Calculating and Placing Non-Residential Receptors (NRRs)

Methodology: Lot Size

FHWA-HEP-17-056

This Fact Sheet is intended to provide basic information regarding the calculation (Step 1) and placement (Step 2) of Non-Residential Receptors (NRRs) using the Lot Size-based Methodology.

1. How many Receptors will I have?
2. Where would I then place those receptors within a site?
3. What impact do these decisions have on the Feasibility and Reasonableness of Noise Abatement?

LEGEND

☆ One star = One receptor

For this methodology, NRR Values are usually calculated using an equation:

$$\text{NRR Value} = \frac{\text{Parcel's Size}}{\text{Average lot size of residential properties within a predetermined zone}}$$

The NRR points can be placed within the parcel using one of the following options:

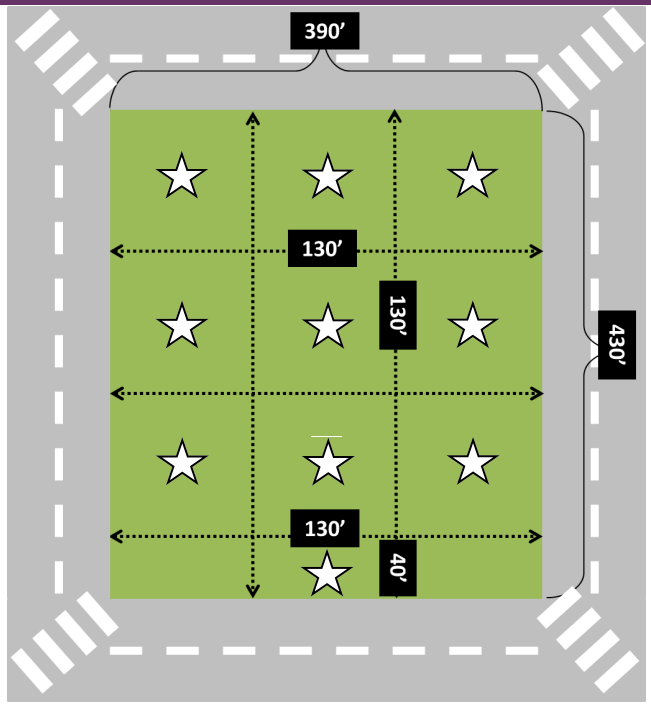
1) All together at the center of the parcel.
2) At points along the property line.
3) Along a line representing front row residential receptors.
4) At some other predetermined setback distance.
5) As grid with the NRR value distributed evenly among the grid points at the center of each parcel (see also Methodology 4 (Grid-based)).

While the point placement options would not affect the number of NRR points, it would affect the noise level and insertion loss at each point. The placement can have a substantial influence when dealing with large properties.

Note: The range of residential properties to consider for average lot size can vary. State Highway Agencies (SHA) usually use one of the following zones to obtain average lot sizes:

Within the project area	Local (city, subdivision)
CMSA, MSA, or County-wide	Statewide

Option 5
[Result: (390 x 430) / (130 x 130) ≈ a total of 10 receptors]



The Lot Size-based methodology usually differs from the Grid-based methodology in the following way:

SHAs that use the Lot-Size based methodology calculate NRR values based on the formula which relates to lot sizes. The NRR value may then be distributed in a variety of ways, dependent upon the SHA policy. The Grid-based methodology typically calculates the number of NRR points within a property based on the statewide statistics related to existing noise barriers and automatically places the NRR points where the grid lines intersect.

CASE STUDY EXAMPLES

U.S. Department of Transportation
Federal Highway Administration

No actual data on the sites was obtained, the examples assume:

That all properties were impacted.

A 10,000 square foot (100' x 100') Statewide average residential lot size.

Both the East and West parcels of the property have 680' of frontage to the highway. The West parcel has a depth of 240', and an area of 163,200 square feet. The East parcel has a depth of 320', and an area of 217,600 square feet. Activity areas are spread throughout the parcels.		West Parcel NRR Value = 16.3 East Parcel NRR Value = 21.8 Total facility NRR Value = 38.1 (rounded to 39) NRR Points distributed evenly as a grid at the center of each lot equivalent.
The outdoor amphitheatre has 400' of frontage to the highway and a depth of 400' for a total area of 160,000 square feet.		NRR Value = 16 NRR Points placed along a line representing front row residential receptors.
A property contains a Church, a school, and a cemetery. The parcel has 600' of frontage to the highway and an average depth of 350' for a total area of 210,000 square feet.		NRR Value = 21 NRR Points placed at points along the property line.
A motel has 450' frontage facing the highway and a depth of 250' for a total area of 112,500 square feet.		NRR Value = 11.3 (rounded to 12) NRR Points placed at the point of each activity area closest to the noise source, in this case an Interstate.

Median Residential Lot and Frontage Size Information for the United States, by Region *(US Census Bureau)*

Descriptor	2009 Median Lot Information for Single Detached and Attached Units and Mobile Homes in Regions of the United States			
	Northeast	Midwest	South	West
Median Lot Size (acres)	0.34	0.28	0.36	0.18
Median Lot Size (square feet)	14,810	12,197	15,682	7,841
Median Frontage (feet)	122	110	125	89