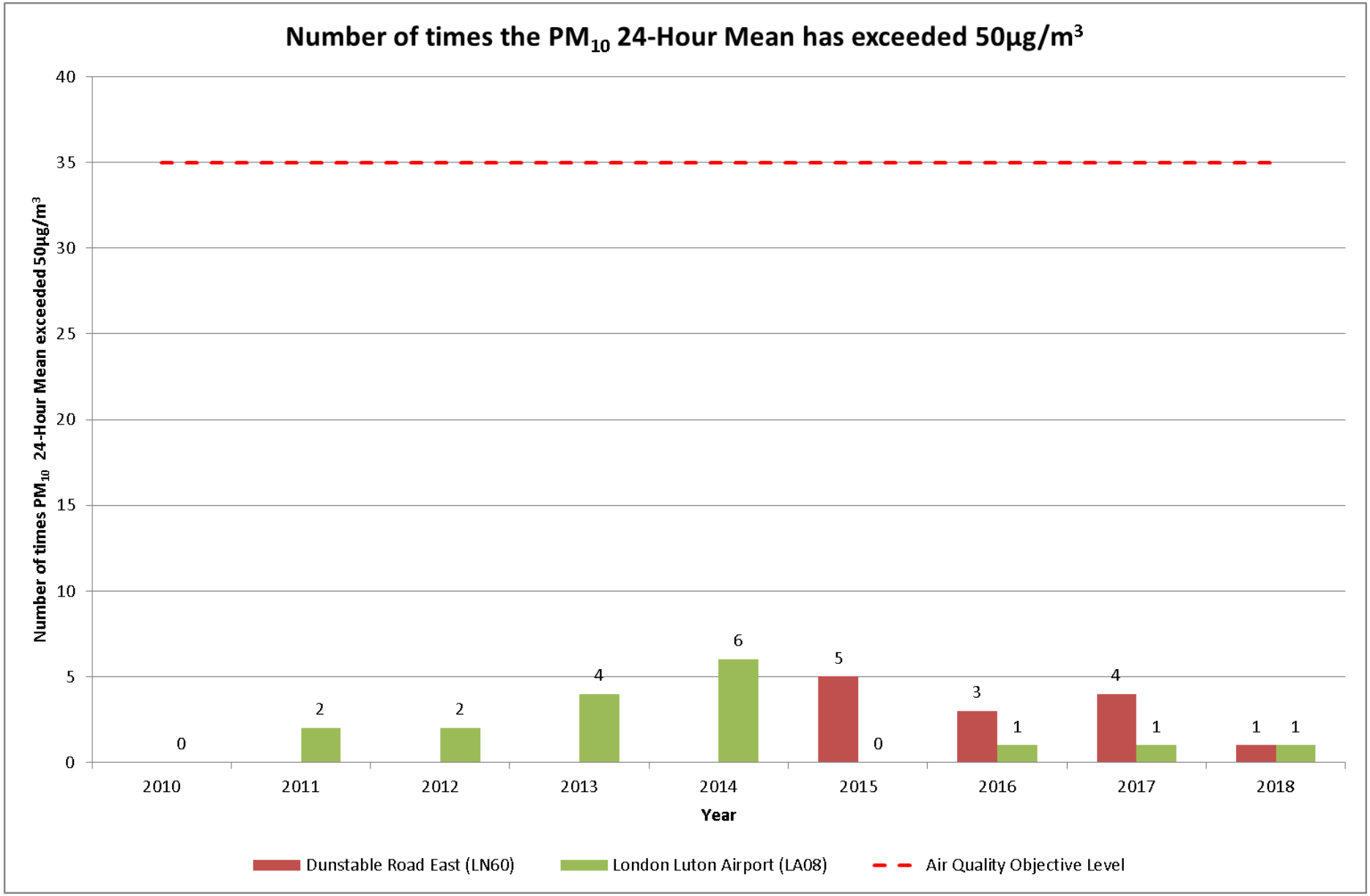
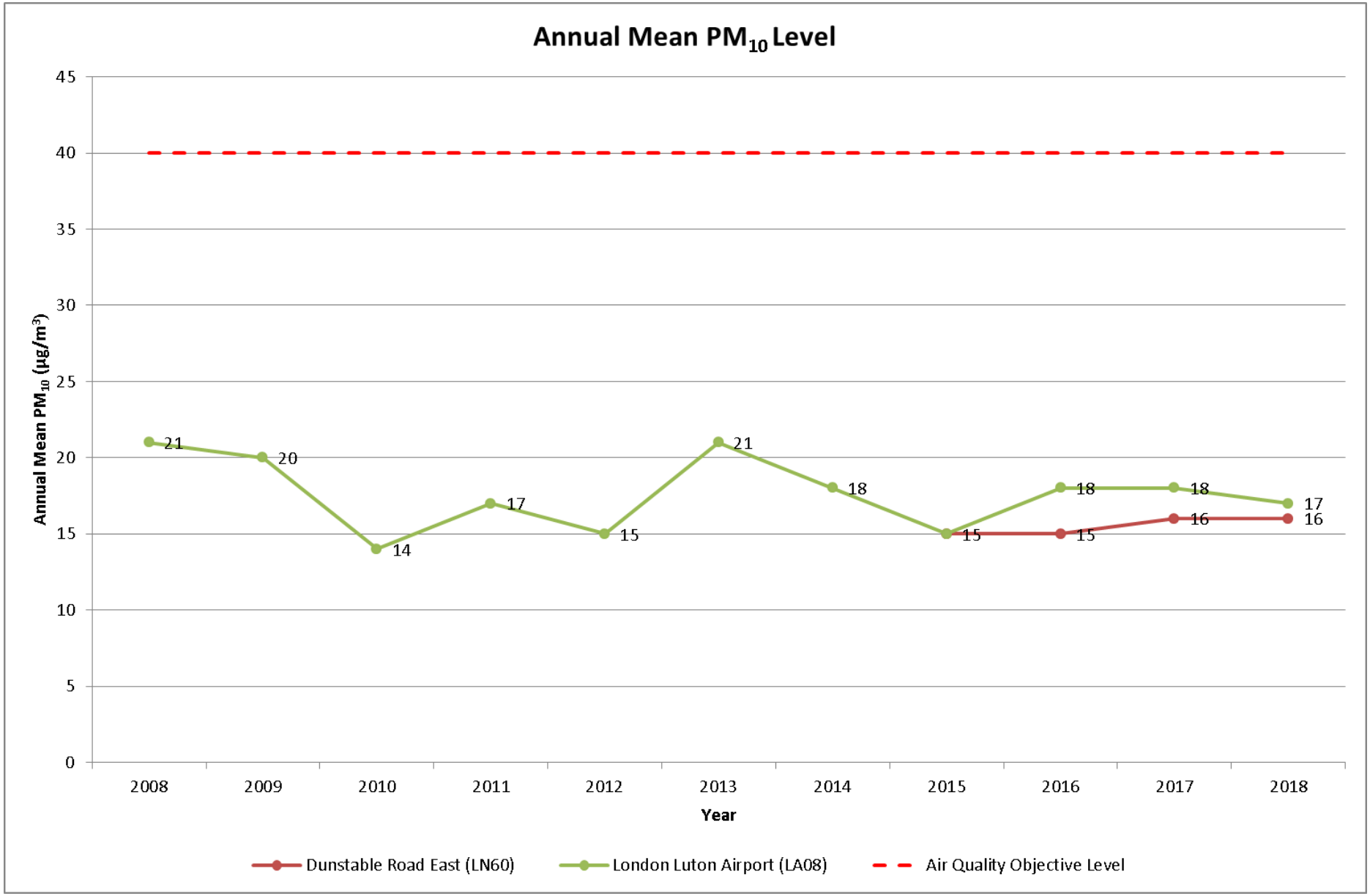
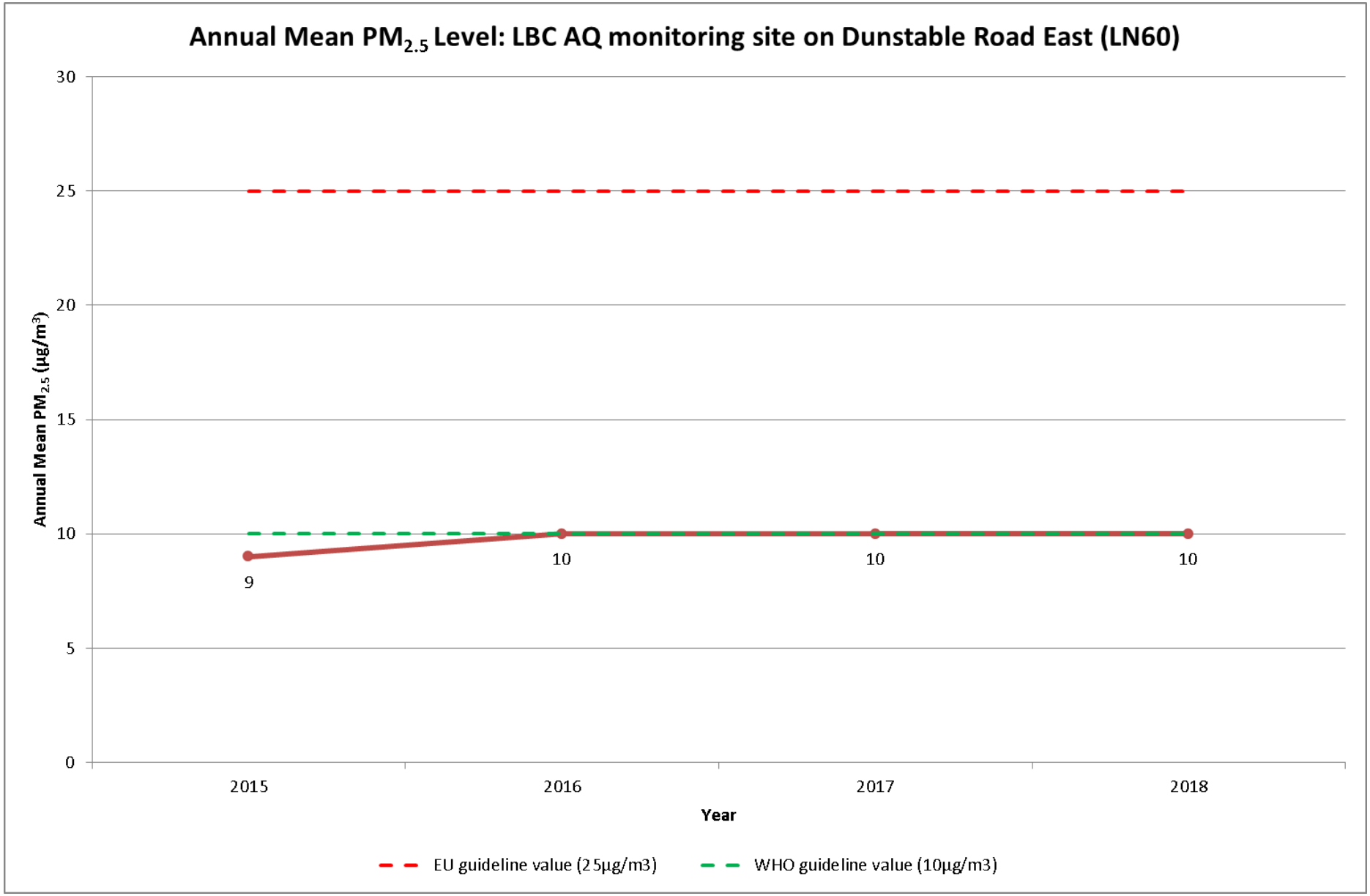
AGENDA ITEM: 9 OVERVIEW OF THE 2019 AIR QUALITY ANNUAL STATUS REPORT

TREND DATA: PM_{10}

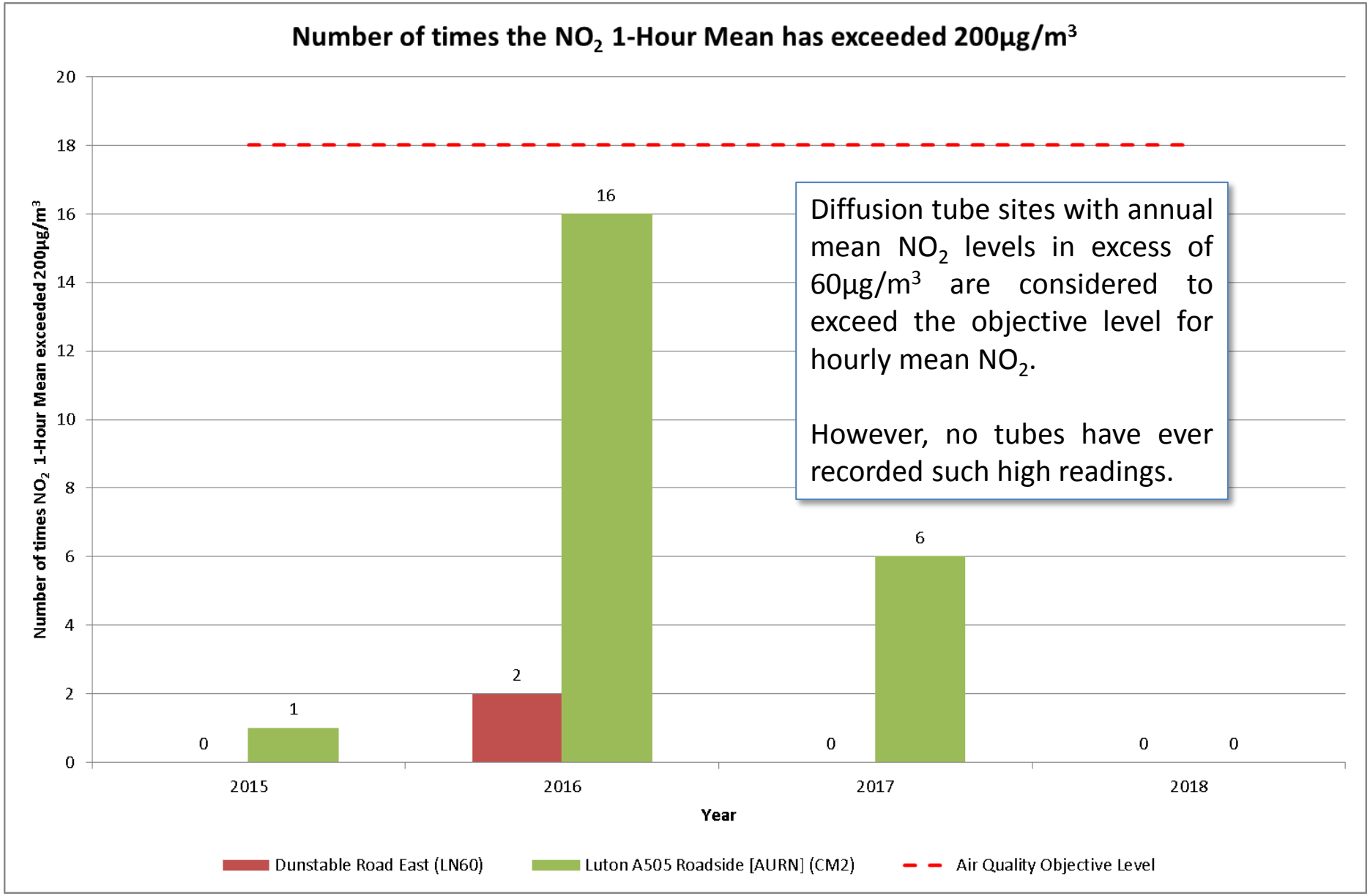

Number of times the PM10 24-Hour Mean has exceeded 50µg/m3
Number of times PM10 24-Hour Mean exceeded 50µg/m3
40
35
30
25
20
15
10
5
0
0
2
2
4
6
5
0
3
1
4
1
1
1
2010
2011
2012
2013
2014
2015
2016
2017
2018
Year
Dunstable Road East (LN60)
London Luton Airport (LA08)
Air Quality Objective Level


Annual Mean PM10 Level
Annual Mean PM10 (µg/m³)
45
40
35
30
25
20
15
10
5
0
21
20
14
17
15
21
18
15
15
15
18
18
16
17
16
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
Year
Dunstable Road East (LN60)
London Luton Airport (LA08)
Air Quality Objective Level

TREND DATA: $PM_{2.5}$

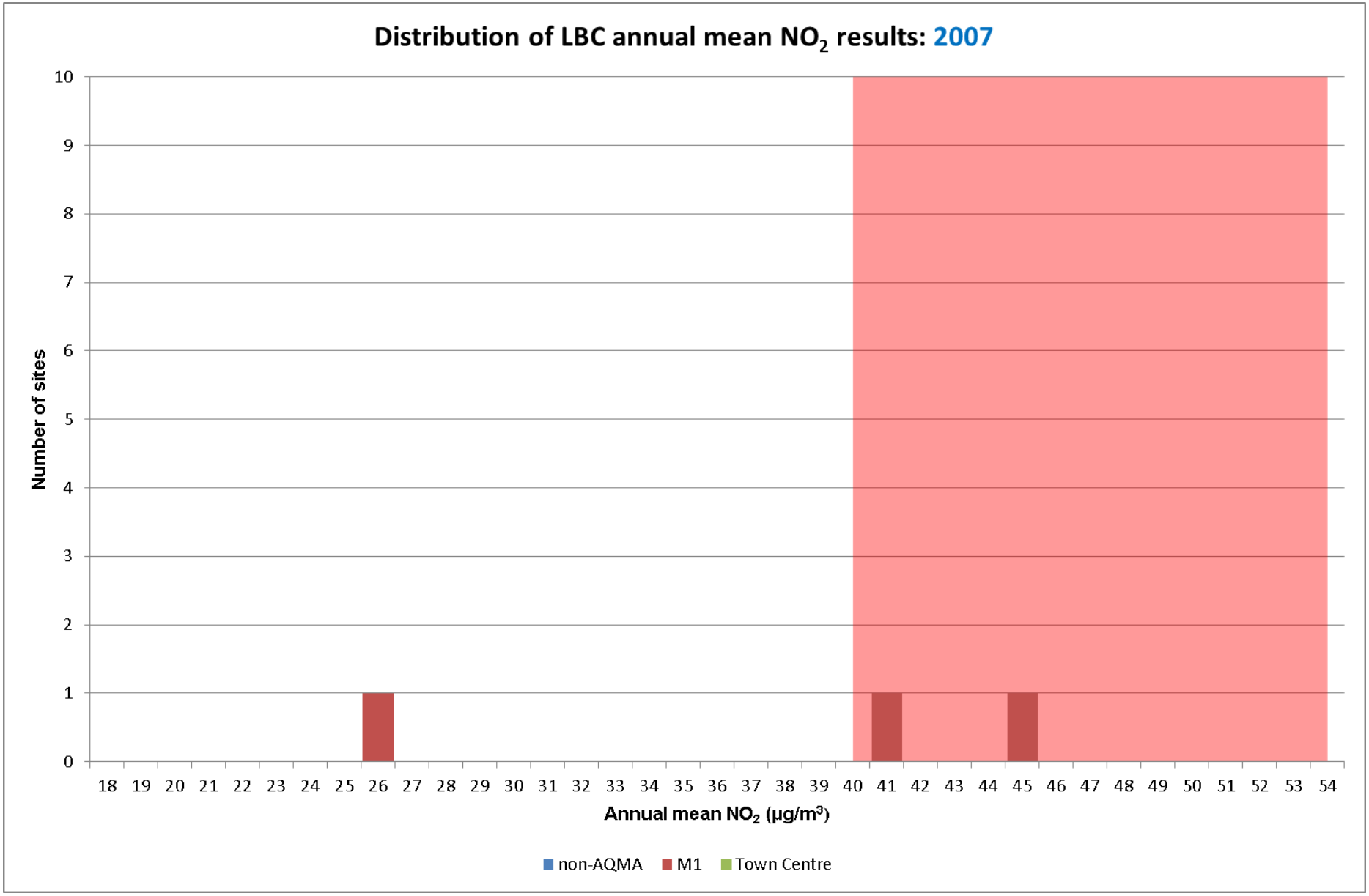

Annual Mean PM2.5 Level: LBC AQ monitoring site on Dunstable Road East (LN60)
Annual Mean PM2.5 (µg/m3)
30
25
20
15
10
5
0
9
10
10
10
2015
2016
2017
2018
Year
EU guideline value (25µg/m3)
WHO guideline value (10µg/m3)

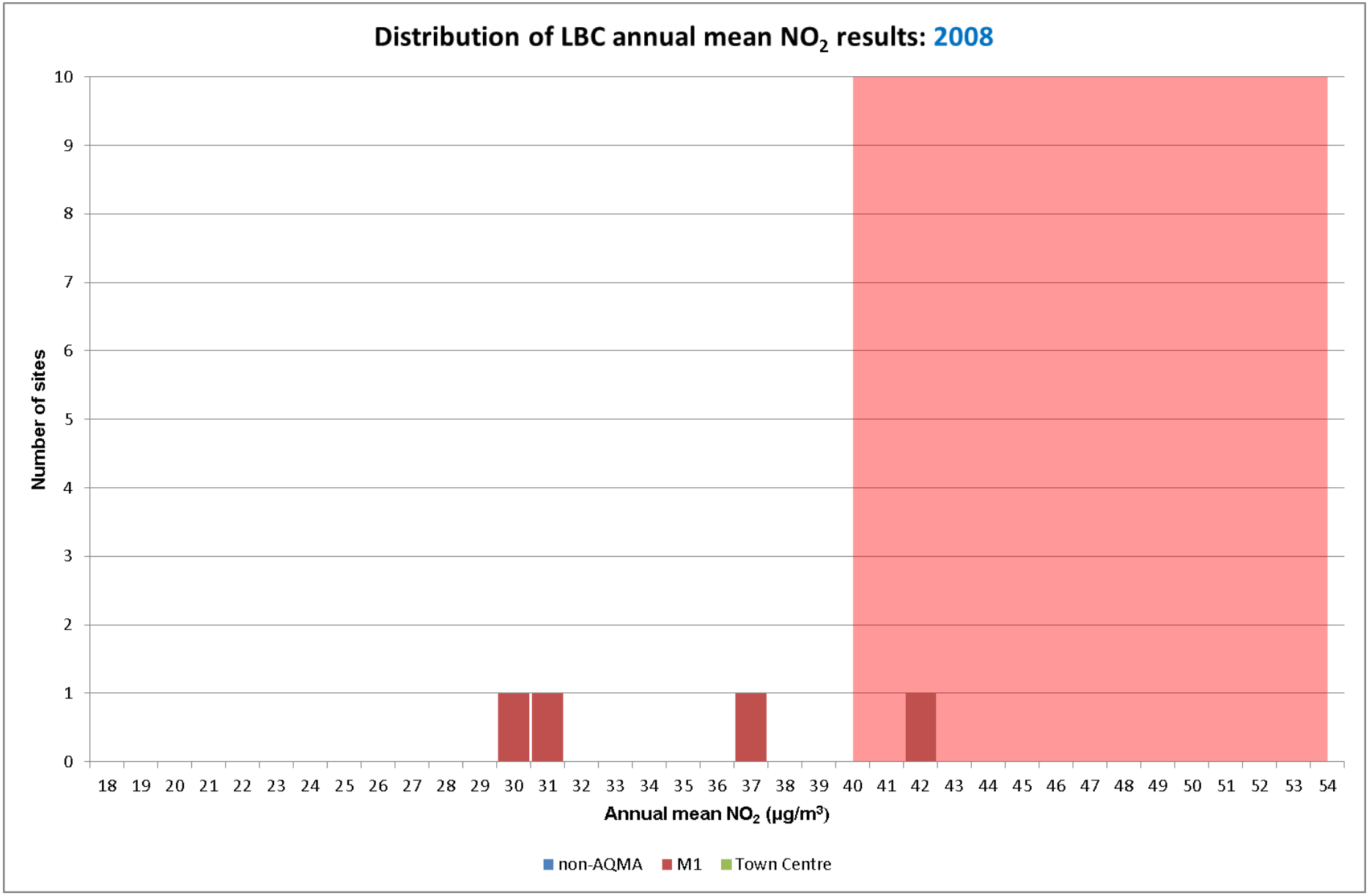
TREND DATA: NO_2

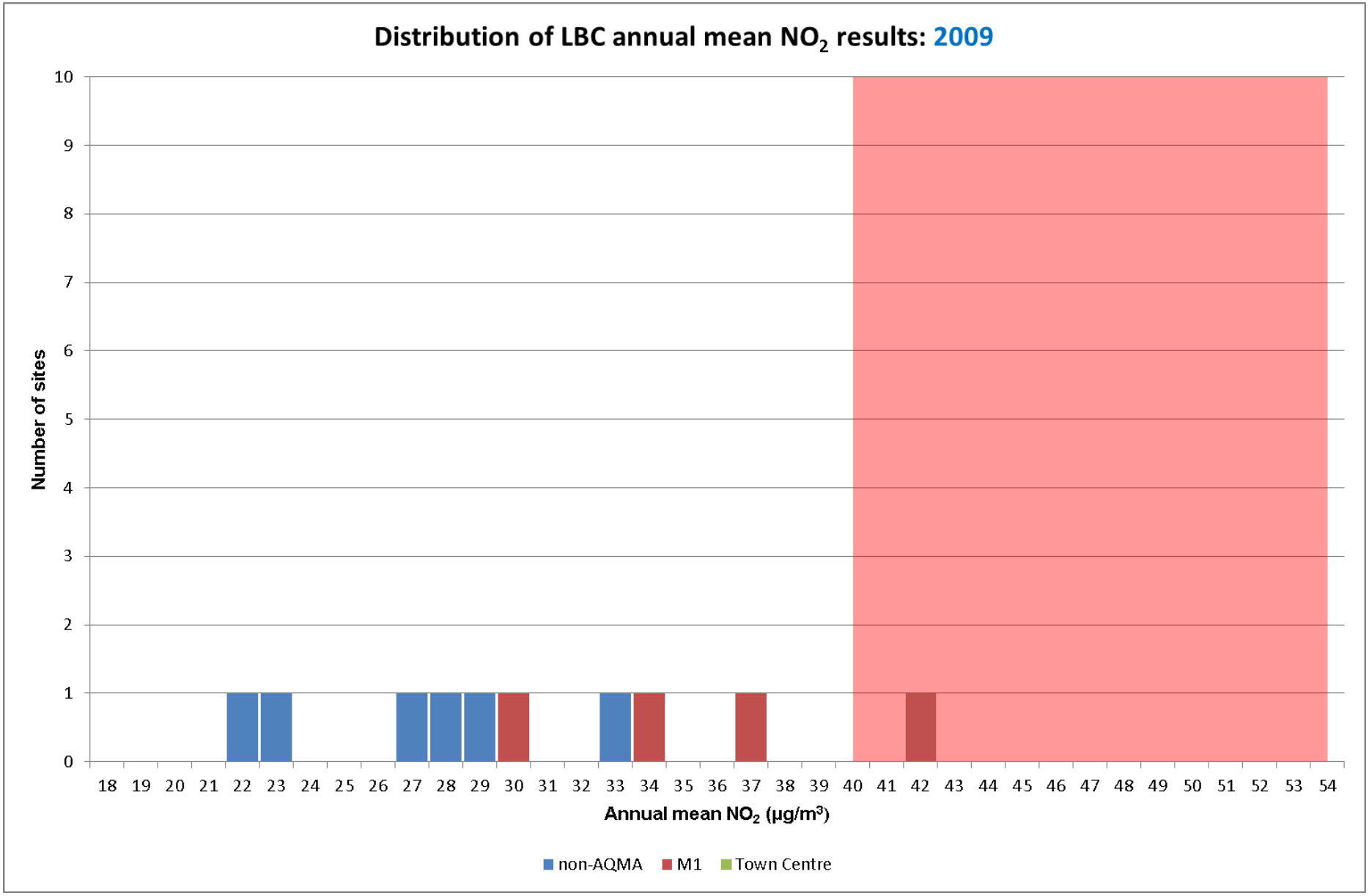


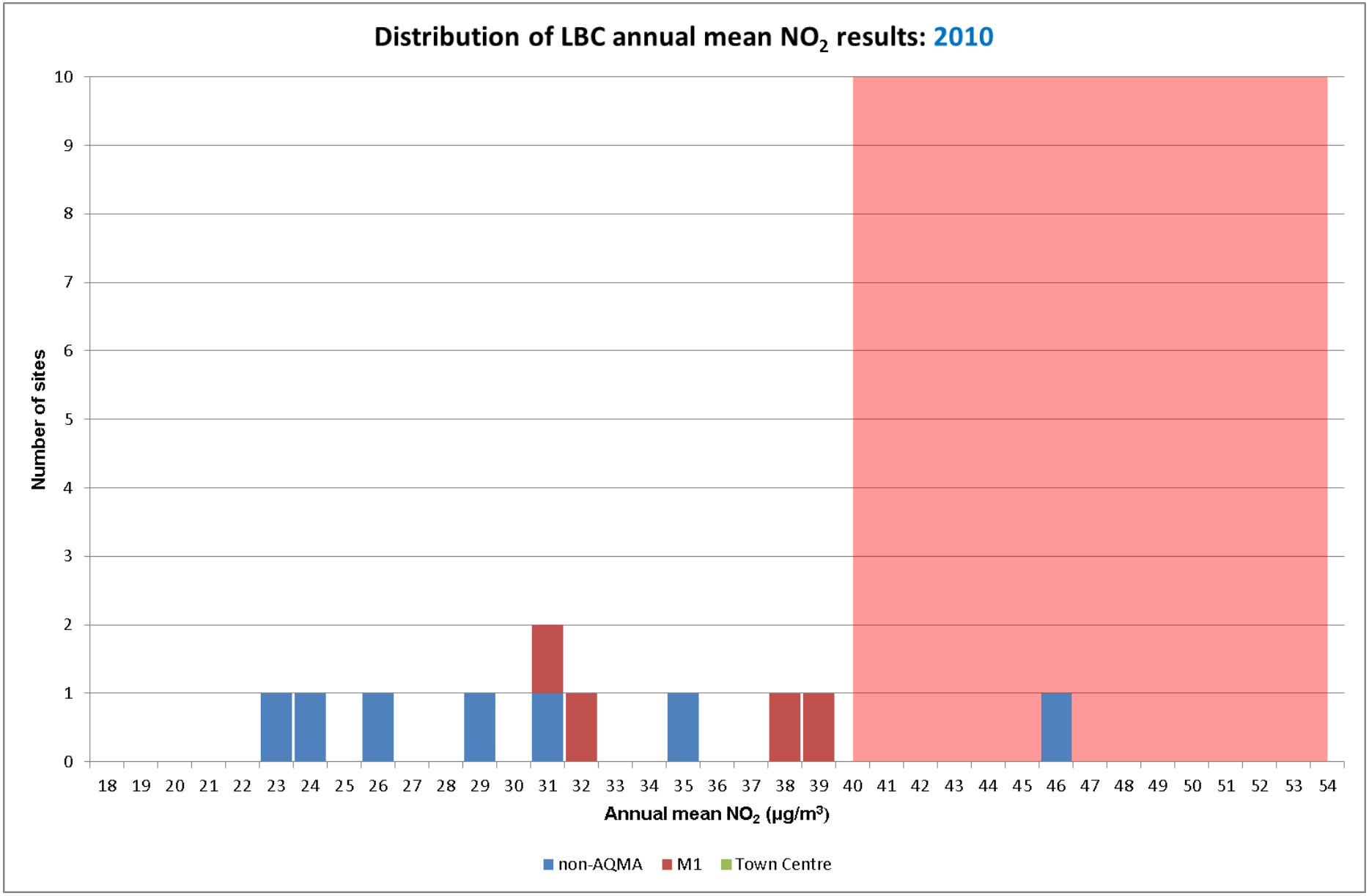
Diffusion tube sites with annual mean NO_2 levels in excess of 60µg/m³ are considered to exceed the objective level for hourly mean NO_2.

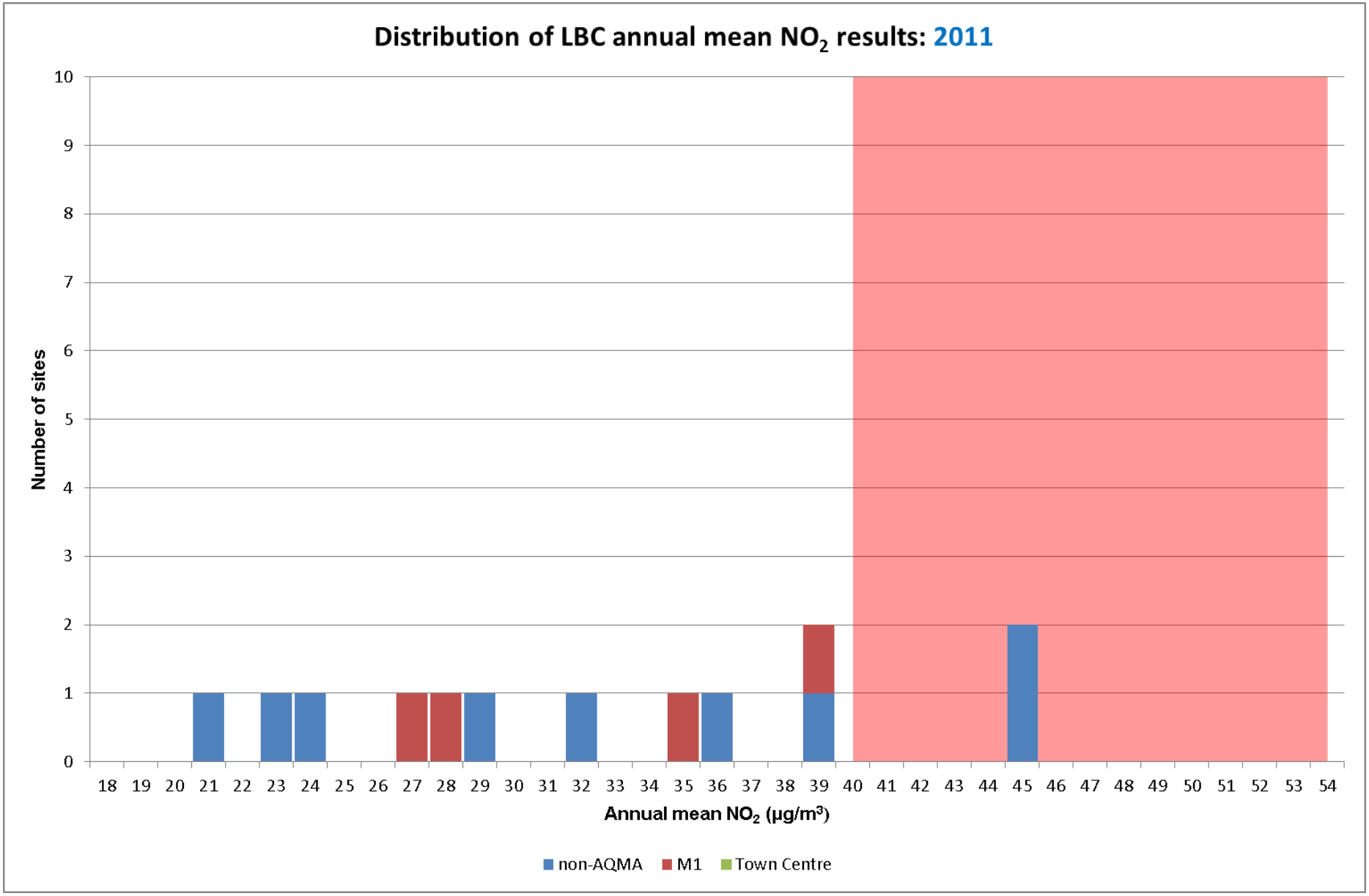
However, no tubes have ever recorded such high readings.

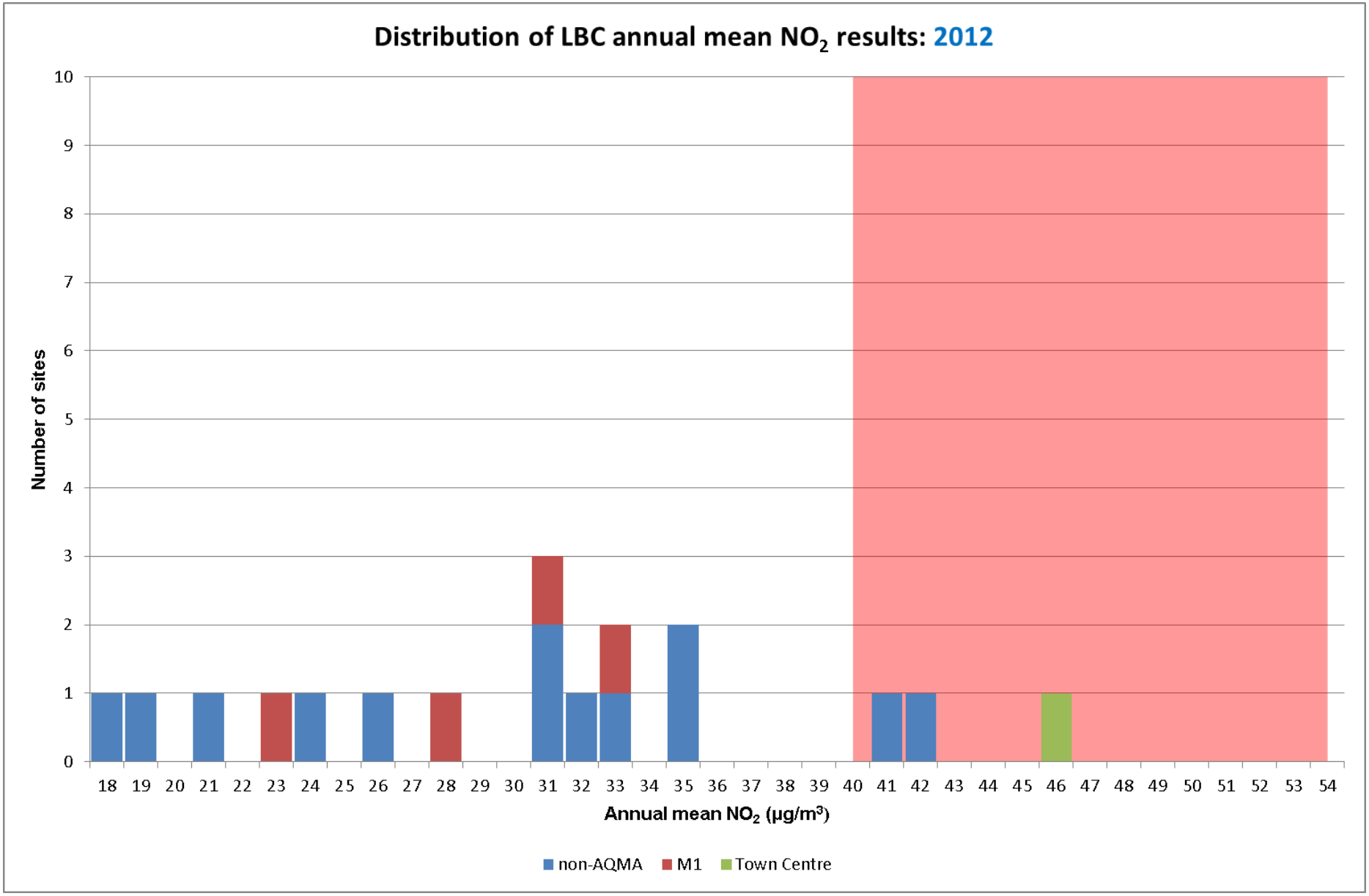

Distribution of LBC annual mean NO2 results: 2007
Number of sites
0
1
2
3
4
5
6
7
8
9
10
18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54
Annual mean NO2 (µg/m3)
non-AQMA
M1
Town Centre

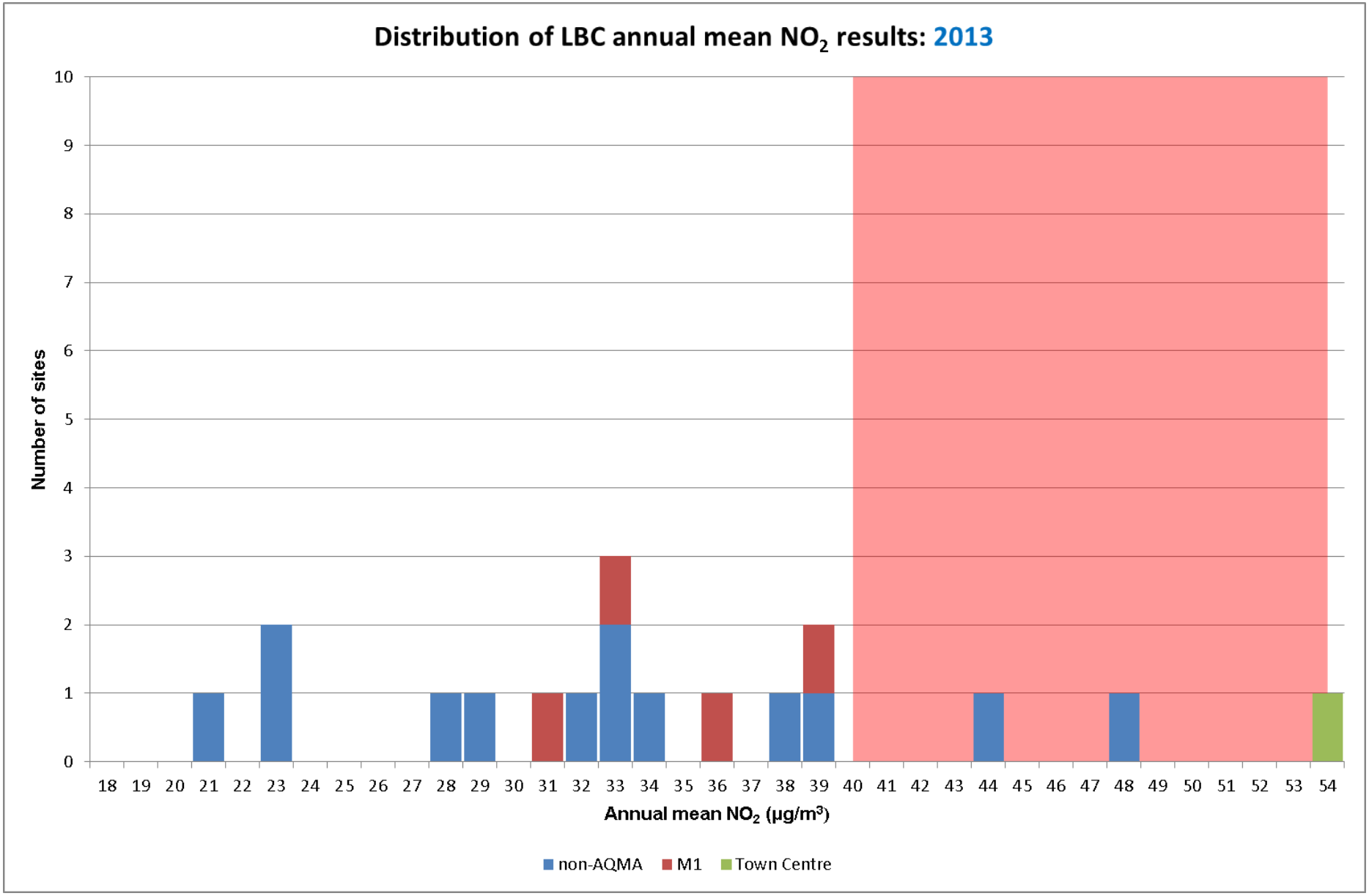

Distribution of LBC annual mean NO2 results: 2008
Number of sites
0
1
2
3
4
5
6
7
8
9
10
18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54
Annual mean NO2 (µg/m3)
non-AQMA
M1
Town Centre

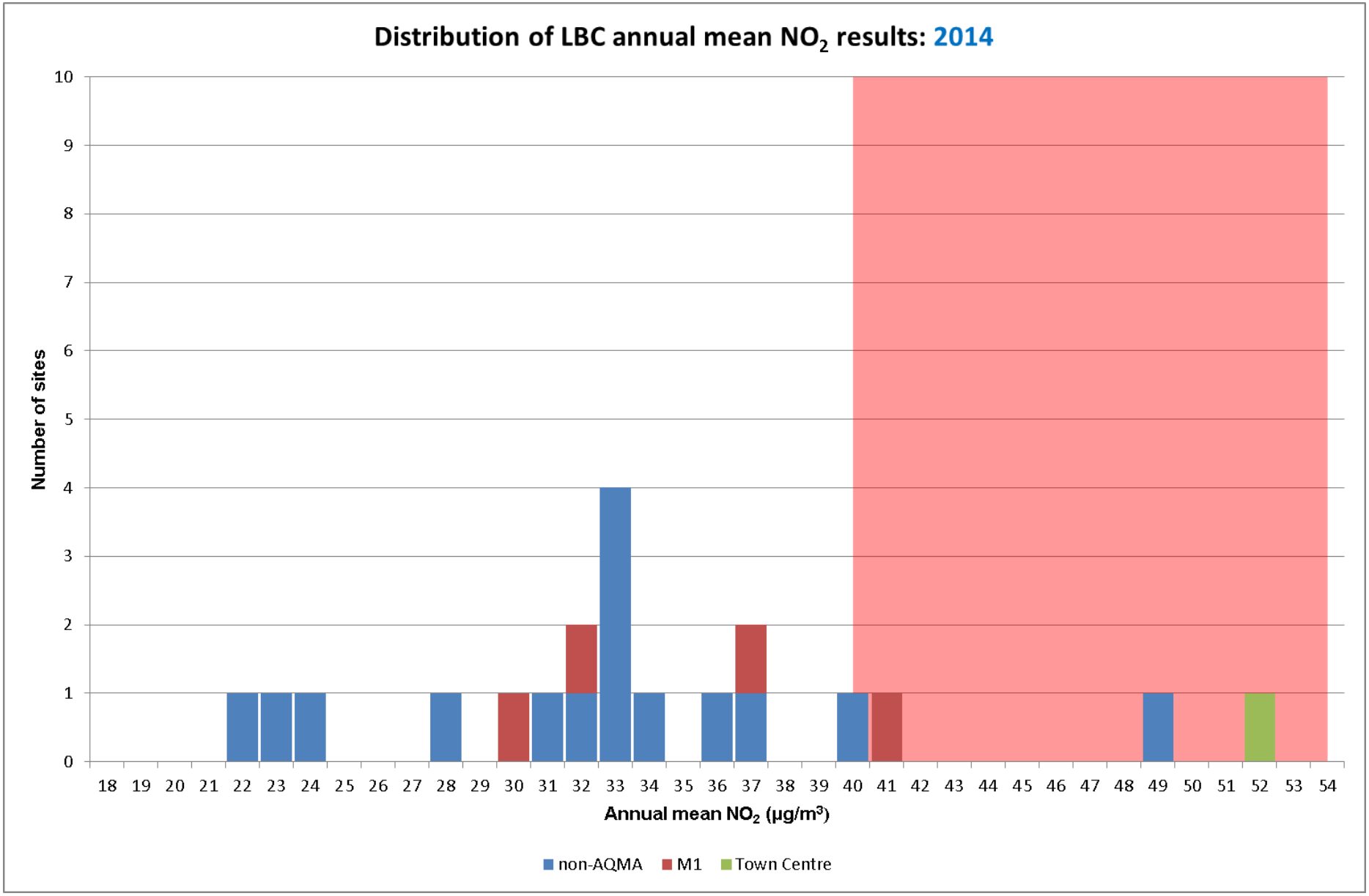

Distribution of LBC annual mean NO2 results: 2009
Number of sites
0
1
2
3
4
5
6
7
8
9
10
18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54
Annual mean NO2 (µg/m3)
non-AQMA
M1
Town Centre

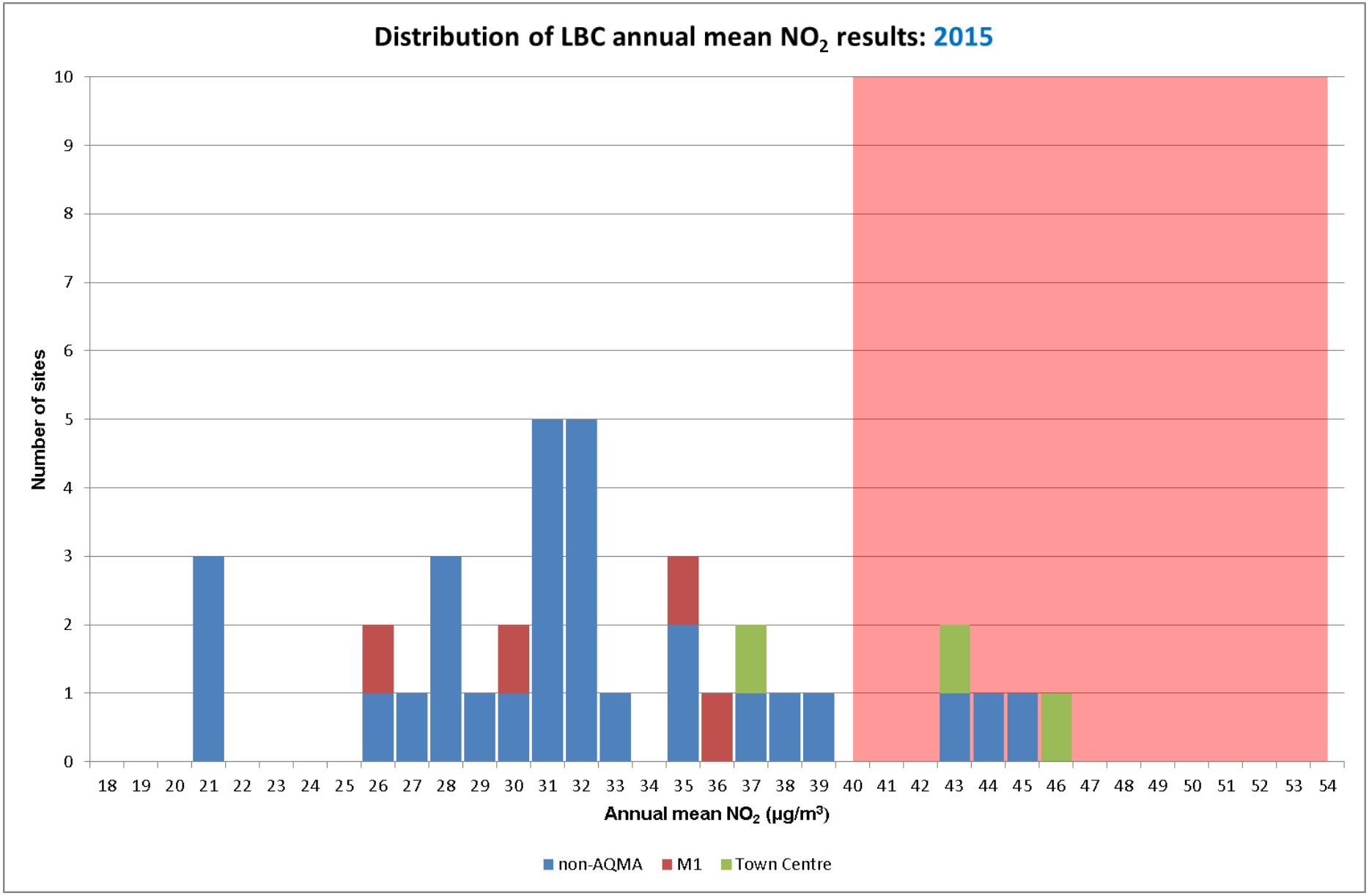

Distribution of LBC annual mean NO2 results: 2010
Number of sites
0
1
2
3
4
5
6
7
8
9
10
18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54
Annual mean NO2 (µg/m3)
non-AQMA
M1
Town Centre

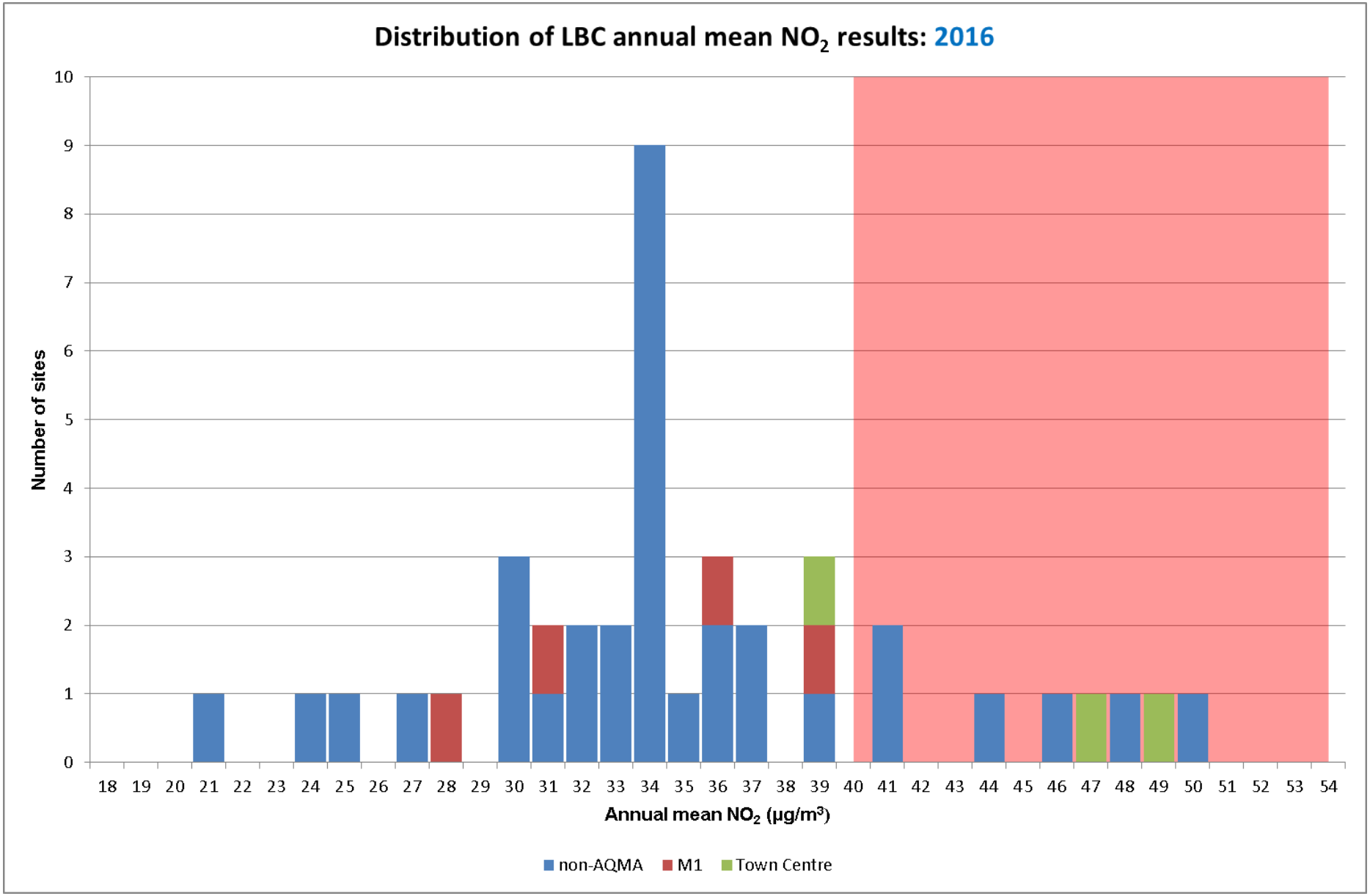

Distribution of LBC annual mean NO2 results: 2011
Number of sites
0
1
2
3
4
5
6
7
8
9
10
18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54
Annual mean NO2 (µg/m3)
non-AQMA
M1
Town Centre

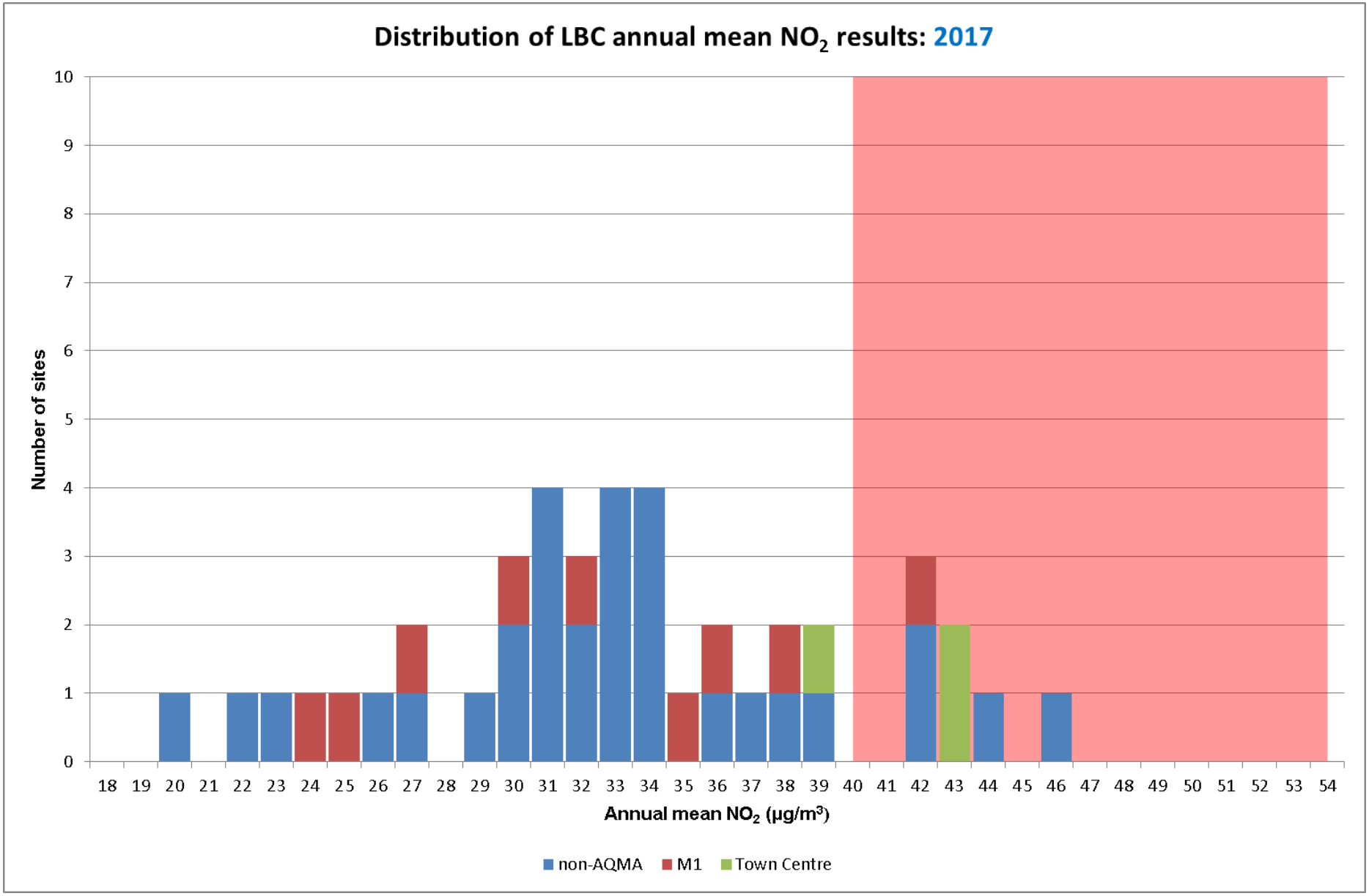

Distribution of LBC annual mean NO2 results: 2012
Number of sites
0
1
2
3
4
5
6
7
8
9
10
18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54
Annual mean NO2 (µg/m3)
non-AQMA
M1
Town Centre

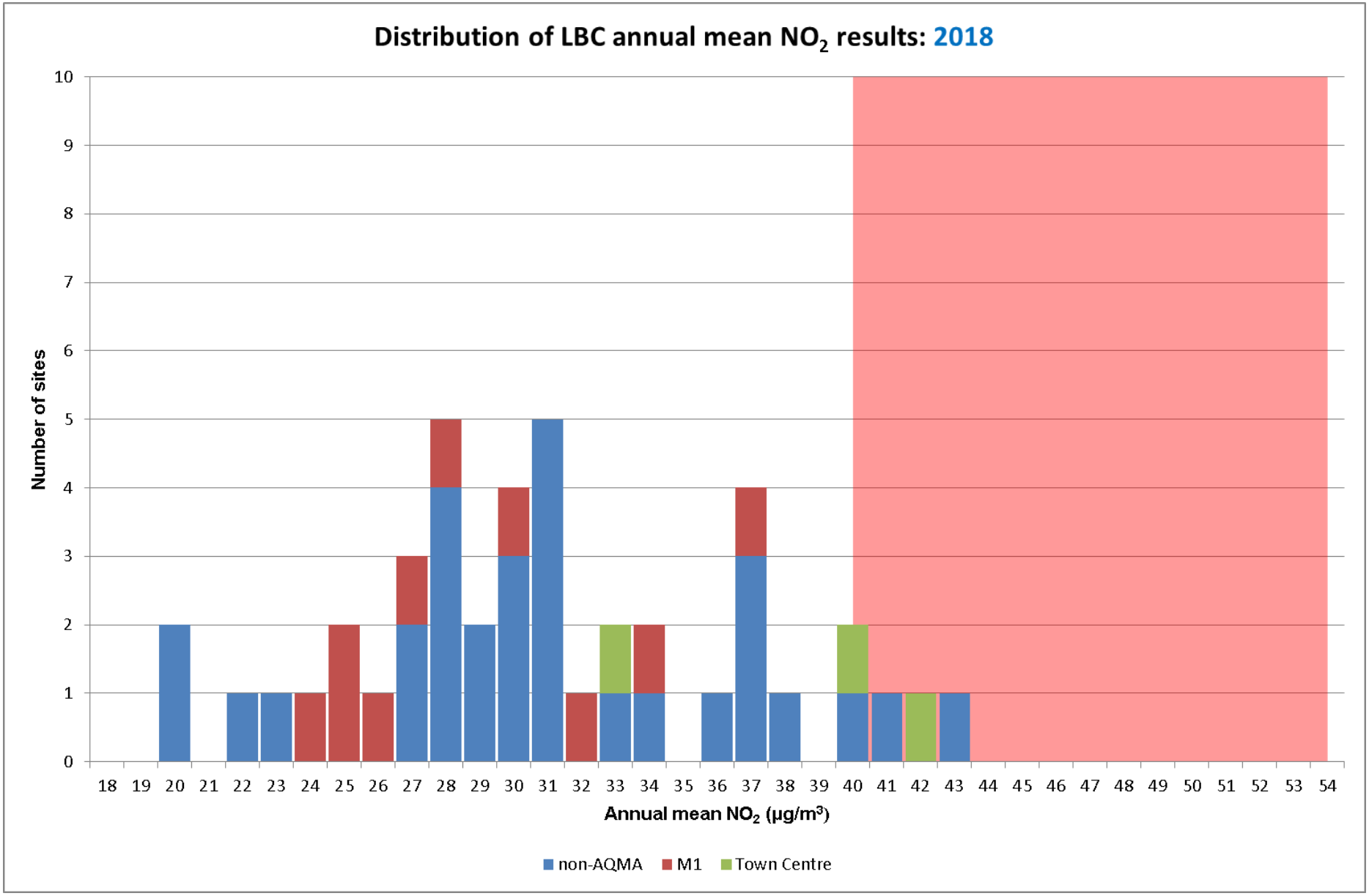

Distribution of LBC annual mean NO2 results: 2013
Number of sites
0
1
2
3
4
5
6
7
8
9
10
18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54
Annual mean NO2 (µg/m3)
non-AQMA
M1
Town Centre

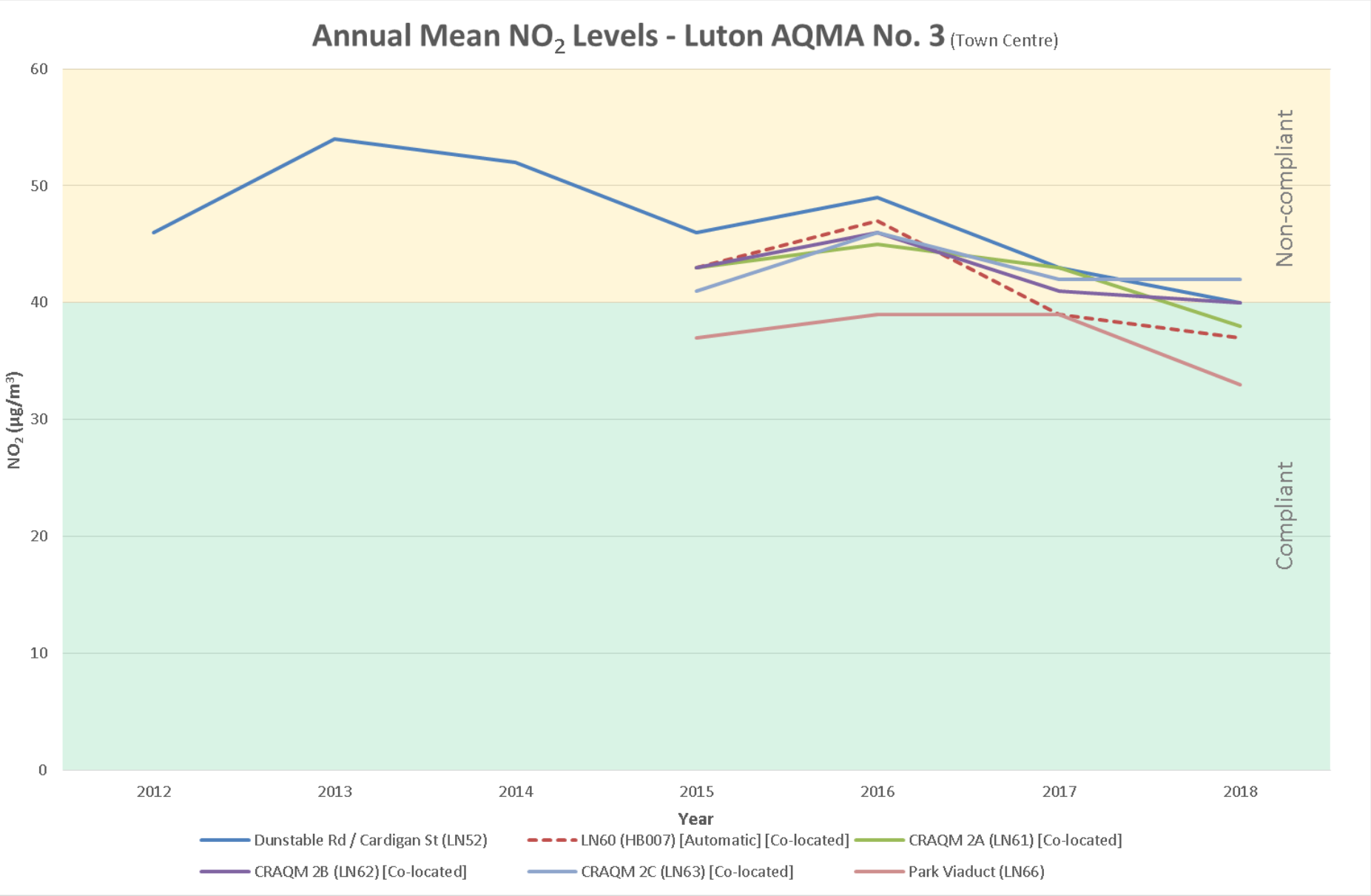

Distribution of LBC annual mean NO2 results: 2014
Number of sites
0
1
2
3
4
5
6
7
8
9
10
18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54
Annual mean NO2 (µg/m3)
non-AQMA
M1
Town Centre


Distribution of LBC annual mean NO2 results: 2015
Number of sites
0
1
2
3
4
5
6
7
8
9
10
18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54
Annual mean NO2 (µg/m3)
non-AQMA
M1
Town Centre


Distribution of LBC annual mean NO2 results: 2016
Number of sites
0
1
2
3
4
5
6
7
8
9
10
18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54
Annual mean NO2 (µg/m3)
non-AQMA
M1
Town Centre


Distribution of LBC annual mean NO2 results: 2017
Number of sites
0
1
2
3
4
5
6
7
8
9
10
18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54
Annual mean NO2 (µg/m3)
non-AQMA
M1
Town Centre


Distribution of LBC annual mean NO2 results: 2018
Number of sites
0
1
2
3
4
5
6
7
8
9
10
18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54
Annual mean NO2 (µg/m3)
non-AQMA
M1
Town Centre


Annual Mean NO2 Levels - Luton AQMA No. 3 (Town Centre)
60
50
40
30
20
10
0
NO2 (µg/m3)
2012
2013
2014
2015
2016
2017
2018
Year
Non-compliant
Compliant
Dunstable Rd / Cardigan St (LN52)
LN60 (HB007) [Automatic] [Co-located]
CRAQM 2A (LN61) [Co-located]
CRAQM 2B (LN62) [Co-located]
CRAQM 2C (LN63) [Co-located]
Park Viaduct (LN66)


LN22 – 1 Mistletoe Hill

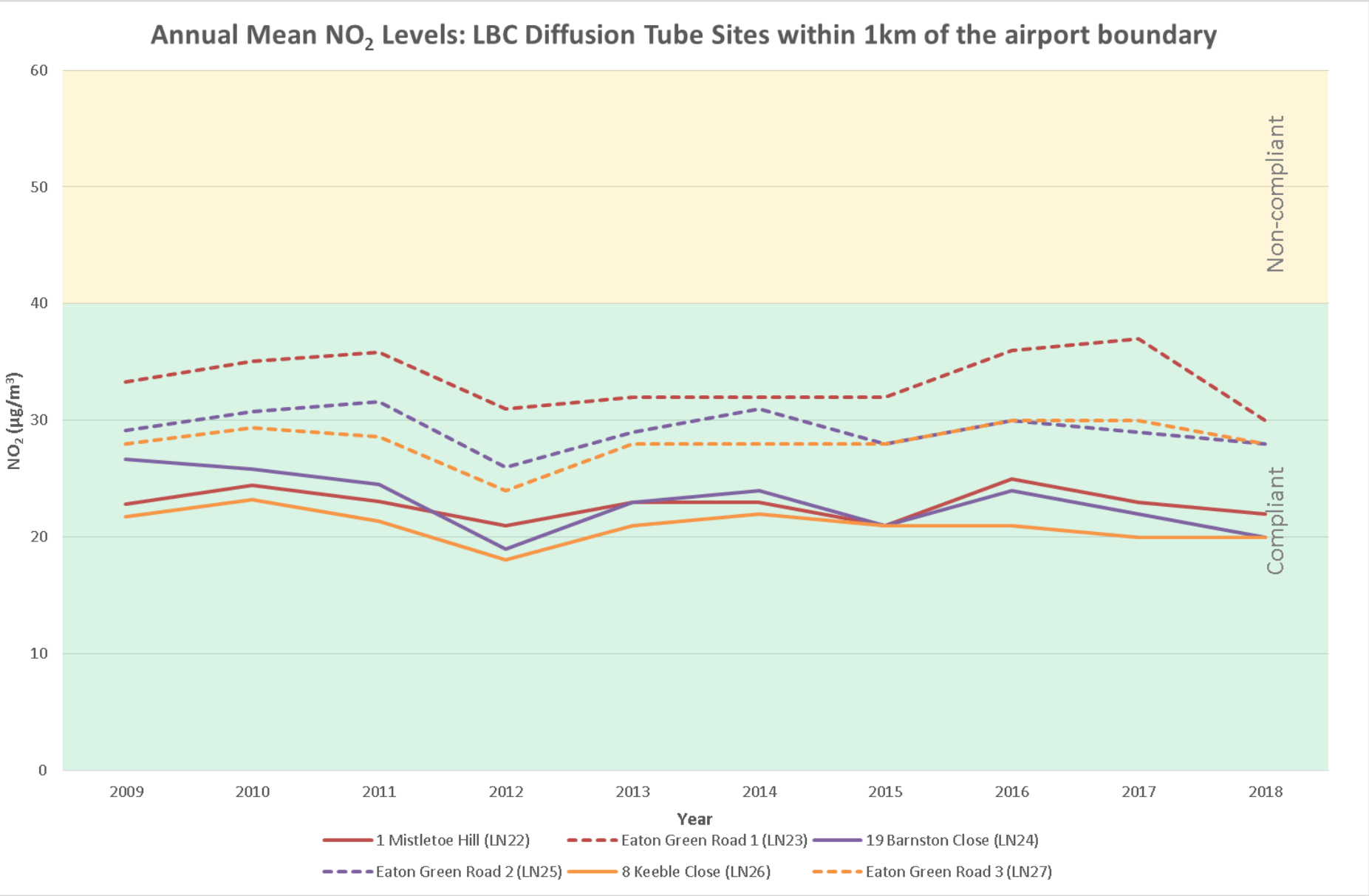

LN23 – Eaton Green Road 1
Tufty's
Tufty's
416500
Flowers
Balloons
Cards

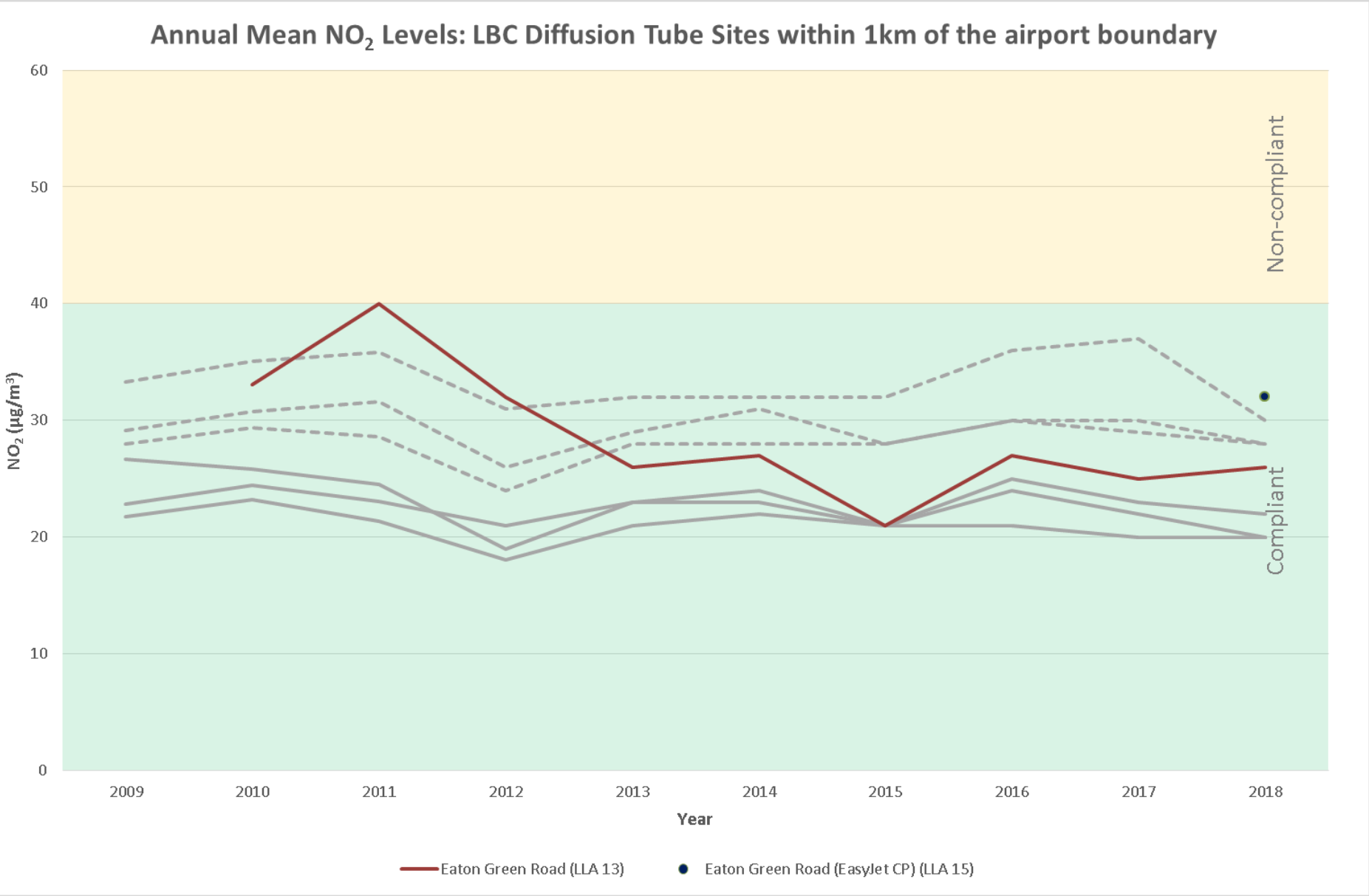

LN24 – 19 Barnston Close

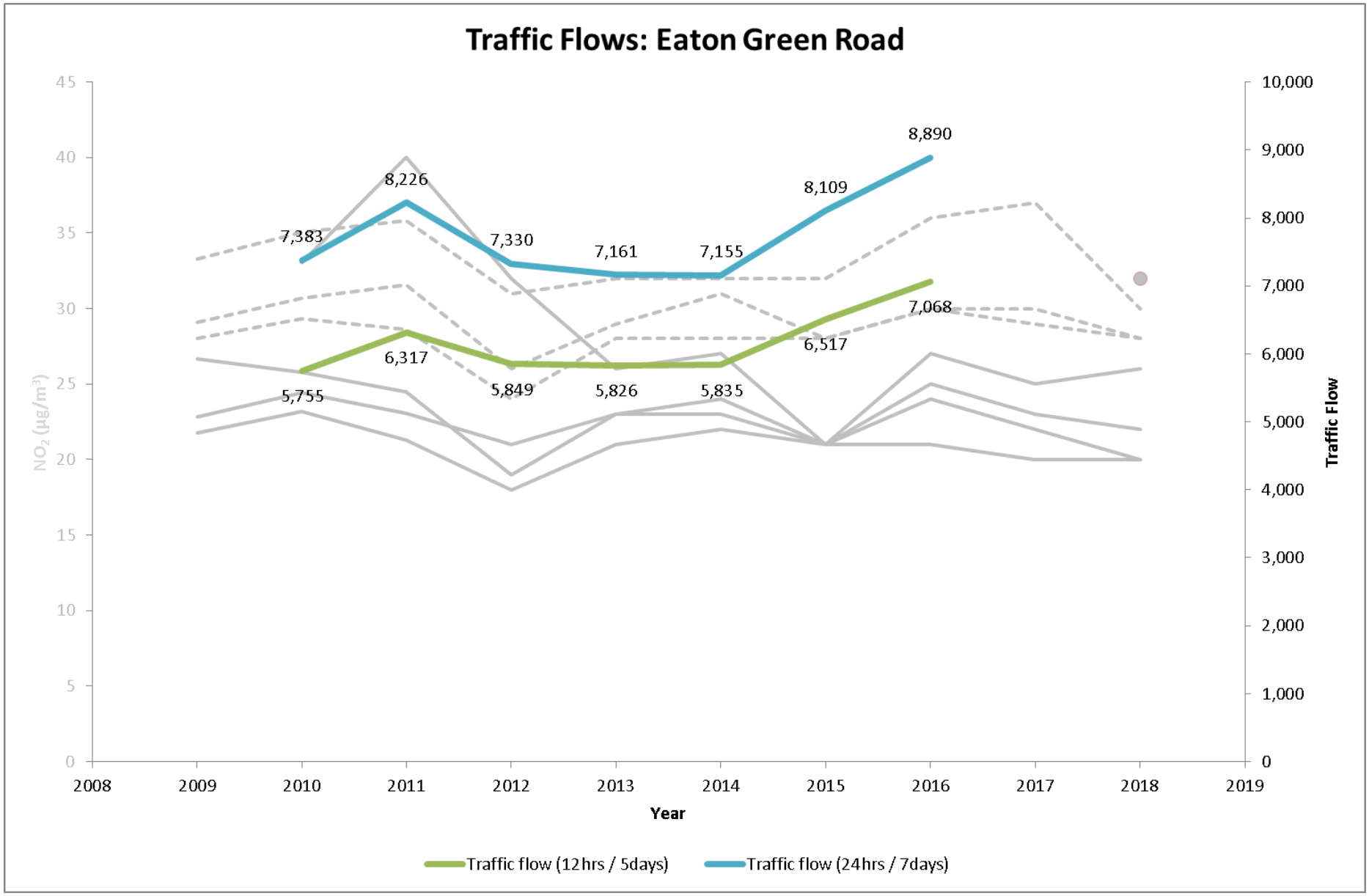

LN25 – Eaton Green Road 2

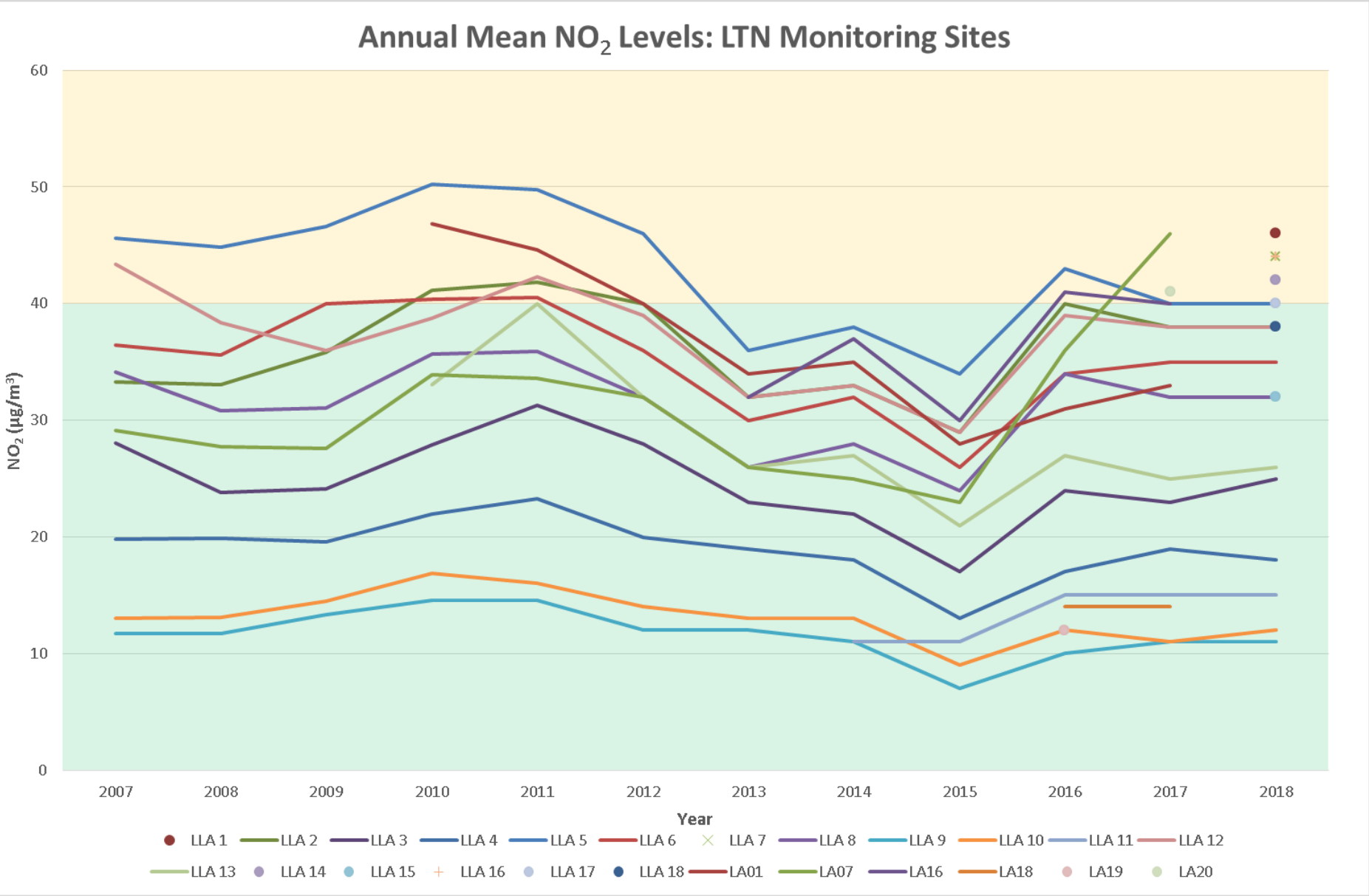

LN26 – 8 Keeble Close

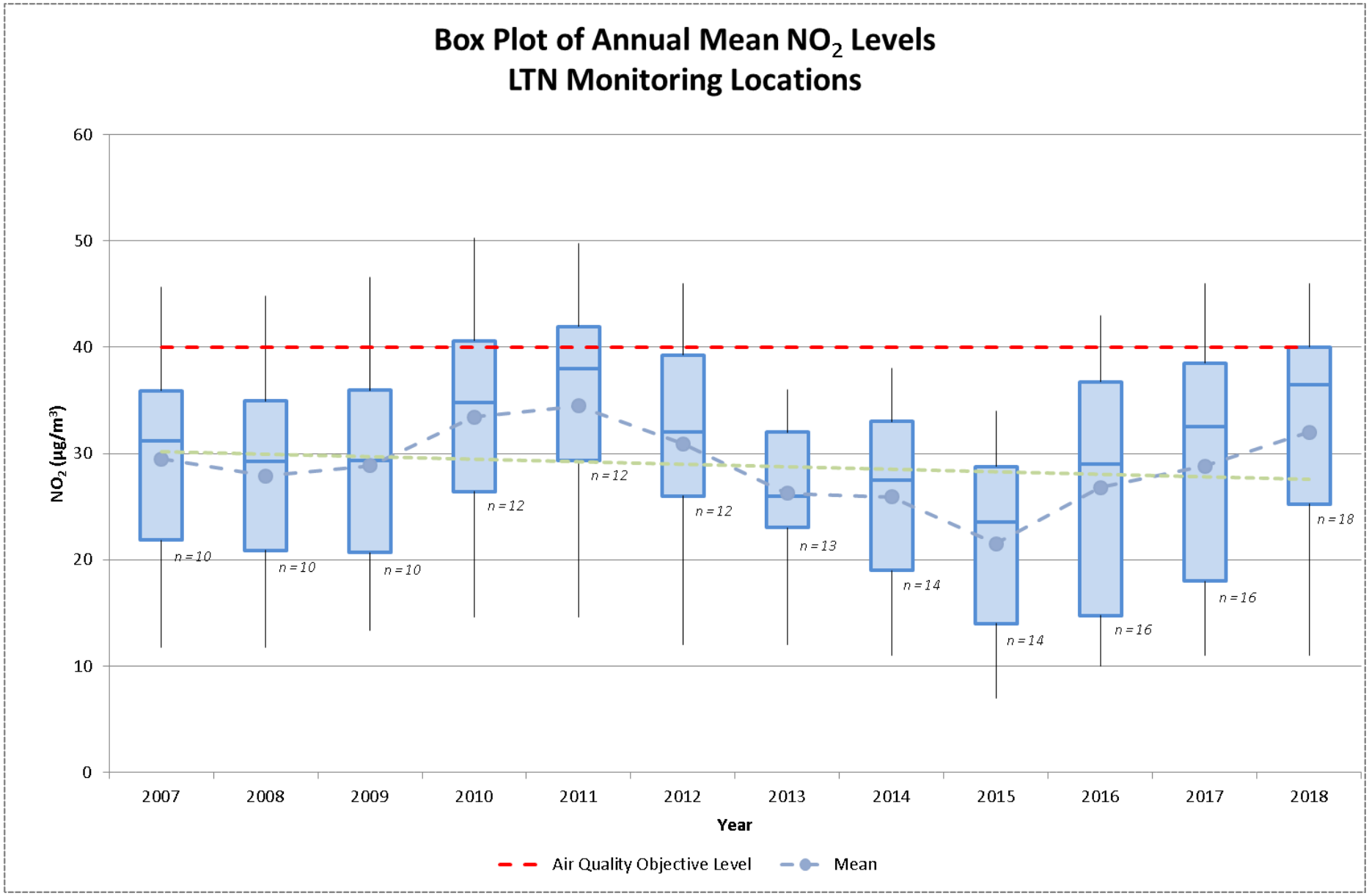

LN27 – Eaton Green Road 3


Annual Mean NO_2 Levels: LBC Diffusion Tube Sites within 1km of the airport boundary
60
50
40
30
20
10
0
NO_2 (µg/m³)
Non-compliant
Compliant
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
Year
1 Mistletoe Hill (LN22)
Eaton Green Road 1 (LN23)
19 Barnston Close (LN24)
Eaton Green Road 2 (LN25)
8 Keeble Close (LN26)
Eaton Green Road 3 (LN27)


Annual Mean NO_2 Levels: LBC Diffusion Tube Sites within 1km of the airport boundary
60
50
40
30
20
10
0
NO_2 (µg/m³)
Non-compliant
Compliant
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
Year
Eaton Green Road (LLA 13)
Eaton Green Road (EasyJet CP) (LLA 15)


Traffic Flows: Eaton Green Road
45
40
35
30
25
20
15
10
5
0
NO2 (µg/m3)
10,000
9,000
8,000
7,000
6,000
5,000
4,000
3,000
2,000
1,000
0
Traffic Flow
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
Year
7,383
8,226
7,330
7,161
7,155
8,109
8,890
5,755
6,317
5,849
5,826
5,835
6,517
7,068
Traffic flow (12hrs / 5days)
Traffic flow (24hrs / 7days)


Annual Mean NO2 Levels: LTN Monitoring Sites
60
50
40
30
20
10
0
NO2 (µg/m3)
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
Year
LLA 1
LLA 2
LLA 3
LLA 4
LLA 5
LLA 6
LLA 7
LLA 8
LLA 9
LLA 10
LLA 11
LLA 12
LLA 13
LLA 14
LLA 15
LLA 16
LLA 17
LLA 18
LA01
LA07
LA16
LA18
LA19
LA20


Box Plot of Annual Mean NO2 Levels
LTN Monitoring Locations
60
50
40
30
20
10
0
NO2 (µg/m3)
n = 10
n = 10
n = 10
n = 12
n = 12
n = 12
n = 13
n = 14
n = 14
n = 16
n = 16
n = 18
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
Year
Air Quality Objective Level
Mean

Airport related emissions

"Aircraft are potentially significant sources of NOx emissions, especially during take-off, and therefore the main risk is related to potential exceedances of the NO_2 air quality objectives."

Local Air Quality Management – Technical Guidance (TG16), Defra, February 2018
[https://tinyurl.com/y8wkdfjg]

"The main pollutant of concern around airports is nitrogen dioxide (NO_2). NO_2 is formed by nitrogen oxide (NOx) emissions from surface traffic, aircraft and airport operations. $PM_{2.5}$ is also of concern, since particulate emissions from jet exhausts are almost all in this fine fraction."

Environmental Protection UK [https://tinyurl.com/yb26xevr]

Airport related emissions

"Studies have shown that NOx emissions from aviation-related operations reduce rapidly beyond the immediate area around the runway. Road traffic remains the main problem with regard to NOx in the UK. Airports are large generators of surface transport journeys and as such share a responsibility to minimise the air quality impact of these operations. The Government expects them to take this responsibility seriously and to work with the Government, its agencies and local authorities to improve air quality."

UK Aviation Policy Framework, HM Government, March 2013 [https://tinyurl.com/y4zzfyxd]

Airport related emissions

"Pollutants associated with aviation come from airborne aircraft, from 'airside' operations such as taxiing and airside equipment, and from passengers and staff (and other airport users) travelling to and from airports. The latter, referred to as surface access, is the largest source and has the most significant effect on local air quality."

Aviation 2050: The future of UK aviation, HM Government, December 2018

[https://tinyurl.com/y8fd6th9]

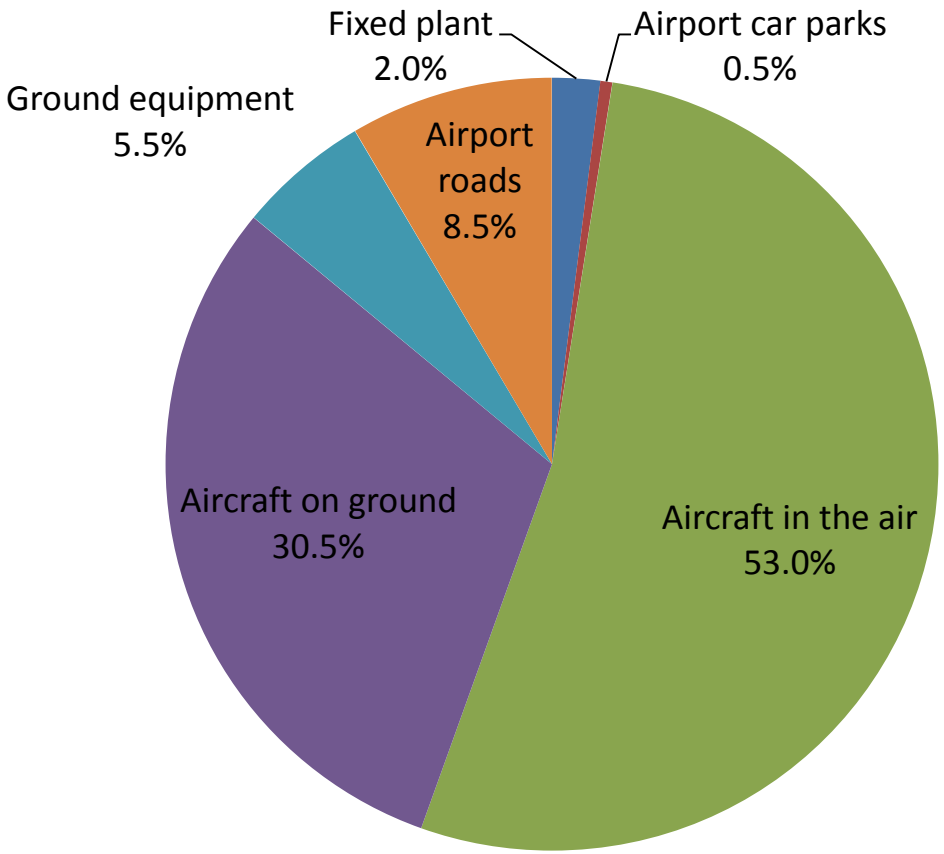
Airport related emissions

"The principal sources of airport-related emissions include aircraft, ground service equipment such as power units and vehicles at the airport or using airport approach roads. Of these, the largest share of total airport related emissions is from aircraft operations on the ground (such as on-stand power, taxiing, and take-off) and in the air below 3,000 feet or 1,000 metres above ground level."

UK Aviation and Air Quality, Sustainable Aviation [https://tinyurl.com/y3v2upmk]

On-airport NOx emission sources

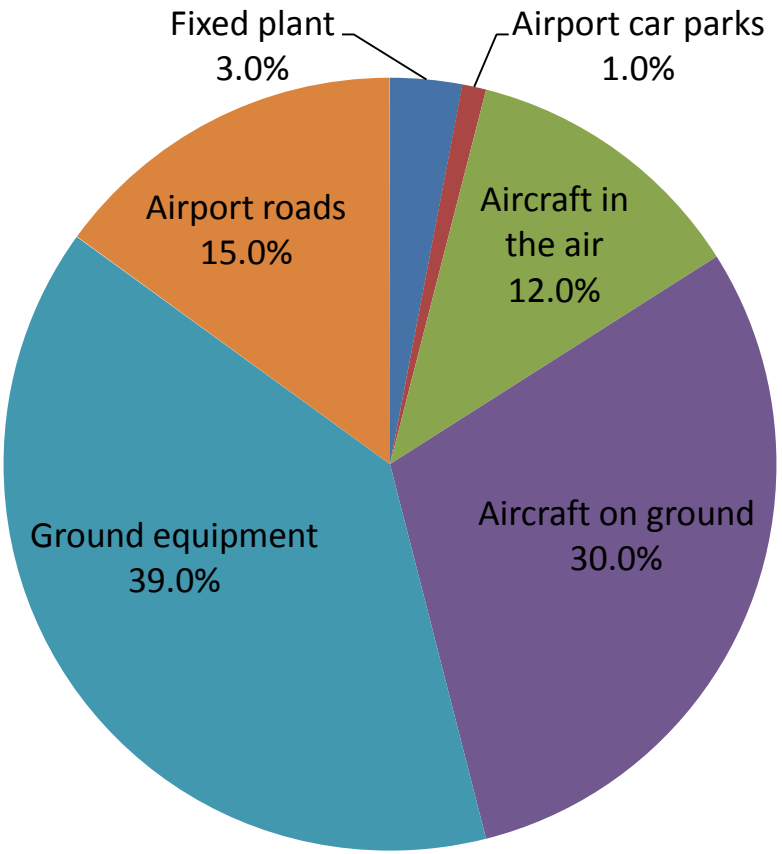
(based on emission inventories for Gatwick [2010] and Heathrow [2013] airports)



Source: UK Aviation and Air Quality, Sustainable Aviation [https://tinyurl.com/y3v2upmk]

On-airport PM_{10} emission sources

(based on emission inventories for Gatwick [2010] and Heathrow [2013] airports)



Source: UK Aviation and Air Quality, Sustainable Aviation [https://tinyurl.com/y3v2upmk]

Airport related emissions

- Apparent discrepancy explained by considering spatial resolution / proximity of relevant receptors.
- Aircraft emissions still have a health impact – 2015 MIT study estimated that globally they are responsible for ~16,000 premature deaths per annum (https://tinyurl.com/y6klqyrw).

Information pertaining to previous session

Aircraft engine efficiency/emission data

The *International Civil Aviation Organisation* (ICAO) provides information about emissions from specific engine models, within a reference landing and take-off cycle (LTO cycle), which are necessary to compare different engine technologies for certification. However, emissions these emissions figures do not reflect day-to-day conditions.

Information pertaining to previous session

AdBlue

AdBlue is a liquid solution of urea. When injected into the hot exhaust systems of larger Diesel engines ammonia is released which acts as a catalyst in a chemical reaction that converts NOx into water vapour and nitrogen (a process referred to as Selective Catalytic Reduction - SCR).