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Impact of Haringey LTNs on traffic count and air pollution

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Introduction

We were tasked with evaluating the impact of the recently implemented Low Traffic Neighbourhoods (LTNs) in Haringey on both traffic and air pollution. To provide an accurate evaluation, it's important to separate the effects of LTNs from other external factors, such as technological advancement, meteorological patterns, Covid-19 impact, work from home and broader economic trends. These factors can influence traffic volume and air pollution independently of the LTNs.

By using a **Difference-in-Differences (DID)** approach, we provide an accurate and robust assessment of how the LTNs have affected both traffic volumes and air quality. DID is a widely used method to identify the causal effects of policies and interventions. This approach has been applied in similar evaluations, including studies on Low Traffic Neighbourhoods (LTNs) (Yang et al., 2022; Xiao et al., 2023), congestion charges and low-emission zones (Ait Bihi Ouali et al., 2021; Chamberlain et al., 2023; Gehrsitz, 2017; Green et al., 2020; Li et al., 2012; Margaryan, 2021; Peters et al., 2021; Xiao et al., 2024), and other international studies (Jiménez et al., 2016; Marquet et al., 2024; Rivers et al., 2020). A comprehensive review (Chamberlain et al., 2023) highlights studies assessing the health impacts of congestion charges and low-emission zones, including 11 that employed the DID method.

Methods

Impacts of Haringey Low Traffic Neighbourhoods (LTNs) on traffic and air pollution are evaluated using the Difference-in-Differences (DID) methodology. DID helps to isolate the impact of LTNs by comparing the changes in pollution and traffic within the LTNs with changes in areas where no LTN measures were implemented.

The Difference-in-Differences (DID) model is a statistical technique used to evaluate the effect of a policy or intervention by comparing changes in outcomes over time between a group that is exposed to the intervention (the treatment group) and a group that is not (the control group). It is especially useful for evaluating LTNs or similar policy interventions when randomised controlled trials are not possible or practical. In other words, it allows us to attribute any change observed in air pollution or traffic to the LTN policy intervention, accounting for any other trends that may be occurring in the area. We consider separately how the intervention impacts streets within the LTN area and boundary roads surrounding the LTN.

How DID works:

- Pre- and Post-intervention Data: The DID method requires data from two time periods: before and after the intervention. For example, we look at data on traffic volumes and air pollution levels both before and after the LTNs were implemented.
- Treatment and Control Groups: The treatment group is exposed to the intervention (i.e., areas impacted by LTNs - either internal or boundary roads), while the control group is not exposed (i.e., areas outside the LTNs and not affected by the LTNs).
- Parallel Trend Assumption: A key assumption of DID is that, in the absence of the intervention, the treatment and control groups would follow similar trends over time. This allows the method to account for any external factors that may affect both groups equally, such as seasonal changes in traffic patterns, Covid 19 impacts, meteorological impacts on air pollution, or broader economic shifts.
- Calculation: DID compares the difference in the outcome variable (e.g., NO2 levels or traffic volumes) before and after the intervention for both the treatment and control groups. The

difference in these changes between the two groups is attributed to the intervention. This helps isolate the effect of the LTN from other factors.

- Statistical Significance: The DID method tests whether the observed differences between treatment and control groups are statistically meaningful, meaning they are unlikely to have occurred due to random chance. This is assessed using p-values and confidence intervals (CIs). Statistical significance suggests that the observed changes are robust and likely caused by the LTNs rather than random variability or external factors. Results are presented with confidence intervals to reflect the range of plausible values for the estimated impacts. The CIs account for variability in the data and provide a measure of uncertainty. Narrower intervals indicate more precise estimates, while wider intervals highlight greater uncertainty in the results.

For example, if traffic volume decreases by 10% in LTN areas but only by 3% in control areas (perhaps due to citywide traffic trends), the DID method would attribute the additional 7% reduction in traffic volume to the LTN intervention.

DID vs before-after analysis:

The key difference between DID and a simple before-and-after comparison is that DID helps distinguish between changes caused by the intervention and changes that could have occurred regardless of it. A before-and-after comparison looks at the average outcome in the same group before and after the intervention, assuming that any observed change is entirely due to the intervention. This approach can be misleading, as it ignores other factors or trends that might have influenced the outcome. DID, on the other hand, separates the impact of the intervention from other influences by using a control group and a regression model. Additionally, while before-and-after comparisons don't account for uncertainty, DID provides estimates with confidence intervals, giving a more reliable and nuanced analysis of the intervention's effect.

DID is often implemented as a type of regression model to measure the effect of an intervention more precisely, especially when other factors are at play. If no other factors influenced the outcome, the regression would show their estimated impact as zero, effectively reducing the analysis to a simple comparison of changes between the treatment and control groups (which would be similar to a simple before-and-after comparison). However, when other factors do influence the outcome, the DID regression accounts for these, allowing us to isolate the true, unbiased effect of the intervention. This makes DID a more robust method for evaluating the real impact of policies.

Key Benefits of DID:

- Teases out external factors: DID separates the intervention's effect from changes that might have occurred anyway, ensuring that the estimate is unbiased.
- Accounts for uncertainty: Unlike simple before-after comparisons, DID provides confidence intervals to measure how certain we are about the estimated impacts.

DID in a simple form can be expressed as:

$$Y_{gt} = a_g + b_t + \delta D_{gt} + \epsilon_{gt}$$

where

- Y_{gt} is the outcome of interest (e.g., pollution level, traffic counts) for group g at time t.
- $D_{gt} = 1$ if group g is exposed to treatment (e.g. LTN) at time t, and $D_{gt} = 0$ if group g is exposed to the control condition at time t.

- δ is the estimated treatment effect which tells us the impact of the policy (in our case, the LTNs)
- a_g represents the fixed effects of each group (e.g., differences that don't change over time, like the location of the group).
- b_t represents time-fixed effect i.e., the time-varying effects but group-invariant characteristics (e.g., month or day-of-week effects that are the same for all groups).
- ϵ is the error term (random noise).

In simple terms, DID allows us to isolate the effects of the LTN policy from time-based factors (b_t) and group-specific characteristics (a_g), giving us a clearer view of the intervention's true impact.

In before-after analysis, aggregating (averaging) data can obscure important trends and patterns, especially in cases like air pollution, which is highly influenced by external factors such as meteorological patterns. In this project, we use a generalised version of DID, which allows for complex evaluations, such as multiple intervention and control sites, temporally uneven monitoring, and adjustments for confounding factors like road types or the COVID-19 lockdown's effect on traffic. This helps to ensure that the estimates of the impact of LTNs on traffic and pollution are as accurate and robust as possible.

Results

Traffic counts

Generalised DID Model for Traffic Counts:

$$Ln(TC) = \alpha + \beta_{site}X_{site} + \beta_{time}X_{time} + \beta_{internal}X_{internal}D_{post} + \beta_{boundary}X_{boundary}D_{post} + \epsilon$$

$Ln(TC)$	Outcome variable: natural logarithm of daily traffic counts
α	Base effect
D_{post}	Indicator for the measurement is taken post LTN implementation
X_{site}	Indicators for different sites
β_{site}	Site fixed effect
X_{time}	Indicators for different time periods (dates)
β_{time}	Date fixed effect
$X_{internal}$	Indicator for the site being an internal road for an LTN
$\beta_{internal}$	Policy effect: impact of LTNs on internal roads
$X_{boundary}$	Indicator for the site being a boundary road for an LTN
$\beta_{boundary}$	Policy effect: impact of LTNs on boundary roads
ϵ	Error term

The data comprises 1,483 sample points from 108 Automatic Traffic Counter (ATC) sites, collected in 2021 and 2023. Each sample point shows the daily traffic volumes for 14 vehicle classes. We adopted a classification approach suggested by Haringey Council to aggregate traffic volume into three vehicle types: Bike, light vehicle, and heavy vehicle. The mapping between the vehicle classes recorded in ATC and vehicle types considered in this report is outlined in the appendix. This process resulted in three traffic datasets.

We estimated three generalised DID models based on these datasets. The results reveal the impacts of LTNs on traffic volumes, by vehicle type, on internal and boundary roads. Full estimates are

presented in the appendix. Table 1 presents the estimated impact of LTNs (i.e. $\beta_{internal}$ and $\beta_{boundary}$) converted to percentage change and the corresponding 95% confidence intervals (Statistically non-significant effects are presented in light grey font). We transformed the natural log to convert estimates to percentage change. A 95% confidence interval means that if we repeated the same study many times, 95 out of 100 times, the true value (the actual effect) would fall within the range we calculated.

Main findings:

- The light and heavy traffic volumes on internal roads in the three LTNs have decreased due to the implementation of the policy. This reduction varies for light vehicles (76%, 32%, 34%) and heavy vehicles (74%, 42%, 59%) between the schemes.
- The reductions of heavy vehicle traffic on boundary roads in Bounds Green and Bruce Grove due to LTNs are also statistically significant (46% and 60%). Other estimates on boundary roads are not statistically significant: this means that LTNs have not increased light vehicle traffic on boundary roads for three LTNs and have not increased heavy vehicle traffic on boundary roads in St Ann's.
- The bike traffic volumes have decreased on both internal and boundary roads after the implementation of LTNs in Bounds Green and St Ann's. The change in Bruce Grove is, however, not statistically significant.

Table 1: Percentage change due to policy, 95% confidence intervals in brackets

	Traffic *count*		
	(1) Bike	**(2) Light vehicle**	**(3) Heavy vehicle**
Bounds Green			
Boundary	-31.4% [-48.1%, -9.4%]	8.0% [-20.2%, 46.2%]	-45.8% [-69.8%, -2.6%]
Internal	-29.3% [-44.3%, -10.3%]	-76.4% [-81.7%, -69.4%]	-74.0% [-84.2%, -57.2%]
Bruce Grove			
Boundary	-0.9% [-24.3%, 29.6%]	2.9% [-23.1%, 37.6%]	-59.5% [-76.9%, -28.8%]
Internal	17.7% [-6.9%, 48.8%]	-31.7% [-47.0%, -11.9%]	-41.9% [-64.5%, -5.1%]
St Ann's			
Boundary	-27.0% [-42.6%, -7.2%]	13.1% [-12.8%, 46.7%]	-27.0% [-55.9%, 20.9%]
Internal	-28.8% [-42.6%, -11.6%]	-33.9% [-47.7%, -16.5%]	-59.0% [-73.9%, -35.4%]

Air pollution

Generalised DID Model for Air Pollution:

$$Ln(AP) = \alpha + \beta_{site}X_{site} + \beta_{time}X_{time} + \beta_{internal}X_{internal}D_{post} + \beta_{boundary}X_{boundary}D_{post} + \epsilon$$

$Ln(AP)$	Outcome variable: natural logarithm of monthly average NO2
α	Base effect
D_{post}	Indicator for the measurement is taken post LTN implementation

X_{site}	Indicators for different sites
β_{site}	Site fixed effect
X_{time}	Indicators for different time periods (dates)
β_{time}	Date fixed effect
$X_{internal}$	Indicator for the site being an internal road for an LTN
$\beta_{internal}$	Policy effect: impact of LTNs on internal roads
$X_{boundary}$	Indicator for the site being a boundary road for an LTN
$\beta_{boundary}$	Policy effect: impact of LTNs on boundary roads
ϵ	Error term

The final dataset used for estimation comprises 1,528 sample points from 66 sites, collected between September 2021 and October 2023.
The impacts of LTNs on air pollution on internal and boundary roads (i.e. $\beta_{internal}$ and $\beta_{boundary}$) converted to percentage change and the corresponding 95% confidence intervals for the three LTNs separately are presented in Table 2 (Statistically non-significant effects are presented in light grey font). We transformed the natural log to convert estimates to percentage change. A 95% confidence interval means that if we repeated the same study many times, 95 out of 100 times, the true value (the actual effect) would fall within the range we calculated. Full estimates are presented in the appendix.

Main findings:

- Overall, our findings indicate that the implementation of LTNs has no statistically significant impact on air pollution. This means we can be confident that NO2 levels did not significantly increase or decrease for LTN sites due to the policy, relative to the external sites.
- For internal sites, NO2 levels increased in St Ann's by 3.2% (95% CI: [—3.3%, 10.1%]), in Bounds Green by 0.2% (95% CI: [-7.1%, 8.0%]) and Bruce Grove by –4.5% (95% CI: [-12.6%, 4.4%], but these results were not statistically significant.
- For boundary sites, NO2 levels increased for Bruce Grove by -2.3% (95% CI: [-10.6%, 6.8%]), Bounds Green by 2.7% (95% CI: [-7.4%, 13.9%]) and St Ann's by 1.0% (95% CI: [-8.1%, 11%]), but these results were not statistically significant.

Table 2: Percentage change in air pollution due to policy, 95% confidence intervals in brackets

Air pollution (NO2)	
Bounds Green	
Boundary	2.7% [-7.4%, 13.9%]
Internal	0.2% [-7.1%, 8.0%]
Bruce Grove	
Boundary	-2.3% [-10.6%, 6.8%]
Internal	-4.5% [-12.6%, 4.4%]
St Ann's	
Boundary	1.0% [-8.1%, 11.0%]
Internal	3.2% [-3.3%, 10.1%]

Discussion and Conclusions

Support from the scientific literature

LTNs have been in place in many locations in the UK since the 1970s, but they have become particularly prominent since November 2020 when the UK Department for Transport announced active travel funding to go towards their implementation (Mason, 2021). LTNs subsequently spread across London to encourage active travel during the COVID-19 lockdowns and can be found across many boroughs, including Camden, Ealing, Hackney, and Waltham Forest (Transport for London, 2020).

Many studies have supported the concept of LTNs as an effective, sustainable transport initiative aimed at reducing vehicle traffic, promoting active travel, and improving air quality, in addition to having much further-reaching benefits such as promoting health and local businesses (Aldred et al., 2024; Furlong et al., 2023; Mason, 2021; Yang et al., 2022). However, extensive debates about the overall effects of LTNs have led to some controversy. While the existing (but limited) scientific literature supports improving air quality and traffic conditions within LTN boundaries and multiple other co-benefits, concerns have persisted that the policy may lead to deteriorations in these metrics at the fringes due to traffic rerouting. In some cases, LTNs have been eliminated by authorities within *weeks* – far from enough time for evaluation of their impacts to support their becoming permanent (Laverty et al., 2021).

However, the ideas that have caused the most controversy – namely, that traffic and air pollution are simply displaced – are not supported by the evidence. Several previous studies have demonstrated that LTNs result in a **decrease in traffic volumes** in residential neighbourhoods (Goodman et al., 2023; Pritchett et al., 2024; Thomas & Aldred, 2024; Xiao et al., 2023), while evidence also supports LTNs **decreasing air pollution without displacing it** to surrounding areas (Yang et al., 2022). Other studies have shown that many other benefits are supported by LTNs, including promoting **social equity** (Aldred et al., 2021; Dudley et al., 2022), **local businesses** (Mason, 2021), **community engagement** (Aldred et al., 2019; Pritchett et al., 2024), **safety for pedestrians and cyclists** (Goodman et al., 2021; Goodman & Aldred, 2021; Mason, 2021; Pritchett et al., 2024; Xiao et al., 2023), and **uptake of active travel** (Aldred et al., 2019; Aldred & Goodman, 2021; Goodman et al., 2021; Aldred et al., 2024; Mason, 2021) as well as **support for mobility needs of older or disabled people** (Macniven et al., 2024).

Analyses and discussions

Vehicle traffic

For vehicle traffic, our results align with the literature that LTN implementation leads to a decrease in traffic volumes on internal roads (Goodman et al., 2023, Thomas & Aldred, 2024; Xiao et al., 2023). We did not find evidence that LTN implementation displaces internal traffic to boundary roads (Pritchett et al., 2024, Mason, 2021). On the contrary, we observed notable decreases in heavy vehicle traffic on boundary roads across the LTNs, except for St Ann's, where the decrease was not statistically significant. These results are consistent with the analyses of Yang et al. (2022), which were based on LTN data collected in Islington, a neighbouring borough. Taken together, these findings provide strong empirical evidence supporting the benefits of LTNs in reducing traffic without exacerbating traffic issues in fringe areas.

We do, however, want to highlight a caveat in interpreting the results. Specifically, we could not find comparable figures from other empirical studies concerning heavy vehicle traffic, as heavy vehicles are not usually analysed separately from light vehicles. While the observed 27–74% reduction in heavy

vehicle traffic following LTN implementation appears promising, it is important to note that this reduction could partly be influenced by surges in heavy vehicle traffic at two control sites: CE141 (Middle Ln) and CE142 (Park Road). This underscores the limitation of this study: the relatively small number of control sites. In general, having a larger number of external sites would improve the robustness of the analysis.

Bike traffic

We found that LTN implementation appears to suppress bike traffic, which contradicts prior propositions suggesting an uptake in active travel following LTNs (Aldred et al., 2019; Aldred & Goodman, 2021, Pritchett et al., 2024). While bike traffic remained relatively stable in Crouch End (control group) and Bruce Grove LTN, bike traffic significantly dropped in St Ann's and Bounds Green in November 2023 compared to November 2021. These two LTNs may have been influenced by concurrent policies that did not affect Bruce Grove or the control sites. For example, introducing new cycle lanes might have altered overall cycling patterns.

To better understand this trend, we examined the sites with the most significant declines, in percentage terms, in bike traffic and identified two key corridors: Bounds Green Road and St Ann's Road. These patterns suggest that **rerouting behaviours occurred among cyclists rather than a modal shift away from cycling**. If the LTNs had discouraged cycling altogether, the decreases would likely have been more evenly distributed across the LTN areas than what is seen here. Due to the limited availability of traffic data outside the LTNs, however, we cannot determine where this redirected traffic has gone.

Air quality

Empirical studies on the impacts of LTNs on air quality are limited in the literature. Yang et al. (2022) reported that LTNs reduce NO2 levels on both internal and boundary roads. In this study, however, we cannot reach the same conclusion because none of our air pollution results are statistically significant. The differing results reported by Yang et al. (2022) may stem from variations in the air quality monitoring processes in the two studies. That said, Yang et al.'s reported reductions were 5.7% (95% CI: [0.1%, 11.0%]) for internal roads and 8.9% (95% CI: [0.2%, 15.7%]) for boundary roads. Our confidence intervals overlap substantially (see Table 2). Since our estimates of the policy effect are not statistically significant, we similarly report no evidence that LTN implementation worsens air quality or traffic at the fringes—an issue previously highlighted by policymakers and researchers.

Conclusion

The current data supports the conclusion that LTN implementation reduces traffic volumes on internal roads. Furthermore, no evidence was found of a deterioration in traffic conditions or air quality in fringe areas. Based on this evidence, we recommend that Haringey Council continue to support and conserve the LTNs. For future analysis, we recommend the following:

1. Investigate the surges in heavy traffic volumes at CE141 and CE142 in 2023. Local knowledge should be able to quickly determine whether these surges are attributable to local factors or general trends and concurrent policies. This will help assess whether the estimates of LTN effects on heavy vehicle traffic are overestimated.
2. Investigate whether concurrent policies (e.g., provision of new cycling lanes) might have affected cycling routes around Bounds Green and St Ann's. This could explain the negative estimates of LTN effects on bike travel.

3. A more dispersed selection and larger number of control sites could have mitigated the issues related to heavy vehicle traffic and bike traffic mentioned above. We recommend collecting data from more dispersed and extensive sites in future projects.
4. Evaluate other impacts of LTNs identified in the literature, including promoting health, social equity, local businesses, community engagement, safety for pedestrians and cyclists, road safety, and support for mobility needs of older or disabled people.

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Annex 1.1 Vehicle type mapping

Vehicle classes in ATC	Vehicle types in the current models
PC	Bike
MC SV SVT TB2	Light vehicle
TB3 T4 ART3 ART4 ART5 ART6 BD DRT TRT	Heavy vehicle

Annex 1.2 Traffic count sites

scheme	site	site_class	address
Bounds	BG144	Internal	Ring Way
Bounds	BG145	Internal	Cline Rd
Bounds	BG148	Internal	Passmore Gardens
Bounds	BG149	Internal	Gordon Rd
Bounds	BG150	Internal	Blake Rd
Bounds	BG152	Internal	Queen's Rd
Bounds	BG153	Internal	Whittington Rd
Bounds	BG154	Internal	Marlborough Rd
Bounds	BG155	Internal	Myddleton Rd
Bounds	BG156	Internal	Palmerston Rd
Bounds	BG157	Internal	Truro Rd
Bounds	BG158	Internal	Nightingale Rd
Bounds	BG159	Internal	Commerce Rd
Bounds	BG163	Boundary	A109 Bounds Green Road (@Gordon Road/Passmore Gardens)
Bounds	BG164	Boundary	B106 Durnsford Road
Bounds	BG165	Boundary	A109 Bounds Green Road (@Truro Road/Nightingale Road)
Bounds	BG166	Boundary	A105 High Road (@Cranbrook Park/Watsons Road)
Bounds	BG168	Boundary	A105 High Road (@Sidney Road/Woodside Road)
Bruce Grove	BR178	Internal	Napier Road
Bruce Grove	BR179	Internal	St. Loys Road
Bruce Grove	BR180	Internal	Woodside Gardens
Bruce Grove	BR181	Internal	The Avenue (@Broadwater Road)
Bruce Grove	BR182	Internal	Elmhurst Road
Bruce Grove	BR183	Internal	Hartham Road
Bruce Grove	BR184	Internal	Mount Pleasant Road (#316/Lordship Lane)
Bruce Grove	BR185	Internal	Lordsmead Road
Bruce Grove	BR186	Internal	Broadwater Road
Bruce Grove	BR187	Internal	Linley Road
Bruce Grove	BR189	Boundary	A109 Lordship Lane (@Elsden Road)
Bruce Grove	BR190	Boundary	A109 Lordship Lane (@Waltheof Avenue)
Bruce Grove	BR191	Boundary	B155 Downhills Way
Bruce Grove	BR192	Internal	Sandringham Road
Bruce Grove	BR193	Boundary	A1080 Westbury Avenue (@Willingdon Road)
Bruce Grove	BR194	Internal	Carlingford Road
Bruce Grove	BR195	Boundary	A105 Green Lanes (@Carlingford Road)
Bruce Grove	BR196	Internal	Mannock Road
Bruce Grove	BR197	Boundary	B155 Belmont Road
Bruce Grove	BR198	Internal	Langham Road
Bruce Grove	BR199	Internal	Wilmot Road
Crouch End	CE140	External	Priory Road
Crouch End	CE141	External	Middle Ln

Crouch End	CE142	External	Park Road
Crouch End	CE143	External	Palace Road
St Anns	ST039	Internal	Park Road
St Anns	ST040	Internal	Ritches Road
St Anns	ST041	Internal	Brampton Road
St Anns	ST042	Internal	Rowley Road
St Anns	ST043	Internal	Glenwood Road
St Anns	ST044	Internal	Cissbury Road
St Anns	ST045	Internal	South Grove
St Anns	ST046	Internal	Gorleston Road
St Anns	ST047	Internal	Clarence Road
St Anns	ST048	Internal	Conway Road (@Rowley Road/Ritches Road)
St Anns	ST049	Internal	Abbotsford Avenue
St Anns	ST051	Internal	Etherley Road
St Anns	ST052	Internal	Terront Road
St Anns	ST053	Internal	Culvert Road
St Anns	ST054	Internal	Harringay Road (#67)
St Anns	ST055	Internal	Cranleigh Road
St Anns	ST056	Internal	Stanley Road
St Anns	ST057	Internal	Outlon Road
St Anns	ST058	Internal	Falmer Road
St Anns	ST059	Boundary	B152 St Ann's Road (@Chestnuts Park)
St Anns	ST060	Boundary	A504 West Green Road (@Bedford Road/Lawrence Road)
St Anns	ST061	Internal	Harringay Road (#68)
St Anns	ST062	Internal	Stanmore Road
St Anns	ST063	Internal	Carlingford Road (@Crescent Road/Green Lanes)
St Anns	ST069	Boundary	A504 West Green Road (@Suffield Road)
St Anns	ST073	Internal	St Margaret's Avenue
St Anns	ST074	Boundary	Alfoxton Avenue
St Anns	ST075	Boundary	B152 Colina Road
St Anns	ST076	Internal	Colina Mews
St Anns	ST077	Boundary	A504 West Green Road (@Carlingford Road)
St Anns	ST077	Boundary	A504 West Green Road (@Carlingford Road)
St Anns	ST078	Internal	Avondale Road
St Anns	ST079	Internal	Conway Road (@Avondale Road/Woodlands Park Road)
St Anns	ST080	Internal	Woodlands Park Road (#87/Avondale Road)
St Anns	ST081	Internal	Woodlands Park Road (#16/Clarendon Road)
St Anns	ST082	Boundary	B152 St Ann's Road (@Rowley Road/La Rose Lane)
St Anns	ST083	Boundary	A504 West Green Road (@Etherley Road)
St Anns	ST083	Boundary	A504 West Green Road (@Etherley Road)
St Anns	ST084	Internal	La Rose Lane (#31)
St Anns	ST085	Internal	Clinton Road
St Anns	ST086	Internal	Station Crescent
St Anns	ST087	Internal	Dagmar Road

St Anns	ST088	Internal	Cornwall Road (#47/West Green Road)
St Anns	ST089	Internal	Alexandra Road (@North Grove)
St Anns	ST090	Internal	Cornwall Road (@Penrith Road)
St Anns	ST091	Internal	Penrith Road
St Anns	ST092	Internal	North Grove
St Anns	ST093	Internal	Ascot Road
St Anns	ST094	Boundary	B152 St Ann's Road (@Hermitage Road/Cornwall Road)
St Anns	ST095	Internal	Avenue Road (#41/Newsam Avenue)
St Anns	ST096	Internal	Ida Road
St Anns	ST097	Internal	Avenue Road (#95/Ida Road)
St Anns	ST098	Internal	Breamar Road
St Anns	ST204	Boundary	B152 St Ann's Road (@Salisbury Road)
St Anns	ST205	Internal	Salisbury Road
St Anns	ST206	Internal	Clarendon Road
St Anns	ST207	Boundary	B152 Harringay Road
St Anns	ST208	Internal	La Rose Lane (@Chestnuts Park)
St Anns	ST209	Boundary	B152 St Ann's Road (@Suffolk Road)
St Anns	ST210	Internal	Elmar Road
St Anns	ST211	Internal	Seaford Road
St Anns	ST212	Internal	Roslyn Road
St Anns	ST213	Internal	Greenfield Road
St Anns	ST214	Internal	Suffield Road
St Anns	ST215	Internal	Westerfield Road

Annex 1.3 Traffic Full Results

Model 1 – Bike counts

	Estimate	Std. Error	t-value	Pr(>|t|)	
(Intercept)	3.9173	0.1159	33.8080	< 2e-16	***
LTN effects					
(policy)Bounds-Boundary	-0.3774	0.1425	-2.6490	0.0082	**
(policy)Bounds-Internal	-0.3464	0.1215	-2.8510	0.0044	**
(policy)Bruce Grove-Boundary	-0.0091	0.1371	-0.0660	0.9471	
(policy)Bruce Grove-Internal	0.1630	0.1195	1.3640	0.1729	
(policy)St Anns-Boundary	-0.3152	0.1226	-2.5710	0.0102	*
(policy)St Anns-Internal	-0.3390	0.1103	-3.0740	0.0022	**
Site effects (Relative to BG144)					
(site)BG145	-0.5706	0.1502	-3.8000	0.0002	***
(site)BG148	-0.9399	0.1531	-6.1400	0.0000	***
(site)BG149	-0.3800	0.1502	-2.5300	0.0115	*
(site)BG150	-0.6302	0.1502	-4.1970	0.0000	***
(site)BG152	0.2385	0.1502	1.5880	0.1125	
(site)BG153	0.2721	0.1502	1.8120	0.0702	.
(site)BG154	-0.3388	0.1502	-2.2560	0.0242	*
(site)BG155	1.0484	0.1502	6.9810	0.0000	***
(site)BG156	0.4717	0.1502	3.1410	0.0017	**
(site)BG157	-0.1955	0.1502	-1.3020	0.1932	
(site)BG158	-0.6642	0.1502	-4.4230	0.0000	***
(site)BG159	0.3774	0.1502	2.5130	0.0121	*
(site)BG163	1.0238	0.1603	6.3880	0.0000	***
(site)BG164	1.6688	0.1603	10.4140	< 2e-16	***
(site)BG165	1.5130	0.1603	9.4410	< 2e-16	***
(site)BG166	2.8353	0.1603	17.6930	< 2e-16	***
(site)BG168	2.0323	0.1603	12.6820	< 2e-16	***
(site)BR178	1.9780	0.1555	12.7210	< 2e-16	***
(site)BR179	1.3595	0.1555	8.7430	< 2e-16	***
(site)BR180	-0.5413	0.1555	-3.4810	0.0005	***
(site)BR181	0.3246	0.1555	2.0870	0.0370	*
(site)BR182	-1.0332	0.1555	-6.6440	0.0000	***
(site)BR183	0.2364	0.1555	1.5200	0.1286	
(site)BR184	-0.3003	0.1555	-1.9310	0.0536	.
(site)BR185	-0.7975	0.1555	-5.1290	0.0000	***
(site)BR186	1.2156	0.1555	7.8180	0.0000	***
(site)BR187	-0.8599	0.1555	-5.5300	0.0000	***
(site)BR189	0.9980	0.1591	6.2740	0.0000	***
(site)BR190	1.5064	0.1591	9.4690	< 2e-16	***
(site)BR191	0.4247	0.1591	2.6700	0.0077	**
(site)BR192	-0.6828	0.1555	-4.3910	0.0000	***

(site)BR193	1.4121	0.1591	8.8770	< 2e-16	***
(site)BR194	-0.3275	0.1555	-2.1060	0.0354	*
(site)BR195	2.6828	0.1591	16.8650	< 2e-16	***
(site)BR196	1.4502	0.1555	9.3270	< 2e-16	***
(site)BR197	1.0398	0.1591	6.5370	0.0000	***
(site)BR198	0.6574	0.1555	4.2280	0.0000	***
(site)BR199	0.3474	0.1555	2.2340	0.0256	*
(site)CE140	0.9540	0.1620	5.8890	0.0000	***
(site)CE141	1.7051	0.1620	10.5250	< 2e-16	***
(site)CE142	1.9402	0.1620	11.9760	< 2e-16	***
(site)CE143	0.4494	0.1620	2.7740	0.0056	**
(site)ST039	-0.1980	0.1538	-1.2880	0.1981	
(site)ST040	0.1732	0.1538	1.1260	0.2602	
(site)ST041	-0.5338	0.1538	-3.4710	0.0005	***
(site)ST042	-0.0846	0.1538	-0.5500	0.5822	
(site)ST043	1.2625	0.1538	8.2100	0.0000	***
(site)ST044	0.0622	0.1538	0.4050	0.6858	
(site)ST045	-0.7583	0.1538	-4.9310	0.0000	***
(site)ST046	0.6376	0.1538	4.1460	0.0000	***
(site)ST047	0.5903	0.1538	3.8390	0.0001	***
(site)ST048	0.5343	0.1538	3.4750	0.0005	***
(site)ST049	-0.4984	0.1538	-3.2410	0.0012	**
(site)ST051	0.2511	0.1538	1.6330	0.1027	
(site)ST052	-1.1851	0.1538	-7.7060	0.0000	***
(site)ST053	0.3081	0.1538	2.0040	0.0453	*
(site)ST054	0.8237	0.1538	5.3570	0.0000	***
(site)ST055	0.4718	0.1538	3.0680	0.0022	**
(site)ST056	-0.6065	0.1538	-3.9440	0.0001	***
(site)ST057	-0.2841	0.1538	-1.8480	0.0649	.
(site)ST058	0.1958	0.1538	1.2730	0.2032	
(site)ST059	2.2077	0.1561	14.1430	< 2e-16	***
(site)ST060	2.1178	0.1561	13.5670	< 2e-16	***
(site)ST061	0.4281	0.1538	2.7840	0.0054	**
(site)ST062	-0.4820	0.1538	-3.1350	0.0018	**
(site)ST063	0.7097	0.1538	4.6150	0.0000	***
(site)ST069	2.4915	0.1561	15.9610	< 2e-16	***
(site)ST073	-0.7062	0.1538	-4.5930	0.0000	***
(site)ST074	1.1579	0.1561	7.4180	0.0000	***
(site)ST075	0.2607	0.1561	1.6700	0.0951	.
(site)ST076	-2.1272	-0.1538	13.8330	< 2e-16	***
(site)ST077	2.3269	0.1561	14.9070	< 2e-16	***
(site)ST078	-0.4019	0.1538	-2.6140	0.0091	**
(site)ST079	-1.2543	0.1538	-8.1570	0.0000	***
(site)ST080	0.4878	0.1538	3.1720	0.0015	**
(site)ST081	0.7082	0.1538	4.6050	0.0000	***
(site)ST082	2.1477	0.1561	13.7590	< 2e-16	***

(site)ST083	2.1690	0.1561	13.8950	< 2e-16	***
(site)ST084	1.4720	0.1538	9.5720	< 2e-16	***
(site)ST085	0.3704	0.1538	2.4090	0.0161	*
(site)ST086	-0.1597	0.1538	-1.0380	0.2993	
(site)ST087	-1.2587	0.1538	-8.1850	0.0000	***
(site)ST088	0.3656	0.1538	2.3780	0.0176	*
(site)ST089	-0.3259	0.1538	-2.1200	0.0342	*
(site)ST090	0.6998	0.1538	4.5510	0.0000	***
(site)ST091	-0.8757	0.1538	-5.6950	0.0000	***
(site)ST092	1.4084	0.1538	9.1590	< 2e-16	***
(site)ST093	-0.4685	0.1538	-3.0470	0.0024	**
(site)ST094	2.0053	0.1561	12.8470	< 2e-16	***
(site)ST095	1.3377	0.1538	8.6990	< 2e-16	***
(site)ST096	-1.2067	0.1538	-7.8470	0.0000	***
(site)ST097	1.8817	0.1538	12.2370	< 2e-16	***
(site)ST098	0.7410	0.1538	4.8190	0.0000	***
(site)ST204	2.1202	0.1561	13.5830	< 2e-16	***
(site)ST205	0.6833	0.1538	4.4430	0.0000	***
(site)ST206	-0.2212	0.1538	-1.4380	0.1506	
(site)ST207	1.2142	0.1561	7.7790	0.0000	***
(site)ST208	1.7550	0.1538	11.4130	< 2e-16	***
(site)ST209	1.7403	0.1561	11.1490	< 2e-16	***
(site)ST210	-0.8930	0.1538	-5.8070	0.0000	***
(site)ST211	-0.0927	0.1538	-0.6030	0.5469	
(site)ST212	0.5135	0.1538	3.3390	0.0009	***
(site)ST213	0.2531	0.1538	1.6460	0.1000	
(site)ST214	0.2709	0.1538	1.7620	0.0783	.
(site)ST215	0.5846	0.1538	3.8020	0.0002	***
Time effects (Relative the Monday(s) in 2021)					
(day)Tue 2021	0.0733	0.0546	1.3420	0.1797	
(day)Wed 2021	0.0576	0.0546	1.0560	0.2911	
(day)Thu 2021	0.0484	0.0546	0.8860	0.3756	
(day)Fri 2021	0.0019	0.0546	0.0340	0.9727	
(day)Sat 2021	-0.2432	0.0546	-4.4560	0.0000	***
(day)Sun 2021	-0.3854	0.0546	-7.0620	0.0000	***
(day)Mon 2023	0.2409	0.1176	2.0480	0.0407	*
(day)Tue 2023	0.2656	0.1176	2.2580	0.0241	*
(day)Wed 2023	0.1837	0.1176	1.5620	0.1185	
(day)Thu 2023	-0.0322	0.1176	-0.2740	0.7842	
(day)Fri 2023	0.2233	0.1176	1.8980	0.0578	.
(day)Sat 2023	-0.2404	0.1176	-2.0430	0.0412	*
(day)Sun 2023	-0.2743	0.1176	-2.3330	0.0198	*

Signif. codes: 0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1					
Adjusted R-squared: 0.8758					

Model 2 – Light vehicle counts

	Estimate	Std. Error	t-value	Pr(>|t|)	
(Intercept)	8.0800	0.1255	64.3870	< 2e-16	***
LTN effects					
(policy)Bounds-Boundary	0.0774	0.1543	0.5010	0.6162	
(policy)Bounds-Internal	-1.4430	0.1316	-10.9680	< 2e-16	***
(policy)Bruce Grove-Boundary	0.0282	0.1485	0.1900	0.8492	
(policy)Bruce Grove-Internal	-0.3806	0.1294	-2.9400	0.0033	**
(policy)St Anns-Boundary	0.1232	0.1328	0.9280	0.3536	
(policy)St Anns-Internal	-0.4146	0.1194	-3.4710	0.0005	***
Site effects (Relative to BG144)					
(site)BG145	-0.6887	0.1626	-4.2350	0.0000	***
(site)BG148	-2.0620	0.1658	-12.4360	< 2e-16	***
(site)BG149	-1.5580	0.1626	-9.5770	< 2e-16	***
(site)BG150	-0.9760	0.1626	-6.0010	0.0000	***
(site)BG152	-2.6370	0.1626	-16.2150	< 2e-16	***
(site)BG153	-0.5100	0.1626	-3.1360	0.0017	**
(site)BG154	-1.2650	0.1626	-7.7800	0.0000	***
(site)BG155	0.1883	0.1626	1.1580	0.2471	
(site)BG156	-0.5636	0.1626	-3.4650	0.0005	***
(site)BG157	-1.5240	0.1626	-9.3680	< 2e-16	***
(site)BG158	-0.0971	0.1626	-0.5970	0.5506	
(site)BG159	0.0028	0.1626	0.0170	0.9862	
(site)BG163	1.7940	0.1736	10.3360	< 2e-16	***
(site)BG164	1.3300	0.1736	7.6620	0.0000	***
(site)BG165	1.7960	0.1736	10.3470	< 2e-16	***
(site)BG166	1.8480	0.1736	10.6510	< 2e-16	***
(site)BG168	1.5810	0.1736	9.1070	< 2e-16	***
(site)BR178	-1.1790	0.1684	-7.0020	0.0000	***
(site)BR179	-0.0260	0.1684	-0.1550	0.8771	
(site)BR180	-1.8350	0.1684	-10.8970	< 2e-16	***
(site)BR181	-0.7518	0.1684	-4.4640	0.0000	***
(site)BR182	-1.9340	0.1684	-11.4830	< 2e-16	***
(site)BR183	-3.3590	0.1684	-19.9480	< 2e-16	***
(site)BR184	-0.1898	0.1684	-1.1270	0.2600	
(site)BR185	-0.9967	0.1684	-5.9190	0.0000	***
(site)BR186	-0.1665	0.1684	-0.9880	0.3231	
(site)BR187	-1.2430	0.1684	-7.3790	0.0000	***
(site)BR189	1.4350	0.1723	8.3300	< 2e-16	***
(site)BR190	1.4020	0.1723	8.1360	0.0000	***
(site)BR191	1.4790	0.1723	8.5820	< 2e-16	***
(site)BR192	-1.4790	0.1684	-8.7830	< 2e-16	***
(site)BR193	1.5480	0.1723	8.9830	< 2e-16	***
(site)BR194	-1.5220	0.1684	-9.0390	< 2e-16	***

(site)BR195	1.8990	0.1723	11.0200	< 2e-16	***
(site)BR196	-0.8337	0.1684	-4.9510	0.0000	***
(site)BR197	0.9851	0.1723	5.7180	0.0000	***
(site)BR198	-0.2318	0.1684	-1.3770	0.1689	
(site)BR199	-1.7010	0.1684	-10.1040	< 2e-16	***
(site)CE140	1.6820	0.1754	9.5840	< 2e-16	***
(site)CE141	0.9954	0.1754	5.6740	0.0000	***
(site)CE142	1.0680	0.1754	6.0860	0.0000	***
(site)CE143	-3.6260	0.1754	-20.6670	< 2e-16	***
(site)ST039	-1.6530	0.1665	-9.9260	< 2e-16	***
(site)ST040	-2.3680	0.1665	-14.2160	< 2e-16	***
(site)ST041	-2.2800	0.1665	-13.6900	< 2e-16	***
(site)ST042	-2.2150	0.1665	-13.2980	< 2e-16	***
(site)ST043	-1.4750	0.1665	-8.8570	< 2e-16	***
(site)ST044	-1.4950	0.1665	-8.9800	< 2e-16	***
(site)ST045	-1.9820	0.1665	-11.9010	< 2e-16	***
(site)ST046	-1.0170	0.1665	-6.1040	0.0000	***
(site)ST047	-1.3460	0.1665	-8.0800	0.0000	***
(site)ST048	-2.4810	0.1665	-14.8950	< 2e-16	***
(site)ST049	-2.2100	0.1665	-13.2730	< 2e-16	***
(site)ST051	-1.5280	0.1665	-9.1760	< 2e-16	***
(site)ST052	-1.7050	0.1665	-10.2400	< 2e-16	***
(site)ST053	-1.4580	0.1665	-8.7570	< 2e-16	***
(site)ST054	-1.8380	0.1665	-11.0340	< 2e-16	***
(site)ST055	-1.8980	0.1665	-11.3950	< 2e-16	***
(site)ST056	-2.1030	0.1665	-12.6290	< 2e-16	***
(site)ST057	-2.7520	0.1665	-16.5270	< 2e-16	***
(site)ST058	-2.0450	0.1665	-12.2820	< 2e-16	***
(site)ST059	1.3150	0.1690	7.7770	0.0000	***
(site)ST060	0.9404	0.1690	5.5630	0.0000	***
(site)ST061	-2.1250	0.1665	-12.7590	< 2e-16	***
(site)ST062	-1.3430	0.1665	-8.0630	0.0000	***
(site)ST063	-1.2090	0.1665	-7.2580	0.0000	***
(site)ST069	0.9805	0.1690	5.8000	0.0000	***
(site)ST073	-2.3500	0.1665	-14.1120	< 2e-16	***
(site)ST074	0.9700	0.1690	5.7380	0.0000	***
(site)ST075	-0.3004	0.1690	-1.7770	0.0758	.
(site)ST076	-3.1070	0.1665	-18.6570	< 2e-16	***
(site)ST077	1.5310	0.1690	9.0570	< 2e-16	***
(site)ST078	-2.1050	0.1665	-12.6430	< 2e-16	***
(site)ST079	-2.3450	0.1665	-14.0790	< 2e-16	***
(site)ST080	-0.8340	0.1665	-5.0080	0.0000	***
(site)ST081	-0.4692	0.1665	-2.8170	0.0049	**
(site)ST082	1.2480	0.1690	7.3830	0.0000	***
(site)ST083	1.3100	0.1690	7.7510	0.0000	***
(site)ST084	0.5244	0.1665	3.1490	0.0017	**

(site)ST085	-2.1130	0.1665	-12.6870	< 2e-16	***
(site)ST086	-2.4430	0.1665	-14.6680	< 2e-16	***
(site)ST087	-2.1860	0.1665	-13.1240	< 2e-16	***
(site)ST088	-0.4918	0.1665	-2.9530	0.0032	**
(site)ST089	-2.7780	0.1665	-16.6810	< 2e-16	***
(site)ST090	-0.3328	0.1665	-1.9980	0.0459	*
(site)ST091	-2.6140	0.1665	-15.6950	< 2e-16	***
(site)ST092	-2.2450	0.1665	-13.4790	< 2e-16	***
(site)ST093	-2.0780	0.1665	-12.4780	< 2e-16	***
(site)ST094	1.4100	0.1690	8.3390	< 2e-16	***
(site)ST095	-0.4363	0.1665	-2.6200	0.0089	**
(site)ST096	-3.1170	0.1665	-18.7150	< 2e-16	***
(site)ST097	0.0049	0.1665	0.0290	0.9766	
(site)ST098	-2.4050	0.1665	-14.4430	< 2e-16	***
(site)ST204	1.2370	0.1690	7.3170	0.0000	***
(site)ST205	0.5429	0.1665	3.2600	0.0011	**
(site)ST206	-2.1690	0.1665	-13.0230	< 2e-16	***
(site)ST207	0.0398	0.1690	0.2350	0.8140	
(site)ST208	0.3430	0.1665	2.0600	0.0396	*
(site)ST209	1.3210	0.1690	7.8140	0.0000	***
(site)ST210	-2.1850	0.1665	-13.1210	< 2e-16	***
(site)ST211	-1.7360	0.1665	-10.4240	< 2e-16	***
(site)ST212	-1.8670	0.1665	-11.2130	< 2e-16	***
(site)ST213	-1.9240	0.1665	-11.5500	< 2e-16	***
(site)ST214	-0.0136	0.1665	-0.0810	0.9352	
(site)ST215	-0.3358	0.1665	-2.0160	0.0440	*
Time effects (Relative the Monday(s) in 2021)					
(day)Tue 2021	0.0283	0.0591	0.4790	0.6318	
(day)Wed 2021	0.0521	0.0591	0.8810	0.3784	
(day)Thu 2021	0.0938	0.0591	1.5870	0.1128	
(day)Fri 2021	0.1784	0.0591	3.0180	0.0026	**
(day)Sat 2021	0.0346	0.0591	0.5850	0.5587	
(day)Sun 2021	-0.1491	0.0591	-2.5230	0.0118	*
(day)Mon 2023	-0.0457	0.1274	-0.3590	0.7196	
(day)Tue 2023	0.0000	0.1274	0.0000	0.9997	
(day)Wed 2023	0.0133	0.1274	0.1040	0.9170	
(day)Thu 2023	-0.0006	0.1274	-0.0050	0.9961	
(day)Fri 2023	0.0521	0.1274	0.4090	0.6828	
(day)Sat 2023	-0.0254	0.1274	-0.1990	0.8420	
(day)Sun 2023	-0.1325	0.1274	-1.0400	0.2985	

Signif. codes: 0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1					
Adjusted R-squared: 0.9315					

Model 3- Heavy vehicle counts

	Estimate	Std. Error	t-value	Pr(>|t|)	
(Intercept)	4.5612	0.2431	18.7630	< 2e-16	***
LTN effects					
(policy)Bounds-Boundary	-0.6122	0.2989	-2.0480	0.0408	*
(policy)Bounds-Internal	-1.3485	0.2549	-5.2890	0.0000	***
(policy)Bruce Grove-Boundary	-0.9035	0.2876	-3.1410	0.0017	**
(policy)Bruce Grove-Internal	-0.5437	0.2507	-2.1680	0.0303	*
(policy)St Anns-Boundary	-0.3146	0.2573	-1.2230	0.2215	
(policy)St Anns-Internal	-0.8907	0.2314	-3.8500	0.0001	***
Site effects (Relative to BG144)					
(site)BG145	-0.4725	0.3151	-1.5000	0.1340	
(site)BG148	-2.9757	0.3212	-9.2660	< 2e-16	***
(site)BG149	-1.3702	0.3151	-4.3490	0.0000	***
(site)BG150	-2.0915	0.3151	-6.6380	0.0000	***
(site)BG152	-3.6702	0.3151	-11.6490	< 2e-16	***
(site)BG153	-2.7914	0.3151	-8.8600	< 2e-16	***
(site)BG154	-2.2963	0.3151	-7.2880	0.0000	***
(site)BG155	0.1730	0.3151	0.5490	0.5830	
(site)BG156	-2.6854	0.3151	-8.5230	< 2e-16	***
(site)BG157	-1.6280	0.3151	-5.1670	0.0000	***
(site)BG158	-1.0412	0.3151	-3.3050	0.0010	***
(site)BG159	-1.0066	0.3151	-3.1950	0.0014	**
(site)BG163	1.2783	0.3362	3.8020	0.0002	***
(site)BG164	1.8770	0.3362	5.5830	0.0000	***
(site)BG165	1.0806	0.3362	3.2140	0.0013	**
(site)BG166	1.6404	0.3362	4.8790	0.0000	***
(site)BG168	0.6990	0.3362	2.0790	0.0378	*
(site)BR178	-2.3902	0.3262	-7.3270	0.0000	***
(site)BR179	-1.1784	0.3262	-3.6120	0.0003	***
(site)BR180	-2.6078	0.3262	-7.9940	0.0000	***
(site)BR181	-2.2724	0.3262	-6.9660	0.0000	***
(site)BR182	-2.4929	0.3262	-7.6420	0.0000	***
(site)BR183	-4.0147	0.3262	-12.3070	< 2e-16	***
(site)BR184	-0.3599	0.3262	-1.1030	0.2702	
(site)BR185	-2.4156	0.3262	-7.4050	0.0000	***
(site)BR186	-1.1362	0.3262	-3.4830	0.0005	***
(site)BR187	-2.1069	0.3262	-6.4590	0.0000	***
(site)BR189	1.0482	0.3337	3.1410	0.0017	**
(site)BR190	1.5150	0.3337	4.5390	0.0000	***
(site)BR191	0.2502	0.3337	0.7500	0.4535	
(site)BR192	-3.3032	0.3262	-10.1260	< 2e-16	***
(site)BR193	1.7309	0.3337	5.1860	0.0000	***
(site)BR194	-3.1341	0.3262	-9.6080	< 2e-16	***

(site)BR195	2.0883	0.3337	6.2570	0.0000	***
(site)BR196	-2.3704	0.3262	-7.2660	0.0000	***
(site)BR197	0.8882	0.3337	2.6610	0.0079	**
(site)BR198	-0.4927	0.3262	-1.5100	0.1312	
(site)BR199	-2.4352	0.3262	-7.4650	0.0000	***
(site)CE140	0.5790	0.3399	1.7030	0.0887	.
(site)CE141	-0.0038	0.3399	-0.0110	0.9911	
(site)CE142	0.5171	0.3399	1.5220	0.1284	
(site)CE143	-4.3529	0.3399	-12.8070	< 2e-16	***
(site)ST039	-2.2000	0.3226	-6.8190	0.0000	***
(site)ST040	-3.0270	0.3226	-9.3830	< 2e-16	***
(site)ST041	-2.6515	0.3226	-8.2190	0.0000	***
(site)ST042	-3.6927	0.3226	-11.4460	< 2e-16	***
(site)ST043	-1.9881	0.3226	-6.1620	0.0000	***
(site)ST044	-1.6782	0.3226	-5.2020	0.0000	***
(site)ST045	-3.6533	0.3226	-11.3240	< 2e-16	***
(site)ST046	-1.7591	0.3226	-5.4530	0.0000	***
(site)ST047	-1.4548	0.3226	-4.5090	0.0000	***
(site)ST048	-3.7317	0.3226	-11.5670	< 2e-16	***
(site)ST049	-2.9254	0.3226	-9.0680	< 2e-16	***
(site)ST051	-1.5903	0.3226	-4.9290	0.0000	***
(site)ST052	-3.3074	0.3226	-10.2520	< 2e-16	***
(site)ST053	-2.0413	0.3226	-6.3270	0.0000	***
(site)ST054	-3.4451	0.3226	-10.6790	< 2e-16	***
(site)ST055	-1.5336	0.3226	-4.7540	0.0000	***
(site)ST056	-3.4367	0.3226	-10.6530	< 2e-16	***
(site)ST057	-2.5975	0.3226	-8.0510	0.0000	***
(site)ST058	-3.7216	0.3226	-11.5360	< 2e-16	***
(site)ST059	0.7200	0.3275	2.1990	0.0281	*
(site)ST060	1.2108	0.3275	3.6970	0.0002	***
(site)ST061	-2.4389	0.3226	-7.5600	0.0000	***
(site)ST062	-1.6706	0.3226	-5.1780	0.0000	***
(site)ST063	-1.7018	0.3226	-5.2750	0.0000	***
(site)ST069	1.2826	0.3275	3.9160	0.0001	***
(site)ST073	-4.2541	0.3226	-13.1860	< 2e-16	***
(site)ST074	0.4417	0.3275	1.3490	0.1776	
(site)ST075	-0.7663	0.3275	-2.3400	0.0194	*
(site)ST076	-4.0972	0.3226	-12.7000	< 2e-16	***
(site)ST077	1.8598	0.3275	5.6790	0.0000	***
(site)ST078	-3.5537	0.3226	-11.0150	< 2e-16	***
(site)ST079	-3.4787	0.3226	-10.7830	< 2e-16	***
(site)ST080	-1.9176	0.3226	-5.9440	0.0000	***
(site)ST081	-1.0949	0.3226	-3.3940	0.0007	***
(site)ST082	-0.0046	0.3275	-0.0140	0.9888	
(site)ST083	1.4491	0.3275	4.4250	0.0000	***
(site)ST084	0.0536	0.3226	0.1660	0.8681	

(site)ST085	-2.2953	0.3226	-7.1150	0.0000	***
(site)ST086	-3.6516	0.3226	-11.3190	< 2e-16	***
(site)ST087	-2.7933	0.3226	-8.6580	< 2e-16	***
(site)ST088	-0.6168	0.3226	-1.9120	0.0561	.
(site)ST089	-4.2541	0.3226	-13.1860	< 2e-16	***
(site)ST090	-0.7055	0.3226	-2.1870	0.0289	*
(site)ST091	-3.5088	0.3226	-10.8760	< 2e-16	***
(site)ST092	-2.9704	0.3226	-9.2070	< 2e-16	***
(site)ST093	-3.5042	0.3226	-10.8620	< 2e-16	***
(site)ST094	1.5160	0.3275	4.6290	0.0000	***
(site)ST095	-1.7903	0.3226	-5.5490	0.0000	***
(site)ST096	-4.2046	0.3226	-13.0330	< 2e-16	***
(site)ST097	-0.8284	0.3226	-2.5680	0.0103	*
(site)ST098	-3.3085	0.3226	-10.2550	< 2e-16	***
(site)ST204	0.4579	0.3275	1.3980	0.1623	
(site)ST205	0.3843	0.3226	1.1910	0.2338	
(site)ST206	-2.9957	0.3226	-9.2860	< 2e-16	***
(site)ST207	-0.7847	0.3275	-2.3960	0.0167	*
(site)ST208	0.7518	0.3226	2.3300	0.0199	*
(site)ST209	1.4025	0.3275	4.2830	0.0000	***
(site)ST210	-4.1962	0.3226	-13.0070	< 2e-16	***
(site)ST211	-3.6356	0.3226	-11.2690	< 2e-16	***
(site)ST212	-3.1509	0.3226	-9.7670	< 2e-16	***
(site)ST213	-1.0291	0.3226	-3.1900	0.0015	**
(site)ST214	-0.0675	0.3226	-0.2090	0.8343	
(site)ST215	-2.5877	0.3226	-8.0210	0.0000	***
Time effects (Relative the Monday(s) in 2021)					
(day)Tue 2021	-0.0852	0.1145	-0.7440	0.4568	
(day)Wed 2021	0.1371	0.1145	1.1970	0.2315	
(day)Thu 2021	0.1186	0.1145	1.0360	0.3003	
(day)Fri 2021	0.1041	0.1145	0.9090	0.3636	
(day)Sat 2021	-0.2464	0.1145	-2.1520	0.0315	*
(day)Sun 2021	-0.4269	0.1145	-3.7280	0.0002	***
(day)Mon 2023	0.6070	0.2467	2.4600	0.0140	*
(day)Tue 2023	0.6847	0.2467	2.7750	0.0056	**
(day)Wed 2023	0.6514	0.2467	2.6400	0.0084	**
(day)Thu 2023	0.5643	0.2467	2.2870	0.0223	*
(day)Fri 2023	0.5808	0.2467	2.3540	0.0187	*
(day)Sat 2023	0.3850	0.2468	1.5600	0.1190	
(day)Sun 2023	0.2469	0.2467	1.0010	0.3172	

Signif. codes: 0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1					
Adjusted R-squared: 0.833					

Annex 2.1 Air quality monitoring sites

scheme	site_id	site_class	address
Bounds Green	LTN/15	Boundary	300A High Rd, London N22 8JR
Bounds Green	LTN/16	Boundary	5 Brownlow Rd, London N11 2ET
Bounds Green	LTN/17	Internal	46, Myddleton Road, London, N22 8NW
Bounds Green	LTN/18	Internal	66 Truro Rd, London N22 8DN
Bounds Green	LTN/19	Internal	6 Warwick Rd, London N11 2TU
Bounds Green	LTN/20	Internal	St Martin of Porres Pr. Schl, Bounds Green, N11 2AF
Bounds Green	LTN/21	Internal	21 Queen's Rd, London N11 2QJ
Bounds Green	LTN/23	Internal	162 Woodfield Way, London N11 2NU
Bounds Green	LTN/24	Boundary	83 Durnsford Rd, London N11 2EN
Bruce Grove	LTN/29	Boundary	Harris Primary Academy, Philip Lane, London, N15 4AE
Bruce Grove	LTN/30	Internal	Bruce Grove Primary School, Sperling Road, London, N17 6UL
Bruce Grove	LTN/32	Boundary	87 Bruce Grove, London N17 6UZ
Bruce Grove	LTN/33	Internal	Park View Academy, Langham Road, London, N15 3RA
Bruce Grove	LTN/34	Boundary	104 Westbury Ave, London N22 6RT
Bruce Grove	LTN/35	Boundary	85 Downhills Way, London N17 6AL
Bruce Grove	LTN/37	Internal	The Grove School, Downhills Park Road, London, N17 6AR
Bruce Grove	LTN/38	Internal	73 Broadwater Rd, London N17 6EP
External	HR06	External	200A, Archway Road, N6 5BA
External	HR08	External	7 Cross Lane, N8 7QG
External	HR14a	External	639 High Road, N17
External	HR14b	External	639 High Road, N17
External	HR14c	External	639 High Road, N17
External	HR21	External	Lordship Lane Primary School, N22 5PS
External	HR25	External	Rowland Hill Nursery, White Hart Lane
External	HR30	External	Earlsmead Primary School, N17
External	HR31	External	97/101 High Road, N22 6BB
External	HR32	External	271 Archway Road, N6 5AA
External	HR34	External	Coleridge Primary school
External	HR36	External	Holy Trinity CE School, Tottenham
External	HR37	External	Weston Park/Broadway, 48 The Broadway, N8 9TP
External	HR38	External	Welbourne Primary School N15
External	HR39	External	Fortismere School, N10 1NE
External	HR40	External	Opposite Highgate Private Hospital, 17 â€“ 19 View Road, Highgate. N6 4DJ
External	HR41	External	258 Muswell Hill Broadway, N10 3SH
External	HR42	External	15 Stanhope Road, N6 5NE
External	HR43	External	St Aidanâ€™s VC Primary School, N4 4RR
External	HR44	External	North Harringay Primary School, N8 0NU
External	HR45	External	Tiverton Primary School, Pulford Road. N15 6SP
External	HR48	External	Mulberry Primary School, N17 9RB
External	HR51	External	76 Coburg Road, N22 6UB
External	HR52	External	263 Victoria Road, N22 7XH

External	HR54	External	Woodside High Road/ White Hart Lane, N22 5QJ
External	HR55	External	Risley Ave. Primary, London N17 7AB
External	HR56	External	Dukes Aldridge Academy, Almond Road, N17 0PG
External	HR57	External	Campsbourne School Nightingale Lane, N8 7AF
External	LTN/14	External	9 Bramble Cl, Broad Ln, South Tottenham, London N15 4NF
External	LTN/22	External	St Cuthberts Church, 85 Wolves Lane, N22 5JD
External	LTN/25	External	112 Crescent Road, London N22 7RX
External	LTN/26	External	10 Palace Gates Rd, London N22 7BN
External	LTN/27	External	188 Albert Rd, London N22 7AQ
External	LTN/28	External	84 Victoria Rd, London N22 7XF
External	LTN/39	External	96 Risley Ave, London N17 7ES
External	LTN/40	External	47 Lawrence Road, N15 4EF
St Ann's	LTN/1	Internal	Saint John Vianney Roman Catholic Pr. School, N15 3HB
St Ann's	LTN/10	Internal	Seven Sisters Primary Sch, Edgecot Grove, London, N15 5HD
St Ann's	LTN/11	Boundary	730 Seven Sisters Rd, South Tottenham, London N15 5NH
St Ann's	LTN/12	Internal	20, Suffield Road, London, N15 5JX
St Ann's	LTN/13	Boundary	142 Allison Rd, Harringay Ladder, London N8 0AS
St Ann's	LTN/2	Internal	26 Clarendon Rd, Harringay Ladder, London N15 3JX
St Ann's	LTN/3	Internal	West Green Primary School, Woodlands Park Rd, London N15 3RH
St Ann's	LTN/4	Internal	Woodlands Park Nur. Sch., 74-76 Woodlands Park Rd, N15 3SD
St Ann's	LTN/5	Internal	Chestnuts Primary School, Black Boy Lane, London, N15 3AR
St Ann's	LTN/6	Boundary	St. Ann's Hospital, St Ann's Road, London N15 5BN
St Ann's	LTN/7	Internal	114 Cornwall Rd, London N15 5AU
St Ann's	LTN/8	Internal	St Ann's CE Primary School, Avenue Rd, London N15 5JG
St Ann's	LTN/9	Boundary	The Green Dental Surgery, 200 W Green Rd, London N15 5AG

Annex 2.2 Air pollution (NO2) full results

	Estimate	Std. Error	t value	Pr(>|t|)	
(Intercept)	3.2077	0.0485	66.1870	< 2e-16	***
LTN effects					
(policy)Bounds Green-Boundary	0.0264	0.0529	0.4980	0.6186	
(policy)Bounds Green-Internal	0.0020	0.0383	0.0510	0.9592	
(policy)Bruce Grove-Boundary	-0.0230	0.0455	-0.5060	0.6131	
(policy)Bruce Grove-Internal	-0.0461	0.0453	-1.0180	0.3090	
(policy)St Ann's-Boundary	0.0095	0.0482	0.1970	0.8441	
(policy)St Ann's-Internal	0.0312	0.0331	0.9420	0.3464	
Site effects (Relative to HR06)					
(site_id)HR08	-0.2460	0.0576	-4.2680	0.0000	***
(site_id)HR14a	-0.1816	0.0576	-3.1520	0.0017	**
(site_id)HR14b	-0.1600	0.0582	-2.7490	0.0061	**
(site_id)HR14c	-0.0979	0.0582	-1.6820	0.0927	.
(site_id)HR21	-0.4591	0.0576	-7.9660	0.0000	***
(site_id)HR25	-0.3412	0.0576	-5.9200	0.0000	***
(site_id)HR30	-0.1301	0.0628	-2.0720	0.0384	*
(site_id)HR31	0.6274	0.0595	10.5420	< 2e-16	***
(site_id)HR32	0.3870	0.0588	6.5780	0.0000	***
(site_id)HR34	-0.1344	0.0602	-2.2310	0.0258	*
(site_id)HR36	-0.1264	0.0576	-2.1940	0.0284	*
(site_id)HR37	-0.0324	0.0595	-0.5450	0.5861	
(site_id)HR38	-0.3933	0.0595	-6.6080	0.0000	***
(site_id)HR39	-0.3523	0.0602	-5.8480	0.0000	***
(site_id)HR40	-0.1958	0.0576	-3.3970	0.0007	***
(site_id)HR41	0.1608	0.0588	2.7330	0.0063	**
(site_id)HR42	-0.3998	0.0595	-6.7170	0.0000	***
(site_id)HR43	-0.5171	0.0582	-8.8830	< 2e-16	***
(site_id)HR44	-0.4957	0.0576	-8.6020	< 2e-16	***
(site_id)HR45	-0.5395	0.0582	-9.2660	< 2e-16	***
(site_id)HR48	-0.3989	0.0595	-6.7030	0.0000	***
(site_id)HR51	-0.4964	0.0582	-8.5270	< 2e-16	***
(site_id)HR52	-0.2214	0.0582	-3.8020	0.0001	***
(site_id)HR54	-0.3761	0.0576	-6.5250	0.0000	***
(site_id)HR55	-0.0837	0.0588	-1.4220	0.1552	
(site_id)HR56	-0.4334	0.0588	-7.3660	0.0000	***
(site_id)HR57	-0.4752	0.0576	-8.2450	0.0000	***
(site_id)LTN/1	-0.4225	0.0612	-6.9100	0.0000	***
(site_id)LTN/10	-0.1756	0.0641	-2.7400	0.0062	**
(site_id)LTN/11	-0.4991	0.0652	-7.6510	0.0000	***
(site_id)LTN/12	-0.5930	0.0620	-9.5700	< 2e-16	***
(site_id)LTN/13	-0.0076	0.0669	-0.1130	0.9101	
(site_id)LTN/14	-0.3983	0.0582	-6.8410	0.0000	***

(site_id)LTN/15	0.2933	0.0668	4.3940	0.0000	***
(site_id)LTN/16	-0.4294	0.0647	-6.6350	0.0000	***
(site_id)LTN/17	-0.2886	0.0632	-4.5650	0.0000	***
(site_id)LTN/18	-0.1822	0.0619	-2.9440	0.0033	**
(site_id)LTN/19	-0.0897	0.0623	-1.4400	0.1501	
(site_id)LTN/2	-0.2619	0.0625	-4.1910	0.0000	***
(site_id)LTN/20	-0.4849	0.0637	-7.6070	0.0000	***
(site_id)LTN/21	-0.4372	0.0619	-7.0630	0.0000	***
(site_id)LTN/22	-0.4134	0.0582	-7.1000	0.0000	***
(site_id)LTN/23	-0.4578	0.0628	-7.2930	0.0000	***
(site_id)LTN/24	-0.5106	0.0668	-7.6480	0.0000	***
(site_id)LTN/25	-0.3659	0.0576	-6.3490	0.0000	***
(site_id)LTN/26	-0.4156	0.0576	-7.2110	0.0000	***
(site_id)LTN/27	-0.0487	0.0576	-0.8460	0.3979	
(site_id)LTN/28	-0.4300	0.0595	-7.2240	0.0000	***
(site_id)LTN/29	-0.5629	0.0634	-8.8820	< 2e-16	***
(site_id)LTN/3	-0.4938	0.0625	-7.9000	0.0000	***
(site_id)LTN/30	-0.0405	0.0630	-0.6430	0.5206	
(site_id)LTN/32	-0.2646	0.0644	-4.1100	0.0000	***
(site_id)LTN/33	-0.3759	0.0630	-5.9640	0.0000	***
(site_id)LTN/34	0.0998	0.0634	1.5740	0.1157	
(site_id)LTN/35	-0.4987	0.0631	-7.9070	0.0000	***
(site_id)LTN/37	-0.2066	0.0643	-3.2120	0.0013	**
(site_id)LTN/38	-0.2991	0.0633	-4.7230	0.0000	***
(site_id)LTN/39	-0.3695	0.0751	-4.9220	0.0000	***
(site_id)LTN/4	-0.6037	0.0616	-9.7940	< 2e-16	***
(site_id)LTN/40	-0.0961	0.0650	-1.4790	0.1394	
(site_id)LTN/5	-0.5407	0.0682	-7.9260	0.0000	***
(site_id)LTN/6	-0.0791	0.0674	-1.1730	0.2410	
(site_id)LTN/7	-0.6111	0.0622	-9.8280	< 2e-16	***
(site_id)LTN/8	-0.4938	0.0625	-7.9000	0.0000	***
(site_id)LTN/9	-0.4975	0.0636	-7.8210	0.0000	***
Time effects (Relative to Apr.2021)					
(month)Apr.23	0.3569	0.0389	9.1750	< 2e-16	***
(month)Aug.22	0.3005	0.0375	8.0020	0.0000	***
(month)Aug.23	0.0466	0.0388	1.2030	0.2293	
(month)Dec.21	0.4503	0.0369	12.1970	< 2e-16	***
(month)Dec.22	0.5321	0.0383	13.8960	< 2e-16	***
(month)Feb.22	0.4885	0.0374	13.0630	< 2e-16	***
(month)Feb.23	0.6485	0.0387	16.7730	< 2e-16	***
(month)Jan.22	0.5960	0.0372	16.0070	< 2e-16	***
(month)Jan.23	0.4724	0.0380	12.4170	< 2e-16	***
(month)Jul.22	0.2975	0.0374	7.9570	0.0000	***
(month)Jul.23	0.1603	0.0395	4.0620	0.0001	***
(month)Jun.22	0.1491	0.0372	4.0050	0.0001	***
(month)Jun.23	0.1488	0.0397	3.7480	0.0002	***

(month)Mar.22	0.4903	0.0369	13.2880	< 2e-16	***
(month)Mar.23	0.4174	0.0387	10.7830	< 2e-16	***
(month)May.22	0.0720	0.0376	1.9170	0.0554	.
(month)May.23	0.2879	0.0388	7.4130	0.0000	***
(month)Nov.21	0.4802	0.0372	12.8990	< 2e-16	***
(month)Nov.22	0.5622	0.0391	14.3720	< 2e-16	***
(month)Oct.21	0.3939	0.0387	10.1770	< 2e-16	***
(month)Oct.22	0.5975	0.0382	15.6480	< 2e-16	***
(month)Oct.23	0.6278	0.0436	14.4020	< 2e-16	***
(month)Sep.21	0.4805	0.0383	12.5400	< 2e-16	***
(month)Sep.22	0.3638	0.0384	9.4700	< 2e-16	***
(month)Sep.23	0.5334	0.0426	12.5190	< 2e-16	***

Signif. codes: 0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1					
Adjusted R-squared: 0.6777					