers were invalidated for a particular run (see Section 2.6.1). TNM saves a copy of this report in a file called, batchCalc.out, and places it in your TNM Program subdirectory. This file is over-written each time batch-mode calculations are performed.



2.7 Contours Menu

2.7.1 Calculating Contours. NMPlot Version 3.06 has been incorporated into TNM. The previous version of NMPlot was having difficulties running on computers with CPUs faster than 200 MHz giving some users a runtime error message.

Development is underway to incorporate the Windows version of NMPlot (Version 4.7) into TNM. In the interim, for users who would like to use some of the additional features that can be found in the Windows Version of NMPlot, it is available on the NMPlot website,

http://www.wasmerconsulting.com/nmplot.htm. To use Version 4.7, download and run install_nmplot.exe. Once TNM has computed the grid file (*.grd), it may be read by Version 4.7 and used to compute contours external to TNM.

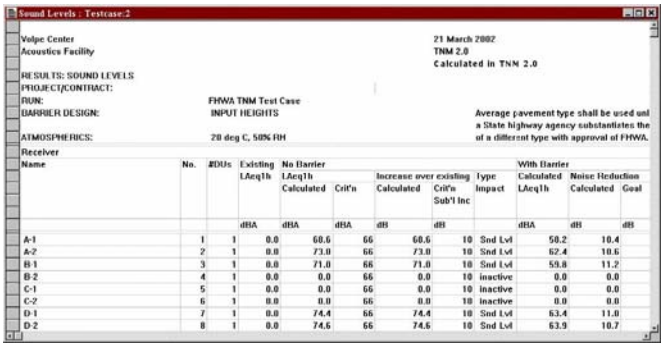
"NMPlot Out of Memory" Error: If your computer displays an "Out of Memory" error while running NMPlot, modify your computer's memory allocation for MS-DOS applications as follows: open an MS-DOS window; select the MS-DOS window's upper-left icon; select Properties in the resultant pull-down menu; select the Memory tab; then increase the values shown. You may need to refer to your system administrator for additional assistance.

"Run-time 216" Error: If your TNM run is uses very large coordinates (e.g., greater than 1,000,000.00, NMPlot may display this error. Scaled all the coordinates down and the contours should be able to compute.

"Noisemap Grid File Could Not Be Opened" Error: NMPlot is a DOS application with an 8-character filename/directory limit. If your TNM run is greater than 8-characters or is embedded within many subdirectories or has long subdirectory names, then NMPlot may display this error. Reduce the number of characters in your run name or move your run to the root directory to run contours.

2.8 Tables Menu

2.8.1 All Results Tables. In the right header area, TNM displays the current date and the version of TNM that is being used. An additional line of text has been added to let the user know which version of TNM was used to calculate the results being displayed (see Figure 18).


Sound Levels : Testcase:2

Volpe Center
Acoustics Facility

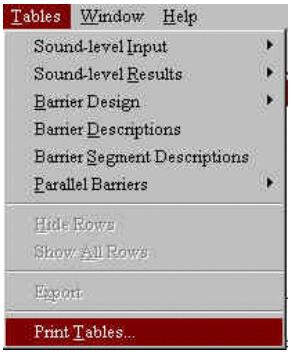
21 March 2002
TNM 2.0
Calculated in TNM 2.0

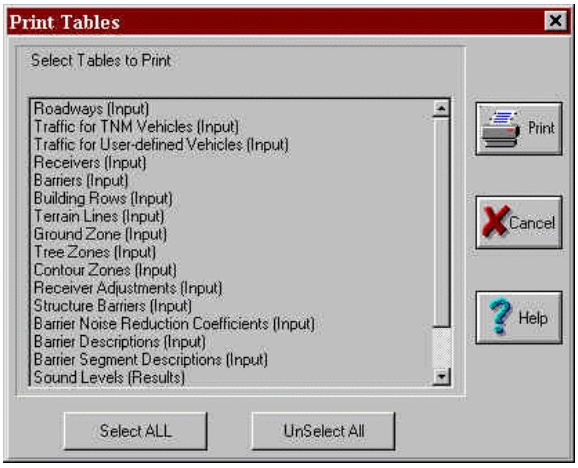
RESULTS: SOUND LEVELS
PROJECT/CONTRACT:
RUN: FHWA TNM Test Case
BARRIER DESIGN: INPUT HEIGHTS
ATMOSPHERICS: 20 deg C, 50% RH
Average pavement type shall be used unl a State highway agency substantiates the of a different type with approval of FHWA.

Receiver

Name	No.	#DUs	Existing LAeq1h	No Barrier LAeq1h Calculated	Crit'n	Increase over existing Calculated	Increase over existing Crit'n Sub'l Inc	Type Impact	With Barrier Calculated LAeq1h	With Barrier Noise Reduction Calculated	With Barrier Noise Reduction Goal
			dBA	dBA	dBA	dB	dB		dBA	dB	dB
A-1	1	1	0.0	68.6	66	68.6	10	Snd Lvl	58.2	10.4	
A-2	2	1	0.0	73.0	66	73.0	10	Snd Lvl	62.4	10.6	
B-1	3	1	0.0	71.0	66	71.0	10	Snd Lvl	59.8	11.2	
B-2	4	1	0.0	0.0	66	0.0	10	inactive	0.0	0.0	
C-1	5	1	0.0	0.0	66	0.0	10	inactive	0.0	0.0	
C-2	6	1	0.0	0.0	66	0.0	10	inactive	0.0	0.0	
D-1	7	1	0.0	74.4	66	74.4	10	Snd Lvl	63.4	11.0	
D-2	8	1	0.0	74.6	66	74.6	10	Snd Lvl	63.9	10.7	

2.8.2 Print Tables. A new menu item in the Tables menu, Print Tables, has been implemented to allow the user to print all TNM tables at once (see Figures 19 and 20). When the user selects this menu item, TNM displays a **Print Tables** dialog that lists all TNM tables (labeling each as an Input or Results table). The user can individually select tables by highlighting/clicking on the them in the list.

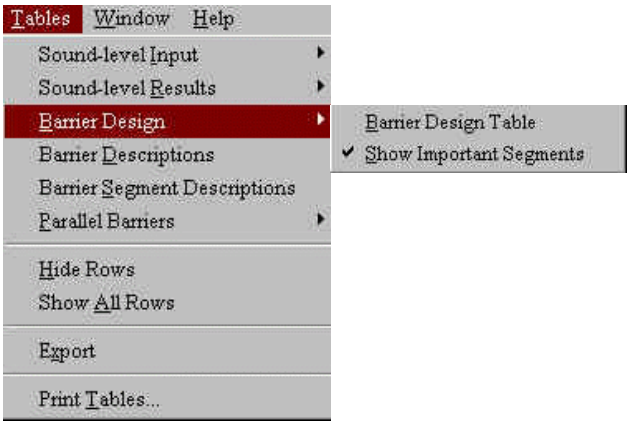




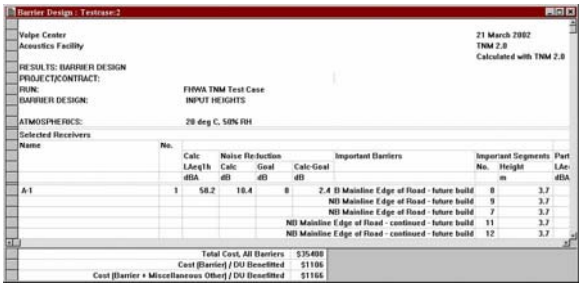
2.8.3 Barrier Design Table. A new table has been designed and incorporated into TNM. The Barrier Design Table was developed to aid the user during the barrier analysis and design process by placing the most frequently referred to information from various tables into one comprehensive table. The Barrier Design Table combines select information from the following tables:

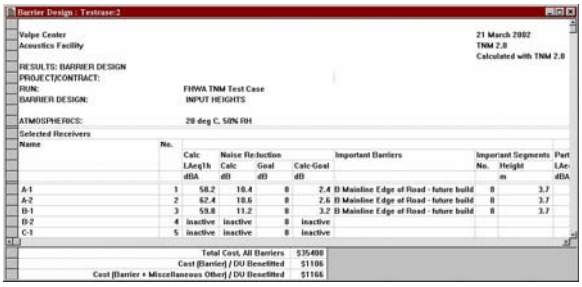
- Sound Level Results;
- Barrier Descriptions;
- Barrier Segment Descriptions; and

- Diagnosis by Barrier Segment.



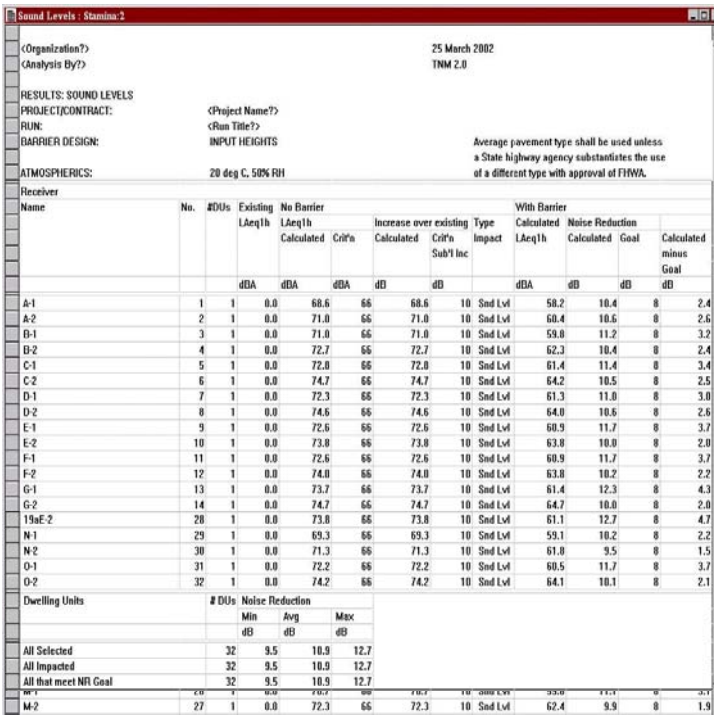
The table is available in two forms and can be selected using the Tables menu (see Figure 21). Two submenu options are listed: Barrier Design Table and Show Important Segments. Note that the Show Important Segments option is greyed-out until the user first opens a barrier design table. When the user opens a barrier design table, the table is displayed with the selected barrier analysis receivers and their associated data on sound levels, noise reduction, important barriers and barrier segments, and partial sound levels (see Figure 22). The user may then select the Show Important Segments option, which "unchecks" the option in the menu and toggles the table to a more condensed form, hiding the important barrier segment rows and their associated partial sound levels (see Figure 23).





3. CERTIFIED OUTPUT FOR THE OFFICIAL TNM TEST CASE

This section contains the certified output computed for the official TNM test case using Version 2.0. Since TNM Version 1.0, updates to the model have resulted in an average 0.1-0.2 dB difference at receivers for some geometries due to an adjustment to one of TNM's computation variables. Appendix E in the TNM 1.0 User's Guide displays the sound level results computed using TNM Version 1.0 for the official TNM test case. The sound level results computed using the current version are shown in Figure 24 below.



Sound Levels : Stamina:2

<Organization?> 25 March 2002
<Analysis By?> TNM 2.0

RESULTS: SOUND LEVELS
PROJECT/CONTRACT: <Project Name?>
RUN: <Run Title?>
BARRIER DESIGN: INPUT HEIGHTS
ATMOSPHERICS: 20 deg C, 50% RH

Average pavement type shall be used unless a State highway agency substantiates the use of a different type with approval of FHWA.

Receiver Name	No.	#DUs	Existing LAeq1h	No Barrier LAeq1h Calculated	Crit'n	Increase over existing Calculated	Crit'n Sub'l Inc	Type Impact	With Barrier Calculated LAeq1h	Noise Reduction Calculated	Goal	Calculated minus Goal
			dBA	dBA	dBA	dB	dB		dBA	dB	dB	dB
A-1	1	1	0.0	68.6	66	68.6	10	Snd Lvl	58.2	10.4	8	2.4
A-2	2	1	0.0	71.0	66	71.0	10	Snd Lvl	60.4	10.6	8	2.6
B-1	3	1	0.0	71.0	66	71.0	10	Snd Lvl	59.8	11.2	8	3.2
B-2	4	1	0.0	72.7	66	72.7	10	Snd Lvl	62.3	10.4	8	2.4
C-1	5	1	0.0	72.8	66	72.8	10	Snd Lvl	61.4	11.4	8	3.4
C-2	6	1	0.0	74.7	66	74.7	10	Snd Lvl	64.2	10.5	8	2.5
D-1	7	1	0.0	72.3	66	72.3	10	Snd Lvl	61.3	11.0	8	3.0
D-2	8	1	0.0	74.6	66	74.6	10	Snd Lvl	64.0	10.6	8	2.6
E-1	9	1	0.0	72.6	66	72.6	10	Snd Lvl	60.9	11.7	8	3.7
E-2	10	1	0.0	73.8	66	73.8	10	Snd Lvl	63.8	10.0	8	2.0
F-1	11	1	0.0	72.6	66	72.6	10	Snd Lvl	60.9	11.7	8	3.7
F-2	12	1	0.0	74.0	66	74.0	10	Snd Lvl	63.8	10.2	8	2.2
G-1	13	1	0.0	73.7	66	73.7	10	Snd Lvl	61.4	12.3	8	4.3
G-2	14	1	0.0	74.7	66	74.7	10	Snd Lvl	64.7	10.0	8	2.0
19aE-2	28	1	0.0	73.8	66	73.8	10	Snd Lvl	61.1	12.7	8	4.7
N-1	29	1	0.0	69.3	66	69.3	10	Snd Lvl	59.1	10.2	8	2.2
N-2	30	1	0.0	71.3	66	71.3	10	Snd Lvl	61.8	9.5	8	1.5
O-1	31	1	0.0	72.2	66	72.2	10	Snd Lvl	60.5	11.7	8	3.7
O-2	32	1	0.0	74.2	66	74.2	10	Snd Lvl	64.1	10.1	8	2.1

Dwelling Units	# DUs	Noise Reduction Min	Avg	Max
		dB	dB	dB
All Selected	32	9.5	10.9	12.7
All Impacted	32	9.5	10.9	12.7
All that meet NR Goal	32	9.5	10.9	12.7

M-2	27	1	0.0	72.3	66	72.3	10	Snd Lvl	62.4	9.9	8	1.9

REFERENCES

1. Anderson, Grant S., Cynthia S.Y. Lee, Gregg G. Fleming. FHWA Traffic Noise Model,® Version 1.0: User's Guide. Report No. FHWA-PD-96-009 and DOT-VNTSC-FHWA-98-1. Cambridge, MA: John A. Volpe National Transportation Systems Center, Acoustics Facility, January 1998.

2. Menge, Christopher W., Christopher J. Rossano, Grant S. Anderson, Christopher J. Bajdek. FHWA Traffic Noise Model,® Version 1.0: Technical Manual. Report No. FHWA-PD-96-010 and DOT-VNTSC-FHWA-98-2. Cambridge, MA: John A. Volpe National Transportation Systems Center, Acoustics Facility, February 1998.

3. Fleming, Gregg G., Amanda S. Rapoza, Cynthia S.Y. Lee. Development of National Reference Energy Mean Emission Levels for the FHWA Traffic Noise Model,® Version 1.0. Report No. FHWA-PD-96-008 and DOT-VNTSC-FHWA-96-2. Cambridge, MA: John A. Volpe National Transportation Systems Center, Acoustics Facility, November 1995.

4. Bowlby, William, Theodore Patrick, Cynthia S.Y. Lee, Gregg G. Fleming. FHWA Traffic Noise Model,® Version 1.0: Trainer CD-ROM. Cambridge, MA: John A. Volpe National Transportation Systems Center, Acoustics Facility, March 1998.

5. Lee, Cynthia S.Y., Gregg G. Fleming. Measurement of Highway-Related Noise. Report No. FHWA-PD-96-046 and DOT-VNTSC-FHWA-96-5. Cambridge, MA: John A. Volpe National Transportation Systems Center, Acoustics Facility, May 1996.