Strategic Noise Mapping

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GIS Environment

J. McGurk (RPS)

GIS - NRA Data

B. Kennedy

GIS Manager

E. Laurinaviciute (RPS)

GIS - LA Data

V. O'Malley

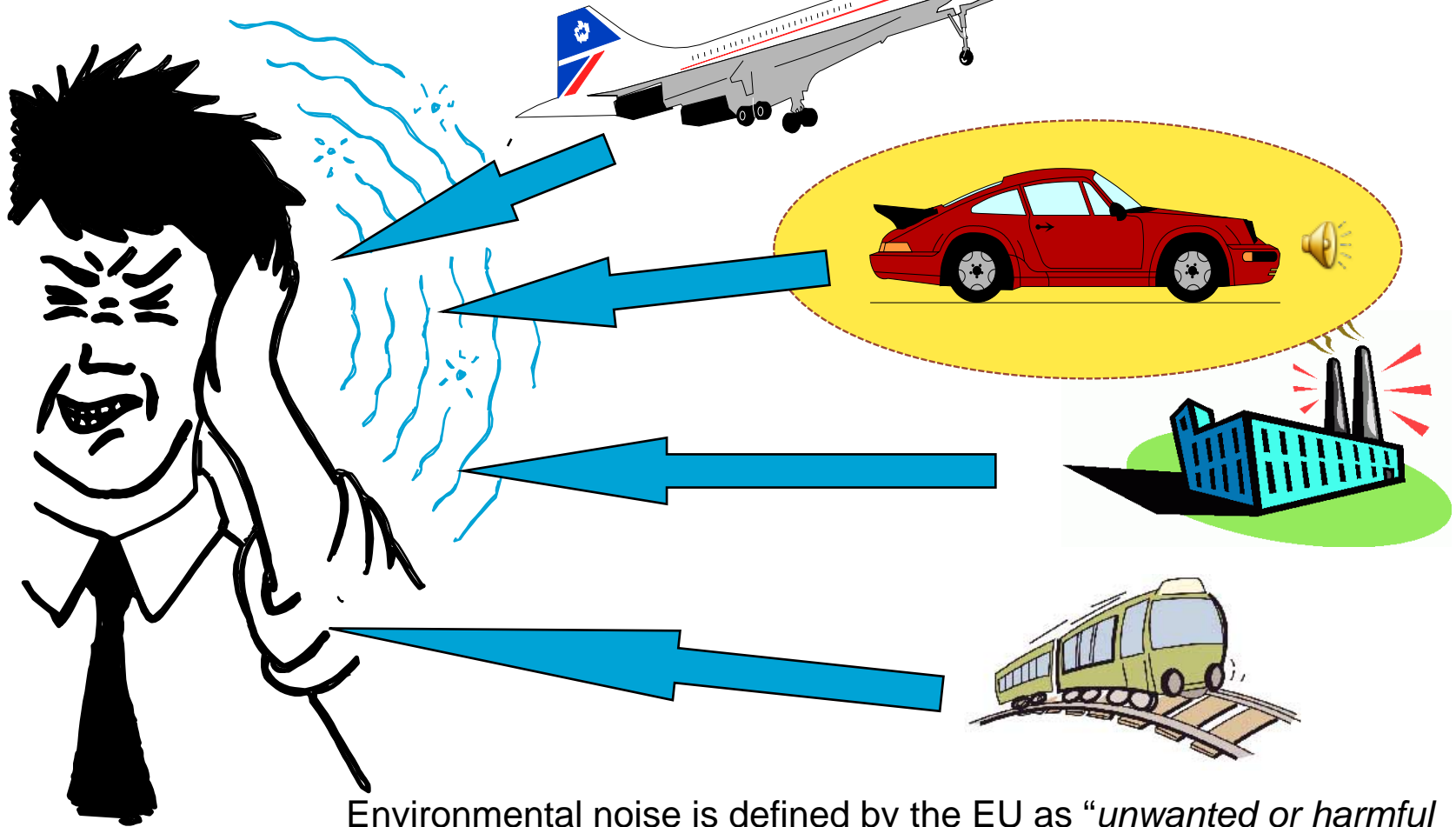Management

E. King

Noise Models

Noise Model

Environmental noise is defined by the EU as "*unwanted or harmful outdoor sound created by human activities, including noise emitted by means of transport and sites of industrial activity*"
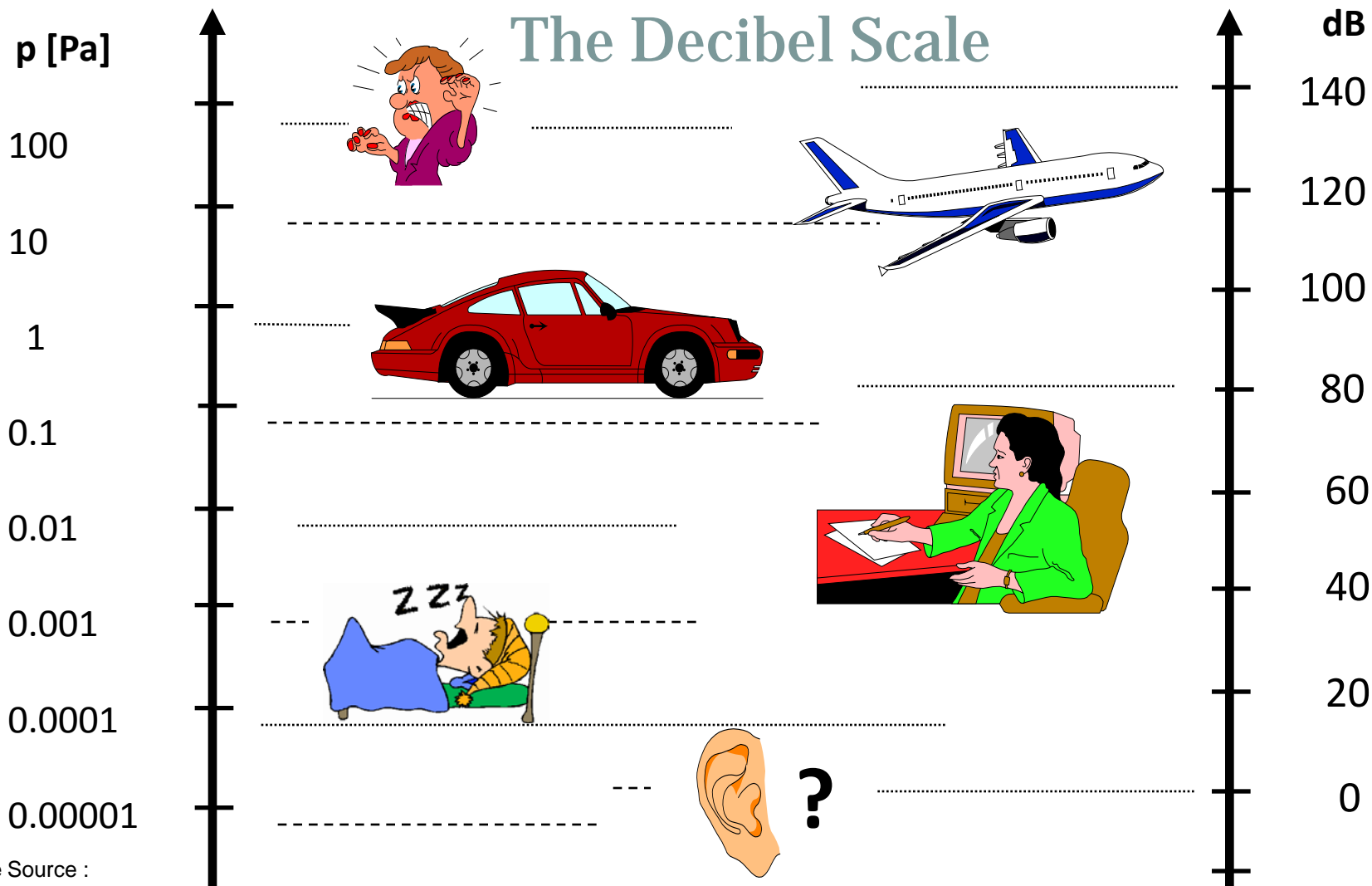
Image Source :

Bruel & Kjaer

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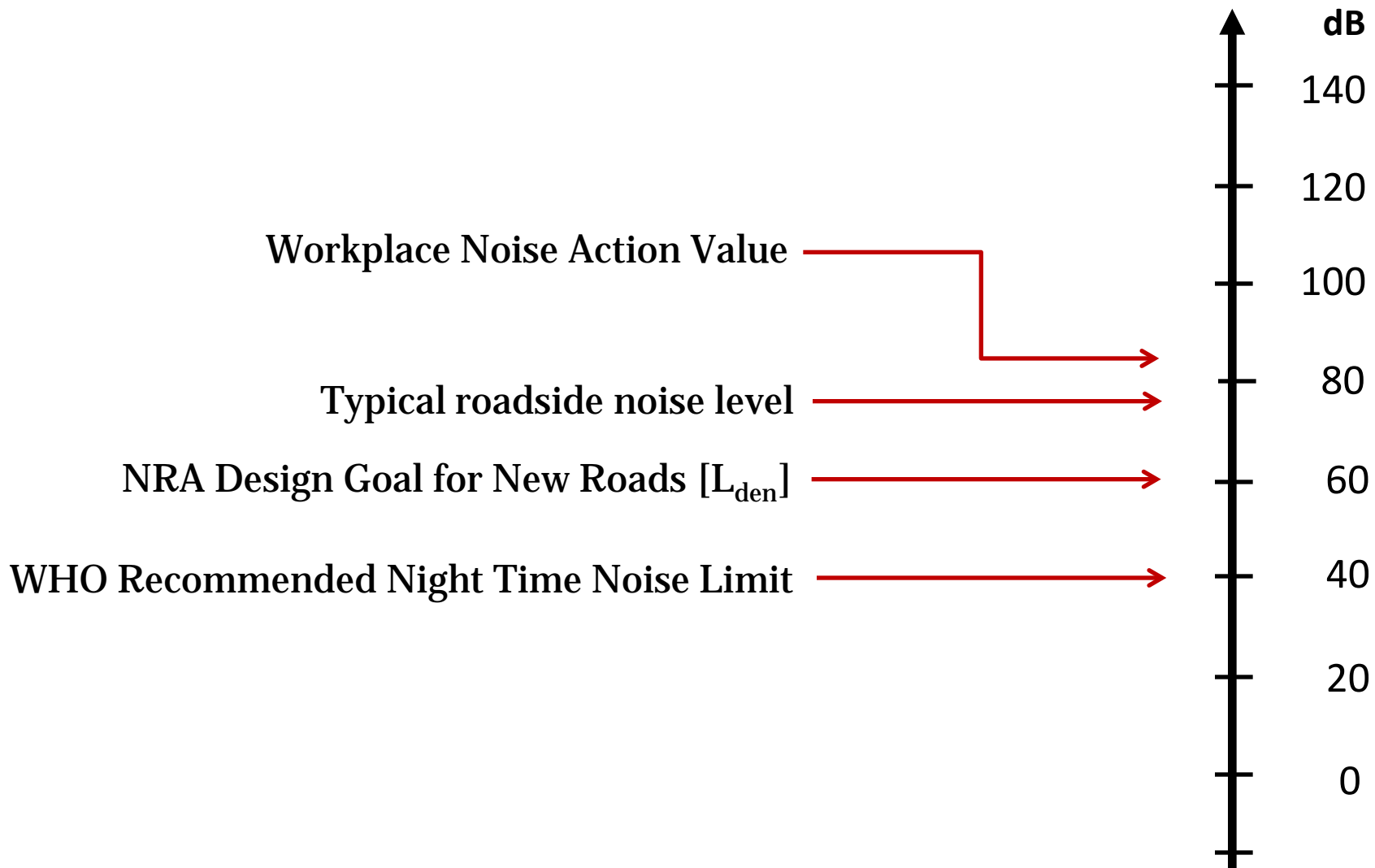
Image Source :

Bruel & Kjaer

The Decibel Scale

p [Pa]

100

10

1

0.1

0.01

0.001

0.0001

0.00001

dB

140

120

100

80

60

40

20

0

?

Image Source :
Bruel & Kjaer

dB

— 140

— 120

Workplace Noise Action Value ——————

— 100

—— 80

Typical roadside noise level ——————

NRA Design Goal for New Roads [L_{den}] ——————— 60

WHO Recommended Night Time Noise Limit ——————— 40

— 20

— 0

Adverse Effects of Exposure to Noise

➢ Sleep Deprivation

   ➢ Reduced productivity in adults

➢ Annoyance

   ➢ Reduced quality of life

➢ Auditory Impairments

➢ Cardiovascular Effects

➢ Children are particularly susceptible

   ➢ Reduced cognitive development
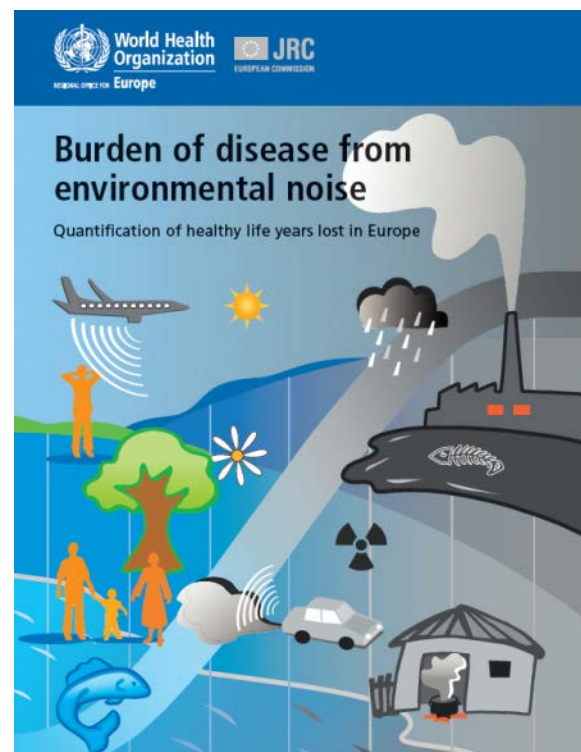
*World Health Organisation, (2011)

Some Statistics....

➢ **Results from Exposure Estimates (2007)**

    ➢ Approx 13% of the population of 27 EU Member States

    ➢ Road Traffic Noise is by the far the most dominant source

    ➢ 40 million people within agglomerations exposed >50 dB(A) at night

    ➢ 25 million outside agglomerations exposed >50 dB(A) at night

➢ **World Health Organisation**

    ➢ 40dB(A) : Recommended Night-time Noise Limit

    ➢ 1 Million healthy life years lost each year

➢ **European Commission**

    ➢ Costs of noise from road and rail traffic - €40 Billion a year

Legislation

- EU Directive 2002/49/EC

  - Strategic Noise Maps & Noise Action Plans
    - Major Cities
    - Major Roads
    - Major Railways
    - Major Airports

- Environmental Noise Regulations (S.I. No. 140 of 2006)
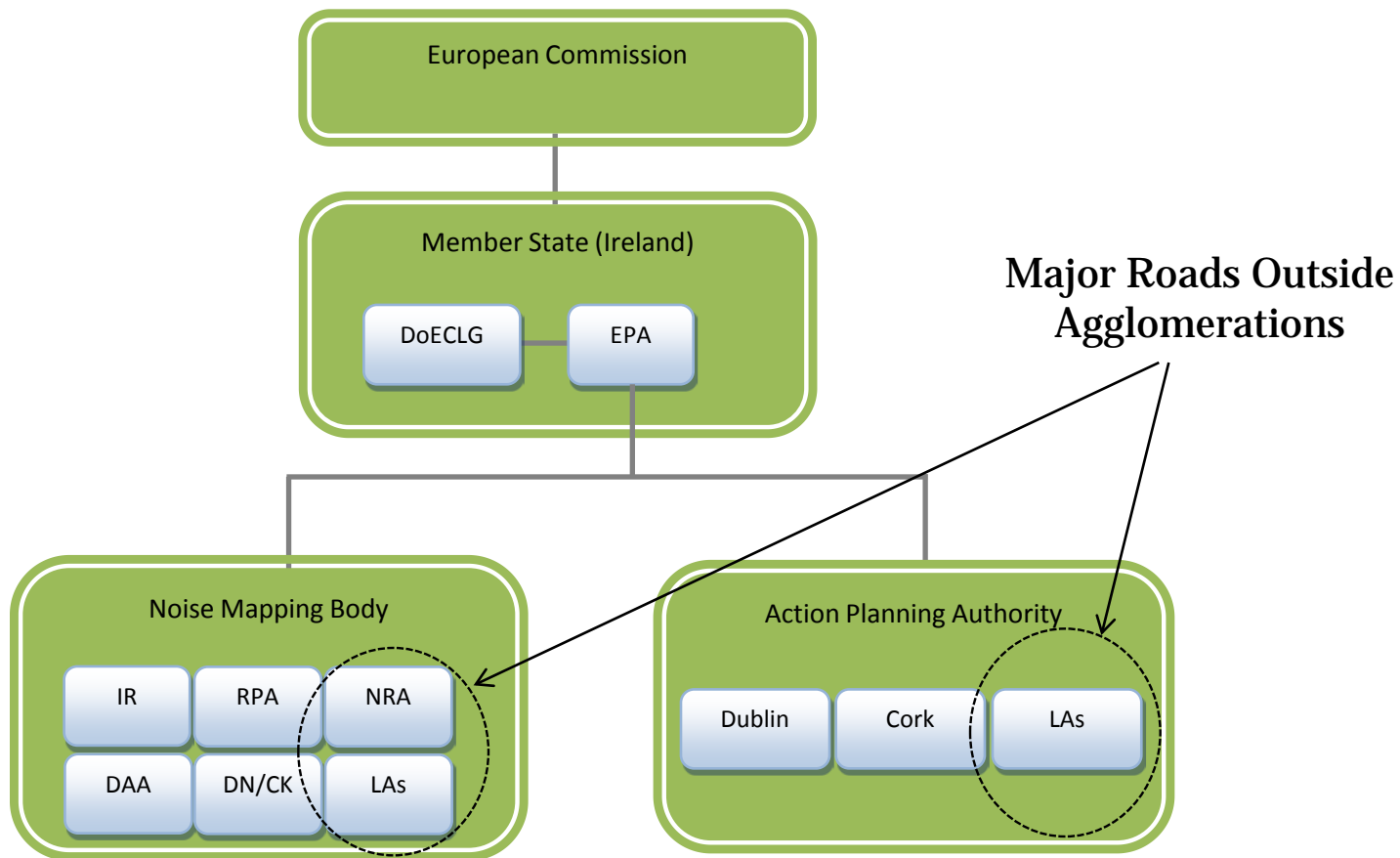 - 1st Phase Completed in 2007
  - 2nd Phase now finished

Noise Mapping - 2007

➢ AADT : 16,000
➢ 650 km of major roads

Noise Mapping - 2012

➢ AADT : 8,000
➢ Over 3,000 km of major roads

European Commission

Member State (Ireland)

DoECLG — EPA

Major Roads Outside Agglomerations

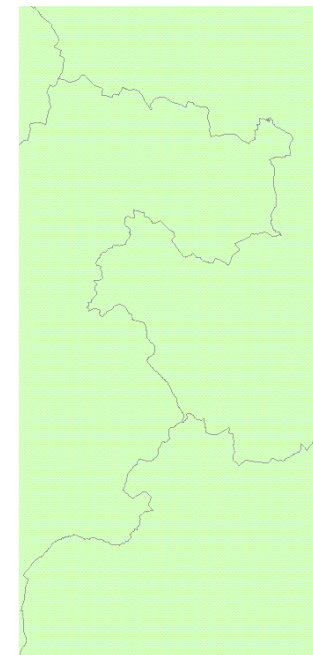Noise Mapping Body

IR | RPA | NRA
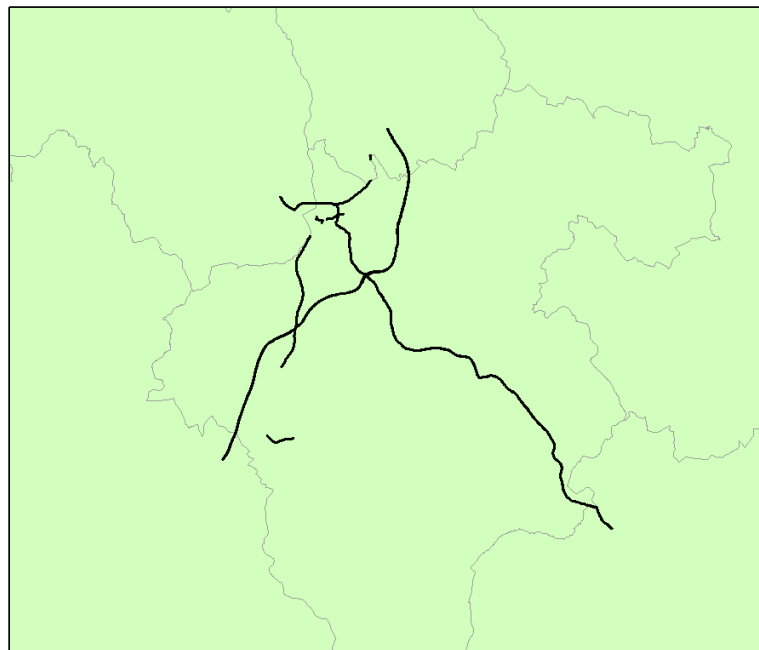DAA | DN/CK | LAs

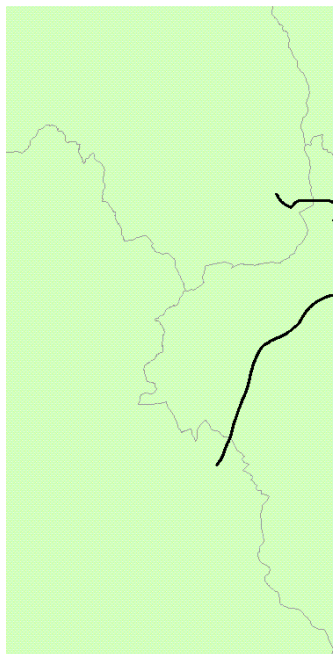Action Planning Authority

Dublin | Cork | LAs

Centralised Approach to Noise Mapping

National Roads - Approx 70km   **Non-National Roads - Approx 17km**

Centralised Approach to Noise Mapping

NRA Model Data

County Council Model Data

City Council Model Data [where applicable]

Noise Map per County
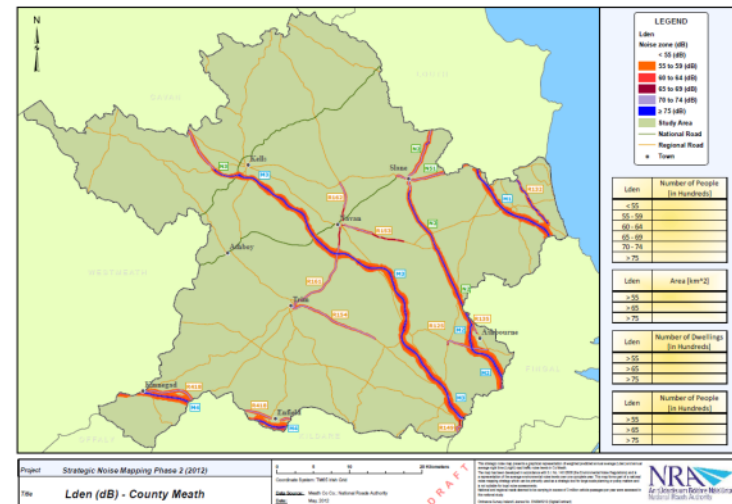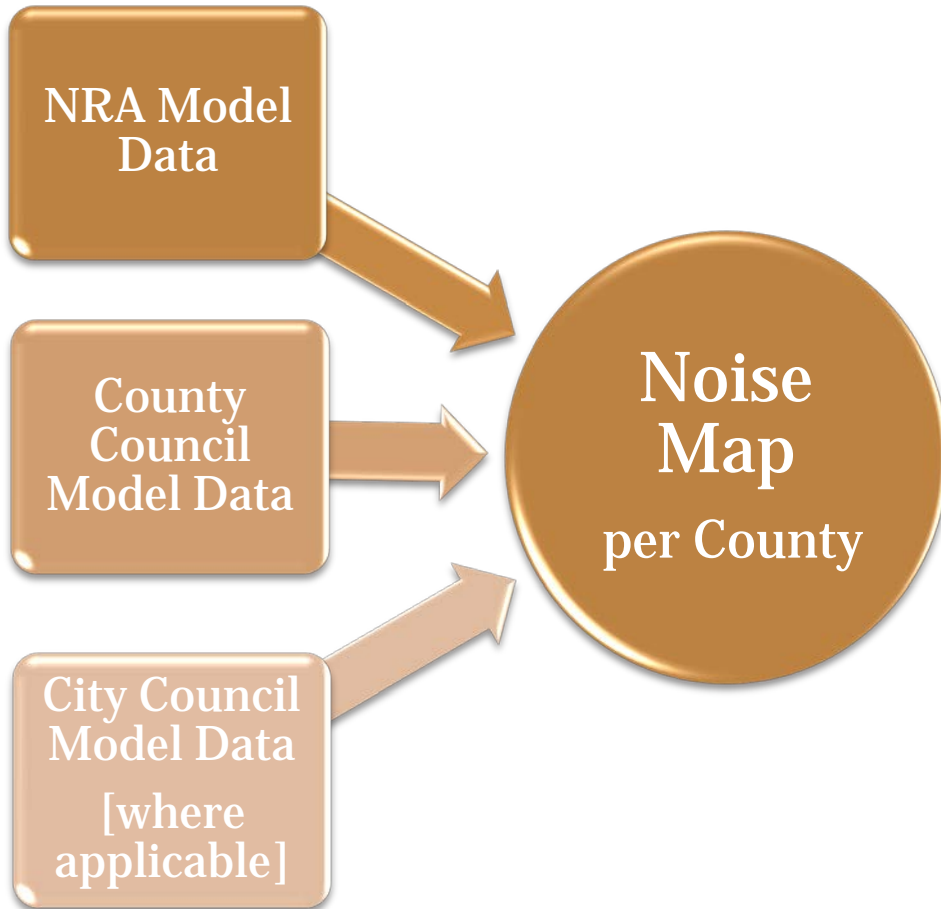
Main Input Datasets - National Roads

➢ **Roads**

  ➢ Traffic Count, Composition, Speed, Road Surface, Texture Depth

➢ **Topography**

  ➢ Contour Datasets, Ground Cover

➢ **Buildings**

  ➢ Location, Height, Residential/Commercial, Occupied/Unoccupied

➢ **Barriers**

  ➢ Location, Height

Roads

- ➢ **Traffic Counts, Composition**
  - ➢ National Traffic Model
  - ➢ Automatic Traffic Counters

- ➢ **Speeds**
  - ➢ Signposted Speed Limit

- ➢ **Road Surface**
  - ➢ Type
  - ➢ Texture Depth

- ➢ **Road Type**

Ground Model

➤ **Topography**
  ➤ Aerial LiDAR
  ➤ 2-4 pts per m²

➤ **Ground Type**
  ➤ Corine Database

Buildings

- **Building Location**
  - OSI Data
  - Aerial LiDAR

- **Building Height**
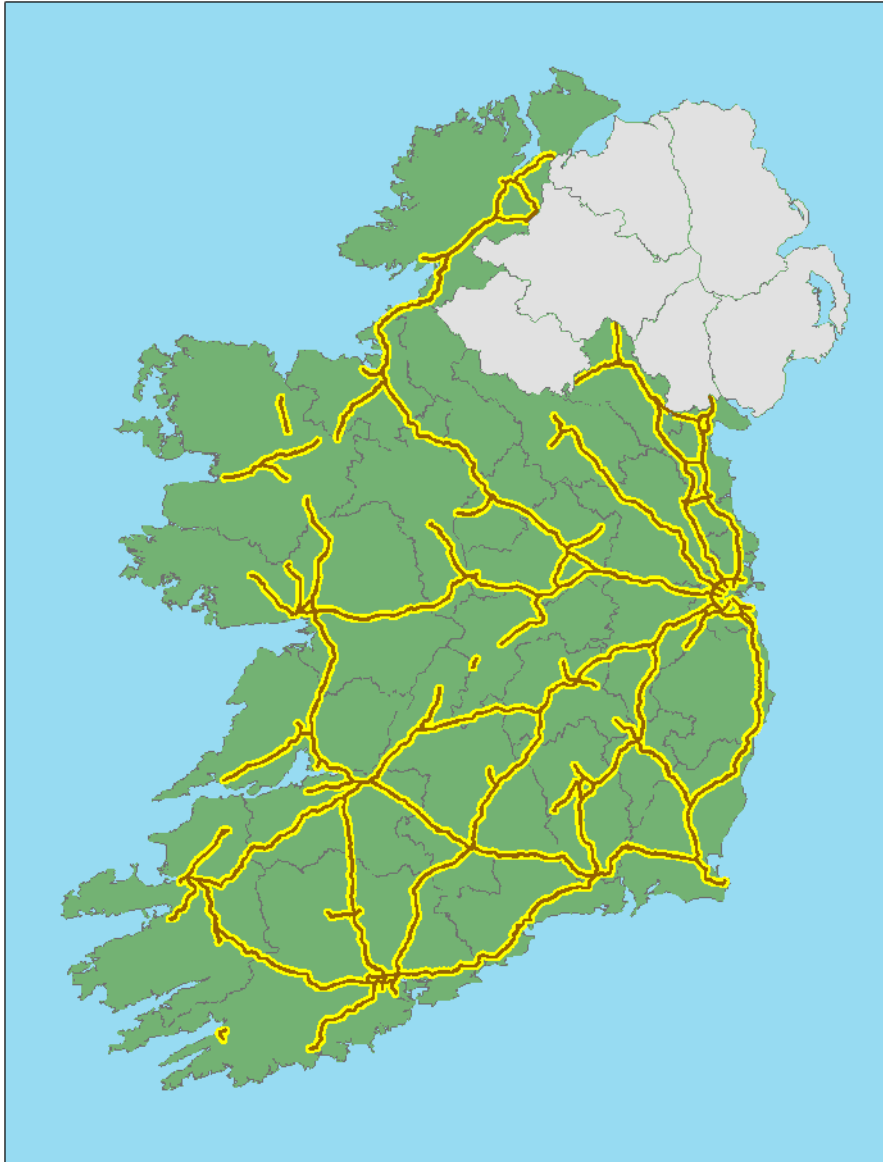 - Aerial LiDAR

- **Use**
  - GeoDirectory

Overall Process

- **Model Preparation**
  - ArcGIS

- **Model Calculation**
  - Predictor v8.1 (8-core Machine)
  - Grid Calculations & Façade Point Calculations
  - All Calculations performed over tiles (10km x 10km)

- **Results Analysis**
  - ArcGIS

- **Exposure Assessment**
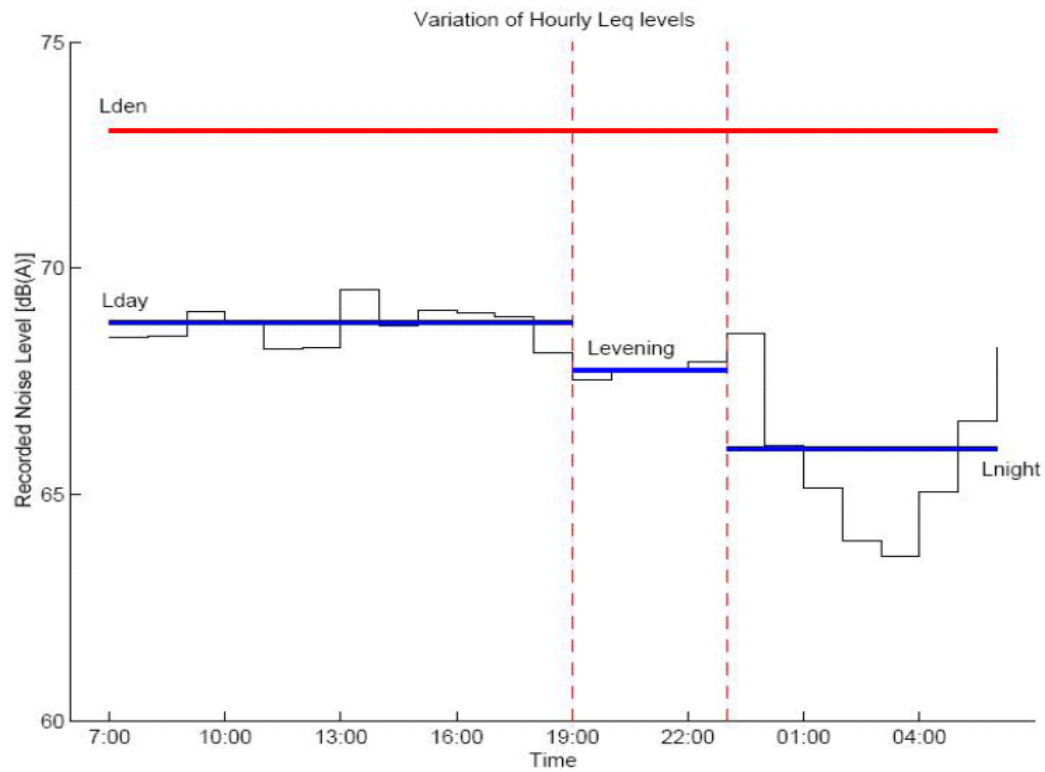 - GeoDirectory, Small Area Datasets (Census 2011)

Results

- **Completed September 2012**
  - L_{den}
  - L_{night}
  - Façade Points (Most Exposed)
- **Population Exposure**
  - County by County
  - City Councils reported separately
- **Next Steps:**
  - Dissemination
  - Action Plans
  - Calculation Method

What is L_{den} ?

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    - WHAT IS A NOISE MAP?
    - Strategic Noise Maps
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- General Tolling Information
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- Research

What is a Noise Map?

A noise map is a graphical representation of the predicted situation with regards to noise in a particular area with different colours representing different noise levels in decibels [dB(A)].

To develop a noise map a number of variables must be determined in order to correctly represent the amount of noise generated at the source, i.e. by traffic driving on the road. The noise level at the source is primarily influenced by the speed at which traffic is travelling at, the overall quantity of vehicles in the traffic flow, the proportion of heavy commercial vehicles (HCVs) in the flow and the type of road surface in the area.

The manner in which the noise propagates away from the source must then be calculated which involves determining the reduction in noise level as it propagates from the source. Distance, ground cover and the presence of barriers such as walls, noise barriers, etc, will all influence the level of noise attenuation.

All noise maps are presented in terms of two noise indicators L_{den} and L_{night}.

L_{den} is the day-evening-night noise indicator and it represents the noise indicator for overall annoyance. It is 'weighted' to account for extra annoyance in the evening and night periods.

L_{night} is the night time noise indicator and is used in the assessment of sleep disturbance

These indicators are based on year long averages of the day (07:00-19:00), evening (19:00 - 23:00) and night (23:00-0700) time periods.

www.nra.ie/Environment/Noisemaps

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LEGEND

Lden
Noise zone (dB)
- < 55 (dB)
- 55 to 59 (dB)
- 60 to 64 (dB)
- 65 to 69 (dB)
- 70 to 74 (dB)
- ≥ 75 (dB)
- Study Area
- National Road
- Regional Road
- Town

N

L_{den}	Approximate Number of People	
	Galway City	Galway County
< 55	54,507	17,730
55 - 59	5,772	3,769
60 - 64	4,533	2,732
65 - 69	4,845	2,918
70 - 74	1,382	574
> 75	0	6

L_{den}	Approximate Area [km^2]	
	Galway City	Galway County
> 55	12	99
> 65	3	19
> 75	0.1	2

L_{den}	Approximate Number of Dwellings	
	Galway City	Galway County
> 55	7,733	4,188
> 65	3,015	1,497
> 75	0	2

L_{den}	Approximate Number of People	
	Galway City	Galway County
> 55	16,532	9,998
> 65	6,227	3,498
> 75	0	6

Map labels: MAYO, ROSCOMMON, CLARE, TIPPERARY NORTH

Towns: Oughterard, Headford, Tuam, Claregalway, Galway, Oranmore, Athenry, Ballinasloe, Kilcolgan, Loughrea, Gort, Portumna

Roads: N17, N83, N63, N84, N59, N17, N6, M6, R339, R336, R337, R446, N18, N66, M18

LEGEND

Lnight
Noise zone (dB)

	< 45 (dB)
	45 to 49 (dB)
	50 to 54 (dB)
	55 to 59 (dB)
	60 to 64 (dB)
	65 to 69 (dB)
	≥ 70 (dB)
	Study Area
	National Road
	Regional Road
●	Town

L_{night}	Approximate Number of People	
	Galway City	Galway County
< 50	59,179	20,873
50 - 54	4,628	2,721
55 - 59	5,573	3,219
60 - 64	1,659	897
65 - 69	0	18
>70	0	0

L_{night}	Approximate Area [km^2]	
	Galway City	Galway County
>50	7	53
>60	2	10
>70	0	0

L_{night}	Approximate Number of Dwellings	
	Galway City	Galway County
>50	5,570	2,894
>60	818	400
>70	0	0

L_{night}	Approximate Number of People	
	Galway City	Galway County
>50	11,860	6,855
>60	1,659	915
>70	0	0

Map labels: MAYO, ROSCOMMON, CLARE, TIPPERARY NORTH
Towns: Tuam, Headford, Oughterard, Claregalway, Galway, Oranmore, Athenry, Ballinasloe, Kilcolgan, Loughrea, Portumna, Gort
Roads: N17, N83, N63, N84, N59, R339, R336, R337, R446, N18, N66, M6, N6, M18

Project: *Strategic Noise Mapping Phase 2 (2012)*

Title: **Lnight (dB) - County Galway & Galway City**

0   5   10   20 Kilometers

Coordinate System: TM65 Irish Grid

Data Source: GalwayCo Co.; Galway City Co; National Roads Authority

Date: September, 2012

This strategic noise map presents a graphical representation of weighted predicted annual average (Lden) and annual average night time (Lnight) road traffic noise levels in Co Galway & Galway City.
The map has been developed in accordance with S.I. No. 140.0006 (the Environmental Noise Regulations) and a representation of the average environmental noise levels over one complete year. This map forms part of a national noise mapping strategy which can be primarily used as a strategic tool for large scale planning or policy matters and is not suitable for local noise assessments.
National and regional roads deemed to be carrying in excess of 3 million vehicle passages per year were assessed in this national study.
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LEGEND

Lden
Noise zone (dB)

- < 55 (dB)
- 55 to 59 (dB)
- 60 to 64 (dB)
- 65 to 69 (dB)
- 70 to 74 (dB)
- ≥ 75 (dB)
- Study Area
- National Road
- Regional Road
- Town

L_{den}	Approximate Number of People
< 55	31,303
55 - 59	8,879
60 - 64	4,344
65 - 69	3,059
70 - 74	1,844
> 75	77

L_{den}	Approximate Area [km^2]
> 55	150
> 65	30
> 75	5

L_{den}	Approximate Number of Dwellings
> 55	7,703
> 65	2,346
> 75	33

L_{den}	ApproximateNumber of People
> 55	18,203
> 65	4,980
> 75	77

Project	Strategic Noise Mapping Phase 2 (2012)
Title	Lden (dB) - County Cork

0   5   10   20 Kilometers

Coordinate System: TM65 Irish Grid

Data Source: Cork Co Co.; National Roads Authority

Date: September, 2012

This strategic noise map presents a graphical representation of weighted predicted annual average (Lden) and annual average night time (Lnight) road traffic noise levels in Co Cork.
The map has been developed in accordance with S.I. No. 140/2006 (the Environmental Noise Regulations) and is a representation of the average environmental noise levels over one complete year. This map forms part of a national noise mapping strategy which can be primarily used as a strategic tool for large scale planning or policy matters and is not suitable for local noise assessments.
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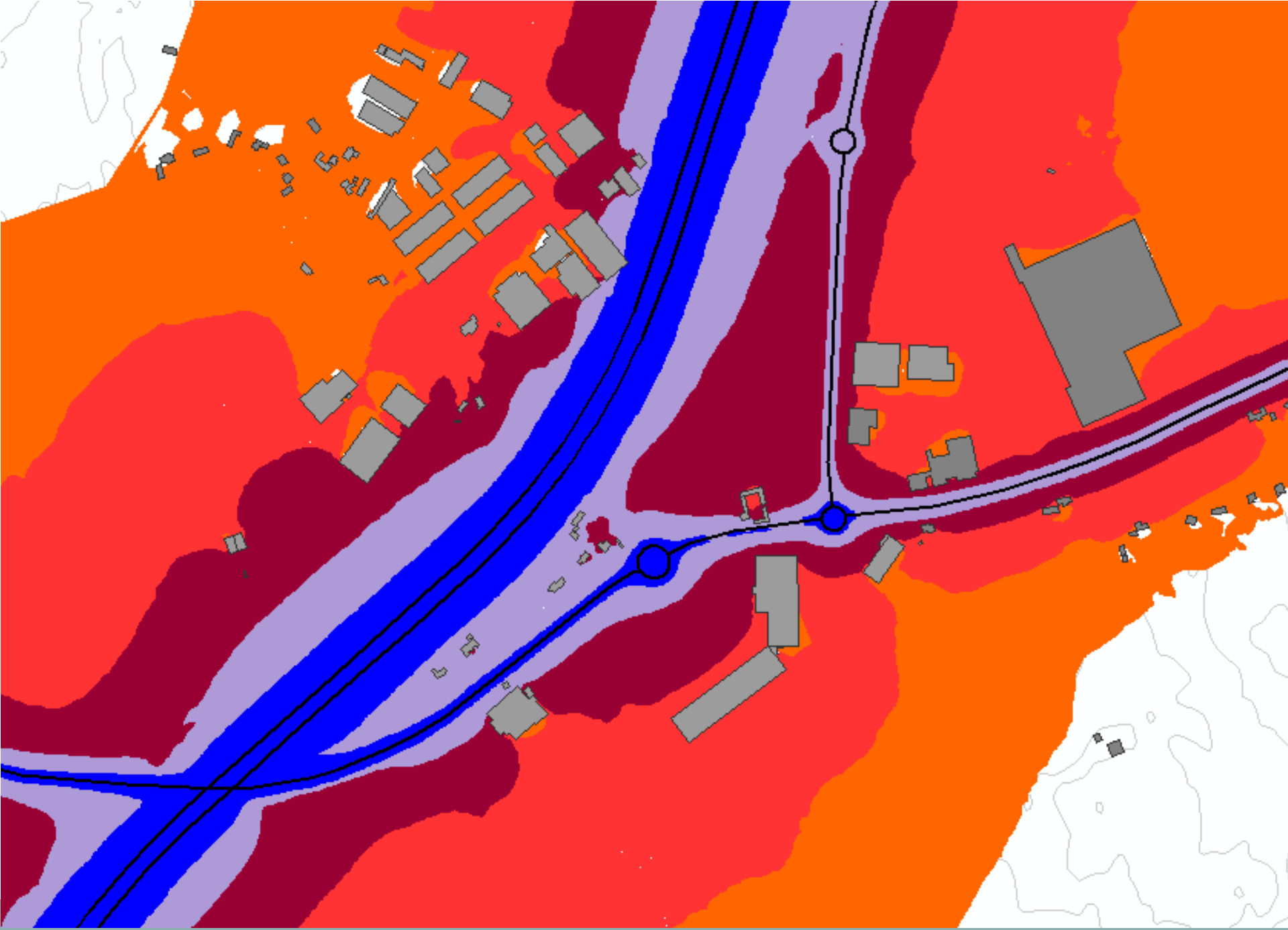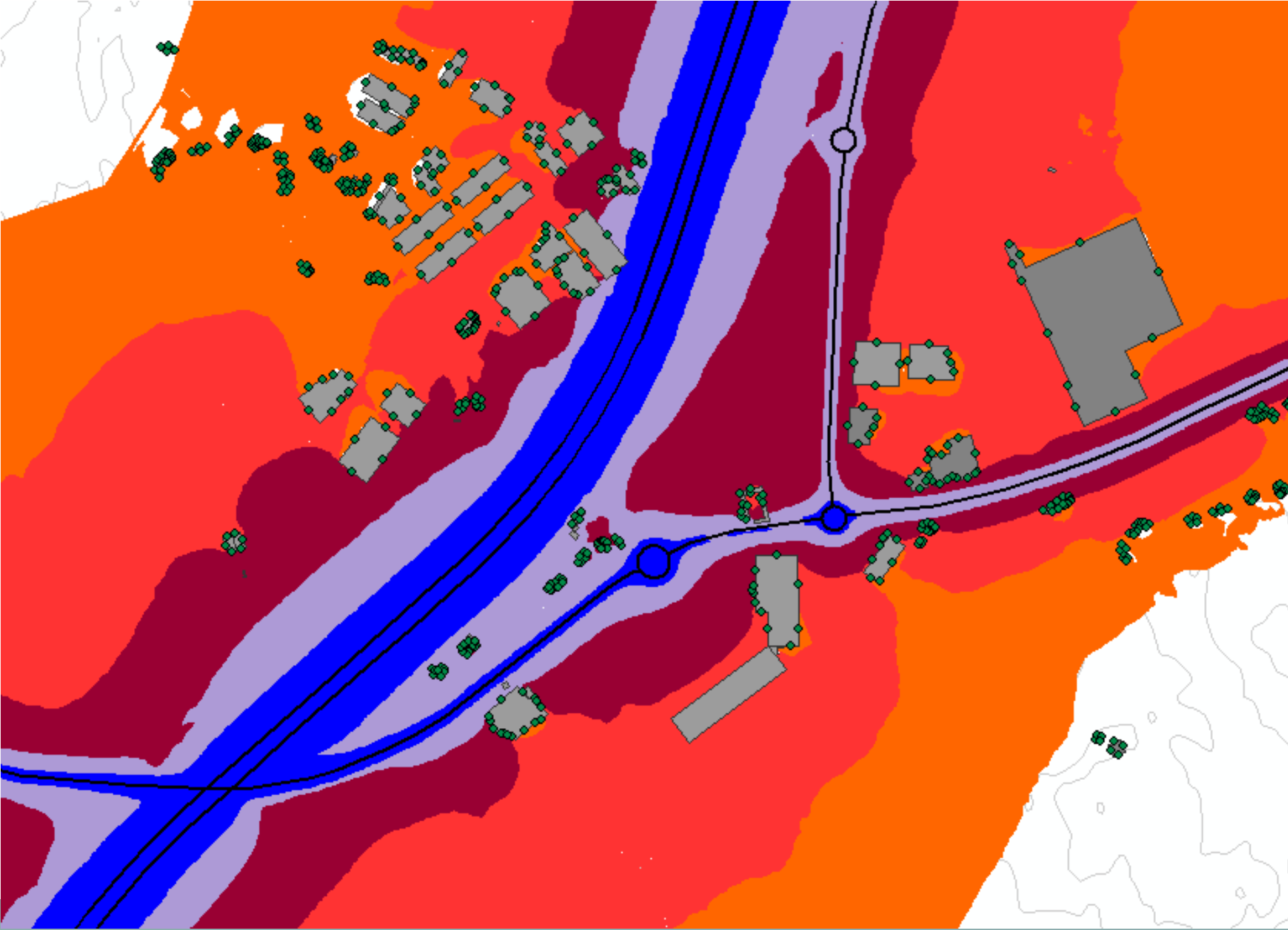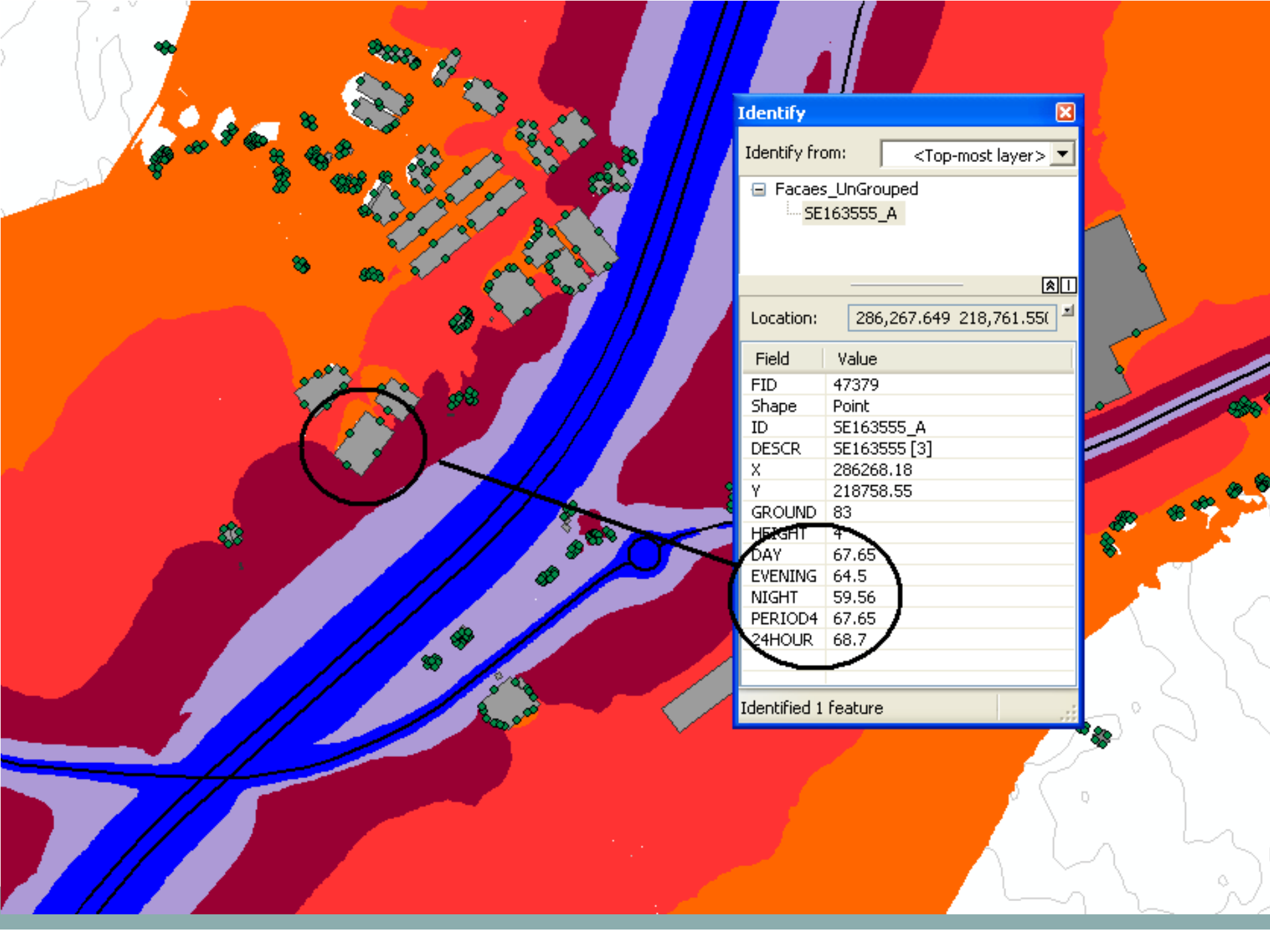
Identify

Identify from: `<Top-most layer>`

- Facaes_UnGrouped
  - SE163555_A

Location: 286,267.649 218,761.550

Field	Value
FID	47379
Shape	Point
ID	SE163555_A
DESCR	SE163555 [3]
X	286268.18
Y	218758.55
GROUND	83
HEIGHT	4
DAY	67.65
EVENING	64.5
NIGHT	59.56
PERIOD4	67.65
24HOUR	68.7

Identified 1 feature

National Exposure Estimates

➤ **Results from National Exposure Estimates:**

    ➤ Almost <u>250,000</u> people exposed to noise levels >55dB L_{den}

    ➤ Almost <u>140,000</u> people exposed to noise levels >60dB L_{den}

    ➤ Almost <u>20,000</u> people exposed to noise levels >70dB L_{den}

    ➤ Almost <u>157,000</u> people exposed to noise levels >50dB L_{night}

Using an Online Presentation Tool

What's Next....

➤ <u>Action Plans</u> must be completed by all Local Authorities by mid 2013

  ➤ <u>Preserve</u> areas that have a 'good' noise environment

  ➤ <u>Improve</u> those areas identified as having an unacceptable noise environment

    ➤ Noise 'hotspots'

➤ Process must be repeated in 2017!

  ➤ This will involve a new calculation method – 'CNOSSOS-EU'

Thank you for your attention

Any Questions?

Contact Details:

eking@nra.ie