

Evaluation of Street Works Permit Schemes

ECORYS  
OPEN ROAD ASSOCIATES



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1.0 Legislative Background

This section provides information on the legislative background for the management of street works and road works and supports the background information provided in Section 1.1 of the main report.

Timeline of developments

1991: The New Roads and Street Works Act placed a duty on highway authorities to coordinate works.

2004: The Traffic Management Act (part 3) introduced the possibility of permit schemes, subject to approval by the Secretary of State.

2007: Permit Scheme Regulations came into force to provide structure for schemes.

2008/9: A Code of Practice and Statutory Guidance were provided for permit schemes.

2010: The first permit schemes were launched.

2013: An Advice Note was released. This suggested that permit schemes should comply with the needs of national infrastructure projects and, where possible, enable early starts.

2015: The Traffic Management Act was amended to remove the need for the Secretary of State to approve permit schemes¹. The mechanism for this change was provided by the 2015 Deregulation Act. Additional changes were also made as a result of the Infrastructure Act (2015) which saw the Highways Agency change to Highways England².

Statutory guidance was provided on a set of national conditions followed later by statutory guidance on the development of permit schemes. These are the only statutory guidance documents which currently apply to permit schemes.

An amendment to the Permit Scheme Regulations was provided which included requirements for the evaluation of permit schemes.

Highway Authorities needed to enact the changes by varying their schemes (so that all schemes would have the same basis). Existing schemes were required to

¹ However, the Secretary of State can still direct that schemes are implemented and also revoke existing schemes.

² Highways England is a Highway Authority and, as such, could introduce a permit scheme.

comply by 1st October 2015. An Advice Note was provided to show those with existing schemes how to achieve compliance.

2017: HAUC³ (England) published its Operational Guidance for Permit Schemes.

The New Roads and Street Works Act (NRSWA) of 1991 places a duty on highway authorities to **coordinate street and road (or highway) works** and also to facilitate the expeditious movement of traffic within their areas (the network management duty).

Street works and road works

Works carried out by statutory undertakers or licensees under section 50 of NRSWA, or their contractors, to install, inspect, maintain, repair or replace apparatus (or work required for or incidental to such works such as breaking up or opening the street) are known as street works. Most utility companies are statutory undertakers; this means that they have a statutory right or duty to install, inspect, maintain, repair, or replace apparatus in or under the street which is set out in primary legislation.

Road works (or works for road purposes) are usually carried out by, or on behalf of, highway authorities and involve the repair, maintenance or replacement of highways, including works to replace or maintain street lighting.

Highway authorities are responsible for making appropriate use of the powers at their disposal, recognising that different tools may be appropriate in different situations. The NRSWA places a general duty on the undertaker to cooperate in the coordination of works and also requires that street works promoters provide **advance notice** of certain works to the highway authority. This practice is referred to as **noticing**. The notice must contain any information prescribed by the authority for the purposes of coordinating street works taking place in the area.

The Traffic Management Act (TMA) of 2004 introduced the option for highway authorities to implement a **permit scheme**, which requires those wishing to carry out street or road works to first obtain a permit from the authority.

³ The Highway Authorities and Utilities Committee. HAUC's main aims are to advise the Secretary of State on issues relating to street works legislation, to provide guidance to practitioners and to provide a forum for matters of mutual interest in relation to street works.

Traffic Management Act

The Traffic Management Act (TMA) came into effect in 2004. The Act made a provision for the designation of traffic officers within a local highway authority and set out duties in relation to the management of road networks;

The Act also made new provisions for regulating the carrying out of works and other activities in the street, establishing specified guidelines for all the parties interested in occupying the highway.

The main elements of the TMA are as follows:

- effective communication between highway authorities and parties interested in carrying out street work;
- powers given to highway authorities to impose fixed charges in case of any failure to follow the guidelines;
- disciplined approach and advance communication to plan the works;
- introduction of web services for communication;
- introduction of Level 3 NSG data; and
- explicit provision for cancelling/correcting or reverting the work status.

The second wave of the Traffic Management Act, Part 3, implemented permit regulation. Under this regulation, LHAs can introduce a permit scheme under which work promoters must apply for a permit to work on a street.

Regulations to allow the introduction of permit schemes were introduced in 2007. Initially, scheme applications were submitted to the Department for Transport and required Ministerial approval. However, the Deregulation Act⁴ paved the way for a change to the regulations which meant that permit schemes no longer required this approval and could instead be approved (or varied or revoked) by the Chief Executive (or similar) of the relevant local authority (this change came into effect in June 2015). Any authorities which wanted their schemes to be approved by the Department were required to submit scheme documentation by August 2014 to allow this process to be completed by the end of March 2015.

Amended permit scheme regulations came into effect in 2015 to reflect the **change in the approval process**. It also included a requirement for all permit schemes to use a set of **national conditions** that were set out in statutory guidance having been developed and consulted on by the Highways Authorities and Utilities Committee (HAUC) on behalf

⁴ The Deregulation Act (2015) makes provision for the reduction of burdens resulting from legislation, the repeal of legislation which no longer has practical use and the exercise of regulatory functions and related purposes.

of the sector⁵. The Statutory Guidance for Permit Conditions sets out the conditions that can be applied by a Permit Authority, together with code references to apply the conditions, prefixed by NCT (National Condition Text) and a reference number, e.g. NCT01 (see Table 1.1). By the nature of conditions and their applications, they may not necessarily apply to all permits, for example a condition to constrain the use of portable-traffic signals would not apply to those works not being carried out under that form of traffic control.

Most recently, HAUC (England) published guidance on the operation of permit schemes, following a process of engagement and consultation with the sector⁶.

Table 1.1 National conditions

Ref.	Condition type	Condition	Application
NCT01a	Date constraint	Specifies the working dates and times of the works, in accordance with the permit	Only works on reinstatement category 0, 1, 2 and traffic-sensitive designation streets.
NCT01b		Specifies the working dates and times of the works, in accordance with the permit where the works promoter is allowed a 'sliding window' in which to start works	Only works on reinstatement category 3, 4 and non-traffic-sensitive designation streets.
NCT02a	Time constraint	Limits the days and times of day the works can be undertaken	Applied to all works
NCT02b		Specifies the working hours for the works	Applied to all works
NCT04a	Material and plant storage	Specifies the removal of surplus materials/plant during works	Applied to all works
NCT04b		Specifies the storage of surplus materials/plant during works	Applied to all works
NCT05a	Road occupation dimensions	Specifies the width and/or length of road space that can be occupied	Only works using a form of traffic control
NCT06a	Traffic space dimensions	Specifies the road space to be available to traffic/pedestrians at certain times of day	Applied to all works
NCT07a	Road closure	Specifies the road [to be] closed to traffic when works take place	Only works undertaken using a road closure

⁵ <https://www.gov.uk/government/publications/street-works-permit-schemes-conditions>

⁶ <https://www.jaguk.org/documents/48947/409754/National+guidance+for+Permit+Schemes/e9e157e2-223e-4ece-990f-36f1a8d54a3d>

Ref.	Condition type	Condition	Application
NCT08a	Light signals and shuttle working	Specifies works, or part of, that can take place when the use of temporary traffic control is in use.	Only works undertaken using a form of traffic control
NCT08b		Specifies the manual control (instead of automated) of temporary traffic control at certain times.	Only works using traffic control of two-way or multi-way signals
NCT09a	Traffic management changes	Specifies that the LHA must be contacted if changes to traffic management arrangements are made during the works.	Only works using a form of traffic control
NCT09b		Specifies the traffic management arrangements to be in place at certain times of the works.	Only works using a form of traffic control
NCT09c		Specifies the removal of portable traffic signals within a set time upon completion of the works.	Only works using traffic control of two-way or multi-way signals
NCT10a	Works methodology	Specifies the employment of appropriate methodology for the works	Applied to all works
NCT11a	Consultation and publicity	Specifies the display of a permit number, on a site information board, during the life of the works.	Applied to all works
NCT11b		Specifies the publicity, or advertisement, of works prior to the works taking place.	Applied to all works
NCT12a	Environmental	Limiting the timing of certain activities (works) to prevent impact to the environment (noise).	Applied to all works

2.0 Description of Permit Schemes

This section provides further details about permit schemes, supplementing that which is contained in the main report.

The option for a local highway authority (LHA) to implement a permit scheme was introduced as a way to improve their ability to **proactively coordinate street and road works** by requiring that promoters apply for permission to undertake their works in advance, compared to the practice of noticing where promoters submit notice of their intentions.

Features of a permit scheme

The Traffic Management Act of 2004 sets out the main features of a permit scheme as follows:

- works promoters have to discuss and agree the restriction on work timing, apparatus etc. with the LHA;
- the LHA has to approve or reject a permit application after verifying the works and permit conditions;
- a permit must be kept relevant to the works and therefore any variation must be submitted for approval;
- promoters of all works are to be treated with parity, including both street works, typically carried out by utility companies, and works for road purposes, typically carried out by or on behalf of a council.
- LHAs can apply a fee for the processing of a permit, from which they can recover prescribed costs for running the scheme; and
- LHAs can apply two new offences for working without a permit or in breach of a condition of the permit.

Permit schemes represent an important change compared to noticing as promoters must proactively seek **permission to undertake the work** and the authority must consider whether to grant the permit and whether to impose any conditions on the work being undertaken (this may include, for example, restrictions on the times of day during which the work may be carried out).

It was intended that permit schemes would provide highway authorities with more scope to **control and coordinate works** in their area and also to charge a **fee for permit**

applications (intended to support the attributable costs of running the scheme, defined below). Unlike noticing, the permit scheme applies to both utilities and highway authorities' own works, although the latter are not expected to pay permit fees.

In designing a permit scheme, LHAs must consider whether it will apply to all roads or only the most strategically significant (where the costs of delays would be expected to be higher).

The Traffic Management Act (TMA) allows LHAs to charge for work related to the issue of permits (or variations to permits) but authorities may not use permit schemes to generate a surplus; the **income from fees must not exceed the total attributable costs** set out in the permit scheme regulations⁷. The statutory guidance for permit schemes notes that fee levels must be justified and must not exceed the maximum levels, which are structured to reflect the greater amount of work involved in dealing with larger activities and busier roads. A permit scheme should also provide for **discounts** for collaboration (where undertakers collaborate to carry out works in the same location at the same time), works on traffic sensitive streets which are wholly outside of traffic sensitive times and where a number of applications are submitted together and form part of a wider project.⁸ Where there is found to be an imbalance between fees and costs, adjustments should be considered.

The New Roads and Street Works Act (NRSWA) already provided for the introduction of financial incentives to reduce the disruption caused by street works. Under Section 74, authorities can levy overrun charges where works are not completed within an agreed, reasonable period of time. However, the TMA also provides LHAs that introduce a permit scheme with the option to issue **fixed penalty notices** (FPNs) for non-compliance with permit conditions or working without a permit.

The current Permit Scheme Regulations also set out requirements for evaluation of schemes. Section 16A of the regulations was introduced as part of the amendment undertaken in 2015. Prior to this, LHAs were required to develop and issue evaluations of their permit schemes in accordance with any provision set out in the scheme itself; many permit schemes included a provision for evaluation, but these were not always explicit on the content, timescales or requirement for publicity.

⁷ Total allowable costs are defined as the proportion of direct costs and overheads attributable to operating the scheme for statutory undertakers which are over and above the cost of fulfilling the LHA's duty to coordinate works as set out in the New Roads and Street Works Act (i.e. the costs associated with a noticing arrangement).

⁸ https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/465803/statutory-guide-for-permit-schemes.pdf

Evaluation of permit schemes⁹

A permit scheme shall contain information on how the Permit Authority must evaluate that scheme.

The Permit Authority shall evaluate each permit scheme following:

- a) the first, second and third anniversary respectively of the date on which the permit scheme came into effect; and
- b) every third anniversary thereafter.

In carrying out the evaluation, the Permit Authority shall include consideration of:

- a) whether the fee structure needs to be changed in light of any surplus or deficit;
- b) the costs and benefits (whether or not financial) of operating the scheme; and
- c) whether the permit scheme is meeting key performance indicators where these are set out in the Guidance.

The outcome of each evaluation shall be made available to the persons referred to in regulation 3(1) within three months of the relevant anniversary.

⁹ Taken from the Permit Scheme Regulations 2015.

3.0 Uptake of Permit Schemes

This section contains information on the uptake of permit schemes, to supplement the background information provided in Section 1.1 of the main report.

In 2009, Kent County Council received the first legal Order, from the Secretary of State for Transport, to bring a permit scheme into legal effect.

The first operational permit schemes came into effect in January 2010, with 17 London LHAs introducing the London Permit Scheme (LoPS) and Kent County Council introducing the Kent Permit Scheme. Since then the number of LHAs with a permit scheme has steadily increased, reaching a total of 95 Permit Authorities by September 2016 - which represents 63% of the LHAs in England.

The remaining LHAs continue to operate a notice regime, using the powers contained within the New Roads and Street Works Act (NRSWA) to coordinate and control works on their network.

There are 32 individually named permit schemes, with some LHAs operating a common permit scheme (one which is functionality identical and operated by several authorities). In addition, there is a single joint permit scheme, operated in Greater Manchester, which comprises 10 LHAs using a shared service to support the operation of the permit scheme¹⁰. Although there are many named permit schemes, with some variations in content, the scope and structure of these permit schemes remains broadly identical in order to align with regulatory requirements.

The majority (82 of 95) of permit schemes are applied to all roads, with the remaining 13 applying to the more strategically significant roads¹¹ within the network.

The uptake of permit schemes has accelerated since 2013 and in 2016 around 63% of recorded works were within a permit scheme. As shown in Figures 3.1 and 3.2 (overleaf), the proportion of works undertaken within a permit regime has increased over time (as would be expected given the increased uptake).

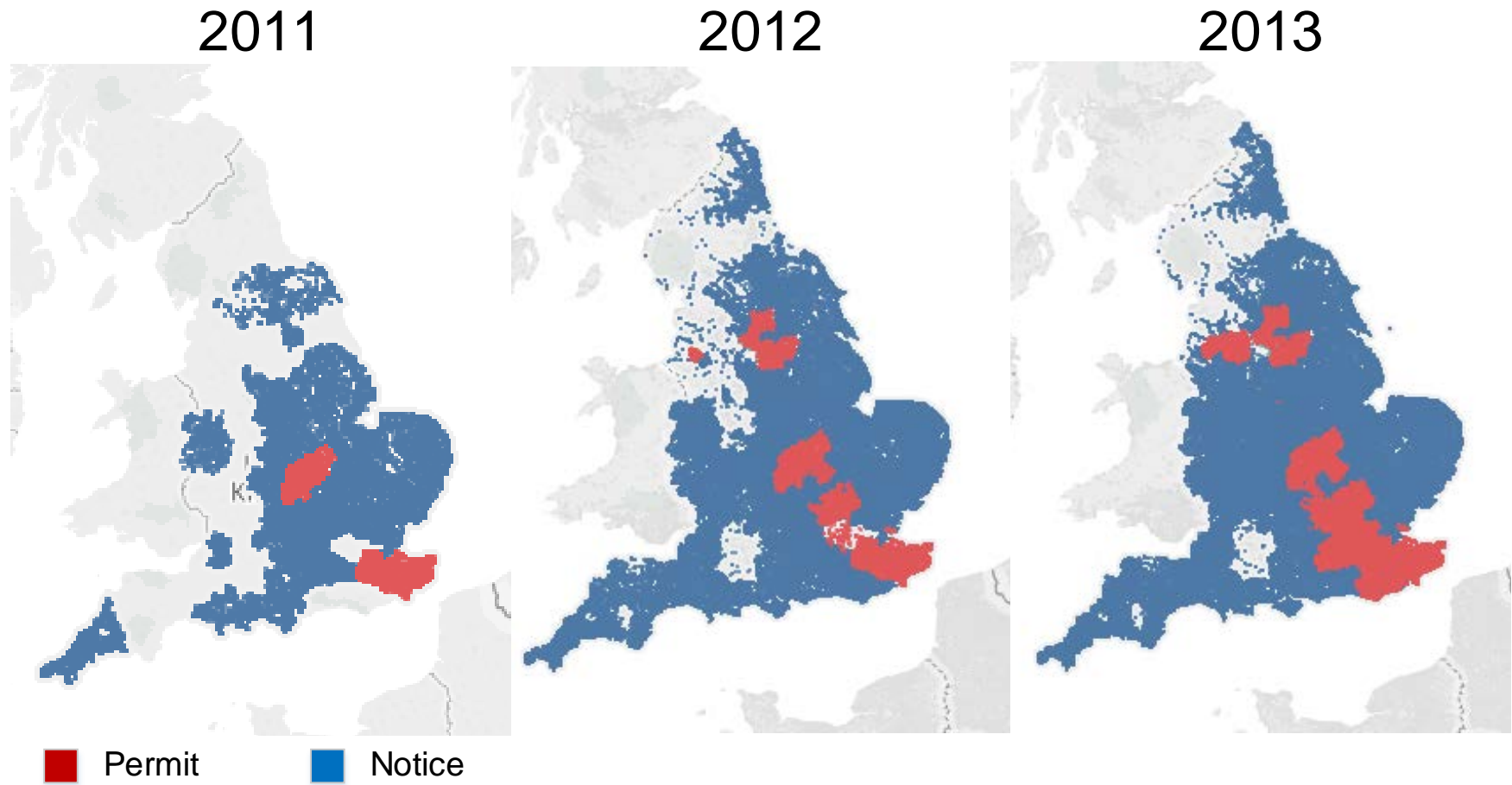
The LHAs that continue to operate notice regimes are predominantly in the South West and North East regions (see Figure 3.3, also overleaf).

¹⁰ Each participating authority was required to create its own statutory instrument for ministerial sign-off.

¹¹ Those with a reinstatement category of 0, 1, 2 or those with a traffic sensitive designation (this designation is used to highlight locations where works or activities are likely to be particularly disruptive to other road users). See Traffic Sensitive Streets Guidance Notes. Geoplace Streets Team (2017).

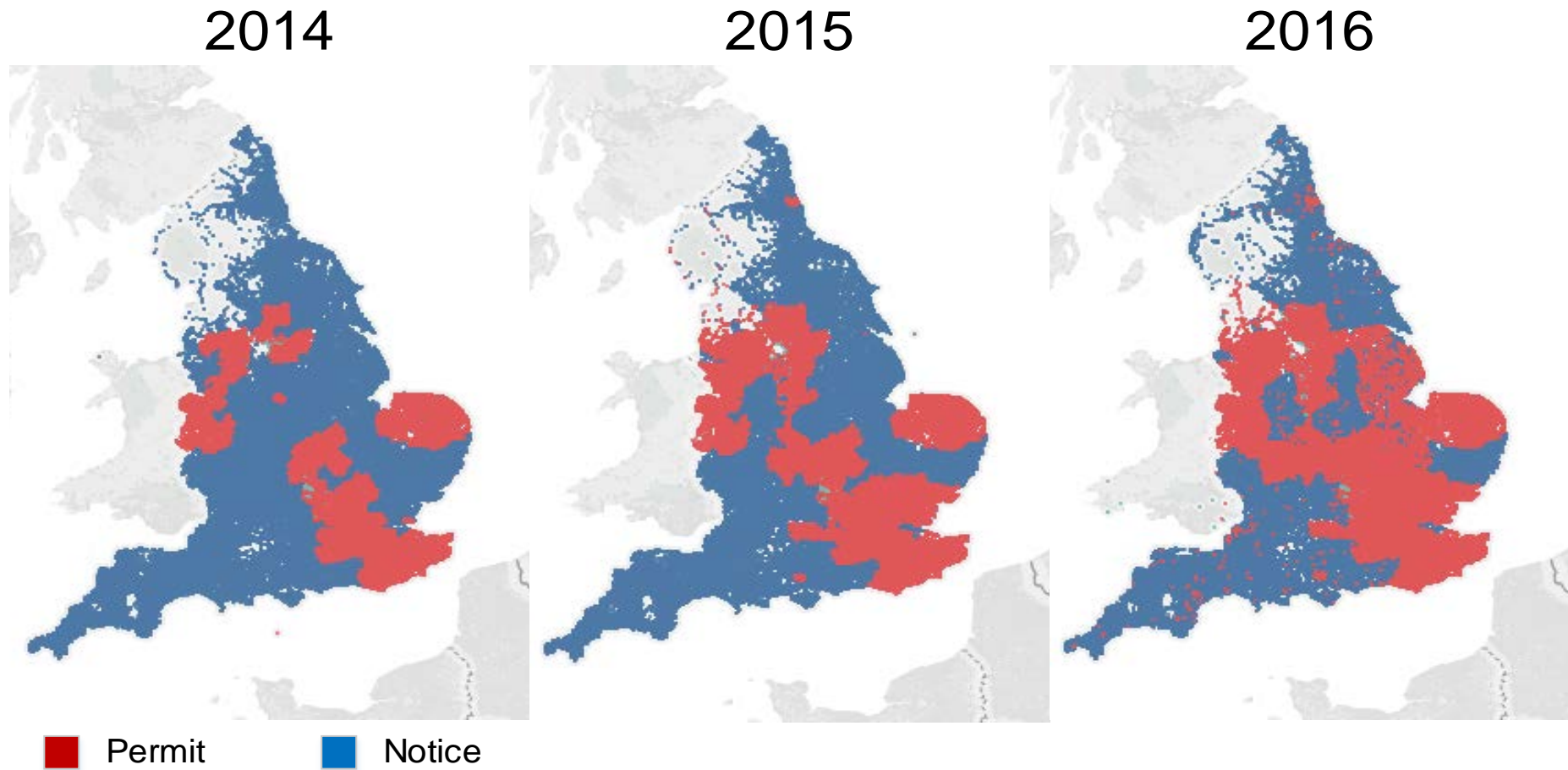
<https://www.geoplace.co.uk/documents/10181/110496/JAG+UK+Traffic+Sensitivity+Guidance/e70ccdb5-ccb9-4ca0-bd21-25d656055031>

Figure 3.1 Works undertaken under permit or notice regime, 2011-2013



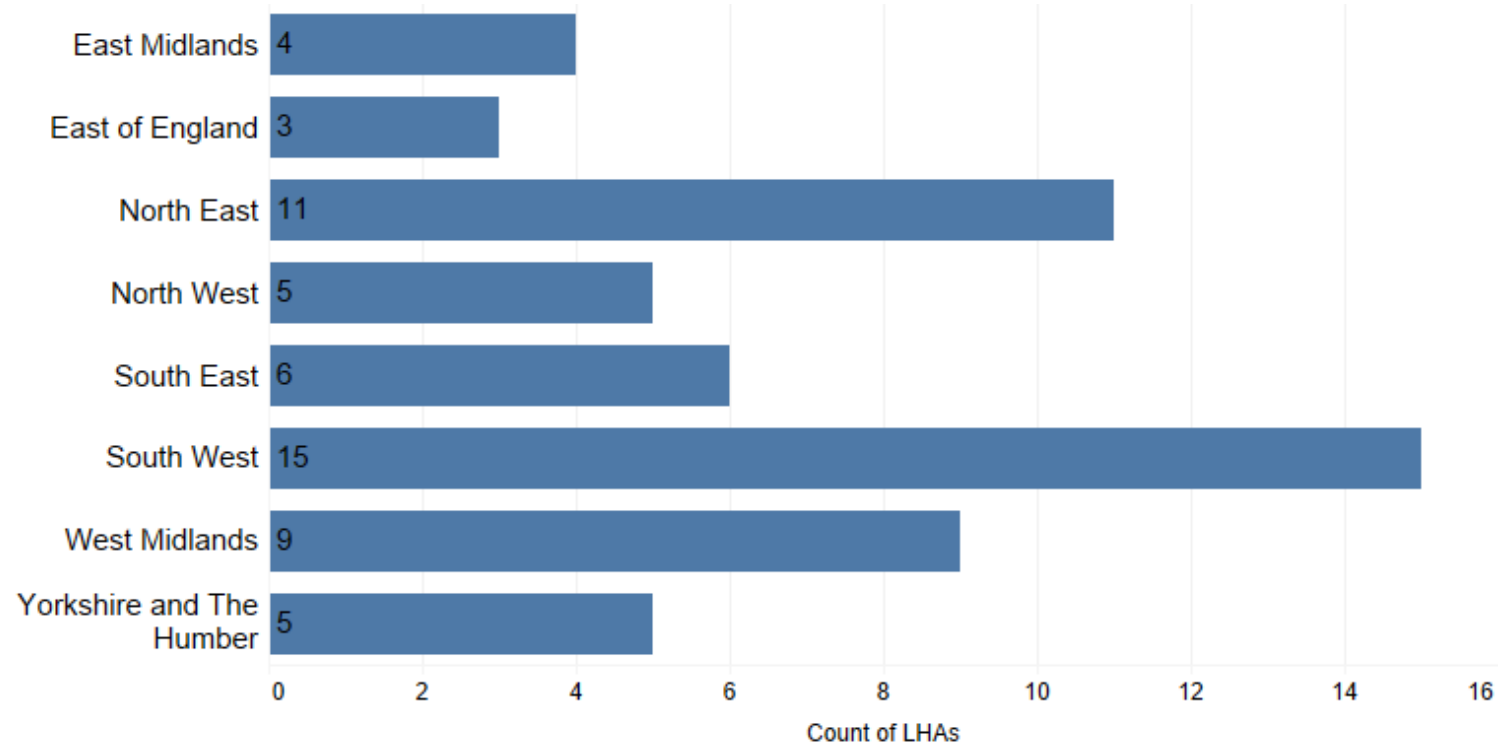
Source: Own analysis of EToN data

Figure 3.2 Works undertaken under permit or notice regime, 2014-2016



Source: Own analysis of EToN data

Figure 3.3 LHAs which continue to operate a notice regime, by region

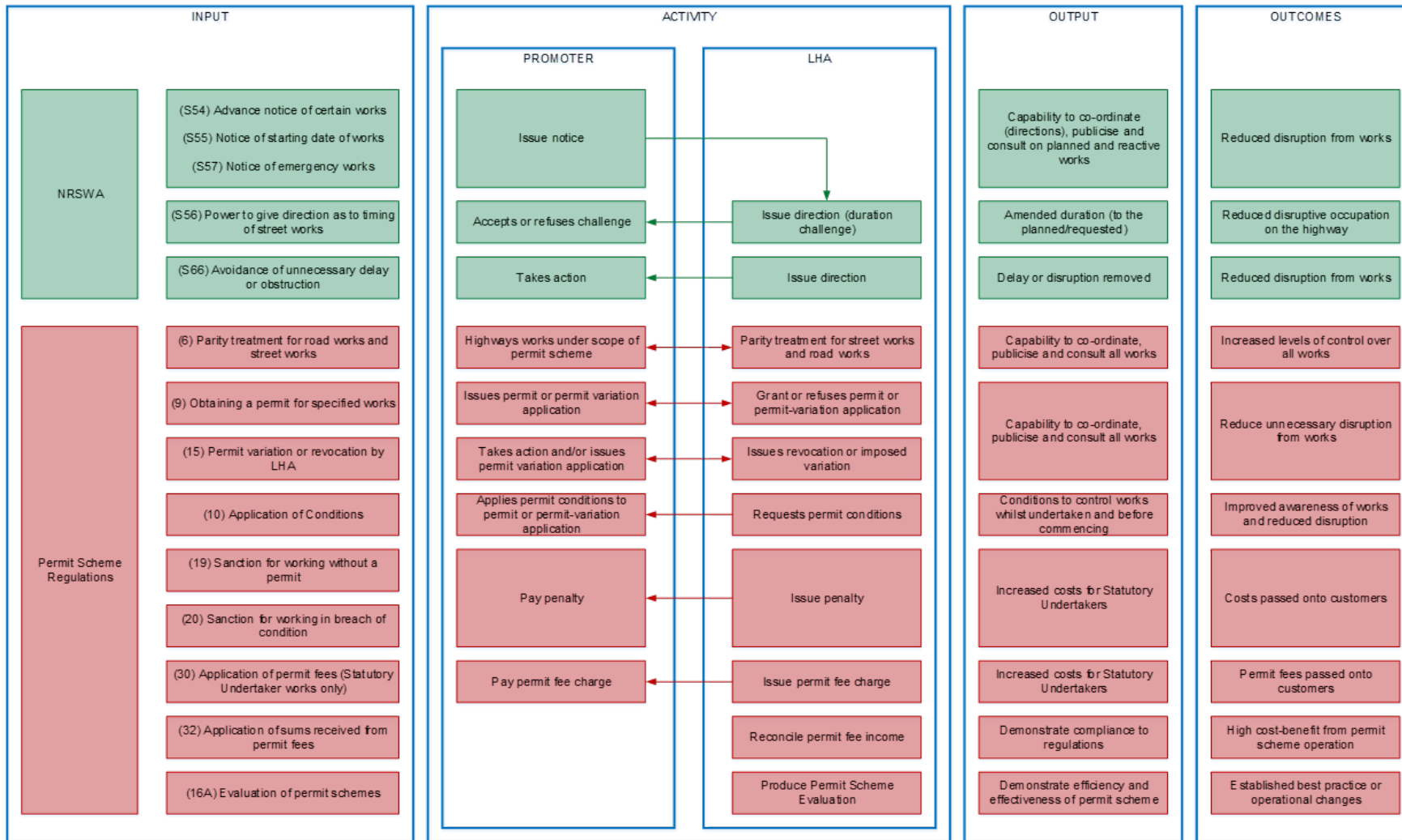


Source: Own analysis of EToN data.

4.0 Detailed Logic Map

This section provides a more detailed logic map (Figure 4.1) which shows the link between the activities (and associated outputs and outcomes) and the applicable regulations – the New Roads and Street Works Act (NRSWA) and the Permit Scheme Regulations. It complements the logic map set out in Section 2.1 of the main report.

Figure 4.1 Detailed Logic Map



5.0 Works Data Analysis

This section provides additional information on the works data analysis, to support that provided within the main report.

5.1 Background

To undertake analysis of the effects of a permit scheme it is necessary to consider the steps or processes that have taken place, i.e. the submission of a notice or the application for a permit and the subsequent direction from the LHA.

These processes are predicated on information sent between parties (LHAs and works promoters) using an established structure, the Technical Specification for the Electronic Transfer of Notifications (commonly referred to as EToN), which establishes a common platform on which notifications – information or required actions – are shared.

EToN data is stored in IT systems used by works promoters and LHAs, with the latter having a statutory responsibility to maintain a register of works. EToN systems maintained by the LHAs therefore provide an important source of data with which to investigate and analyse changes in processes and behaviour, including comparisons between notice and permit regimes.

For most LHAs, this data is then provided to Elgin¹². Once a work has reached the end of its lifecycle, Elgin archives the history of this work. Elgin provided access to this archive to the evaluation team for the purposes of this research.

5.2 Elgin works data archive

The data provided by the Elgin archive covers 93% of the road network in England and is the only collated source of transactional data at the works level.

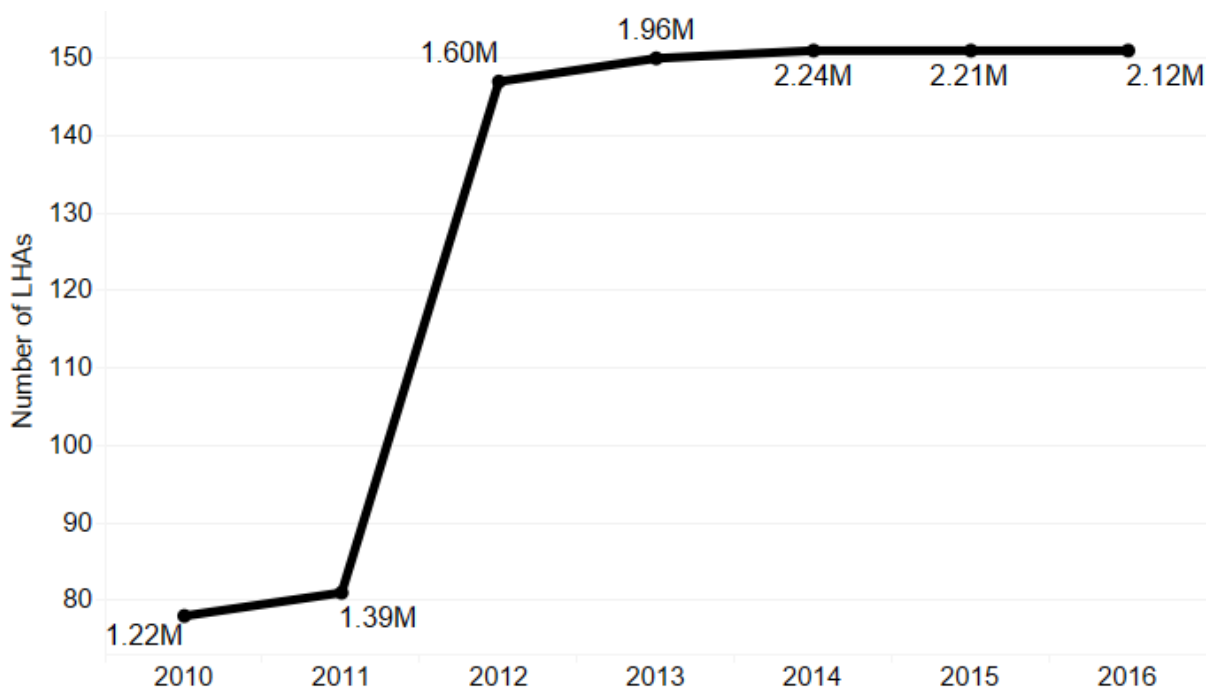
The dataset covers the period 2010 to 2016 (inclusive). It contains 12.7 million works, with over 22 million individual notification sequences (since June 2013), across 145 LHAs. This covers both permit and notice authorities, although the number of works undertaken under a permit regime has increased over time (as would be expected given the increased take-up of permit schemes by LHAs).

It provides a unique and rich source of works data, although the following limitations should be noted:

¹² <https://www.elgin.org.uk/>

- Not all LHAs within England subscribe to the Elgin product, but since 2010 the number providing data has increased so that, as of 2016, only 7 of the 152 English LHAs are missing. Figure 5.1 shows the increasing trend in the volume of works data and number of LHAs supplying data to Elgin between 2010 and 2016. Analysis of the works data suggests that many LHAs joined the Elgin service at or around the same time as introducing a permit scheme.
- The works are divided by their individual phases, therefore within this analysis the term works refers to an individual phase (of occupation).
- From June 2013 to the end of 2016 the data contains all recorded notification sequences (showing the history of each individual works notification). However, prior to June 2013, the archive contains only the final sequence record of the works so it is not possible to unpick any changes which took place during the notification process.
- Elgin does not capture all of the notifications sent between the works promoter and LHAs (e.g. inspections and their results) nor does it collate the full content of the notifications (e.g. works comments).
- The methods used to collect data from the London LHAs do not provide full coverage of the individual notification sequence.

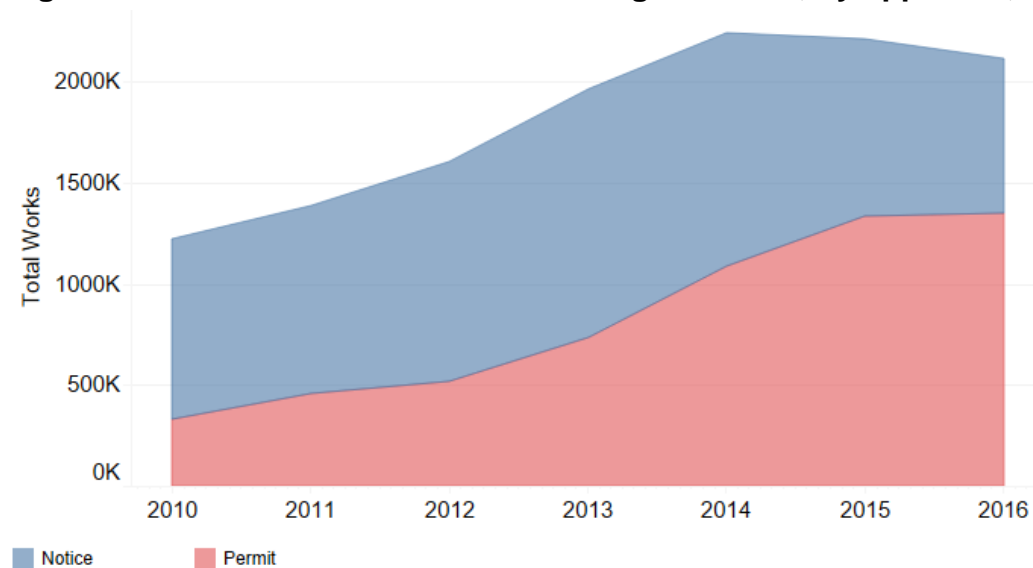
Figure 5.1 Number of LHAs supplying data to Elgin and the volume of works, 2010-2016



Source: Own analysis of EToN data.

Figure 5.2 illustrates the increasing volume of works captured by Elgin over time, and the split between those undertaken under a permit or notice regime.

Figure 5.2 Volume of works within the Elgin dataset, by approach, 2010-2016



Source: Own analysis of ETON data.

5.3 Elgin works data analysis

Analysis of the Elgin data has been undertaken in order to:

- provide analysis of the characteristics of works; and
- identify changes throughout the lifecycle of the works¹³.

The start date of the relevant LHA permit scheme was used to determine whether a work is categorised as being completed under a permit regime.

At the outset, a process of checking and cleaning the data was undertaken. This revealed some apparent errors in works start or stop dates which implied that durations for some works were either negative or abnormally large. In order to ensure that these outliers did not distort any subsequent calculations, following discussion, it was decided that, for each works category, actual durations which fell outside of a range amounting to 98% of all works within that category would be replaced with the average figure for that grouping for the purposes of the works data analysis. This range was able to eliminate any negative durations which were clearly an error. While it is plausible that some works have very lengthy durations it is also believed that occasional oversights may occur, meaning that

¹³ Changes can be identified for notifications within both permit and notice regimes (as LHAs operating the latter can issue a direction in response to a notice being received).

works do not get recorded as complete at the appropriate time and are only corrected at a later date leading to abnormally large durations. Use of this approach also enabled implausibly high works durations to be adjusted.

5.4 General principles and definitions

Works are typically defined as being in one of four categories, which can be based on duration of works, the traffic management required and/or the nature of the works.

Table 5.1 Works categories

Works category	Description
Major ¹⁴	Major works are those which fall into one of the following three categories: <ul style="list-style-type: none"> - those that have been identified in an annual operating programme or, are normally planned or known about at least six months in advance of the proposed start date. - those that require a temporary traffic order (not a temporary traffic notice) under the Road Traffic Regulation Act 1984 (except for those which meet the definition of immediate works). - those that have a planned duration of 11 days or more (except for those which meet the definition of immediate works).
Standard	Standard works are works (other than those which meet the definition of immediate or major work) with a planned duration of between four and ten days inclusive.
Minor	Minor works are works (other than those which meet the definition of immediate or major works) with a planned duration of three days or less.
Immediate	Immediate works are defined as either emergency works or urgent works: <ul style="list-style-type: none"> - Emergency works are works required to end, or prevent, circumstances, either existing or imminent, that might cause damage to people or property. - Urgent works are works required to prevent, or put an end to, an unplanned interruption in any supply or service provided by the works promoter or to avoid substantial loss to the works promoter in relation to an existing service or to reconnect supplies or services where the works promoter would be under a civil or criminal liability if the reconnection is delayed by the lead time for notices for the appropriate works category (see Table 5.5).

¹⁴ In the 2013 advice note and 2015 statutory guidance changes were made to permit fees for major works that did not have a temporary traffic regulation order and a duration of less than 11 days.

Works promoters have also been assigned to a group for the purposes of analysis and presentation of results (see Table 5.2).

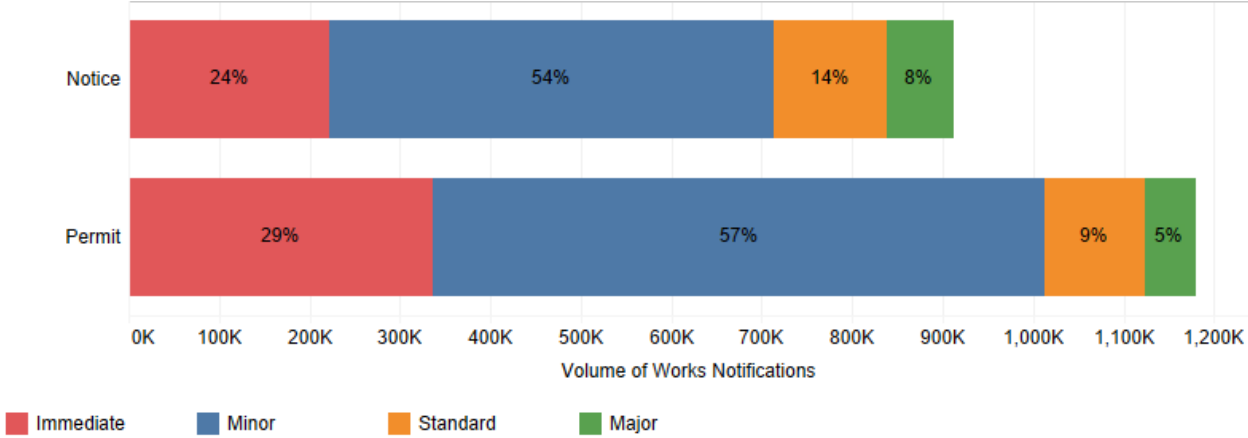
Table 5.2 Works promoter groupings

Group	Description
Electricity	Electricity
Gas	Gas
Highway authority	Highway authority; highway authority contractor
Other	Rail; national infrastructure; petroleum transmission; tram and tube; other
Telecommunications	Telecommunications
Water	Water

5.5 Results of the analysis

Figure 5.3 shows the volume of works notifications in 2016, divided into notice and permit regimes and broken down by works category. Over time, there has been a general increase in the volume of notifications submitted under a permit regime as would be expected given the continued increase in the number of LHAs choosing to adopt such a scheme.

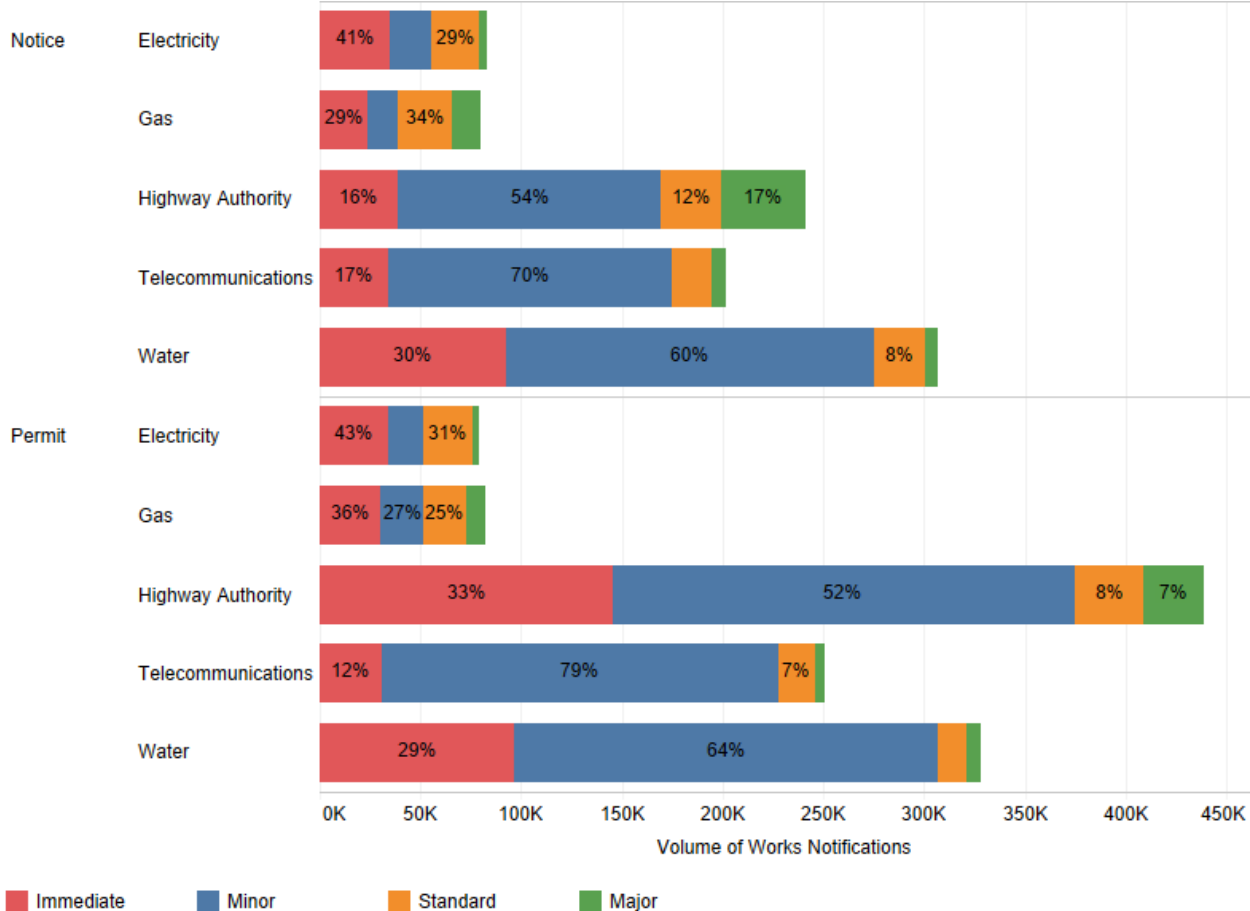
Figure 5.3 All (works) notifications, 2016, by LHA type



Source: Own analysis of ETON data.

Figure 5.4 further breaks down this information by works promoter type. The data shows some fluctuation in the number of works undertaken by promoter type over time, although discussions with promoters and LHAs note that works volumes are driven by many factors, including the investment and maintenance plans of promoter organisations as well as agreements made between utility companies and their regulators.

Figure 5.4 All (works) notifications, 2016, by works promoter type



Source: own analysis of EToN data.

5.5.1 Notification of Works

Analysis of the proportion of statutory undertaker and highway authority works shows that the latter make up a greater share of the total works that take place under a permit scheme. This would be expected given the requirement for parity treatment of statutory undertakers and highway authorities under a permit scheme.

Table 5.3 Average proportions of statutory undertaker and highways works

	Notice regime	Permit regime
Statutory undertaker work	73%	64%
Highways work	27%	36%

Source: own analysis of EToN data. This analysis is based on data for 144 LHAs.

Further analysis (Table 5.4) of those LHAs operating a permit scheme where the volume of highways works is below the average shows that there are 11 LHAs where the average is below 15% (decreasing to 6% in one case). Nine of these LHAs have published a permit scheme evaluation although none of these reports provide any explanation for the apparently low proportion of highways works in comparison to statutory undertaker works.

Table 5.4 Breakdown of proportion of highways works

Highways works (% of total works)	Notice regime (no. of LHAs)	Permit regime (no. of LHAs)	Total (no. of LHAs)
<5	12	0	12
5-10	11	6	17
11-15	7	5	12
16-20	6	13	19
21-25	8	12	20
26-30	2	9	11
31-35	1	3	4
36-40	1	8	9
41-45	2	10	12
46-50	3	5	8
50+	4	16	20
Total LHAs	57	87	144

Source: own analysis of EToN data.

5.5.2 Lead times

The New Roads and Street Works Act (NRSWA) sets out minimum lead times, in working days, for a notification or permit application made to the LHA by the works promoter depending on the works category (Table 5.5). The requirement to provide notice to the LHA was replaced under Permit Regulations with the requirement to submit a permit application. The lead times remain the same for both advanced notifications and permit applications.

Table 5.5 Minimum lead times

Works category	Notification/permit application	Lead time
Major	3 month notice or Provisional Advanced Authorisation	3 months from the proposed start date of the work
	Confirmation notice or permit application	10 days from the proposed start date of the work
Standard	Initial notice or permit application	10 days from the proposed start date of the work
Minor	Initial notice or permit application	3 days from the proposed start date of the work
Immediate	Initial notice or permit application	2 hours after works start or by 10.00 on the next working day

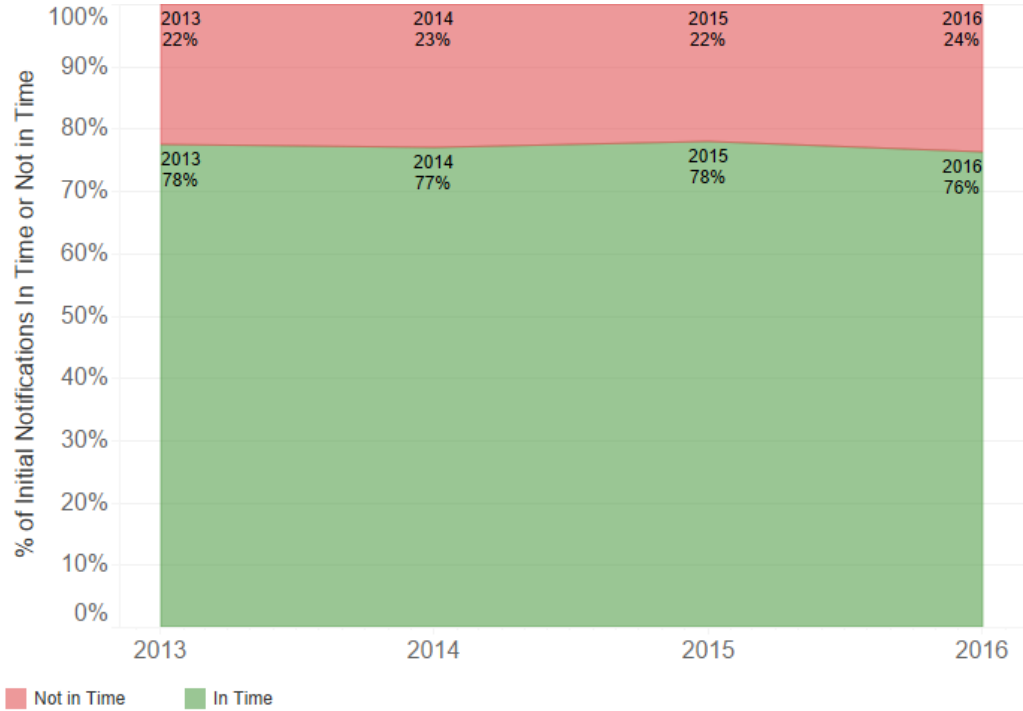
Lead times for initial notifications to the LHA from the works promoter are critical for the effective coordination of works, as they allow the LHA time to take any required action to control the works and potentially mitigate for their impact. In addition, publicity about the works (typically via roadworks.org), provides visibility to members of the public and other works promoters. More specifically, adherence to lead times can allow time for:

- interaction between the LHA and works promoters;
- collaboration between works promoters to work at similar times or proximity;
- other service providers, such as the emergency services or passenger transport providers, to plan around the works; and
- advanced warning of network disruption to the road user.

Where initial notifications are not submitted within the minimum lead time the options to control these works and reduce their impact could be severely limited.

Analysis of the percentage of initial notification received in time shows that they had been broadly constant in recent years, ranging from 76% to 78% over the period 2013-2016 (Figure 5.5). Breaking this down, the data indicates that permit regimes are likely to have a slightly higher proportion of in time notifications (ranging from 79% to 80% between 2013 and 2016) than noticing (77% in 2013 falling to 73% in 2016)¹⁵.

Figure 5.5 Percentage of Initial Notifications in Time or Not, 2013-2016



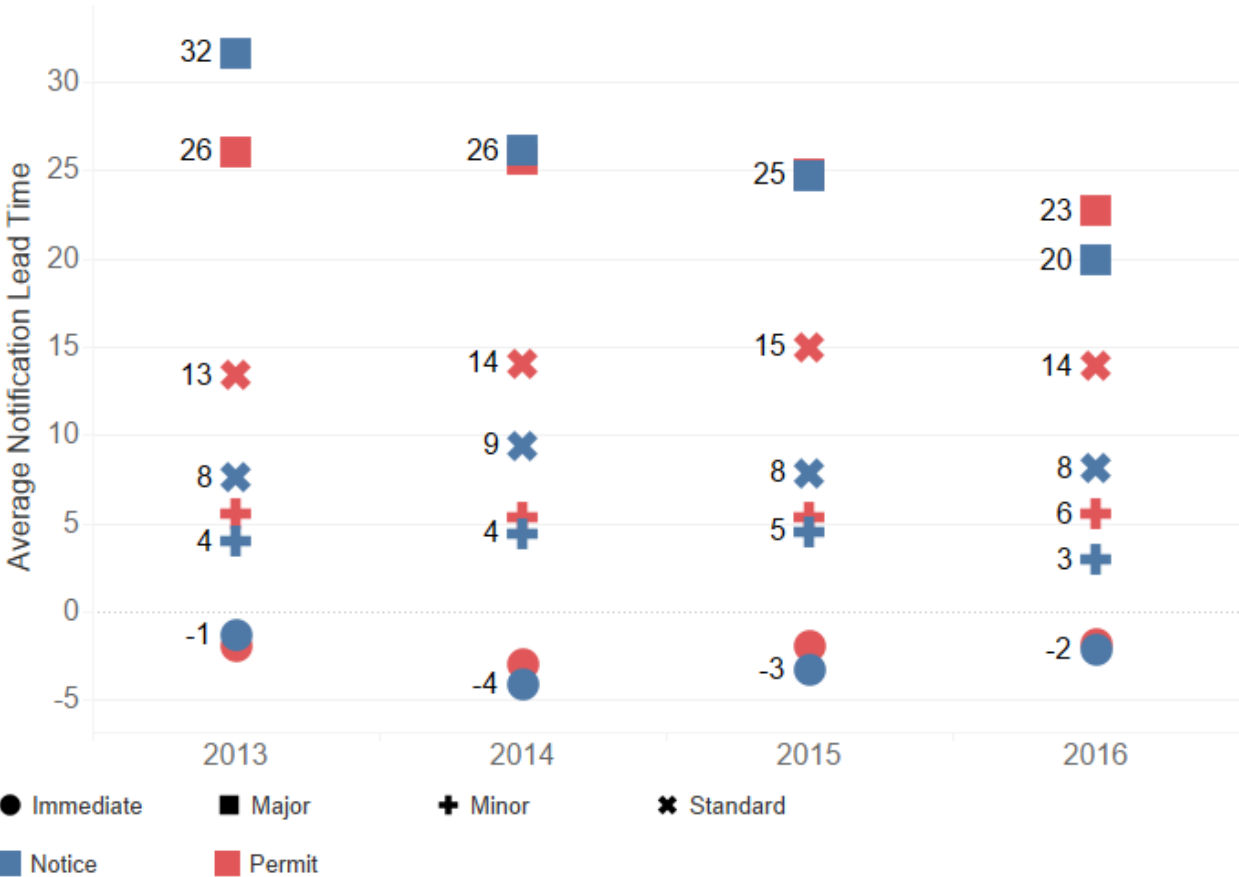
Source: own analysis of EToN data.

¹⁵ It is worth noting that analysis of lead times can be affected by LHA-specific processes, such as the process for obtaining an early start agreement (where the promoter wishes to start in advance of the date implied by the minimum lead time).

Analysis by works category shows that, on average, the initial notification or permit application is received within the minimum lead time for the applicable works category (Figure 5.6). It is interesting to note the following:

- The lead time for major applications is decreasing over time.
- The application lead time for immediate works is increasing.
- The lead time for standard works is greater within permit schemes compared to notice regimes.
- The lead time for minor works is consistently lower within notice regimes.

Figure 5.6 Lead time for works (major confirmation notice or permit application)



Source: own analysis of EToN data.

Overall, this high-level analysis of lead times suggests that permit schemes have had a positive effect on visibility of works for LHAs, which, in turn, should result in improved capability to coordinate works and mitigate for their impact through publicity.

5.5.3 Use of directions

To explore the use of directions, under either a permit or notice regime, the works data was analysed to identify specific notifications related to this process¹⁶.

Power to give directions

Section 56 of NRSWA provides a LHA with the capability to serve a direction on a statutory undertaker, to affect when and where works can be undertaken in the street:

- Section 56 Direction – covering the times that works either proposed, or subsisting, can be carried out;
- Section 56A Direction – covering restrictions on placing apparatus in the street.

As stated in the Code of Practice for the Co-ordination of Street Works and Works for Road Purposes and Related Matters a section 56 direction is subject to four constraints:

- it cannot affect the right of an undertaker to execute emergency works;
- it can be used only where proposed street works are likely to cause serious traffic disruption that would be avoided or reduced if the works were carried out at other specific times;
- it can be used only where subsisting street works are causing, or are likely to cause, serious traffic disruption that would be avoided or reduced if the works were carried out at other specific times; and
- a direction requiring street works to be executed out of normal hours should not be issued if it would cause the undertaker to breach noise abatement or prevention legislation.

The LHA's power to give directions is replaced under Permit Regulations with the power to grant or refuse a permit application or permit-variation, together with the capability to vary or revoke a permit.

Section 66 of NRSWA requires street works to be completed as quickly as possible. If an LHA believes that a works promoter is causing an obstruction by occupying more of the street, or taking longer to complete the works, than is reasonable, it may issue a section 66 notice. This notice can direct the works promoter, either to reduce the obstruction or to remove it altogether. The works promoter must comply within 24 hours, or any longer period specified in the notice.

¹⁶ EToN provides specific notifications for directions related to duration, placing apparatus and undue delay. However, under permitting these directions are provided under a notification that is not specific to the intended purpose, such as a modification request.

This power to give directions for the avoidance of unnecessary delay is replaced by equivalent provisions for permit authorities to require promoters in breach of the permit requirements to take remedial action and failing that for the LHA to take further action.

The volume of directional notifications identified within the works data was exceptionally low indicating that the powers available to a LHA under NRSWA are either not used or are being undertaken outside of the EToN system. It should be noted that the notification collection process undertaken by Elgin may result in notifications being missed during the lifecycle, therefore the data collection may ignore a notification that has taken place between the collection periods if this has been superseded. To compensate for any missed notifications in the works data and give a more thorough analysis of changes, the following parameters (between the initial notification (notice or permit) and works start) were examined:

- Change to the proposed duration of works – identified from the total proposed duration.
- Change to the proposed start date of works – identified through a change of date and the amount of days revised.
- Change to the proposed traffic management for the works – identified through a change within the relevant text field.
- Changes to the quality of information for the location of the works – identified through changes in the coordinates for the works.
- Changes to the information provided in relation to the description of the works to be carried out – identified through changes in the works description text field.

Duration changes

Changes to proposed duration (both increases and decreases) prior to works start were identified in both permit and notice authorities. In 2016, on average, in notice authorities there was an increase in the proposed duration for 3% of works and a decrease was identified for 8%. However, the proportion of works with increases and decreases in the proposed duration prior to works start was similar for works within permit regimes.

In addition, most of these changes could not be attributed directly to intervention by a LHA – either a notice direction or permit response – the only exception to this was for major works on strategically significant streets in permit regimes; however, the percentage volume of duration decrease was still exceptionally low (around 4%).

Location changes

Very few instances of location changes were identified by the analysis. Less than 1% of the total notifications or permit applications received during 2016 resulted in a change of location.

Works description changes

Very few instances of works description changes were identified by the analysis. The changes identified, amounted to 2.2% of the total notified works in notice regimes and 3.4% of the total applications in permit regimes.

Start date changes

The analysis of changes to start dates identified an average of 22% of works in permit scheme LHAs and 30% of works in notice regime LHAs recording a change to the start date.

However, further analysis of this data showed that the recorded instances of change could not be attributed to a direct LHA response (request) and, in addition, changes were undertaken predominantly on road categories where a validity period applies, which allows for a sliding window in which works can start after the agreed start date. The variation in number of days was generally one or two, which supports the assertion that it is more likely that the works promoter decided to amend their start date, from that originally proposed, in line with the validity period.

Traffic management changes

The volume of traffic management changes applied to both notice regime and permit scheme notifications was very low: 2% of the total notifications within a notice regime and 3.8% of permits. The findings were also consistent with the other areas of analysis, whereby the changes could not be attributed to a direct LHA response.

LHA permit responses

Further analysis of the works data was undertaken to identify instances of LHA permit responses (Table 5.6). This analysis shows an increase in the use of permit responses between 2014 and 2016 for all categories of works.

Table 5.6 Volume of permit application responses, 2014 – 2016

Works category	LHA permit response	2014	2015	2016
Major	Refuse PAA	6.32%	9.14%	9.06%
	Refuse permit	12.26%	10.72%	11.05%
	Permit modification request	4.88%	8.98%	9.73%
	Total responses	17.15%	19.71%	20.78%
Standard	Refuse PAA	n/a	n/a	n/a
	Permit modification request	6.05%	14.04%	17.76%
	Refuse permit	10.13%	13.00%	12.36%
	Total responses	16.18%	27.04%	30.12%
Minor	Refuse PAA	n/a	n/a	n/a
	Permit modification request	4.65%	10.36%	12.67%
	Refuse permit	7.51%	8.83%	8.42%
	Total responses	12.16%	19.19%	21.08%
Immediate	Refuse PAA	n/a	n/a	n/a
	Permit modification request	1.00%	2.38%	2.16%
	Refuse permit	0.86%	0.96%	1.33%
	Authority imposed variation	0.34%	1.00%	2.97%
	Total responses	2.21%	4.35%	6.45%

Source: own analysis of EToN data. If a permit application received more than one permit modification request then this was only counted as one response.

Although it is positive to note that there is increasing use of permit responses, it is difficult to demonstrate with the available data that a change is being made to applications as a result. It is possible that these responses are being used primarily to manage the application of conditions (see Section 5.5.5).

5.5.4 Obtaining a permit

Analysis of all works notified, or submitted under a permit scheme, before and after the introduction of such schemes was undertaken for a sub-sample of 15 LHAs that had provided sufficient data to allow analysis of works notified two years prior to the introduction of a permit scheme and two years afterwards.

Table 5.7 shows the change in the volume of notifications and permit applications for each works promoter and works category type, based on data for the sample of 15 LHAs. The data shows a clear increase for many promoters in the volume of works being notified following the introduction of a permit scheme.

Table 5.7 Volume of notified works increase before and after permit scheme

Works promoter	Works category	Year +2 compared to year -2	
		Works category	Works promoter
Electricity	Major	121%	107%
	Standard	73%	
	Minor	118%	
	Immediate	146%	
Gas	Major	189%	130%
	Standard	96%	
	Minor	141%	
	Immediate	131%	
Highway authority	Major	143%	162%
	Standard	198%	
	Minor	126%	
	Immediate	209%	
Other	Major	113%	212%
	Standard	115%	
	Minor	277%	
	Immediate	268%	
Telecoms	Major	207%	110%
	Standard	94%	
	Minor	104%	
	Immediate	147%	
Water	Major	147%	89%
	Standard	103%	
	Minor	78%	
	Immediate	122%	

Source: own analysis of EToN data.

Allowing for transitional changes (such as pre-scheme trial periods and embedding new working practices), which might be expected to occur in the year immediately before and immediately after introduction of the permit scheme (years -1 and 1), the analysis focused on data from two years before and two years after the change (years -2 and 2). With a

few exceptions, the volume of works notified to the councils increased for all works promoters, within all works categories¹⁷.

This increase is a positive result from the introduction of permit schemes as a fundamental requirement for the coordination and control of works is for the LHA to be notified of the works. Without any notification (permit application) the LHA is not only unaware of the planned works, but is also unable to mitigate the impact of these works, until they are causing a direct impact – at which point it can be too late to make the necessary changes required to reduce the impact or ensure the works are carried out correctly.

The most significant increase concerned the highways works promoters, which illustrates the effect of the introduction of parity treatment under a permit scheme (i.e. the requirement for these works to be carried out under a permit, and therefore notified to the LHA). Discussions with a sample of permit authorities confirmed that the introduction of a permit scheme had led to an increase in the volume of highways works being notified for this reason.

5.5.5 Application of conditions

The option for the LHA to apply conditions/constraints on the way in which works are undertaken by a works promoter is one of the key powers within a permit scheme. The LHA can apply conditions, that set out actions or parameters the works promoter must follow during and sometimes before the works taking place. This power is additional to the power to give directions which is provided by NRSWA (see Section 5.5.3).

Conditions

In alignment with the regulations, the conditions fall into eight categories:

- days on which permit works may not be carried out;
- times of day during which permit works may not be carried out;
- the area (including areas not forming part of the street) which may be occupied in connection with the permit works;
- the prohibition or restriction of traffic pursuant to orders or notices under section 14 of the Road Traffic Regulation Act 1984 (temporary prohibition or restriction on roads) (a);
- traffic management arrangements to be made in connection with the permit works (including arrangements for the particular benefit of persons with a disability);

¹⁷ Due to the nature of street and road works, it must be noted that fluctuations in works volumes are likely to occur as a result of many factors, such as financial commitments for regeneration, national projects, renewal or maintenance programmes.

- the manner in which the specified works are to be carried out;
- consultation and publicity in relation to the specified works, including the display of information at the location of those works; and
- notification of progress in relation to the specified works.

The Statutory Guidance for Permit Conditions¹⁸ sets out the conditions that can be applied by a permit authority, together with code references to apply the conditions, prefixed by NCT (National Condition Text) and a reference number, e.g. NCT01 (see Annex 1 for further details). Conditions NCT01a, NCT01b are specified as standard conditions that should be applied to all relevant permits. NCT11a also states “APPLIES TO ALL PERMITS” but there is no explicit text that states that it should be applied as a standard condition.

In addition to the listed conditions, there is also provision for the LHA to apply a more specific condition, *under exceptional circumstances*, not covered within the scope of the national conditions. This condition must be agreed with the works promoter before it can be applied.

Prior to the introduction of national conditions, each permit scheme set out their own permit conditions, usually with shared conditions amongst those operating a common permit scheme. The introduction of the national conditions did not provide sufficient scope to apply the specific constraint for these conditions and therefore removed them from use. In total, 41 specific conditions, across eight permit schemes, were removed with the introduction of the national conditions, including those concerned with:

- Ensuring consultation with affected parties, such as local transport providers, e.g. bus companies.
- Specific signage or advanced warning signage ahead of works.
- Controlling material or plant storage outside of the work area.
- Managing and maintain the diversion route.
- Use of extended reinstatement on streets subject to restriction enforced by the LHA after substantial works.
- Direct contact with the LHA where immediate activities require a road closure or other specified traffic management (an implied standard condition).

¹⁸ To facilitate the systematic application of permit conditions across all permit authorities, HAUC developed Statutory Guidance for Permit Conditions, which forms part of the Permit Scheme Regulations. This guidance was published in March 2015 and came into legal effect with the Permit Regulation amendment of October 2015.

For the purposes of analysis, any non-NCT condition (used prior to the regulation amendment of 2015) was identified by its condition type and, where possible, aligned to one of the national conditions.

Use of condition parameters

With the exception of conditions applied to permits that do not need to be attached to the permit itself, conditions require text to define the parameters, for example: ‘the activities shall only take place between [10:00] and [16:00]. Without such parameters a condition is not valid and cannot be enforced.

Analysis of condition text was undertaken to identify whether a parameter was applied to a (relevant) condition code. It is not possible to determine whether the applied parameters are all well-defined. A review of sample data showed a level of inconsistency with the applied parameters, with many being incorrect (for the relevant condition) or having insufficient detail to make the condition applicable.

Permits with national permit condition codes applied¹⁹

Analysis of the works data²⁰ shows that the application of conditions varies by type. In general, the proportion of permits with conditions applied is low but has increased over time (Table 5.8). The analysis suggests that there is scope for LHAs to take a more proactive and consistent approach to the application of conditions.

Table 5.8 Application of selected conditions²¹

Condition	2014 (%)		2015 (%)		2016 (%)	
	SS	NSS	SS	NSS	SS	NSS
NCT02a – limiting days/times of day where works can take place	7.5	1.9	19.3	8.1	28.9	12.4
NCT02b – use of extended working hours	0.5	0.2	2.4	1.3	6.3	3.3
NCT07a – works can only take place when the road is closed to traffic	3.1	0.3	15.3	12.5	28.8	28.8
NCT08a – limiting works when temporary traffic control is deployed	5.5	0.5	16.1	6.5	35.6	14.1
NCT08b – manual control of traffic management at specific times	3.2	0.0	12.2	4.4	27.9	11.0
NCT09a – notifying the LHA with any changes to traffic management	2.5	0.6	3.3	1.9	5.4	4.2
NCT09b – traffic management arrangements to be in place before works can commence	1.9	0.5	3.2	1.1	1.5	0.6
NCT09c – signal removal from operation when no longer in use	16.4	8.6	20.9	16.5	29.6	25.1
NCT11a – display of permit number in site information board at all times during works	4.9	0.6	11.4	6.3	15.5	9.3
NCT11b – publicity of proposed works (before commencing)	6.0	2.6	6.4	4.6	7.9	7.4

Source: own analysis of EToN data. SS = strategic streets (category 0, 1, 2 and traffic sensitive designations); NSS = non-strategic streets (category 3, 4 and non-traffic sensitive).

¹⁹ The application of conditions can vary according to the specific characteristics of the work, such as the specific street categorisation or use of traffic management (see Annex 1). Where possible this has been taken into consideration in the analysis (for example, if a condition could only be applied to works with specific traffic management, e.g. a road closure or portable-lights, then only works with this designation of traffic management were included in the analysis of that condition). However, in some cases it is not possible to completely delineate all works which are relevant to a specific condition, for example, it is not possible to identify works that are in an area of environmental significance for which an environmental condition could apply.

²⁰ Elgin does not collect condition text data from all permit authorities, so analysis of conditions could only be undertaken for 24 LHAs. These LHA contained 11 county councils and 13 unitary authorities with between 1 and 7 years of permit scheme operation.

²¹ As conditions for date constraints (NCT1a and NCT1b) do not need to be attached to a permit to be applied there is minimal analysis that can be made, expect to conclude that it should be reconfirmed to the industry that these conditions do not need to be attached to a permit.

It is clear from the analysis that conditions for time constraints (NCT02a and NCT02b) are applied more on the significantly strategic streets (SS), which would be appropriate as these streets carry more traffic and are more likely to have traffic-sensitive designations. It is not clear why the volume of conditions for working hours (NCT02b) is low and this possibly reflects the potential for or capability of works promoters to work extended hours.

The analysis of conditions for road closures (NCT07a) was undertaken solely on permits where the designated traffic management was road closure. It is positive that the use of this condition for major and immediate activities has increased over time. As stated within the Statutory Guidance for Permits, it should not be expected that this condition is applied to all works undertaken with a road closure. However, it is interesting to note that this condition has also been applied to both standard and minor works with traffic management designations of a road closure - technically these works should have been categorised as major as the road closure should have required a Temporary Traffic Regulation Order (this was found to apply to approximately 1,300 permits per year).

The increased use of conditions for light signals and shuttle working (NCT08a) since 2014 is positive, as is the use of this condition on the strategically significant streets.

Except for NCT09c the use of conditions for traffic management changes is relatively low. It is not clear why NCT09a is not a condition that should be applied to all works undertaken with a form of traffic management as it seems prudent that any changes are notified to the LHA. The alternative is for the LHA to inspect the works, identify the traffic management does not align to the permit and act, which seems to be a reactive, not proactive, approach.

The use of consultation and publicity condition for proposed works (NCT11b) is applied more to major works, which seems appropriate for this type of condition. It is positive to note a continued high application of this condition for these types of works.

It was observed during the analysis that many conditions were apparently applied to permits inappropriately, i.e. the condition did not relate to the works, for example the use of a traffic management condition where no traffic management was specified. Further analysis showed that in many cases these conditions were on the original application, therefore applied by the works promoter. This would suggest some works promoters adopt an 'include all' approach to the application of permit conditions, perhaps as a result of the lack of systemic approach to the application of conditions across different LHAs.

6.0 Assessment of Local Evaluations

This section presents the findings of a review of the permit scheme evaluation reports published by LHAs, as mentioned in Section 2.3 of the main report.

6.1 Collating permit scheme evaluations

Desk research was undertaken to identify, for those LHAs operating a permit scheme, when evaluation reports were due and if they had been published (on the LHA’s own website or any other website that may be expected to contain this information).

Table 6.1 summarises the findings of this exercise by categorising LHAs into groups depending on the number of reports published. This shows that, in total, 14 LHAs appear to have not published any evaluation reports (even though these would have been expected to have been made available given the regulatory requirements).

Table 6.1 Reports published

Number of reports published	Number of LHAs
0	14
1	36
2	16
3	8
5	3
Total	77

Source: own analysis of published reports.

6.2 Extent to which permit scheme evaluations meet the required criteria

The identified evaluations were then assessed to see how far they met the requirements set out within the Permit Scheme Regulations and Statutory Guidance. This assessment was based on five criteria:

- producing an evaluation;
- providing key performance indicators (see box below);
- demonstrating the benefits of a permit scheme;
- undertaking a fee review; and
- providing a cost to benefit analysis of the permit scheme.

Key performance indicators

The Statutory Guidance for Highway Authority Permit Schemes (Annex A) sets out the following Key Performance Indicators:

- TPI 1 Works Phases Started (Base Data)
- TPI 2 Works Phases Completed (Base Data)
- TPI 3 Days Of Occupancy Phases Completed
- TPI 4 Average Duration of Works
- TPI 5 Phases Completed involving Overrun (this will be reworded to make it a positive figure)
- TPI 6 Number of deemed permit applications
- TPI 7 Number of Phase One Permanent Registrations

Each permit authority was scored according to the presence of published evaluations and an assessment of the required content. The scoring which was applied to each of the identified criteria is shown below (Table 6.2).

Table 6.2 Scoring criteria

	Criteria	Description	Score		
			1	2	3
1	Published report	Number of published evaluations (due August 2017)	No evaluations published	At least one evaluation published	All 'due' evaluations published
2	Performance indicators	At least one evaluation contains performance indicators that demonstrate efficiency and/or effectiveness of the scheme	No performance indicators	Performance indicators provided but no direct relationship to efficiency and/or effectiveness	Performance indicators provided and demonstrate efficiency and/or effectiveness
3	Demonstrating benefits	At least one evaluation provides quantifiable evidence to support the benefits and objectives of the scheme	No quantifiable evidence	Anecdotal evidence provided but not supported by quantified evidence specific to permit scheme	Quantified evidence provided showing direct relationship to permit scheme
4	Fee review	An evaluation contains a review of the permit fees.	No permit fee review	Permit fee review but with no detail	Permit fee review with detailed analysis of income and costs
5	Cost benefit analysis	An evaluation provides a quantifiable cost benefit analysis	No cost benefit analysis	Cost benefit analysis but not quantified or does not show ratio of cost to benefits	Quantified cost benefit analysis with ratio of costs to benefits

The total score for each LHA was then rated as red, amber or green. Table 6.3 shows how the scores relate to these categories and the number of LHAs within each one.

Table 6.3 LHA scoring and categories

Rating	Score	Total	Percentage of permit authorities
Red	0-5	18	23%
Amber	6-10	57	71%
Green	11-15	5	6%

Source: own analysis of published reports.

The primary reason for permit authorities scoring 3 or less (a red rating) is because they had not yet published any scheme evaluations. Without a published evaluation, it is impossible for these LHAs to achieve a score for the other elements (as they have effectively provided no content which can be assessed).

The majority (71%) of permit authorities obtained an amber rating, this was because of:

- Not providing sufficient quantifiable evidence that directly relates the outputs of the permit scheme to a positive outcome or benefit;
- Not including a review of the income, costs and permit fee levels; and
- Not providing a quantified cost-benefit analysis.

Only 6% of the permit authorities achieved a green rating, indicating that at least one published report, or content from multiple reports, contained sufficient detail to satisfy the requirements set out within the Permit Scheme Regulations.

There is substantial variance in how the published reports attempt to demonstrate the benefits of operating a permit scheme. Whilst all authorities state the introduction of a permit scheme has had a positive impact on their network, a lot of the information is anecdotal and not supported by data.

Where the stated benefits are supported by data, there are still many other unexplored factors that may, or may not, have influenced these metrics. For example, network occupation and average duration of works can be influenced by the volume and type of activities which promoters decide to undertake, regardless of whether or not a permit scheme is in operation.

6.3 Findings of local evaluation reports

Until the introduction of the amended regulation in 2015, there were no defined guidelines as to how often reports must be published and what these reports should contain. As a result, the reports reviewed vary enormously in their structure, content, measures and provision of useable data.

There is a considerable variance in the quality and usability of published data. Examples of this include:

- Works data not displayed by works type.
- Data not separated between Statutory Undertakers and Highways Works.
- Tables containing monthly data but no annual total.
- Bar or column charts with no specific values displayed.
- Data shown as percentages in graphs rather than numeric values.
- No context provided for a specific measure e.g. number of Permit Compliance Inspections carried out as a percentage of all works.
- Some schemes have changed the measures reported over the years of operating their scheme and therefore these can't be used for comparative purposes/trend analysis.
- Data cannot be provided due to limitations of EToN systems.

Given these variances and gaps, it is difficult to draw any meaningful conclusions from the measures in terms of LHA or scheme level comparison and impacts to the wider industry.

The published evaluations provide many high-level conclusions; however, these conclusions have generally not been drawn out from the analysis and/or quantifiable evidence has not been provided to support these conclusions. Example of such statements include:

“The successes of the Permit Scheme in its first four years of operation are aptly demonstrated by the total time saving of roadworks occupation that was achieved through coordinated operations and the monetised benefit achieved through reduced congestion”.

“Its introduction [the permit scheme] has been successful with the benefits being delivered against the initial objectives, most visibly in terms of consistency of approach to in the delivery of the Network Management Duty.”

“...this greater preliminary planning means that operatives go to site better informed and prepared, leading to less on-site problems and thus reducing the overall work duration”.

The evaluations also contain many follow-up actions or a suggestion that an action is required to improve the performance of the permit scheme. However, these are rarely returned to in subsequent reports. Examples of this include:

“Another area that requires significant improvement from utility companies is the submission of applications that contain coordinates and location descriptions that are inconsistent with one another”.

“It is therefore recommended that additional research of the impact of this scheme on journey time reliability is undertaken. If the tools and techniques used in this research can provide strong statistical evidence that observed changes in journey time reliability can be directly linked to [the permit scheme] then the draft indicator should be retained for future monitoring, otherwise it should be excluded. As it has also not yet been possible to directly link average journey times with [the permit scheme] and as it has not been possible to accurately compare [the permit scheme] and non [permit scheme] authorities, this indicator has not been provided for the third year of the scheme

Many reports clearly state the need for further research and development to support the evaluation of permit schemes. Examples include:

“Data provided by [x] has confirmed that journey times in authorities have improved when compared to authorities not operating [name of scheme]. However, it is very difficult to attribute this decrease definitively to the [name of scheme] because there are a number of other factors outside of street works that may have an impact on network performance. Unfortunately, it has not been possible to drill down into the data and separate all the different factors to obtain individual results for each one”.

The key conclusion to be drawn from the review of the published reports is the lack of supporting evidence to demonstrate the specific benefits of operating a permit scheme compared to a noticing regime, which is provided by this source.

6.4 Other information contained in the reports

Some of the permit scheme evaluation reports reviewed contained information which was additional to the specific performance indicators. These include, but are not limited to:

- Average Journey Times
- Journey Time Reliability
- Traffic Management Information
- Number of Remedial Works Undertaken
- Road Traffic Collisions
- Carbon Emissions
- The number of agreements to work in Section 58 and Section 58A restrictions
- Volume of Authority Imposed Variations and Revocations
- Complaints Logged Relating to Activity Promoters Works
- Average lead time for permit applications
- Works phase permits granted and subsequently cancelled (%)
- Net savings in monetised costs
- National Highways & Transportation Survey results

These measures typically provide more scope for quantified analysis to demonstrate the benefits of a permit scheme; however, there is insufficient systemic application of these measures (or the approach to collating and reporting these measures) to enable wider conclusions to be drawn.

7.0 Counterfactual Impact Evaluation

This section provides further information on specific aspects of the methodology used for the counterfactual impact evaluation, building on that contained within Section 2.3 of the main report.

7.1 Data quality and cleaning

The data provided by Elgin consisted of almost 13 million records. The first step was to subset the data to only include relevant works for the impact analysis. The data was subset to only include works:

- For LHAs in England
- Recorded as completed
- In 2016 and a baseline year

The baseline year for permit LHAs was the year immediately before each LHA introduced their permit scheme. For notice LHAs, a proxy baseline year was created. The year 2012 was empirically selected as the baseline year for notice LHAs on the basis that this was the year immediately before more than 50% of permit LHAs started their scheme.

The data was then cleaned based on the following criteria:

- Outlier works removed by formulating plausible ranges for each works category. These ranges included c.98% of total recorded works with a duration greater than 0:
 - ▶ Immediate works – 1 to 15 days
 - ▶ Minor works – 1 to 7 days
 - ▶ Standard works – 1 to 25 days
 - ▶ Major works – 1 to 200 days
- LHAs that for the entirety of 2016 were using either permits or notices. Five LHAs were excluded at this point due to starting a permit scheme during 2016.
- LHAs where the proportion of total works recorded at baseline to 2016 were within a range where there could be confidence all works within an LHA had been recorded in Elgin. 74 LHAs were excluded at this point in order to give greater confidence in the impact estimates generated. Those remaining provided good variation in the LHA and network characteristics.
- Duplicate records removed.

The final dataset consisted of works data for 36 permit LHAs and 36 notice LHAs. Table 7.1 details the frequency and proportion of works by category of work (based on data for 2016 only).

Table 7.1 Total works in final dataset (2016)

	Notice		Permit		Total
	Freq.	%	Freq.	%	
Immediate - Statutory Undertaker	70,604	27.51%	76,764	25.76%	147,368
Minor - Highway Authority	17,777	6.93%	42,109	14.13%	59,886
Minor - Statutory Undertaker	112,571	43.87%	129,789	43.55%	242,360
Standard - Highway Authority	6,370	2.48%	7,287	2.45%	13,657
Standard - Statutory Undertaker	29,744	11.59%	25,985	8.72%	55,729
Major - Highway Authority	9,273	3.61%	6,673	2.24%	15,946
Major - Statutory Undertaker	10,286	4.01%	9,395	3.15%	19,681
Total	256,625	100.00%	298,002	100.00%	554,627

7.2 Descriptive statistics on permit and notice LHAs

This sub-section presents descriptive statistics on permit and notice LHAs. The analysis highlights where differences between the two groups are statistically significant. Overall, we find that there are limited significant differences between those LHAs that apply a permit and those that apply a notice scheme in terms of their traffic and the composition of works characteristics. These statistics should not be interpreted as impacts of permit schemes. Only those LHAs which are included in the final dataset (72 LHAs) are included in this analysis.

The analysis shows that there are no significant differences between notice and permit LHAs when it comes to the type of authority (Table 7.2): 36.1% of notice LHAs are county authorities and the same is true for 33.3% of permit LHAs. There are no significant differences between both groups in terms of estimated population size and estimated vehicle miles. In addition, no significant differences can be observed in the composition of the network, including average total road length, major trunk roads, major principal roads and minor roads. However, permit and notice schemes are significantly different when it comes to vehicle miles divided by non-strategic road length, i.e. traffic density. Permit scheme LHAs have a higher traffic density on average than notice LHAs, perhaps suggesting that works have potential to cause greater disruption in permit authority areas.

Table 7.2 Key characteristics of notice and permit LHAs, averages and shares

		Notice LHAs	Permit LHAs	Significant difference
Type of LHA	% County LHAs	36.1%	33.3%	No
Traffic and population density	Estimated population	369,982.6	438,410.9	No
	Estimated vehicle miles (millions)	2,166.3	2,652.2	No
	Vehicles miles / non-strategic roads	1.7	2.0	Yes*
Network	Total road length (average)	1,870.4	1,599.5	No
	Major trunk roads – average road length	43.6	43.0	No
	Major Principal Road	166.3	148.1	No
	Minor Road	1,660.5	1,408.4	No

*Note: significance tests conducted using Welch's t-test, ***p<0.001, **p<0.01, *p<0.05*

Looking at the volumes of works with notifications at baseline, i.e. before the introduction of the permit scheme, also indicates that there are few significant observable differences between notice and permit LHAs (Table 7.3).

Table 7.3 Works volumes of works with notifications in notice and permit LHAs at baseline, averages

Type of works	Indicator	Notice LHAs	Permit LHAs	Significant difference
Total works (average)	Number	8,850.8	12,376.1	No
Immediate works (average)	Number	2,207.3	3802.1	Yes*
	% of total	26.08%	28.77%	No
Major works (average)	Number	494.8	514.8	No
	% of total	6.01%	5.82%	No
Minor works (average)	Number	4,944.8	6,904.6	No
	% of total	52.42%	55.09%	No
Standard works (average)	Number	1,203.9	1,154.7	No
	% of total	15.48%	10.31%	Yes***
Highway authority works (average)	Number	1,287.9	2,870.1	Yes*
	% of total	14.78%	20.17%	No
Statutory undertaker works (average)	Number	7,559.6	9,472.9	No
	% of total	85.15%	79.55%	No

Note: significance tests conducted using Welch's t-test, *** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$

While the average volume of works seems to be higher in permit LHAs, this difference is not significant. The few significant differences between notice and permit LHAs at baseline are:

- A significantly higher average number of immediate urgent works with notifications in permit LHAs.
- A significantly lower share of standard works with notifications in permit LHAs.
- A significantly higher share of highway authority works with notifications in permit LHAs.

Looking at works volumes in 2016 paints a similar picture (Table 7.4). While permit scheme authorities record lower shares of major works and standard works with notifications, they record higher numbers of highway authority works with notifications. In fact, while 14.7% of all works with notifications in notice LHAs are undertaken by the local highway authority, this is true for 24.9% of permit authorities, strongly suggesting that such works are under-recorded in noticing areas.

Table 7.4 Works volumes of works with notifications in notice and permit LHAs in 2016, averages

Type of works	Indicator	Notice LHAs	Permit LHAs	Significant difference
Total works (average)	Number	7,559.3	10,025	No
Immediate works (average)	Number	2,307.5	3,743.3	No
	% of total	29.92%	32.53%	No
Major works (average)	Number	552.5	455.4	No
	% of total	7.26%	5.08%	Yes*
Minor works (average)	Number	3,711.8	4,880.9	No
	% of total	47.92%	51.34%	No
Standard works (average)	Number	1,027.5	945.8	No
	% of total	14.89%	11.05%	Yes**
Highway authority works (average)	Number	1,270.1	3,127.9	Yes*
	% of total	14.69%	24.86%	Yes**
Statutory undertaker works (average)	Number	6,357.7	6,886.9	No
	% of total	85.23%	75.03%	Yes**

Note: significance tests conducted using Welch's t-test, ***p<0.001, **p<0.01, *p<0.05

Key to the estimation of the counterfactual is to understand how far outcome differences between notice and permit LHAs after the introduction of the permit scheme already existed prior to its introduction. Table 7.5 shows that, with the exception of the duration of major works²², there are no significant differences between notice and permit scheme when it comes to the duration of works and weekend working²³. It is important to remember, at this stage, works are unmatched.

Table 7.5 Key outcomes pre introduction of the permit scheme, averages (works with notifications)

		Notice LHAs	Permit LHAs	Significant difference
Work duration	Immediate works	4.54	4.31	No
	Minor works	2.22	2.19	No
	Standard works	7.78	7.81	No
	Major works	34.1	24.01	Yes***
Weekend working	Immediate works	49.94%	48.27%	No
	Minor works	21.63%	22.45%	No
	Standard works	71.61%	72.81%	No
	Major works	82.92%	76.09	No

Note: significance tests conducted using Welch's t-test, ***p<0.001, **p<0.01, *p<0.05

These differences in the number and proportion of works were a key consideration when selecting matching variables and algorithms for the impact analysis.

7.3 Matching process

Due to the large number of works analysed in this study, three inverse probability weighting (IPW) algorithms were used to generate viable comparison groups. The selection is based on the expected robustness of the estimates obtained with these algorithms and the feasibility of implementing them. While IPW is less commonly used than methods such as propensity score matching (PSM), it has been shown that IPW does not exhibit any significant bias and even surpasses Kernel matching (a PSM algorithm) in terms of precision²⁴. As a means of validation of the results, PSM was conducted on a subset of works. The PSM results supported the results obtained through

²² Analysis over subsequent years revealed that the differences declined and by 2016 the durations for permit and notice LHAs was similar.

²³ Baseline data for other outcomes was not recorded comprehensively by all LHAs.

²⁴ Handouyahia, H., Haddad, H. and Eaton, F. (2013), Kernel Matching versus Inverse Probability Weighting: A Comparative Study, International Journal of Mathematical, Computational, Physical, Electrical and Computer Engineering Vol:7, No:8, <http://waset.org/publications/16101/kernel-matching-versus-inverse-probability-weighting-a-comparative-study>

IPW on all works data. However, IPW outperformed PSM in terms of establishing balanced comparison groups.

All matching algorithms take the estimate propensity scores, generated through logistic regression using selected matching variables as predictors of treatment, for each street work belonging to the treatment group and then match or weight works that resemble each other between groups. IPW works by assigning a greater weight to comparison group works with higher propensity scores (estimated probability of being a permit work). IPW reweights the comparison group data to account for the effect that the notice works with low propensity scores are over-represented in the comparison group and under-represented in the treatment group.

Three variations of IPW were used to calculate treatment effects for robustness. In most cases, the estimates generated were the same or very similar. This adds additional confidence to the methodology adopted. The algorithms used were:

- Inverse-probability weighting: estimates probability weights to correct for the missing-data problem arising from the fact that each subject is observed in only one of the potential outcomes.
- Augmented inverse-probability weighting: combines aspects of regression-adjustment and IPW methods to estimate potential-outcome means and average treatment effects.
- Inverse-probability-weighted regression adjustment: uses weighted regression coefficients to compute averages of treatment-level predicted outcomes, where the weights are the estimated IPW of treatment.

It was originally envisaged that, in order to account for the multilevel structure of the data²⁵, a multilevel logistic regression model would be used to estimate the propensity scores used for matching. This proved infeasible due to the model being a perfect predictor of treatment (a work being carried out under a permit). This occurred because all works within an LHA are either permit or notice – there is no overlap and the common support assumption required for PSM is therefore not met.

Immediate works for highway authorities were excluded from the impact analysis. In order for treatment effects to be calculated, there must be sufficient overlap between the propensity scores calculated in the treatment and control groups to allow for matching of similar works – this assumption was not met for this category of works.

²⁵ Individual works are nested within LHAs that have varying characteristics.

7.4 Matching variable selection

The following tables present regression outputs by type of works (Tables 7.6-7.9). These show that the matching variables selected are statistically significant predictors of works duration across most work categories. In other words, the variables selected impact on work durations. Therefore, it is important to ensure balance (see next section) on these variables between the treatment and comparison groups is achieved before estimating the impacts of permit schemes. By balancing matching variables, we can say with greater confidence that impacts are a result of the permit scheme rather than other factors that impact on the outcomes of interest. Works duration was selected as the dependent variable as this is the key outcome of interest.

Table 7.6 Regression output for immediate works

-> works_category_name2 = Immediate						
Source	SS	df	MS	Number of obs	=	212,371
Model	437899.667	5	87579.9333	F(5, 212365)	=	14771.63
Residual	1259096.91	212,365	5.92892854	Prob > F	=	0.0000
				R-squared	=	0.2580
				Adj R-squared	=	0.2580
Total	1696996.58	212,370	7.9907547	Root MSE	=	2.4349

duration_original	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
lha_type_d	-.1546219	.0122433	-12.63	0.000	-.1786184	-.1306253
promoter_type_d	-2.852722	.0127988	-222.89	0.000	-2.877807	-2.827637
traffic_management_coded_d	-.3418243	.0073368	-46.59	0.000	-.3562042	-.3274444
ss_d	.0788783	.0117815	6.70	0.000	.0557867	.1019698
tra903vehiclesmilesroadlength	.4333915	.0137079	31.62	0.000	.4065243	.4602586
_cons	4.378236	.0209184	209.30	0.000	4.337237	4.419236

Table 7.7 Regression output for minor works

-> works_category_name2 = Minor						
Source	SS	df	MS	Number of obs	=	302,246
Model	9909.16836	5	1981.83367	F(5, 302240)	=	962.05
Residual	622618.208	302,240	2.0600126	Prob > F	=	0.0000
				R-squared	=	0.0157
				Adj R-squared	=	0.0156
Total	632527.376	302,245	2.09276374	Root MSE	=	1.4353

duration_original	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
lha_type_d	.093079	.00578	16.10	0.000	.0817503	.1044076
promoter_type_d	-.3705342	.0068369	-54.20	0.000	-.3839344	-.357134
traffic_management_coded_d	-.0756102	.0035304	-21.42	0.000	-.0825298	-.0686907
ss_d	-.0014959	.0057098	-0.26	0.793	-.0126869	.0096951
tra903vehiclesmilesroadlength	.0832084	.0067541	12.32	0.000	.0699706	.0964463
_cons	2.232125	.0108227	206.24	0.000	2.210912	2.253337

Table 7.8 Regression output for standard works

```
-> works_category_name2 = Standard
```

Source	SS	df	MS	Number of obs	=	69,386
Model	4925.84254	5	985.168508	F(5, 69380)	=	53.45
Residual	1278671.68	69,380	18.4299753	Prob > F	=	0.0000
				R-squared	=	0.0038
				Adj R-squared	=	0.0038
Total	1283597.53	69,385	18.4996401	Root MSE	=	4.293

duration_original	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
lha_type_d	-.0955314	.0357684	-2.67	0.008	-.1656373	-.0254255
promoter_type_d	.4582126	.0410718	11.16	0.000	.377712	.5387133
traffic_management_coded_d	-.1073196	.0199067	-5.39	0.000	-.1463368	-.0683025
ss_d	-.3189384	.0354901	-8.99	0.000	-.388499	-.2493779
tra903vehiclesmilesroadlength	-.1017379	.0407125	-2.50	0.012	-.1815344	-.0219413
_cons	8.063033	.0620764	129.89	0.000	7.941363	8.184702

Table 7.9 Regression output for major works

```
-> works_category_name2 = Major
```

Source	SS	df	MS	Number of obs	=	35,627
Model	2114603.54	5	422920.708	F(5, 35621)	=	938.92
Residual	16044917.2	35,621	450.434217	Prob > F	=	0.0000
				R-squared	=	0.1164
				Adj R-squared	=	0.1163
Total	18159520.8	35,626	509.726626	Root MSE	=	21.223

duration_original	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
lha_type_d	-.0891408	.2505774	-0.36	0.722	-.5802802	.4019986
promoter_type_d	-3.742834	.2323499	-16.11	0.000	-4.198247	-3.287421
traffic_management_coded_d	-8.32163	.1356667	-61.34	0.000	-8.58754	-8.055719
ss_d	3.544834	.2525451	14.04	0.000	3.049838	4.03983
tra903vehiclesmilesroadlength	1.540829	.2738055	5.63	0.000	1.004162	2.077496
_cons	29.70034	.4381125	67.79	0.000	28.84163	30.55906

7.5 Balance of matching variables

The following tables detail the balance achieved on matching variables following the IPW by work category (Tables 7.10-7.16). Attention should be paid to the change in variance ratio between the raw and weighted data. IPW seeks to reweight the data so that the variance ratio is close to one – this means that our treatment and comparison group are balanced. Note that the interaction between LHA type and traffic density (tra903vehicle) was included as a matching variable – this was to account for the correlation between these two matching variables and achieve greater balance.

Using Table 7.10 as an example, we can see that reasonable balance was achieved for immediate works by statutory undertakers²⁶. Although not all ratios are close to one, they have improved over the raw data to a satisfactory level. Subsequent tables should be interpreted in the same way.

Table 7.10 Balance summary for immediate works by statutory undertaker

Covariate balance summary				
			Raw	Weighted
	Number of obs =		147,368	147,368.0
	Treated obs =		76,764	75,446.1
	Control obs =		70,604	71,921.9
	Standardized differences		Variance ratio	
	Raw	Weighted	Raw	Weighted
ss_d	.2077783	.0125092	1.219697	1.010514
traffic_mana~d	-.0140298	.0003172	1.062815	1.034995
tra903vehicle~h	.7749431	.0102908	.7312745	1.11384
lha_type_d	.0535425	.0523526	.9745831	.9749507
tra903vehicle~h#				
tra903vehicle~h	.7085213	.0289254	1.091211	1.190143
lha_type_d#				
tra903vehicle~h				
1	.4544537	.0524337	1.797069	1.114778

²⁶ It was not possible to include immediate works by highway authority in the analysis, see Section 7.3.

Table 7.11 Balance summary for minor works by highway authority

Covariate balance summary				
			Raw	weighted
		Number of obs =	59,886	59,886.0
		Treated obs =	42,109	29,678.9
		Control obs =	17,777	30,207.1
	Standardized differences		Variance ratio	
	Raw	weighted	Raw	weighted
ss_d	.0277276	-.0937968	1.008937	.9861788
traffic_mana~_d	-.2116943	-.0134682	.9640921	.93341
tra903vehicle~h	.7315518	.0590115	.8829418	1.105523
lha_type_d	-.229974	-.0189189	1.027085	1.000521
tra903vehicle~h#				
tra903vehicle~h	.6695907	.0748816	1.373632	1.406988
lha_type_d#				
tra903vehicle~h				
1	.1275844	.0014998	1.826539	1.033074

Table 7.12 Balance summary for minor works by statutory undertaker

Covariate balance summary				
			Raw	weighted
		Number of obs =	242,360	242,360.0
		Treated obs =	129,789	122,598.6
		Control obs =	112,571	119,761.4
	Standardized differences		Variance ratio	
	Raw	weighted	Raw	weighted
ss_d	.1949862	-.0020877	1.163123	.9985696
traffic_mana~_d	-.0069452	-.0105177	1.004553	.9584985
tra903vehicle~h	.6597845	.0211581	.7939294	1.069286
lha_type_d	-.0204648	.0247176	1.011727	.9861647
tra903vehicle~h#				
tra903vehicle~h	.6115689	.0322712	1.147746	1.179233
lha_type_d#				
tra903vehicle~h				
1	.3127575	.033867	1.613569	1.096182

Table 7.13 Balance summary for standard works by highway authority

Covariate balance summary				
			Raw	weighted
		Number of obs =	13,657	13,657.0
		Treated obs =	7,287	6,419.3
		Control obs =	6,370	7,237.7
	Standardized differences		Variance ratio	
	Raw	weighted	Raw	weighted
ss_d	.2203832	.0219832	1.109707	1.005773
traffic_mana~_d	-.0033171	.0624651	.9781586	1.025809
tra903vehicle~h	.7875581	.2144942	.5169813	.8564153
lha_type_d	.2307341	-.0302572	.9197103	1.010793
tra903vehicle~h#				
tra903vehicle~h	.6473013	.1874206	.8156177	1.179853
lha_type_d#				
tra903vehicle~h				
1	.72044	.0716812	2.027989	1.144306

Table 7.14 Balance summary for standard works by statutory undertaker

Covariate balance summary				
			Raw	weighted

	Number of obs =		55,729	55,729.0
	Treated obs =		25,985	27,685.9
	Control obs =		29,744	28,043.1

	standardized	differences	Variance ratio	
	Raw	weighted	Raw	weighted

ss_d	.2414645	.0301927	1.184337	1.01739
traffic_mana~d	.149506	.0106555	1.126529	1.001588
tra903vehicle~h	.7876366	.0412372	.620902	.9990486
lha_type_d	.0013743	.0171051	.9993494	.9916886
tra903vehicle~h#				
tra903vehicle~h	.6772023	.0400059	.9500631	1.112273
lha_type_d#				
tra903vehicle~h				
1	.4432347	.0307117	1.827082	1.060971

Table 7.15 Balance summary for major works by highway authority

Covariate balance summary				
			Raw	weighted

	Number of obs =		15,946	15,946.0
	Treated obs =		6,673	7,552.7
	Control obs =		9,273	8,393.3

	standardized	differences	Variance ratio	
	Raw	weighted	Raw	weighted

ss_d	.3131664	.0723291	1.209279	1.026118
traffic_mana~d	.1552903	.035494	.7281223	.8938884
tra903vehicle~h	1.224956	.1096614	.8569877	1.004485
lha_type_d	.2766212	.1249613	.7820277	.8886198
tra903vehicle~h#				
tra903vehicle~h	1.076886	.1030531	1.356141	1.074545
lha_type_d#				
tra903vehicle~h				
1	.8980179	.1217512	1.865588	1.054569

Table 7.16 Balance summary for major works by statutory undertaker

Covariate balance summary				
			Raw	weighted

	Number of obs =		19,681	19,681.0
	Treated obs =		9,395	9,956.3
	Control obs =		10,286	9,724.7

	standardized	differences	Variance ratio	
	Raw	weighted	Raw	weighted

ss_d	.215552	.0210777	1.288767	1.02206
traffic_mana~d	.0325758	.0121659	1.031291	1.046107
tra903vehicle~h	.6797363	-.0070223	.8459891	1.087163
lha_type_d	-.1555998	.018345	1.108652	.9880705
tra903vehicle~h#				
tra903vehicle~h	.6098028	.0082914	1.195821	1.15131
lha_type_d#				
tra903vehicle~h				
1	.2611612	.0150235	1.886023	1.103336

7.6 Limitations of approach

The typical approach to the selection of matching variables in a counterfactual impact evaluation is to include variables that are both predictors of the outcome of interest (e.g. duration of works) and treatment²⁷ (in this case, being undertaken under a permit). No variables within the Elgin data met these criteria. This was due to just one variable (strategically significant streets) being a significant predictor of treatment. Other variables related to road network composition and LHA characteristics did not predict whether an LHA uses permits or notices. This was to some degree expected as the qualitative elements of research suggested that a LHA's decision to permit is largely based on their preferences and/or objectives for network management rather than any measurable characteristics of the road network. Furthermore, the descriptive analysis of LHAs revealed that there were limited significant differences between permit and notice LHAs on key characteristics (see Tables 7.2 – 7.5). The latter point is an advantage to the counterfactual design as it suggests there is already a good level of balance between the treatment and control groups at the LHA level – so we need not include too many variables in the matching process to achieve balance. With this in mind, matching variables were selected on an empirical and theoretical basis. Significant predictors of the key outcome, durations, were included as either matching variables or variables that the analysis was subset by (i.e. type of work and whether the work was carried out by a statutory undertaker or LHA). This decision is supported by the academic literature (including Brookhart et.al²⁸), that found the inclusion of variables that predict outcomes is more important than those that predict treatment.

We are confident that the matching variables selected cover the relevant differences between LHAs and works. At the LHA level, only key variables were selected for the final model. Other LHA variables were either correlated with or subsumed within these key variables – their inclusion would have led to model convergence/balance issues with no positive impact on the overall quality of matching.

The works data provided by Elgin provided the most comprehensive and consistent dataset on works across England. However, the completeness of records and a seeming increase in the number of works recorded when a LHA started a permit scheme created some challenges. Recording for permit and notice LHAs for 2016 was good, however, there were some inconsistencies for previous years. To control for this, it was necessary to restrict the dataset to just LHAs where records for their baseline year was reasonably aligned with their data for 2016.

²⁷ Caliendo, M. and Kopeinig, S., 2008. Some practical guidance for the implementation of propensity score matching. *Journal of economic surveys*, 22(1), pp.31-72

²⁸ Brookhart, M.A., Schneeweiss, S., Rothman, K.J., Glynn, R.J., Avorn, J. and Stürmer, T., 2006. Variable selection for propensity score models. *American journal of epidemiology*, 163(12), pp.1149-1156.

8.0 Cost Benefit Analysis

This section provides further information on specific aspects of the methodology used for the indicative cost benefit analysis (CBA), building on that contained within Section 2.3 of the main report. The CBA draws upon the evaluation findings (notably the counterfactual impact evaluation) to estimate the benefit cost ratio associated with permit schemes.

8.1 Introduction

To establish the impact that permit schemes have had on highway management, and whether they have delivered value to those authorities which have adopted them requires an analysis of the benefits of permits, set against the costs of scheme operation.

The methodology adopted for this national level assessment follows DfT guidance on transport scheme appraisal as set out in WebTAG, and is consistent with the guidance presented in the DfT Permit Scheme Advice Note on undertaking the CBA²⁹.

The high-level process is set out below, with each element explained and expanded in more detail in the following sections.

- Identify the volume and type of works occurring nationally, both within the permit authorities and the notice authorities.
- Quantify the societal impacts of these works in the form of monetised costs relating to business and consumer travel time delay and vehicle operating costs, and wider impacts including environmental aspects.
- Estimate the reduction in the impact of works resulting from the permit scheme and quantify the benefits of this reduction.
- Define the costs of operation of the permit schemes.
- Undertake cost benefit analysis of permit schemes operating nationally.

8.2 Works data

Analysis of the works data provided by Elgin provides a disaggregation of numbers, durations and types of work occurring, which can be split by permit and non-permit authorities. This comprehensive database provides the basis for the impact calculations. Differentiating between different types of traffic management, locations, types of road

²⁹ Department for Transport. (2015). Permit Scheme Advice Note: Implementing changes required by 1 October 2015: <https://www.gov.uk/government/publications/street-works-permit-schemes-implementing-2015-regulatory-changes>

upon which works occur, and duration of works allows detailed modelling of the impact of works on local traffic conditions and the wider economy.

8.3 Quantification of works impact

The QUADRO (Queues and Delays at Roadworks) modelling software has been used as the basis for the impact calculations. QUADRO was originally developed for the DfT and designed to assess and monetise the impact of delays due to works. Whilst no longer hosted by the DfT, the QUADRO model continues to be maintained, under the responsibility of Highways England, and is considered to be most appropriate tool for quantifying the impact of works as part of this evaluation.

The outputs of the QUADRO model provide the basis for the assessment, including:

- Net consumer economic impact (time savings and vehicle operating costs)
- Net business economic impact (time savings and vehicle operating costs)
- Accident impact
- Fuel carbon emissions impact
- Indirect revenue impacts

A series of roadwork scenarios have been run in QUADRO to underpin the impact calculations, with the following dimensions:

- Authority type (4 different groupings based on network characteristics and densities).
- Traffic management type (road closure, lane closure, traffic signals, shuttle working, convoy and carriageway incursion).
- Road type (A, B, C, D/U roads, single and dual carriageway).
- Urban and rural works.

In total, more than 100 individual QUADRO runs were conducted to cover the different combinations of works types based on the above dimension. The runs provide a monetary impact cost for each type of roadwork which, when paired with the recorded roadwork events, can be used to derive global roadwork impact values.

Table 8.1 (overleaf) provides a summary of the modelled impact of works at the national level (all authority types). The headline figure is a national cost of works (statutory undertaker and highway authority) of £1.63bn in 2016 (2010 prices). Works with no carriageway incursion (marked 'none' in the table) are assumed to create no impact for road users.

Table 8.1 Cost of works in all authorities by traffic management type (2016)

		None	Some Carriageway	Traffic Control	Lane Closure	Road Closure	Grand Total
Major	Impact Cost	n/a	17,733,290	56,183,624	324,438,584	561,028,285	959,383,783
	Total Duration	198,362	651,014	628,317	74,492	347,838	1,900,023
	Works Total	5,551	20,834	18,426	2,636	32,687	80,134
Standard	Impact Cost	n/a	7,169,391	42,913,221	114,511,166	15,991,350	180,585,128
	Total Duration	240,087	558,262	471,994	25,586	8,200	1,304,129
	Works Total	28,752	67,086	58,963	3,203	1,081	159,085
Minor	Impact Cost	n/a	12,551,752	49,366,617	143,161,999	8,886,776	213,967,144
	Total Duration	325,830	951,173	466,894	28,206	4,110	1,776,213
	Works Total	133,598	366,171	193,704	13,982	2,046	709,501
Immediate	Impact Cost	n/a	20,821,965	48,016,786	127,080,857	81,294,320	277,213,928
	Total Duration	363,214	1,483,543	451,200	28,879	62,933	2,389,769
	Works Total	76,439	318,047	139,302	10,744	15,544	560,076
Grand Total	Impact Cost	n/a	58,276,398	196,480,247	709,192,606	667,200,731	1,631,149,983
	Total Duration	1,127,493	3,643,992	2,018,405	157,163	423,081	7,370,134
	Works Total	244,340	772,138	410,395	30,565	51,358	1,508,796

Costs presented as 2010 market prices

To quantify the likely benefit of permit scheme works, the works undertaken under permit schemes must be identified. Table 8.2 (overleaf) shows the estimated cost of works undertaken under permit regimes (works with no carriageway incursion are excluded as these are assumed to create no impact for road users).

Whilst QUADRO outputs cover the majority of the standard monetised elements of roadwork impact, an off-model adjustment was made to account for reliability impacts. DfT guidance recommends that this be captured through application of an uplift to journey time costs/benefits. The recommended uplift factor is 10-20%. We have adopted a factor of 15% in order to be consistent with this recommendation.

Table 8.2 Cost of works undertaken under permits (2016)

		Some Carriageway	Traffic Control	Lane Closure	Road Closure	Total
Major	Impact Cost	3,946,313	31,314,036	234,334,014	301,326,599	570,920,962
	Total Duration	246,719	252,436	50,114	131,056	680,325
	Works Total	7,365	7,661	1,918	13,600	30,544
Standard	Impact Cost	4,663,283	24,308,679	80,240,874	9,528,999	118,741,835
	Total Duration	268,134	208,315	17,399	3,946	497,794
	Works Total	31,500	25,487	2,130	495	59,612
Minor	Impact Cost	8,836,460	32,357,379	102,631,826	4,073,390	147,899,055
	Total Duration	563,730	251,224	20,248	1,657	836,859
	Works Total	194,929	102,403	9,642	807	307,781
Immediate	Impact Cost	17,835,418	33,086,768	107,788,761	56,747,106	215,458,053
	Total Duration	938,006	242,245	24,158	37,410	1,241,819
	Works Total	206,720	74,990	9,531	8,904	300,145
Total	Impact Cost	35,281,473	121,066,862	524,995,475	371,676,094	1,053,019,904
	Total Duration	2,016,589	954,220	111,919	174,068	3,256,797
	Works Total	440,514	210,541	23,221	23,806	698,082

Costs presented as 2010 market prices

8.4 Estimation of reduction in works impact

Establishing the impact that permit schemes have on the number of works, their duration and characteristics is the most challenging aspect of the CBA.

The most common approach, and that adopted by almost all LHA permit scheme evaluations, has been to use the default assumption of a 5% reduction in impact as recommended by the DfT in the Permit Scheme Evaluation Guidance. This assumption is proposed in the case where no other evidence is available.

The outputs of the counterfactual impact evaluation undertaken as part of this study (see Annex 7) do, however, provide a statistically rigorous insight into the changes in average duration for different works categories under permit schemes compared with works completed under a noticing regime (see Table 3.1 in the main report). Changes in duration may be expected to have a bearing on the impact of works therefore rather than using the default assumption of impact reduction we have produced an alternative estimate based on this new evidence.

The difference in works durations for each category of works (immediate, minor, major, standard) revealed by the counterfactual impact evaluation forms the basis of the permit scheme impact calculations (Table 8.3, overleaf). The observed difference in durations for works under noticing and permit regimes has been used to provide the likely works duration for permit authorities under the counterfactual scenario (i.e. where they had not implemented a permit scheme). Pairing the hypothetical works durations under the counterfactual with the estimated cost per day of works of different categories provides an estimate of overall works impact under the counterfactual scenario.

Table 8.3 Estimation of impact of permit schemes (2016 works data)

	Duration			Impact		
	Permit	Change	Counterfactual (noticing)	Impact /day	Impact (permit)	Impact counterfactual (noticing)
LHA						
Major	317,709	-6.50%	339,796	£1,335.78	£424,390,207	£453,893,270
Standard	148,546	-7.7%	160,938	£408.49	£60,679,775	£65,741,901
Minor	265,145	-8.9%	291,048	£329.21	£87,287,228	£95,814,740
Immediate	382,664	N/A*	382,664	£224.59	£85,942,546	£85,942,546
Statutory undertaker						
Major	361,796	-13.90%	420,204	£403.13	£145,851,570	£169,397,875
Standard	348,626	-1.6%	354,295	£165.30	£57,626,678	£58,563,697
Minor	569,274	8.1%	526,618	£102.52	£58,360,342	£53,987,365
Immediate	858,719	3.0%	833,708	£150.77	£129,473,275	£125,702,209
LHA	1,114,064	-5.1%	1,174,446	£590.90	£658,299,756	£701,392,457
Statutory undertaker	2,138,415	0.2%	2,134,825	£182.99	£391,311,865	£407,651,146
Total	3,252,479	-1.7%	3,309,271	£322.71	£1,049,611,621	£1,109,043,603
Difference						£59,431,982

* No statistically significant duration impact was found for immediate highways works

Whilst the counterfactual impact evaluation analysis identifies an increase in duration for certain works categories, overall we have assumed a reduction in the estimated impact of works, based on the difference in duration for each works type. For all permit authorities, the difference between estimated works impact under permitting and the counterfactual (no permit scheme) amounts to £59.4 million per year (based on 2016 data). The reduction in works impact due to permitting is therefore estimated to be **5.4%**. This finding is not dissimilar to the default 5% assumption recommended in the DfT guidance.

It should be noted that whilst this approach makes use of the findings of the counterfactual impact evaluation, works duration are not the only aspect of works which can be expected to be influenced by permitting. Better reporting of works, changes to working practices (such as the type of traffic management adopted), or timing of works to minimise delays in peak periods may also be influential so the estimates presented may be a significant underestimate of actual benefits. However, the impact of changes in reporting and working practices are more challenging to quantify and to attribute directly to permit schemes and, as such, duration has proved the only practicable means of quantifying impact given the data available.

8.5 Costs of operation

Obtaining detailed operating cost data from LHAs has only been possible for a small number of authorities (through published scheme information and survey responses). However, as permit fees should be set to reflect the costs of operation (and in the absence of any other comprehensive data on this point), estimated permit fee income has been taken as a proxy for the cost of scheme operation to the LHA.

Permit fees

The Permit Scheme Regulations allow an LHA to charge a fee for the issuing of a permit, an application for a Provisional Advanced Authorisation and a variation to a permit, to recover the prescribed costs of operating a permit scheme in relation to statutory undertakers only. Statutory Guidance builds on this regulatory provision with the following conditions³⁰:

- The income from fees must not exceed the total allowable costs prescribed in permit regulations.
- Allowable costs are limited to: the proportion of direct costs and overheads attributable to operating the scheme for undertakers, which are over and above the cost of the authority's co-ordination duty under NRSWA.

³⁰ Statutory Guidance for Highway Authority Permit Schemes (October 2015).

- In the event that fees and costs do not match the actual outturn for any year adjustments should be considered.
- Transparent information on this should be provided to all stakeholders as part of the published evaluation of the scheme.

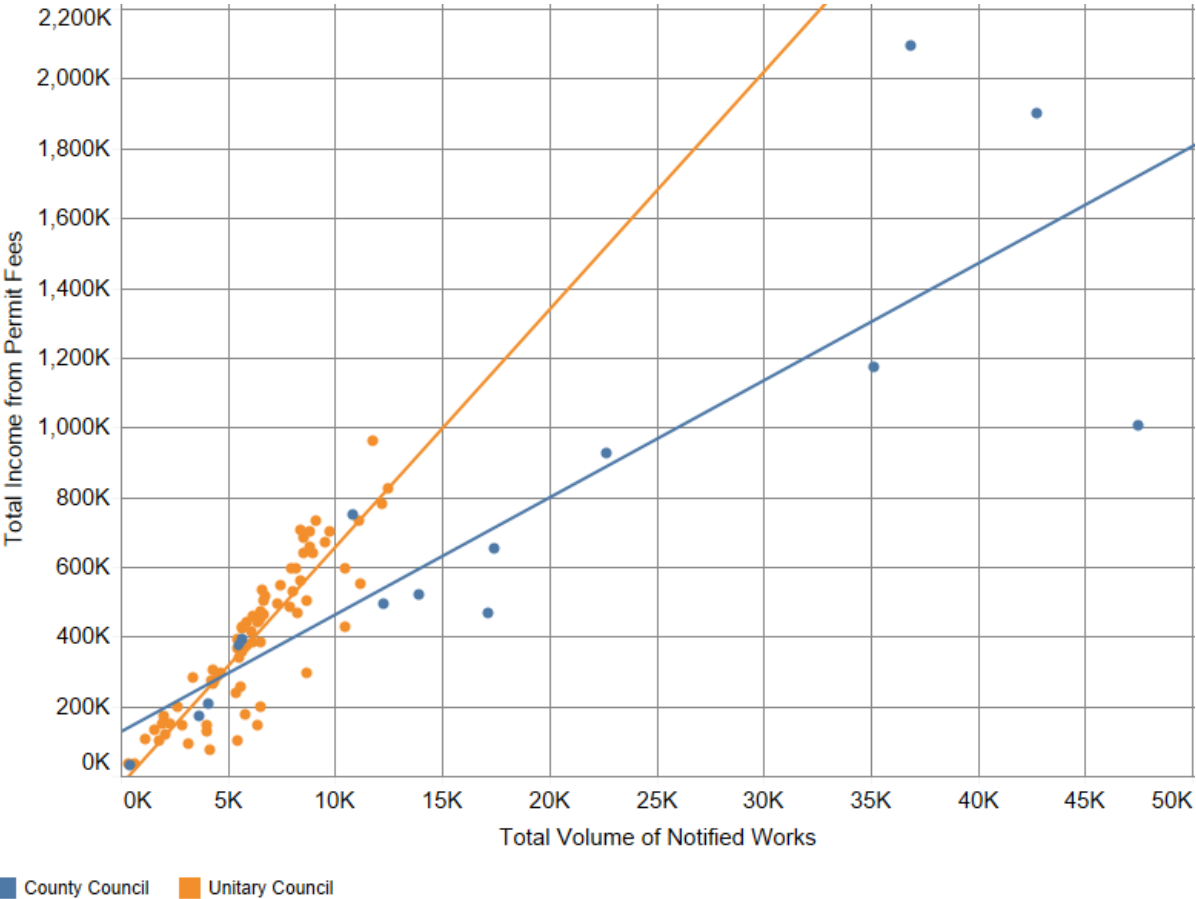
Analysis of the 2016 permit fees levels and associated notification volumes and total permit fee income was undertaken for statutory undertaker works only. This analysis took account of the following:

- There is a distinct charging regime for different works category types, therefore aggregating the works and income does not consider varying levels of works category.
- The income includes fees for permit variations, the numbers of which are linked to changes made by the works promoter.
- LHAs with schemes of less than three years old may not yet have had the opportunity to review and adjust their fees, and therefore income, in accordance with the regulations and statutory guidance.

It was found that the majority of LHAs charge permit fee levels at the maximum amount and 75% (one in four) are charging permit fees within 90% of the maximum fee levels. It appears that 10 LHAs have permit fees which are above the maximum levels set out within the statutory guidance. This results in one of the LHAs having an average of 103% of the maximum fee level.

Figure 8.1 shows the total income from permit fees (statutory undertaker works only) along with the total volume of notified works (that could be subject to a permit fee). It is interesting to note the difference between the two authority types, unitary and county, and the wide variances between those in the latter category.

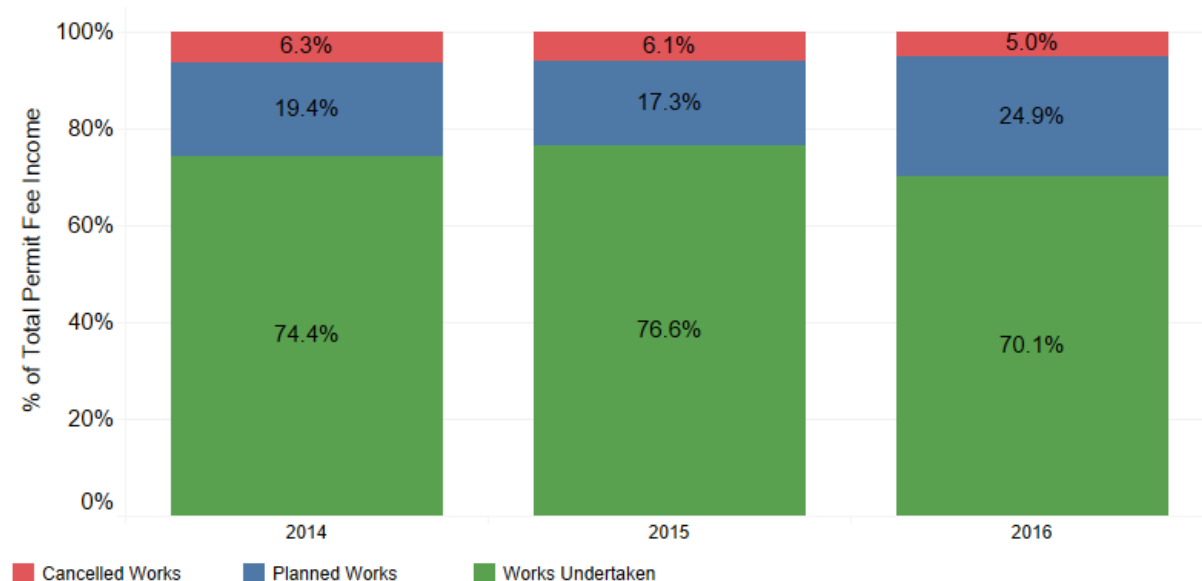
Figure 8.1 Permit fee income and total volume of notified works (permit LHAs, 2016)



Further analysis shows differences in average permit fees across the LHAs. Given that the allowable prescribed costs are clearly defined and that staff costs should not fluctuate considerably across the country (allowing for regional patterns and London weighting) it is difficult to understand why there would be such as variance in average permit fee levels.

Figure 8.2 shows the income from permit fees, including permit variation fees, for statutory undertaker works only, delineated by the final works status.

Figure 8.2 Proportion of permit fee income by final works status



It is interesting to note that around 70% of permit fees are applied to works undertaken, leaving 30% of fees being paid for works that are cancelled or do not progress to a works undertaken status. When analysing this for 2016, this would equate to around £12 million of permit fees nationally for works that are not undertaken.

Table 8.4 summarises the estimated permit fee income if fees were applied to all promoter types. This total figure has been used as a proxy for permit scheme operating costs.

Table 8.4 Estimated national permit fees (£, 2016)

	Permit fees by promoter type			Total
	Statutory undertaker	LHA	Other	
Some carriageway	21,436,501	14,867,580	284,238	36,588,318
Traffic control	10,725,796	6,687,393	26,698	17,439,887
Lane closure	1,103,085	2,717,510	49,014	3,869,609
Road closure	2,487,312	4,040,172	2,896	6,530,380
Total	35,752,694	28,312,655	362,845	64,428,194

(2016 prices)

Permit fee income has been treated as a business cost (to statutory undertakers) and as an income stream for LHAs, applied as a reduction in scheme costs.

Equally, establishing robust data relating to the cost to works promoters of additional administration and changes in working practices have been challenging. Based on a

review of information provided by respondents to a survey undertaken as part of this study, supported by wider evidence derived from permit scheme evaluations³¹, promoter administration costs have been estimated at 20% of the cost to the LHA. It has not been possible to estimate the costs of any changes to working practices implemented by promoters in response to directions or conditions being applied by LHAs.

All costs have been rebased to 2010, and converted from factor costs to market prices.

8.6 Permit scheme assessment

The assessment has been undertaken in line with standard WebTAG/Green Book parameters, as well as drawing on the DfT guidance specifically relating to permit scheme CBA. The main assumptions are as follows:

- 25 year appraisal period
- Discount rate of 3.5%
- Use of 2010 market prices

The results of the indicative CBA of permit schemes for all those in operation at the national level are as follows:

Net present benefits	£709,734,447
Net present costs	£528,936,941
Net present value	£180,797,506
Benefit to cost ratio	1.34

A positive net present value demonstrates that the scheme delivers greater benefits than scheme costs and therefore provides a positive net value to society. This is also reflected in the benefit to cost ratio (BCR) of above 1.

However, this assessment should be seen as **indicative** in nature as it has only been possible to quantify one dimension of scheme impact (duration) and there is limited evidence on the actual costs to both LHAs and promoters so various assumptions have been required in this regard.

8.7 Sensitivity tests

As noted, the CBA is dependent on a range of assumptions. The most pivotal of these is the scale of estimated impact reduction attributable to permit schemes, which has been

³¹ See Leicestershire Permit Evaluation, https://www.leicestershire.gov.uk/sites/default/files/field/pdf/2017/4/6/CBA_Report-CONSULTATION.doc

calculated based on the findings of the counterfactual impact evaluation. Sensitivity testing has been undertaken using alternative assumptions relating to reduction in impact, namely:

- A 5% reduction in impact which is commonly used as the default assumption in ex-ante CBA of permit schemes, following the DfT’s own guidance.
- A 10% reduction in impact as used in the ex-ante evaluation for the London Borough Schemes³², and supported by recent published analysis of the Derby Scheme³³.

Adopting these alternative assumptions of works impact reduction results in the following figures:

	5% impact reduction	10% impact reduction
Net present benefits	£603,923,583	£2,154,256,512
Net present costs	£528,936,941	£528,936,941
Net present value	£74,986,643	£1,625,319,571
Benefit to cost ratio	1.14	4.07

The scheme retains a positive net present value under the default 5% impact assumption, although is approaching the break-even point at which the estimated costs equal the benefits (achieved at an impact reduction level of 4.74%). If the permit schemes achieved a 10% impact reduction in impact (which may be possible if taking account of the wider impacts beyond works duration), the net present value increases, and the BCR increases to above 4.

8.8 Conclusions

Overall, based on the 5.4% assumed reduction in roadwork impact, permit schemes are shown to deliver greater benefit than the estimated scheme operating costs. The net present value is therefore positive, and the benefit to cost ratio greater than 1. However, sitting between 1 and 1.5 the scheme would be currently classified as ‘low value for money’. As noted, this assessment should be seen as indicative as it is based on only one dimension of impact (duration) and various assumptions about the actual costs to both LHAs and promoters (in the absence of comprehensive data on this point).

Sensitivity testing demonstrates that based on the typical assumptions of impact reduction, the permit scheme delivers positive value, although there is limited evidence

³² As referenced in https://consultations.tfl.gov.uk/streets/lane-rental/supporting_documents/CoBA%20v1.1.pdf

³³ <https://dspace.lboro.ac.uk/dspace-jspui/bitstream/2134/20072/3/Hussain%20et%20al%20Derby%20utilities%20intervention%20model%20paper%20TRB%202016%20LUPIN%20-%20Jan%202016.pdf>

with which to validate such assumptions. In practice, the value delivered by the permit schemes will depend greatly on how effectively the powers to manage and co-ordinate works are used. Greater use of these powers has been shown to offer the potential to deliver significant additional savings (see Section 3.4.3 of the main report).

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