NACA Western Cape

Ambient Odours: How are they Measured and How do the Results Relate to You

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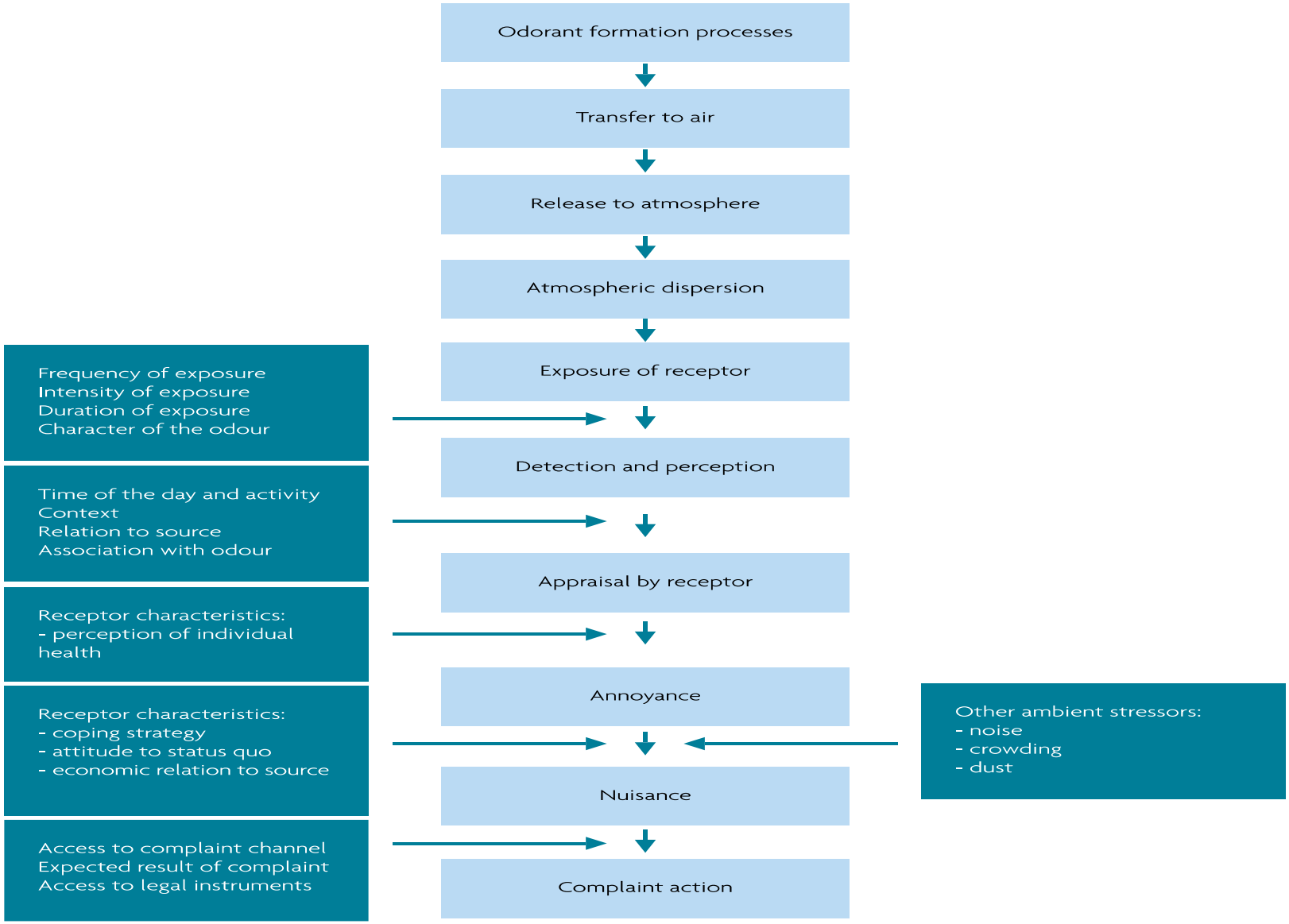
Odours

Mixtures of chemicals that interact to produce what we detect as smell

Frequency	How often an individual is exposed to odour
Intensity	The individual's perception of the strength of the odour
Duration	The overall duration that individuals are exposed to an odour over time.
Odour unpleasantness	Odour unpleasantness describes the character of an odour as it relates to the 'hedonic tone' (which may be pleasant, neutral or unpleasant) at a given odour concentration/intensity. This can be measured in the laboratory as the hedonic tone, and when measured by the standard method and expressed on a standard nine-point scale it is termed the hedonic score.
Location	The type of land use and nature of human activities in the vicinity of an odour source. Tolerance and expectation of the receptor. The 'Location' factor can be considered to encompass the receptor characteristics, receptor sensitivity, and socio-economic factors.

From Source to Complaint (van Harrveld 2005)



Odour Thresholds

Compound	Detection Threshold (ppb)	Threshold (ppb) (Japan)	Recognition (ppb)
Acetaldehyde	67	1.5	210
Ammonia	17	1500	37
Butyric acid	0.5	0.2	1
Dimethyl Amine	340	33	
Dimethyl Sulphide	1	3	1
Dimethyl Disulphide	8	2.2	8
Ethyl Amine	270	46	1700
Ethyl Mercaptan	0.3	< 0.1	1
Hydrogen Sulphide	0.5	0.41	4.7
Indole	0.1	0.3	
Methyl Amine	4700	35	
Methyl Mercaptan	0.5	< 0.1	1
Skatole	1	< 0.1	50
Trimethyl Amine	0.4	< 0.1	

Monitoring: 2 Approaches

- **Compound Analysis**
  - Exposure from Measured Concentration
  - Frequency of detection
  - Duration of detection
- **Sensory**
  - Dynamic Dilution Olfactometry and Modelling
  - Field Olfactometry

Measurement

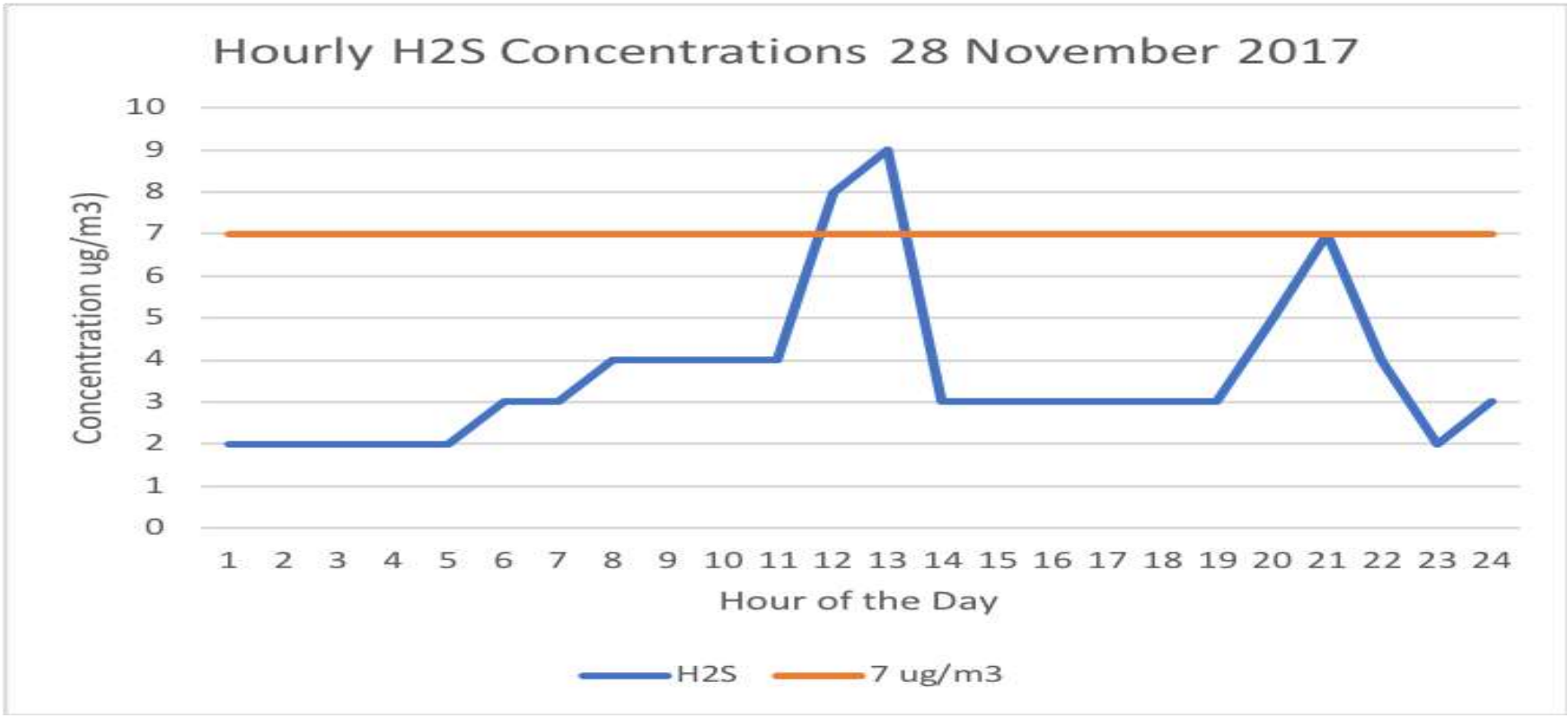
	Detection Threshold (ppb)	Size of Sample to detect 2 ppb (l)	Recognition (ppb)
Hydrogen Sulphide	0.5	0.2	4.7
Methyl Mercaptan	0.1	50	1
Ethyl Mercaptan	0.3	50	1

Hydrogen Sulphide

World Health Organisation (WHO) Air Quality Guidelines: 7 µg/m^3 (5 ppb)
over 30 minutes

- Measurement Techniques
  - UV Fluorescence
  - GC
  - Passive samplers
  - Sensors

UV Fluorescence



Passives

Site	2 Week Average Concentration (ppb)
A	1
B	3
C	5
D	7

Passive Samplers

Site	2 Week Average Concentration (ppb)	Maximum Possible 30 min Concentration (ppb
A	1	8
B	3	26
C	5	44
D	7	61

$C_{tx}/C_{tp} = (tp/tx)^{0.2}$

From day to longer periods:
$C_{period,\ t}/C_{day} = (1/t)^{0.53}$

Beychock M R (2005). Fundamentals of Stack Gas Dispersion

Sensors

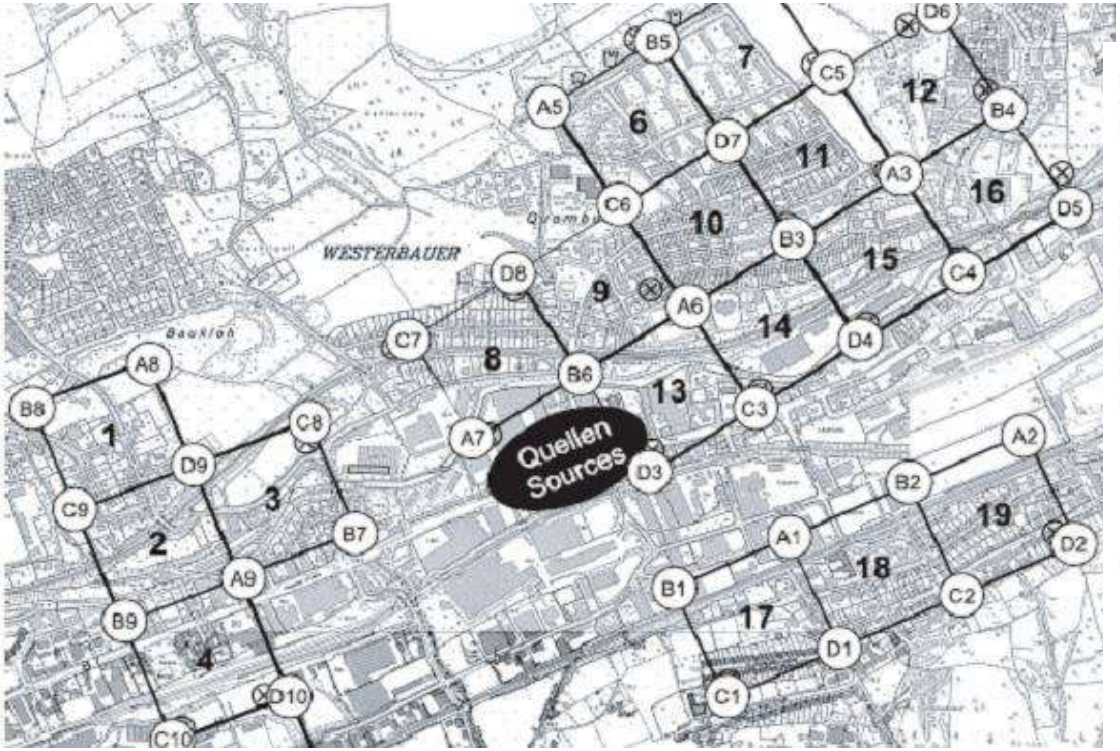
- LDL Determined in the lab
- Responds to RH
- Responds to Temperature
- Responds to other gases (cross interference)

Sensory: Olfactometry

Dynamic Olfactometry (UNE-EN 13725)

- Odour units (OU/m^3)
- High Detection limits
- Odour laboratory
- People as sensors
  - Average sense of smell
  - Calibrated to n-Butanol
- Coupled with Dispersion Modelling

Field Olfactometry (VDI3940)



Data record sheet for grid measurements

Assessor's name: Date:

Measurement point No.:

Start of measurement: End of measurement:

1st minute	2nd minute
3rd minute	4th minute
5th minute	6th minute
7th minute	8th minute
9th minute	10th minute

Characterization of odour qualities

0 – No odour
1 – Facility odour 1
2 – Facility odour 2
3 - .....
4 – Other company (facility) odour *
5 – Miscellaneous odours **
...
...
9 - .....

Remarks:

* "Other company (facility) odours" have to be described in greater detail, e.g. 4^1, 4^2, etc.
** "Miscellaneous odours" have to be described in greater detail, e.g. 5^1 construction site odours, 5^2 barbecue odours, 5^3 painting at home, 5^4 road surface work etc.

Weather data:

Wind force:

no wind	slight	moderate	strong	stormy

Cloud:

none	light	moderate	heavy

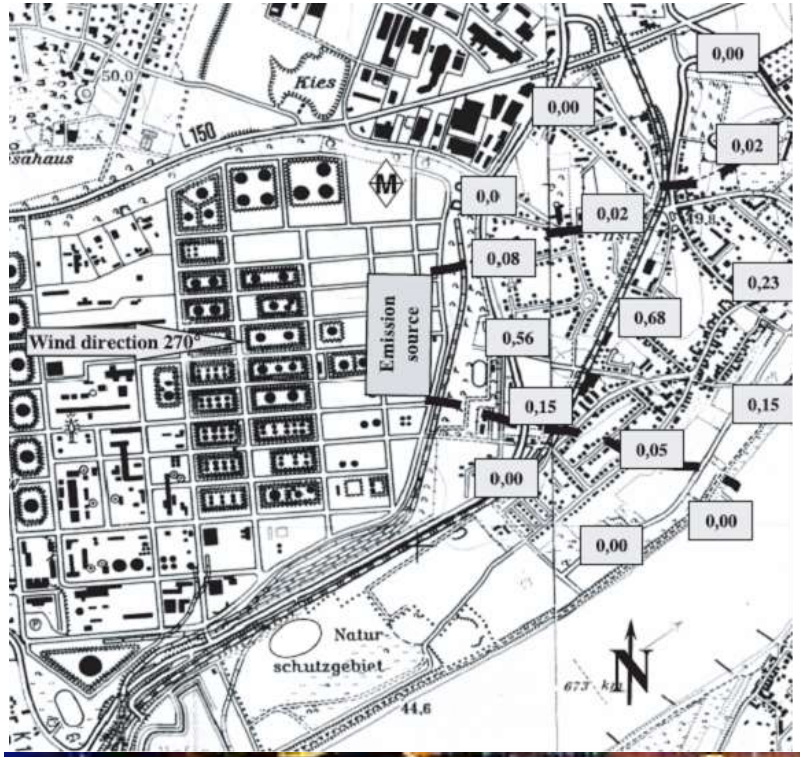
Precipitation:

none	drizzle	rain	snow	mist	other

Wind blowing from:

Field Olfactometry (VDI3940)

Plume Measurement



	Point	A	B	C
	Time			
1st min	0			
	10			
	20			
	30			
	40			
	50			
2nd min	0			
	10			
	20			
	30			
	40			
	50			
3rd min	0			
	10			
	20			
	30			
	40			
	50			
4th min	0			
	10			
	20			
	30			
	40			
	50			
5th min	0			
	10			
	20			
	30			
	40			
	50			

	Point	A	B	C
	Time			
6th min	0			
	10			
	20			
	30			
	40			
	50			
7th min	0			
	10			
	20			
	30			
	40			
	50			
8th min	0			
	10			
	20			
	30			
	40			
	50			
9th min	0			
	10			
	20			
	30			
	40			
	50			
10th min	0			
	10			
	20			
	30			
	40			
	50			

Weather data		
	before the 1st measurement	after the last measurement
Time:		
Wind velocity (in m/s):		
Wind direction (in °):		
Cloud cover (in oktas):		
Air temperature (in °C):		
Relative humidity (in %):		
Precipitation:		
Measuring instruments:		

Scale of intensity:	
6	extremely stron
5	very stron
4	strong
3	distinct
2	weak
1	very weak
0	no odour

Remarks:

What's Next

- Do you want to measure a gas concentration
  - Good for Individual gases
  - Not good for mixtures
  - Expensive to get to a low concentration
- Do you want a measure of the odour
  - Dynamic Olfactometry good at source
  - Field Olfactometry low tech, people on the ground
  - Odour panel can make sensors useful