Preliminary data processing\_update\_05302023

1. Precisions and limit of detection

*Precision and limit of detection vary as a function of aggregation time, so we provide 3 different estimates for 3 different aggregations:* ***1 second*** *(a single data point),* ***8 seconds*** *(approximately the duration of* ***a single road segment*** *visit or pass), and 170 seconds (approximately the total number of 1 second samples for a segment with 20 passes). So depending on which data set you are using (final aggregated map, 1 second data, or something in between) you can decide which is the relevant precision or limit of detection value. (Ref-email-16 Feb)*

*Table

Description automatically generated*

1. METHODS OF DEALING WITH VALUES BELOW THE LIMIT OF DETECTION USING SAS

“*These concentrations are said to be below the limit of detection (LOD). In statistical analyses, these values are often censored and substituted with a constant value, such as half the LOD, the LOD divided by the square root of 2, or zero.”*

<https://cfpub.epa.gov/si/si_public_record_report.cfm?Lab=NERL&dirEntryId=64046#:~:text=These%20concentrations%20are%20said%20to,root%20of%202%2C%20or%20zero>.

*“At the analysis stage (post-aggregation), a common (and simple) approach is to fix all values below the detection limit (LOD) to LOD/sqrt(2) or to zero. There are more complex methods as well that may, in theory, produce a more realistic distribution of values - here is*[*one example*](http://analytics.ncsu.edu/sesug/2003/SD08-Croghan.pdf)*from scientists at the US EPA.” (Ref-email-23 Feb)*

1. Negative values-NO or NO2 sensor

*“a result of the uncertainty limits of the sensor”*

*“ My recommendation on how to handle the negative values will depend somewhat on the use case. In general, my advice is to leave the negative values in the raw data and do not exclude them prior to performing any spatial or temporal aggregation. The aggregation should reduce the number of negative values because the random error (i.e. precision error) is reduced through aggregation (measurements biased high cancel out measurements biased low). (Ref-email-23 Feb)*

1. a. Conversion factors between ppb and ug/m3 for O3, NO2, CO.

*Table

Description automatically generated*

*Notes: Employ the EC conversion factors.*

b. CO2 levels in the atmosphere:

<https://gml.noaa.gov/obop/mlo/programs/esrl/co2/co2.html#:~:text=Carbon%20Dioxide%20(CO2)%20is,per%20mol%20of%20dry%20air>).

<https://climate.nasa.gov/vital-signs/carbon-dioxide/>

1. Detection of outliers, central-tendency metric, et.
2. Data analysis
3. How do pollutant levels vary over time (Time series (day to day)? Weekday variation? Diurnal variation, month/seasonal variation)?
4. Spatial trends?
5. Particle count?
6. Correlation of measured pollutants (particles, gas pollutants)?
7. Potential sources (temporal or spatial)?
8. ICC for each road segment
9. *AirView\_DublinCity\_Measurements\_Metadata (*[*https://data.smartdublin.ie/dataset/google-airview-data-dublin-city/resource/ea9ad286-3267-477a-96b1-70b4b2965a9e*](https://data.smartdublin.ie/dataset/google-airview-data-dublin-city/resource/ea9ad286-3267-477a-96b1-70b4b2965a9e)*)*

gps\_timestamp GPS Timestamp in UTC

latitude GPS position

longitude GPS position

NO\_ugm3 NO concentration in µg/m3

NO2\_ugm3 NO2 concentration in µg/m3

O3\_ugm3 O3 concentration in µg/m3

CO\_mgm3 CO concentration in mg/m3

CO2\_mgm3 CO2 concentration in mg/m3

PMch1\_perL PM channel 1 measurement in counts per litre

PMch2\_perL PM channel 2 measurement in counts per litre

PMch3\_perL PM channel 3 measurement in counts per litre

PMch4\_perL PM channel 4 measurement in counts per litre

PMch5\_perL PM channel 5 measurement in counts per litre

PMch6\_perL PM channel 6 measurement in counts per litre

PM25\_ugm3 PM2.5 concentration in µg/m3

1. *Request for additional context on the data provided*
2. Instrumentation (vehicle, speed, air sensing platform ) and data collection
3. Qualitative assurance and quality control procedures
4. Measurement route description
5. *Meteorological parameters at fixed site across the monitoring area in Dublin city*
6. *Methods: Spatial distribution (Dublin postal districts （postcode boundaries, for Dublin only）*

# *Dublin Postcode Boundaries - Shane McGuinness*

1. *Maximum daily 8-h mean*

*(*[*https://www.law.cornell.edu/cfr/text/40/appendix-I\_to\_part\_50#:~:text=For%20a%20concentration%2Dbased%20standard,design%20value%20for%20the%20site*](https://www.law.cornell.edu/cfr/text/40/appendix-I_to_part_50#:~:text=For%20a%20concentration%2Dbased%20standard,design%20value%20for%20the%20site)*.)*

*(*[*https://www3.epa.gov/ttnairs1/airsaqsORIG/conference/AQS2007/Session%20Handouts/Calculating%20Design%20Values%20updated%202007.pdf*](https://www3.epa.gov/ttnairs1/airsaqsORIG/conference/AQS2007/Session%20Handouts/Calculating%20Design%20Values%20updated%202007.pdf)*)*

1. *NO2 (ug/m3) [single pollutant]*

*-Small Area: min (4.97); 5th (4.97); 25th (4.97); Median (10.7), average(21.43)*

*NO2 (ug/m3), 8s Median [Data8sMedian\_20230830r1\_202503.csv]*

*Min. 1st Qu. Median Mean 3rd Qu. Max.*

*4.973 4.973 12.956 23.652 33.651 2120.317*

1. <https://uk-air.defra.gov.uk/air-pollution/faq?question=16>

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2. Air quality modeling for Ireland (2019) *(*[*https://www.epa.ie/publications/research/air/research-270-air-quality-modelling-for-ireland.php*](https://www.epa.ie/publications/research/air/research-270-air-quality-modelling-for-ireland.php)*)*
3. *Postal code area in dublin (*[*https://en.wikipedia.org/wiki/List\_of\_Dublin\_postal\_districts*](https://en.wikipedia.org/wiki/List_of_Dublin_postal_districts)*)*
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8. [*https://doras.dcu.ie/15041/*](https://doras.dcu.ie/15041/)