



Guidance Note for Strategic Noise Mapping

For the
Environmental Noise Regulations 2006

Version 2

August 2011

Revised Section 10: Methodology for Exposure Assessment - Post Processing and Analysis

October 2017

ENVIRONMENTAL PROTECTION AGENCY
An Ghníomhaireacht um Chaomhnú Comhshaoil
PO Box 3000, Johnstown Castle, Co. Wexford, Ireland

Telephone: +353 53 916 0600 Fax: +353 53 916 0699
Email: info@epa.ie Website: www.epa.ie

© Environmental Protection Agency 2017

10 Stage 7 – Post Processing and Analysis

After the completion of the noise calculations the noise level results are available as derived datasets from the noise modelling process.

The noise results generated can now be mapped, presented graphically, and used as the basis for supplementary analysis in order to derive the required information for reporting to the Commission.

10.1 Reporting Requirements

The EPA is to report to the European Environment Agency using the Electronic Noise Data Reporting Mechanism (ENDRM) as set out in EEA Technical Report No 9/2012 plus the various Annex documents covering the individual reporting data flows.

The Noise Mapping Bodies (NMBs) are to report results to the EPA using the same ENDRM methodology based upon the templates available from the EEA. The EPA will provide NMBs with reporting templates and any specific guidance as appropriate.

10.2 Requirements of the Directive

Annex VI of the END requires that “the estimated number of **people** living in dwellings” exposed to various noise levels “4 m above the ground on the **most exposed façade**” is provided for various scenarios.

For this reason, it is necessary to more clearly define the terms “people”, “dwellings”, and “most exposed façade”.

For the purposes of the statistics required by Annex VI, persons (or people) can be defined as “human” beings, thus being consistent with the scope of the END defined in Article 2, paragraph 1. They are members of “the public” as defined in Article 3 (v) as “one or more natural or legal persons and, in accordance with national legislation or practice, their associations, organisations or groups”.

The term “population” is not referred to in the END, and is only a convenient means of referring to the exposure assessment, which as noted above is for “the estimated number of people living in dwellings”. It should be noted that the estimation of the number of people living in dwellings does not directly assess the exposure of people, as individuals move around; rather the exposure assessment is carried out upon the building/dwelling in which people normally reside. In the assessment there is no attempt to reflect the temporal dimension of the movement of population in this exposure assessment.

The CSO defines dwellings as a self-contained unit of living accommodation that is occupied or, if vacant, is intended for occupation by one or more households. A dwelling should have a separate access to the street (direct or via a garden or grounds) or to a common space within a building (staircase, passage gallery, etc.). Examples include: a family home, a family home on a farm, a separate flat, apartment or bed-sit, a caravan, a caretaker’s accommodation located in an office building, living accommodation over a shop.

A household is an occupied dwelling and forms the basis of the population in the CSO published Census data T5_2_TP field as part of the Small Area Population Statistics. Almost all of these persons in this field are usually resident in the household.

The CSO also publish SAPS data for Communal Establishments, which are defined as establishments providing managed residential accommodation. Managed means

full-time or part-time supervision of the accommodation and generally consist of Hotels, Educational establishments, Prisons, Boarding Houses, Religious communities, Defence establishments, Guest Houses, Children's homes, Civilian ships, boats and barges, Bed and breakfast, Nursing home, Garda station, Hostel, Hospital/Nurses' home and Holiday campsite.

As can be seen some of the people enumerated in Communal Establishments consist of persons who are non-resident and those who are normally residing within the establishment, however they do not fit the CSO definition of dwellings, and are therefore outside the scope of the END assessment. Some of these Communal Establishments may be considered as noise sensitive, and their exposure could be determined separately, or investigated specifically during the development of the Noise Action Plans.

Importantly, the use of "dwellings" within the END indicates that vacant or unoccupied dwellings should be included within the assessment of exposure of dwellings, but not within the assessment of exposure of people if the dwellings are known to be vacant, as this is contra to the phrasing used, e.g. "how many persons in the above categories live in dwellings that have" and "The estimated total number of people (in hundreds) living in dwellings". For this reason, the revised approach set out below will provide two approaches to identifying dwellings, one including vacant dwellings, to be used in the dwelling exposure assessment, and the other which excludes them, for use in the assessment of numbers of people living in dwellings.

The term "building" as used by CSO is not referred to directly in the context of the exposure assessments required by Annex VI. A building may contain zero, one or more individual dwellings. Residential buildings can therefore be considered to be those buildings containing one or more individual "Private dwellings". Noise-sensitive buildings may be considered those buildings which contain "Non-private dwellings", or which have uses which the competent authority deems to be noise sensitive, such as libraries etc for the purpose of the Noise Action Plan.

The façades of a dwelling shall consist of all externally facing walls. Annex I, 1 defines the L_{den} using the stated formula, and in which: "the incident sound is considered, which means that no account is taken of the sound that is reflected at **the façade of the dwelling under consideration**". This indicates that the subsequent references to façade indicate **the façade of the dwelling under consideration**. Which would be consistent with Annex III regarding dose-response relationships: "dwellings with a quiet façade as defined in Annex VI".

Regarding the most exposed façade Annex I, 1 states: "the most exposed façade; for this purpose, the most exposed façade will be the external wall facing onto and nearest to the specific noise source; for other purposes other choices may be made". Subsequent practical experience has demonstrated that selection of the most exposed façade based upon distance may lead to contradictory situations. For this reason, a revised definition is proposed: "the most exposed façade will be the external wall of the dwelling exposed to the highest value of L_{den}/L_{night} from the specific noise source under consideration (e.g. road traffic)." The proposed definition is also more consistent with the existing definition of quiet façade.

Regarding quiet façade, Annex VI, 1.5 states: "a quiet façade, meaning the façade of a dwelling at which the value of L_{den} four metres above the ground and two metres in front of the façade, for the noise emitted from a specific source, is more than 20 dB lower than at the façade having the highest value of L_{den} ." This makes determination of the presence of a quiet façade more complex as it necessary to determine the noise exposure at a different distance from the façade of the dwelling than for the

most exposed façade. As the reporting of quiet facades is optional, it is not currently proposed to determine the presence of quiet facades.

10.3 Preparing the Input Datasets

Given the above definitions the input datasets required to undertake the required assessments may be identified.

10.3.1 SAPS Census Data

Central Statistics Office (CSO) publish statistical information on population based upon Census returns. The most recent Census was held on 24 April 2016, and the majority of the information is now available. The information available on population is issued according to various political boundaries, namely Province or County, Province County or City, Regional Authority, Constituency, Electoral Division and Small Areas. Data is not made available at Census Output Area level; rather these are merged up to the Small Area Population Statistics (SAPS) level which provides for the highest level of resolution available to the location of the population. There are 18,641 SAPS covering Ireland in the 2016 Census output data¹.

The complete SAPS dataset is contained in a CSV file, "SAPS2016_SA2017.csv", with each of the entries explained within the glossary file, "SAPS_2016_Glossary.xlsx". The three most relevant totals within the dataset for the END assessment are:

- T1_1AGETT – Total Population
- T5_2_TP – Total of Persons in Private Households
- T7_1_NP – Total of Persons in Communal Establishments

It is suggested that a revised version of the CSV file is created containing the six relevant fields: GUID, GEOGID, GEOGDESC, T1_1AGETT, T5_2_TP and T7_1_NP.

	A	B	C	D	E	F
1	GUID	GEOGID	GEOGDESC	T1_1AGETT	T5_2_TP	T7_1_NP
2	4c07d11e-11d3-851d-e053-ca3ca8c0ca7f	SA2017_017001001	Small Area	395	395	0
3	4c07d11e-123a-851d-e053-ca3ca8c0ca7f	SA2017_017002001	Small Area	344	353	0
4	4c07d11e-14b1-851d-e053-ca3ca8c0ca7f	SA2017_017002002	Small Area	405	409	0
5	4c07d11e-14b2-851d-e053-ca3ca8c0ca7f	SA2017_017002003	Small Area	276	278	5
6	4c07d11d-f709-851d-e053-ca3ca8c0ca7f	SA2017_017003001	Small Area	243	252	0
7	4c07d11e-1237-851d-e053-ca3ca8c0ca7f	SA2017_017003002	Small Area	319	328	0
8	4c07d11e-0a04-851d-e053-ca3ca8c0ca7f	SA2017_017004001	Small Area	321	324	0
9	4c07d11e-1234-851d-e053-ca3ca8c0ca7f	SA2017_017004002	Small Area	241	218	26
10	4c07d11e-1493-851d-e053-ca3ca8c0ca7f	SA2017_017004003	Small Area	155	155	0
11	4c07d11e-10d9-851d-e053-ca3ca8c0ca7f	SA2017_017005001	Small Area	237	246	0
12	4c07d11e-10d7-851d-e053-ca3ca8c0ca7f	SA2017_017005002	Small Area	188	195	0
13	4c07d11d-f701-851d-e053-ca3ca8c0ca7f	SA2017_017006001	Small Area	344	347	0
14	4c07d11d-f663-851d-e053-ca3ca8c0ca7f	SA2017_017007001	Small Area	275	269	0
15	4c07d11e-10d8-851d-e053-ca3ca8c0ca7f	SA2017_017008001	Small Area	183	184	0
16	4c07d11e-10d6-851d-e053-ca3ca8c0ca7f	SA2017_017008002	Small Area	264	267	0
17	4c07d11e-0a22-851d-e053-ca3ca8c0ca7f	SA2017_017008003	Small Area	204	174	28
18	4c07d11e-1d96-851d-e053-ca3ca8c0ca7f	SA2017_017008004	Small Area	400	347	50

Figure 10.1: SAPS data

In order to provide an accurate spatial location for the population within each SAPS area it is necessary to have an up to date map of SAPS boundaries which matches the SAPS codes within the population exposure statistics report. The Small Areas

¹ <http://www.cso.ie/en/census/census2016reports/census2016smallareapopulationstatistics/> [Accessed September 2017]

Ungeneralised OSi National Statistical Boundaries dataset is available in various formats².

The SAPS boundary data is delivered in WGS 1984 projection, and may need to be projected to either Irish Transverse Mercator (ITM) or Irish National Grid (ING) depending on how the noise mapping datasets have been set up within the project.

The SAPS boundary Shapefile may then be joined to the CSV file based on the GUID which assigns the three population totals to each of the SAPS boundary polygons.

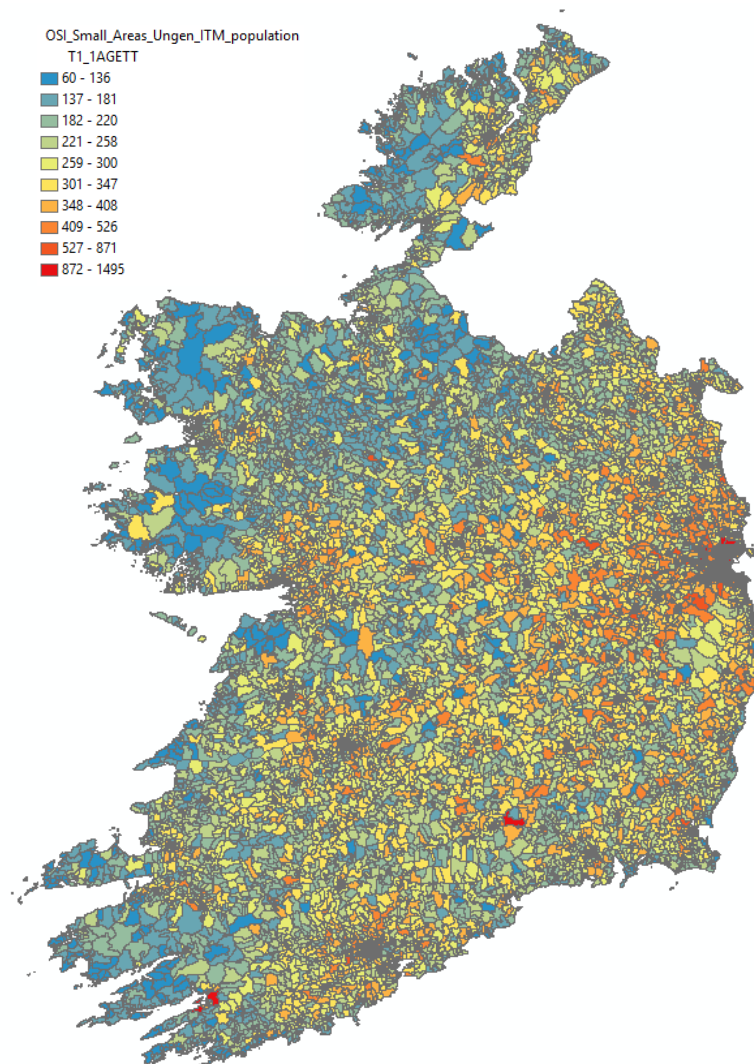


Figure 10.2: Total population per SAPS area

As this is a national coverage dataset, it is recommended that for specific project areas it is filtered on NUTS3, COUNTY, EDNAME or SMALL_AREA to produce smaller coverage datasets which may be used going forward.

Note: It is recommended NOT to run an intersect based on boundary polygons as this can bisect the SAPS polygons and produce erroneous population statistics.

² <https://data.gov.ie/dataset/small-areas-ungeneralised-osi-national-statistical-boundaries> [Accessed September 2017]

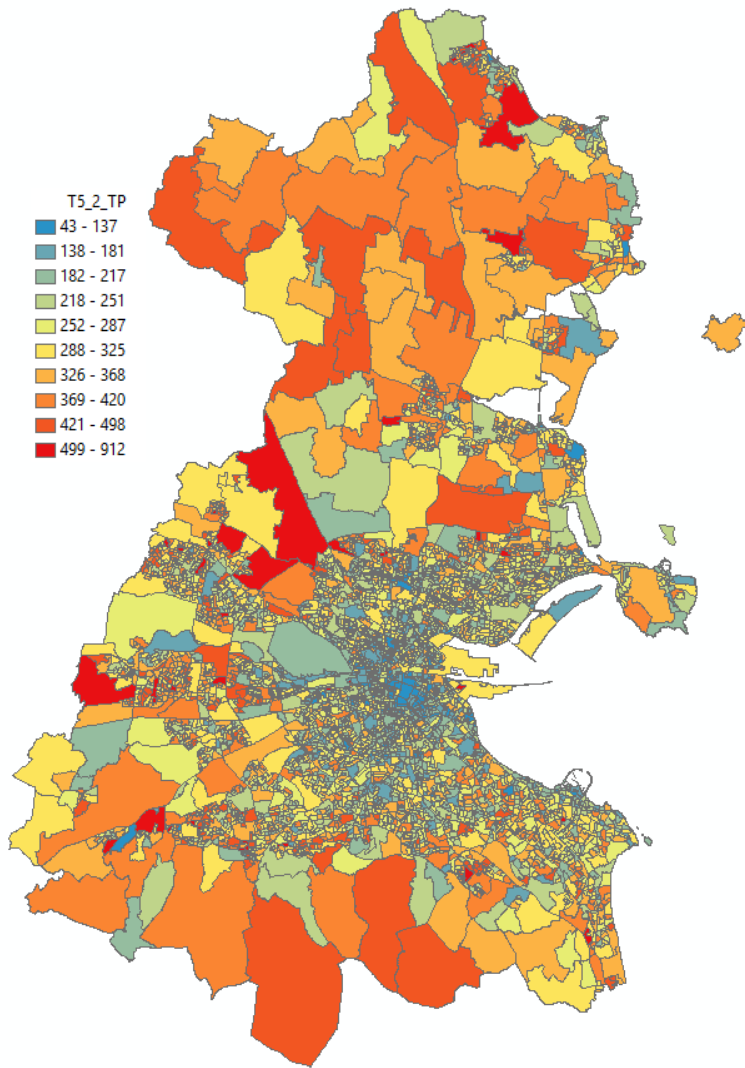


Figure 10.3: 1,308,854 Person in Private Households in 4,882 SAPS area in Dublin County

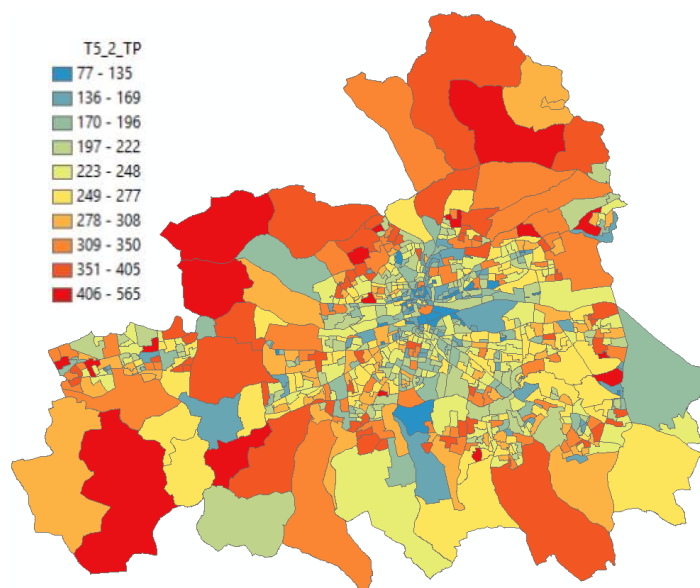


Figure 10.4: 190,938 Person in Private Households in 778 SAPS area in Cork Agglomeration

With the number of people assigned to each SAPS area, it is now necessary to establish which buildings contain dwellings, and the total number of people living within those dwellings.

10.3.2 GeoDirectory

The GeoDirectory data products are developed by OSi and An Post to provide a single point location object for each building in Ireland. The complete dataset is available with the “GeoAddress Locator” product, and each point location has a number of attributes which may be useful in indentifying both vacant and occupied dwellings.

GeoDirectory is updated quarterly, for the purpose of the R3 strategic noise mapping it is recommended to use the **Q1 2016** version following advice from CSO, who used this version when developing the SAPS data for Census 2016.

As GeoDirectory provides a location point for each building, it is necessary to undertake a filter procedure in order to identify the two location datasets required for the assessment, namely:

- Point locations for buildings containing dwellings, and
- Point locations for buildings containing occupied dwellings.

The highest level of resolution within GeoDirectory is within the ADDRESS_POINTS table, which has a many-to-one link to the BUILDINGS table i.e. there can be many address points within one building, and one building may contain one or many address delivery points.

The number of linked address points is provided by the RESIDENTIAL_DELIVERY_POINTS and COMMERCIAL_DELIVERY_POINTS attributes. The RESIDENTIAL_DELIVERY_POINTS have a blank entry in the ORGANISATION attribute within the ADDRESS_POINTS table, whereas the COMMERCIAL_DELIVERY_POINTS should have an entry in the ORGANISATION attribute within the ADDRESS_POINTS table.

The BUILDING_USE attribute has three possible entries: R for Residential, C for Commercial and B for Both. Commercial should have zero RESIDENTIAL_DELIVERY_POINTS, whilst Residential should have zero COMMERCIAL_DELIVERY_POINTS.

The ADDRESS_POINTS table also has attributes for VACANT, INVALID, UNOCCUPIED and UNDER_CONSTRUCTION for each of the entries, whether they are commercial, residential or both.

In order to produce a location dataset of “RESIDENTIAL_ADDRESS_POINT”, the following filters should be applied to the GeoDirectory ADDRESS_POINTS table:

- BUILDING_USE – filter out all C (commercial);
- DERELICT – filter out all Y (yes);
- INVALID – filter out all Y (yes);
- UNDER_CONSTRUCTION – filter out all Y (yes) entries; and
- RESIDENTIAL_DELIVERY_POINTS – filter out all 0 (zero) entries, as they do not have any residential delivery points.

The resultant dataset contains the location points for all residential address point, whilst the RESIDENTIAL_DELIVERY_POINTS attribute provides the total number of residential dwellings within each building.

In order to create a location dataset for occupied buildings, the following steps should be undertaken. Add Field in the attribute table for VACANT_ADD_PNT, use the Field Calculator to assign VACANT_ADD_PNT = 1 if VACANT = "Y".

To produce a building level dataset from the address point data, the GeoDirectory data should be dissolved to result in one entry per BUILDING_ID, keeping the following fields:

BUILDING_ID - first
ADDR_LINE_1 - first
ADDR_LINE_2 - first
ADDR_LINE_3 - first
ADDR_LINE_4 - first
ADDR_LINE_5 - first
ADDR_LINE_6 - first
RESIDENTIAL_DELIVERY_POINTS - mean
COMMERCIAL_DELIVERY_POINTS - mean
BUILDING_USE - first
SMALL_AREA_ID - first
EAST - first
NORTH - first
VACANT_ADD_PNT - sum

Open the attribute table of the new building level dataset and Add Field OCCUPIED_ADD_PNT and use Field Calculator to populate it with MEAN_RESIDENTIAL_ADDRESS_POINTS – SUM_VACANT_ADD_PNT.

Note: In some cases, there are more entries for a building point in the address point dataset than there are residential address points, typically for blocks of flats where the building name has an entry alongside an entry per flat. As a result, this can create negative values for OCCUPIED_ADD_PNT therefore it is recommended to add an if statement to ensure any negative values of OCCUPIED_ADD_PNT are set to zero.

The building level Geodirectory data now contains the two values required for the exposure assessment per building address point:

- Number of dwelling = MEAN_RESIDENTIAL_ADDRESS_POINTS
- Number of occupied dwellings = OCCUPIED_ADD_PNT

As a final step, if necessary, the GeoDirectory point data should be clipped to the dissolved boundaries of the SAPS area covering the project extent.

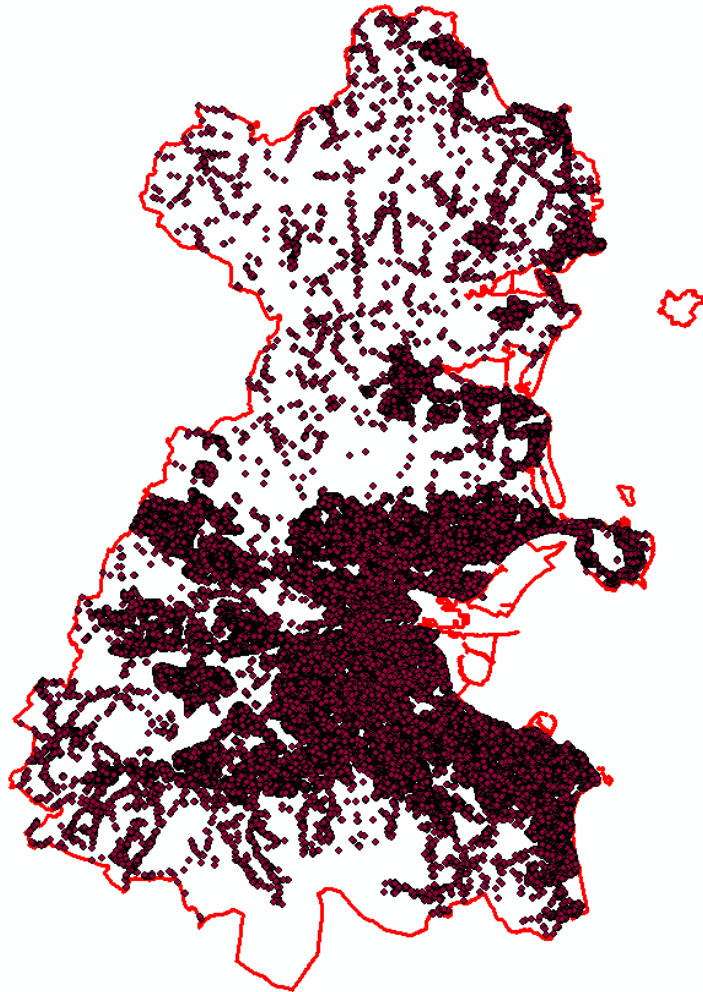


Figure 10.5: Dublin Agglomeration = 400,261 dissolved GeoDirectory points
sum RESIDENTIAL_DELIVERY_POINTS = 535,220
sum OCCUPIED_ADD_PNT = 530,832

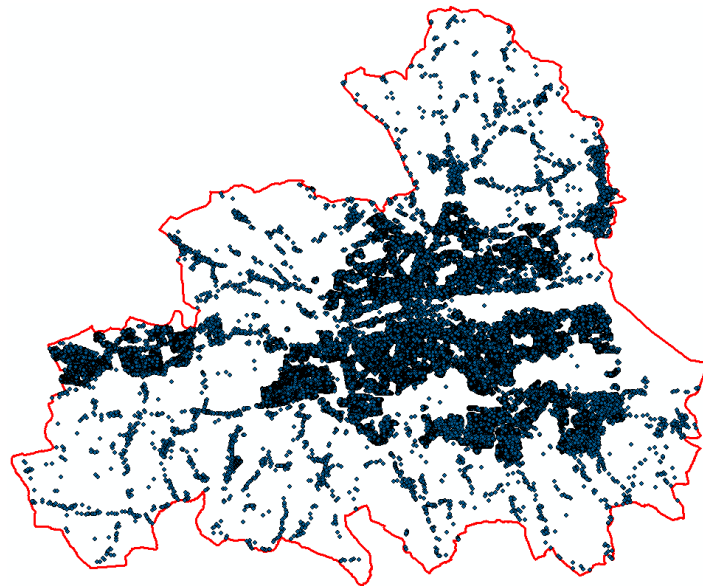


Figure 10.6: Cork Agglomeration = 69,170 dissolved GeoDirectory points
sum RESIDENTIAL_DELIVERY_POINTS = 82,127
sum OCCUPIED_ADD_PNT = 81,172

10.3.3 OSi PRIME2 Buildings

Ordnance Survey Ireland PRIME2 is the newly developed spatial data storage model first delivered in 2014. This authoritative spatial reference framework ensures consistent and unique referencing of topological state information, both in terms of location and in terms ID tag referencing. The database is constantly updated and each object timestamped, which enables datasets to delivered representative a certain point in time. Following discussions with CSO it is recommended to use PRIME2 datasets from July 2016.

Buildings are represented in two themes, as a point at the centre of the building footprint, and as a polygon objects describing the outline of the building.

Within the areas of noise mapping it is necessary to have building polygon objects in order to successfully undertake the noise calculations. Detached, semi-detached and terrace properties should have each unit described as a separate polygon i.e. a semi-detached building is two adjoining polygon objects, a row of terrace properties is a series of adjoining polygon objects.

Within the PRIME2 BUILDING_POLY theme the following attributes may be useful for the noise mapping process:

- FORM_ID – building type category, e.g. apartment building, hospital etc
- FUNC_ID – building use category, e.g. rectory, convent, residence etc
- GEO_ID – GeoDirectory building number
- GUID – unique ID of the building polygon
- WAY_SEG_VALUE – ID of the adjacent road in the WAY theme
- SHAPE_Area – polygon area

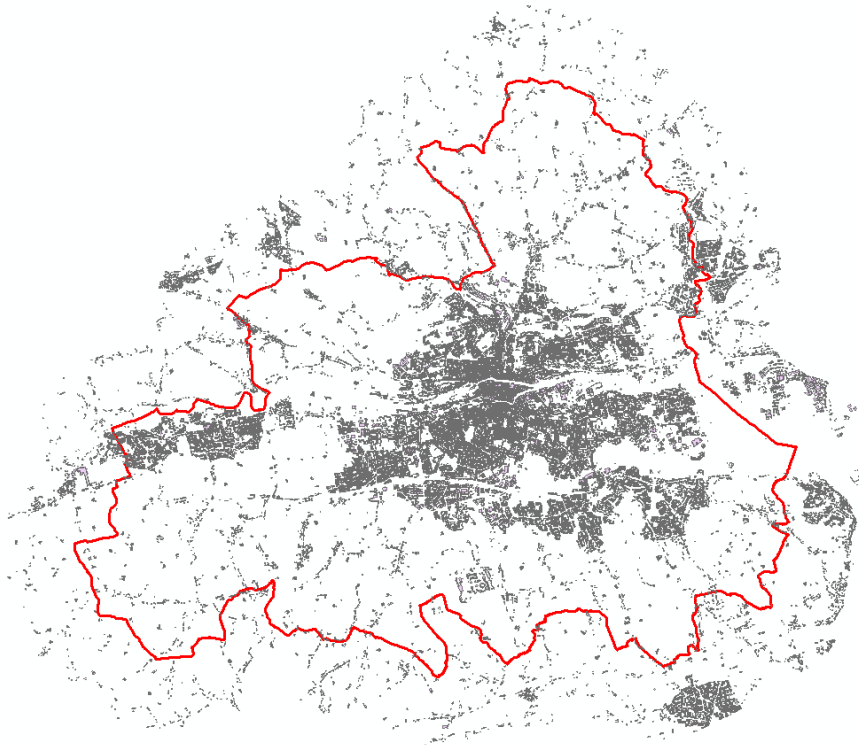


Figure 10.7: Cork Agglomeration plus 2km buffer = 121,500 buildings

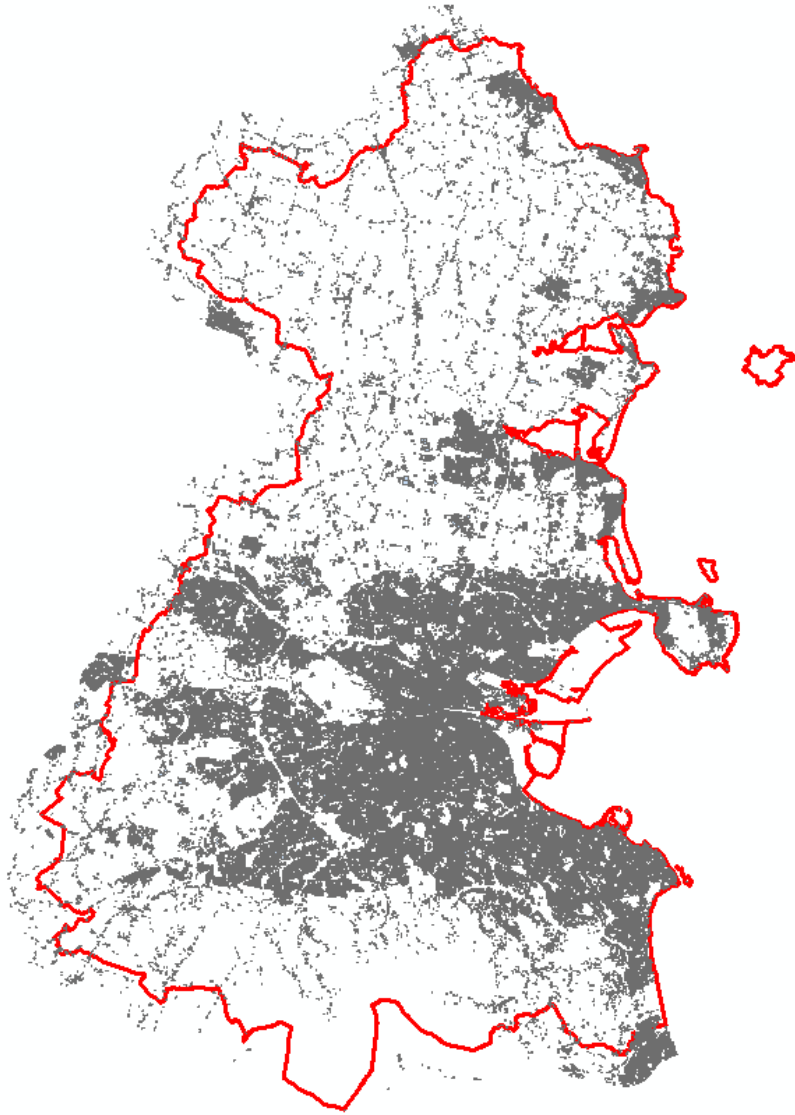


Figure 10.8: Dublin Agglomeration plus 2km buffer = 618,687 buildings

10.4 Developing the Population Distribution Datasets

Ideally the GEO_ID could be used to join the GeoDirectory building data to the building polygons, however it does not form a robust method at present for the following reasons:

- GeoDirectory points for which there is no PRIME2 building polygon, possibly due to recent construction; and
- Multiple GeoDirectory points within a single PRIME2 building polygon.

In order to address these two issues, and prepare the final population distribution datasets required for the exposure assessment the following workflow is proposed.

10.4.1 Stage 1: Clip the GeoDirectory points inside building polygons

The noise mapping software will use the PRIME2 building polygons as part of the noise calculation model. The building polygons will have a height assigned which will be used as part of the propagation model, and the basis for the façade receiver points. Therefore, the buildings within the PRIME2 theme will be used in the calculation model, and the façade receivers used for the basis of the dwellings and

people in dwellings exposure assessment will be placed around these building objects. For this reason, only GeoDirectory points inside building polygons will be considered for the exposure assessment, and the SAPS population data will be assigned to these buildings.

Clip dissolved GeoDirectory points with the PRIME2 BUILDING_Poly theme

Dublin County = 398,860 clipped dissolved GeoDirectory points
sum RESIDENTIAL_DELIVERY_POINTS = 532,974
sum OCCUPIED_ADD_PNT = 529,265

Cork Agglomeration = 69,001 clipped dissolved GeoDirectory points
sum RESIDENTIAL_DELIVERY_POINTS = 81,913
sum OCCUPIED_ADD_PNT = 80,967

10.4.2 Stage 2: Spatial join GeoDirectory Points to SAPS Area Data

Next the number of occupied dwellings is to be joined to the SAPS area data.

Spatial Join SAPS areas to the clipped dissolved GeoDirectory points from Stage 1.

Join Operation: JOIN_ONE_TO_ONE

Keep All Target Features - Ticked

Merge Rules:

BUILDING_ID = Count

RESIDENTIAL_DELIVERY_POINTS = Sum

COMMERCIAL_DELIVERY_POINTS = Sum

VACANT_ADD_PNT = Sum

OCCUPIED_ADD_PNT = Sum

Match Option: CONTAINS

Dublin County = 4,882 SAPS areas
sum RESIDENTIAL_DELIVERY_POINTS = 532,974
sum OCCUPIED_ADD_PNT = 529,265

Cork Agglomeration = 778 SAPS areas
sum RESIDENTIAL_DELIVERY_POINTS = 81,913
sum OCCUPIED_ADD_PNT = 80,967

10.4.3 Stage 3: Assign “Persons in Private Households per Occupied Address Point” to each SAPS Area

Using the SAPS Area output from Stage 2:

Open Attribute Table - Add Field...

PPH_OcAP

Select the new **PPH_OcAP** attribute and **Field Calculator...**

$PPH_OcAP = [T5_2_TP] / [OCCUPIED_ADD_PNT]$

(Persons in Private Households per Occupied Address Point)

10.4.4 Stage 4: Assign “Population per Residential Delivery Point” to each GeoDirectory delivery point

Using the SAPS Area output from Stage 3:

Spatial Join SAPS area from the end of Stage 3, to the clipped dissolved GeoDirectory points.

Join Operation: JOIN_ONE_TO_ONE
Keep All Target Features - Ticked
Merge Rules:
 PPH_OcAP = First
Match Option: WITHIN

10.4.5 Stage 5: Assign Total Residents Per Building to Residential Delivery Points

Using the GeoDirectory data output from Stage 4:

Open Attribute Table - Add Field...
RESIDENTS

Select the new **RESIDENTS** attribute and **Field Calculator...**
RESIDENTS = [PPH_OcAP] * [OCCUPIED_ADD_PNT]

Dublin County = 398,860 GeoDirectory points
sum RESIDENTS = 1,308,629
sum RESIDENTIAL_DELIVERY_POINTS = 532,974
sum OCCUPIED_ADD_PNT = 529,265

Cork Agglomeration = 69,001 GeoDirectory points
sum RESIDENTS = 190,938
sum RESIDENTIAL_DELIVERY_POINTS = 81,913
sum OCCUPIED_ADD_PNT = 80,967

10.4.6 Stage 6: Assign Building Use and Residents and Dwellings per Building to Building Polygons

Using the GeoDirectory data output from Stage 5:

Spatial Join PRIME2 BUILDING_POLY to the GeoDirectory points from the end of Stage 5.

Join Operation: JOIN_ONE_TO_ONE
Keep All Target Features – Ticked
Merge Rules:
 RESIDENTIAL_DELIVERY_POINTS = Sum
 BUILING_USE = First
 VACANT_ADD_PNT = Sum
 OCCUPIED_ADD_PNT = Sum
 PPH_OaAP = Mean
 RESIDENTS = Sum

Match Option: CONTAINS

This joins the Geodirectory and population data to each building polygon, and sums the attributes where there are multiple GeoDirectory points within a building polygon.

IMPORT TO PREDICTOR

These BUILDING_POLYGONS may now be imported to Predictor as Buildings and Grouped according to the Building_Use classes:

- C = Commercial
- B = Both Residential and Commercial
- R = Residential

This will help Predictor to setup façade receiver points around Residential and Mixed-Use buildings.

Note: When preparing building polygons for the noise calculation model, it is a typical approach to remove small buildings from the model, often <25m², if this is undertaken it is important that only buildings with no residents or dwellings are removed.

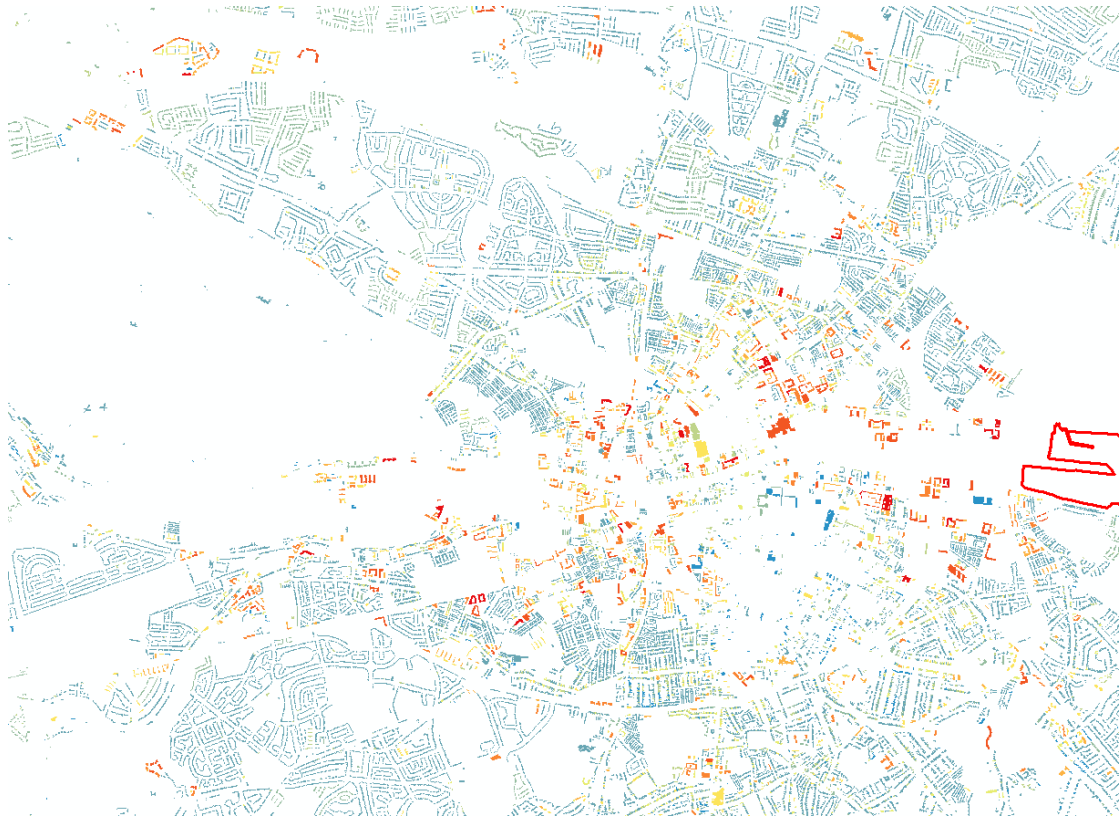


Figure 10.9: Dublin Agglomeration plus 2km buffer = 618,687 buildings
sum RESIDENTS = 1,308,640
sum RESIDENTIAL_DELIVERY_POINTS = 532,978

10.4.7 Stage 7: Create Address Points from building Polygons

Using the building polygon data output from Stage 6:

- Feature to Point**
- Inside – ticked

This process creates the address point dataset with each point being inside the corresponding building polygon, having the same ID as the building polygon, and having the number of dwellings and persons in dwelling as attributes.

IMPORT TO PREDICTOR

These address points may now be imported to Predictor as **Address Points**, with RESIDENTS and Dwellings (RESIDENTIAL_DELIVERY_POINTS) per building.

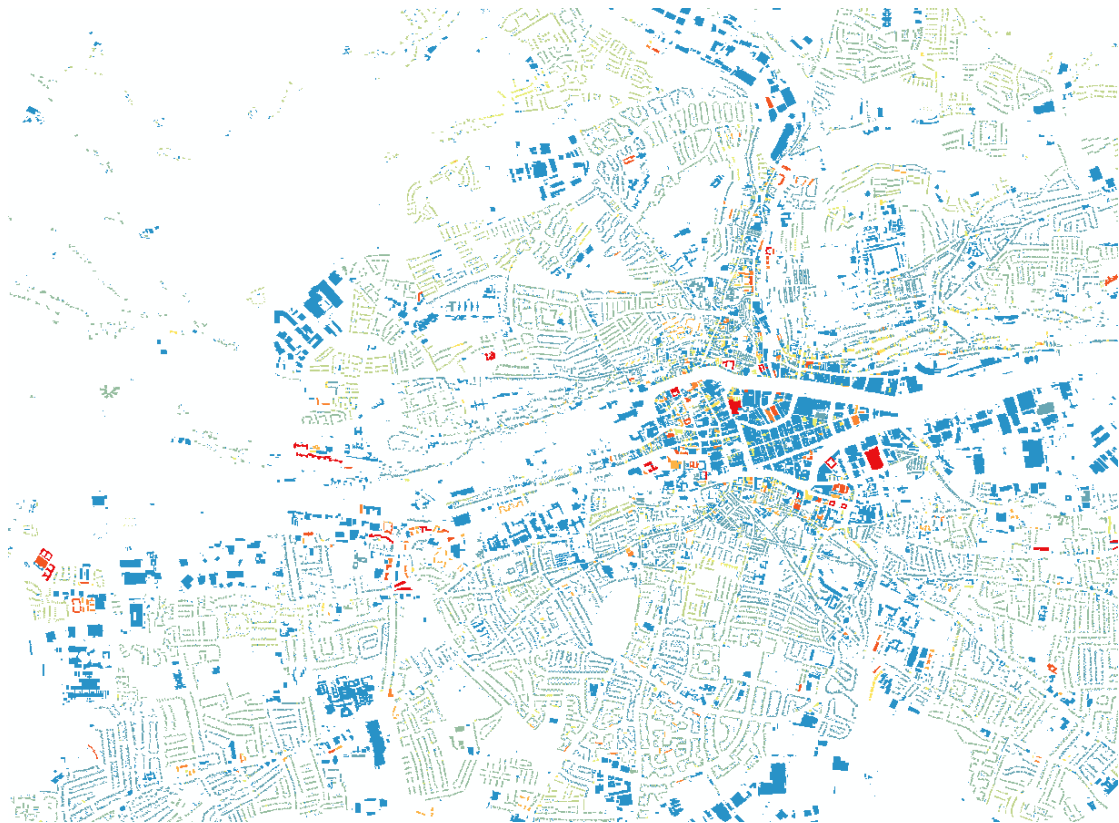


Figure 10.10: Cork Agglomeration plus 2km buffer = 121,500 buildings
sum RESIDENTS = 190,938
sum RESIDENTIAL_DELIVERY_POINTS = 81,913

10.5 Noise Grid Processing

The grids of noise assessment results delivered from the noise mapping software may have a number of aspects which require attention prior to the processing of the various stages of statistical analysis.

Noise results grids may contain:

- Empty grid points or default data values for grid points located inside buildings where an assessment of noise level is not considered appropriate;
- Default data values for grid points located outside the boundary of the area to be mapped; and
- Result values to more than two decimal places.

To prepare the grids of noise results, it is recommended that the results files are verified, and relevant pre-processing undertaken:

- Interpolation of grid values to assign indicated noise levels to points with blank or default values to produce a “seamless” results grid;
- Rounding of the results to two decimal places; and
- Masking of the seamless results grids to the extent of the area to be mapped.

These processed noise results grid files may then be used for the following:

- Production of 5dB noise contour bands for graphical mapping of results; and
- Production of reclassified grids into a set of 5dB categories.
 - The reclassified grids are produced by assigning each point to a classification based upon the 5dB band in which the noise level resides.

The 5dB bands are:

- L_{den} <55, 55 – 59, 60 – 64, 65 – 69, 70 – 74, ≥ 75
- L_{night} <50, 50 – 54, 55 – 59, 60 – 64, 65 – 69, ≥ 70

Note: all class boundaries are .00, i.e. 55-59 is actually 55.00 to 59.99. This is in line with the approach of a number of the commercial noise mapping software packages. This may require the use of a database program such as MS Access, MS SQL or MySQL where class boundaries can be programmed. The default behaviour in MS Excel should not be used for this analysis as it rounds at .49 and .50, however the ROUNDDOWN function may be used to apply the class boundaries.

10.6 Area Analysis

The EC recommended reporting mechanism, ENDRM 2012 DF8, requires information on the total area, inside and outside agglomerations, (in km²) exposed to L_{den} higher than 55, 65 and 75dB for major roads, major railways and major airports.

The reclassified grid files may be used to calculate these areas as each 10m interval grid point is at the centre of an area 10m by 10m, therefore each grid point represents 100 m². This approach avoids the secondary processing required to produce equal noise level contours based upon an interpolation between the grid points, and therefore avoid introducing any further uncertainty into the results.

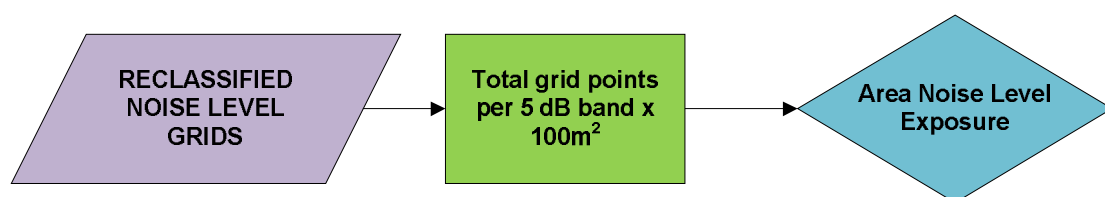


Figure 10.11: Summary of area analysis

10.7 Façade Noise Levels

For the assessment of exposed dwellings and people living in dwellings it is necessary to have façade noise levels around the perimeter of the buildings which contain dwellings.

Façade noise level calculations

The PRIME2 building polygon dataset developed above may have been used within the Predictor noise calculation software, and façade receiver points automatically generated around building_use R and B polygons.

Where noise level calculations have been carried out for façade receptors around buildings, they should be used as the source dataset for noise exposure for each building.

If the façade receptor points are at a distance of 0.1m from the building façade (as recommended by WG-AEN GPG v2) then the building polygon may be buffered by 0.2m and a spatial search undertaken inside the resulting polygon to find the highest and lowest noise level figures from the calculation point. These highest and lowest noise levels may then be assigned to the building polygon as attributes.

Grid noise level calculations

Where only 10m grids of noise levels have been calculated, or where buildings were absent from the noise assessment model but are available within the OSi PRIME2 data, it will be necessary to generate building façade receptor locations, and assign noise levels to these points based upon interpolation from the grid of noise levels.

The façade receptor point should be created on the external building facades in the following manner:

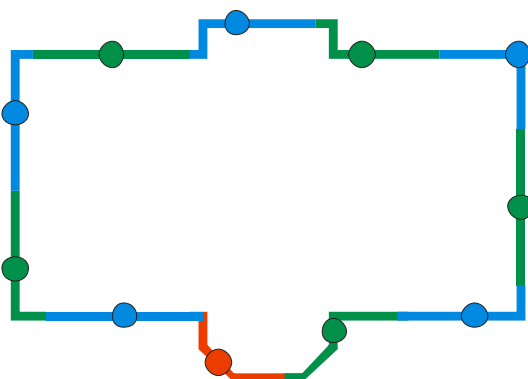


Figure 10.12: Assignment of receptor points to building facades

- a) Façades are split up every 5 m from start position on with a receiver position placed at half distance (blue/green).
- b) The remaining section gets its receiver point in its middle (red).

Note: there are other means of generating façade receptor points which may be acceptable. This approach is presented one being straightforward to implement in GIS. It is discussed in detail within Chapter 8 of the DG JRC CNOSSOS-EU Reference Report³

At each façade receptor point the noise level should be determined by interpolation from the 10m grid noise levels nearby. The highest and lowest noise

³ http://publications.jrc.ec.europa.eu/repository/bitstream/JRC72550/cnossos-eu%20jrc%20reference%20report_final_on%20line%20version_10%20august%202012.pdf
[Accessed September 2017]

levels for each building polygon may then be identified and assigned to the building polygon as attributes.

10.8 Assessment of Noise Level Exposure

The total number of features within dataset “RESIDENTIAL_DELIVERY_POINTS” per noise level band then be calculated using the highest noise level per building to determine the total number of dwellings within each noise level band.

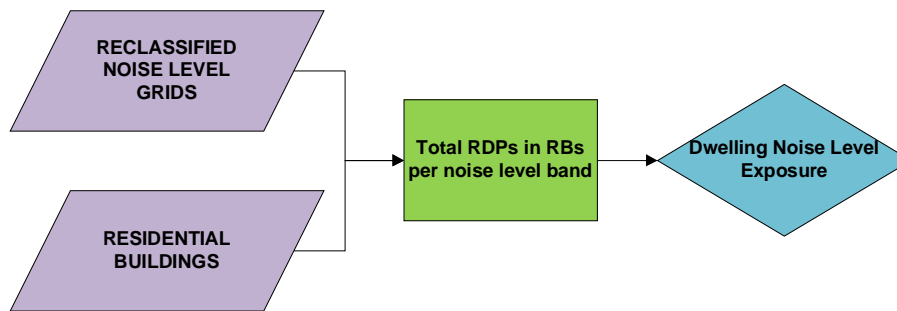


Figure 10.13: Summary of dwelling analysis

The RESIDENTS = 0 (zero) buildings can then be filtered out of the dataset, and the total number of persons per building summed per noise level band, using the highest noise level per building, to determine the total number of people exposed within each noise level band.

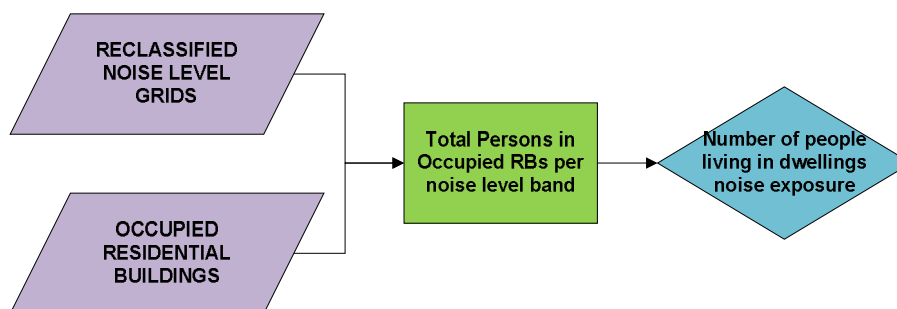


Figure 10.14: Summary of persons in dwellings analysis

The 5dB bands to be used are:

- L_{den} <55, 55 – 59, 60 – 64, 65 – 69, 70 – 74, ≥ 75
- L_{night} <50, 50 – 54, 55 – 59, 60 – 64, 65 – 69, ≥ 70

Note: all class boundaries are .00, i.e. 55-59 is actually 55.00 to 59.99. This is in line with the approach of a number of the commercial noise mapping software packages. This may require the use of a database program such as MS Access, MS SQL or MySQL where class boundaries can be programmed. The default behaviour in MS Excel should not be used for this analysis as it rounds at .49 and .50, however the ROUNDDOWN function may be used to apply the class boundaries.