

<b>Title:</b> Amendment to Data Protection and Digital Information (DPDI) bill: Legislation to deliver the National Underground Asset Register (NUAR)  <b>RPC Reference No:</b> RPC-DSIT-5288(1) <b>Lead department or agency:</b> Geospatial Commission <b>Other departments or agencies:</b> None	<b>Impact Assessment (IA)</b>			
	<b>Date:</b> 28/09/2023			
	<b>Stage:</b> Final			
	<b>Source of intervention:</b> Domestic			
	<b>Type of measure:</b> Primary Legislation			
<b>Contact for enquiries:</b> NUAR@cabinetoffice.gov.uk				

<b>Summary: Intervention and Options</b>	<b>RPC Opinion: Fit for purpose-green rated</b>
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Cost of Preferred (or more likely) Option (in 2019 prices)			
Total Net Present Social Value	Business Net Present Value	Net cost to business per year	Business Impact Target Status
£3,917.1m	£2,244.5m	- £183.7m	Qualifying provision

**What is the problem under consideration? Why is government action or intervention necessary?**

There are over 4 million kilometres of energy, water and telecoms pipes and cables underground, which suffer c.60,000 accidental strikes a year, leading to costs to industry and government of £2.4 billion a year. At a cost to the asset owner, data on these pipes and cables must be shared between them and excavators under current legislation. However, current legislation stops there, it does not specify how data is to be shared. Therefore, although asset owners would benefit most from sharing data in a consistent manner, the complexity and nature of current practices to meet this obligation means that 700+ asset owners have to continually respond to requests for data from numerous excavators, and excavators have to contact multiple asset owners to source it, with data provided in different formats, scales and to varying timeframes. Government intervention is necessary to overcome these issues through reforming legislation to underpin a new sustainable data sharing service (NUAR) that manages commercial interests, legal liabilities and delivers secure and efficient access to underground asset data.

**What are the policy objectives of the action or intervention and the intended effects?**

NUAR will reduce the number of annual utility strikes and improve data sharing and on-site efficiency for utility asset management, resulting in industry and public sector cost savings estimated to deliver £491m per annum of economic growth. There are also a number of indirect benefits such as reduced traffic delays and disruption, programme overruns, costs to local businesses and costs to local highways from closing/redirecting traffic, as well as improved worker safety. It also underpins the government’s priority to get the economy growing; expediting projects like new roads, new houses and broadband roll-out. The new primary legislation is intended to achieve this through updating current data sharing legislative requirements and to create a sustainable funding model for the improved service.

**What policy options have been considered, including any alternatives to regulation? Please justify preferred option (further details in Evidence Base)**

**Option 0:** Do nothing - This is the scenario in which no changes are made to the current legislation and the NUAR MVP is not operationalised. All analysis carried out is compared to this baseline scenario.

**Option 1:** Create a new service - supported by updated government legislation (preferred option). Build NUAR and create powers in legislation to support a sustainable service.

Is this measure likely to impact on international trade and investment?		Yes			
Are any of these organisations in scope?		<b>Micro</b> Yes	<b>Small</b> Yes	<b>Medium</b> Yes	<b>Large</b> Yes
What is the CO <sub>2</sub> equivalent change in greenhouse gas emissions? (Million tonnes CO <sub>2</sub> equivalent)		<b>Traded:</b> N/A		<b>Non-traded:</b> N/A	

**Will the policy be reviewed?** It will not be reviewed.

**I have read the Impact Assessment and I am satisfied that, given the available evidence, it represents a reasonable view of the likely costs, benefits and impact of the leading options.**

Signed by the responsible :

Alison Kilburn

Date:

12/10/2023

# Summary: Analysis & Evidence

Policy Option 1

Description:

## FULL ECONOMIC ASSESSMENT

Price Base Year 2021	PV Base Year 2024	Time Period Years 10	Net Benefit (Present Value (PV)) (£m)		
			Low: 2,629.0	High: 8,687.5	Best Estimate: 4,718.3

COSTS (£m)	Total Transition (Constant Price) Years	Average Annual (excl. Transition) (Constant Price)	Total Cost (Present Value)
Low	14.7	11.6	114.0
High	40.5	24.9	254.9
Best Estimate	29.5	19.3	195.3

### Description and scale of key monetised costs by 'main affected groups'

There will be direct costs to both private and public sector organisations. The assessment provides monetised estimates for these. These estimates include costs to asset owners to conduct data transformation and data refresh activities (including data vectorisation if applicable), as well as familiarisation and administrative costs to comply with the updated legislation.

### Other key non-monetised costs by 'main affected groups'

NA

BENEFITS (£m)	Total Transition (Constant Price) Years	Average Annual (excl. Transition) (Constant Price)	Total Benefit (Present Value)
Low	0	339.0	2,884.0
High	0	1,057.6	8,801.5
Best Estimate	0	588.5	4,913.6

### Description and scale of key monetised benefits by 'main affected groups'

Monetised estimates of direct benefits include cost savings to owners of underground assets through utility strike avoidance, back office efficiencies and on site efficiencies. They also include monetised estimates of indirect benefits associated with both strike avoidance and on-site efficiencies. Monetised estimates of direct benefits for cost savings due to reduction in traffic delays and savings due to reduction in costs to business have also been provided. These are described in the sections below.

<b>Other key non-monetised benefits by 'main affected groups'</b>		
NA		
<b>Key assumptions/sensitivities/risks</b>	<b>Discount rate (%)</b>	3.5
<p>A sensitivities analysis has been conducted in Annex A and informs the low and high scenarios in the tables above. The sensitivities analysis identified the main areas of uncertainty to be (a) the number of asset strikes per year, (b) the maximum reduction in asset strikes produced by NUAR, (c) the rate at which asset owners are onboarded to the NUAR platform and (d) the rate at which users of NUAR start using NUAR on-site.</p> <p>These input variables have been tested to demonstrate their effect on the final net present value of option 1. The results of this analysis are in Annex A.</p>		

**BUSINESS ASSESSMENT (Option 1)**

<b>Direct impact on business (Equivalent Annual) £m:</b>			<b>Score for Business Impact Target (qualifying provisions only) £m:</b>
<b>Costs:</b>	<b>Benefits:</b>	<b>Net:</b>	
7.9	229.2	-221.3	-918.7

# Evidence Base

## Executive summary

### Context

1. There is estimated to be 60,000 accidental strikes per year on the pipes, electricity and telecoms cables, and sewers beneath our feet, leading to injury, project delays, and disruption to traffic and local economies.<sup>1</sup> The total direct and indirect costs of these accidental strikes are estimated to be £2.4 billion a year.
2. The Geospatial Commission is building a digital map of underground pipes and cables that is revolutionising construction and development in the UK - the National Underground Asset Register (NUAR). Once fully operational, NUAR is estimated to deliver £491m per annum in benefits by reducing the frequency of accidental asset strikes, improving the efficiency of works, and enabling better data sharing (resulting in reduced costs to asset owners compared to existing practices). It will also help expedite the delivery of projects related to home building, transport and broadband roll-out by giving planners and excavators immediate access to the data they need in a digital and standardised format.
3. NUAR is a government commitment in the [UK Geospatial Strategy 2030](#) and the [National Infrastructure Strategy](#). It is also part of the IPA's [Transforming Infrastructure Performance: Roadmap to 2030](#). Early access to the first potential NUAR was made available in April 2023, testing delivery of the core functionality to meet the intended 'safe dig' use case and covering North East England, Wales and London; future test releases will cover the rest of England and Northern Ireland by Spring 2024.
4. New primary legislation is required for NUAR to be fully operational, by updating the data-sharing requirements and ensuring a sustainable service.
5. This impact assessment provides:
  - a. An outline of the existing regulatory framework and associated issues
  - b. The policy options being sought and desired package of reforms in overcoming these issues
  - c. The cost benefit analysis of the preferred package of reforms, comprising of:
    - i. Direct costs and benefits
    - ii. Indirect costs and benefits
    - iii. Wider impacts
    - iv. In depth analysis of the impact of these reforms on small and micro businesses and specific sectors within the UK economy
  - d. An overview of all risks and assumptions associated with the modelling
6. The number of organisations affected are given in the table below, split by type of organisation:

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<sup>1</sup> USAG 2014, Beck et al (2007), CECA (2014)

**Table 1: number of organisations affected by NUAR**

Type of organisation	Number
Asset owners	705
– of which are private sector	305
— of which are SMB asset owners	47
– of which are public sector	400
— of which are central government	25
— of which are local authorities	375
Data consumers	3216
– of which are SMB data consumers	3108
Search providers	2

## Findings

7. We estimate the total net present value of the preferred option (creating a new service supported by updated government legislation) to be £4.9bn over 10 years in 2021 prices.
8. A breakdown of the NPV of the costs and benefits of the legislation we have monetised over 10 years can be found in the table below.

**Figures in the “Findings” section differ from the figures in the “Summary” sections because the “Summary” sections are required to be in 2019 prices discounted to 2020 present value. Figures outside of the summary boxes are in 2021 prices and 2021 present value.**

**Table 2: breakdown of the NPV of the costs and benefits of the legislation we have monetised over 10 years**

2021 prices	Low	High	Core
Total NPV	£2,629.0m	£8,687.5m	£4,718.3m
<b>Costs</b>			
Transition Costs	£14.7m	£40.5m	£29.5m
Average Annual costs <sup>2</sup>	£11.6m	£24.9m	£19.3m
Total cost over 10 years in 2021 prices	£114.0m	£254.9m	£195.3m
<b>Benefits</b>			
Total Transitional	£0	£0	£0
Average Annual*	£339.0m	£1,057.6m	£588.5m
Total Benefit	£2,884.0m	£8,801.5m	£4,913.6m

**\*Note** - these are taken from the published [Business Impact Target \(BIT\) calculator](#) when the base year selection is set at “No” (i.e. the base year for calculations in the summary pages differ from Table 2 above). The BIT calculator uses a different annuity rate, which means that the average annual figures will not be totals divided by ten appraisal years.

- Where evidence is currently unavailable, for example on the level of compliance with data provision or meeting charges to use the service because the service is not yet operational, we have provided detailed non-monetised qualitative analysis of the expected direct and indirect costs and benefits.

### Differential impact by sector and organisational size

- There are over 700 asset owners across the UK in the water, energy, and telecommunications sectors, as well as local authorities and transport authorities. These vary in size (e.g. geographic, asset length, customers, employees, revenue, etc) and data maturity.
- In terms of data maturity, this relates to the type, quantity and format of data asset owners hold, and the systems and processes they have in place to manage their data and make it available to others per their existing legal obligations.
- We expect the reforms to have asymmetric distributional impacts on different organisations/sectors based on those characteristics.
- We have provided monetised estimates of the costs and benefits where possible and made some informed assumptions in areas where evidence is lacking. We have therefore carried out sensitivity analysis to ensure that we have appropriately accounted for these potential information gaps.

<sup>2</sup> Note- the average annual costs and benefits are not equal to the total benefits divided by the number of appraisal years (10). This is because they use the BIT calculator's annuity rate as the denominator (8.608) for the calculation.

## Evidence Base

### Problem under consideration

14. A significant proportion of UK utility, building and transport infrastructure is buried underground, including over 4 million kilometres of pipes, electricity and telecoms cables, and sewers.
15. It is estimated that a hole is dug every seven seconds to install, operate, maintain and repair buried pipes and cables - assets that are critical for keeping the water running, gas and electricity flowing and our telecommunications lines connected. This busy and usually unseen environment suffers from an estimated 60,000 accidental strikes per year, leading to injury, project delays, and disruption to traffic and local economies. In its NUAR Economics Benefits Paper<sup>3</sup>, the Geospatial Commission estimated the total direct and indirect costs of these accidental strikes to be £2.4 billion a year. We have since updated the modelled value of NUAR, as described in this impact assessment.
16. Existing legislation<sup>4</sup> outlines obligations on asset owners to:
  - a. Record all underground assets that belongs to them when undertaking works in and along the street;
  - b. Make these records available for inspection for free (at a cost to the asset owner) to certain companies and agencies (including some exceptions to sharing);
  - c. Make sure these records are kept in a prescribed form and manner;
  - d. Share information to a central register<sup>5</sup> intended to fulfil the duties of street authorities to keep information about street works.
17. However, limitations in the existing legislation (particularly related to making records available for inspection for free and the lack of a uniformed digital process for sharing these records) means that the 700+ asset owners across the UK have to continually respond to requests for data from numerous excavators, and excavators have to contact multiple asset owners to source it, with data provided in different formats, scales and to varying timeframes.
18. There are a limited number of existing search providers that charge asset owners to service this complexity, by managing queries regarding underground assets in partnership or on behalf of asset owners. These services are incomplete and do not provide access to the data in a standardised, immediate and digitally interactive format.

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<sup>3</sup> Geospatial Commission, [NUAR Economics Benefits Paper](#), 2021

<sup>4</sup> Relevant legislation to date includes the New Roads and Street Works Act (NRSWA) 1991 for England, Wales and Scotland, the subsequent The Street Works (Records) (England) Regulations 2002, and The Street Works (Northern Ireland) Order 1995 for Northern Ireland.

<sup>5</sup> As part of the legislative amendment made by DfT to Section 53 of NRSWA to implement Street Manager.

19. The Geospatial Commission ran a number of pilots<sup>6</sup> in 2019/20 to test options for improved underground utilities data sharing. Findings were:
- technology is not a barrier to improving the current arrangements
  - the requirement for asset owners to share data would instead be better delivered through the creation of a single, secure data-sharing service for the location and characteristics of underground assets that will provide workers with an interactive, standardised digital view of the underground assets in a given location
  - for the creation of a single service to be successful, legitimate concerns raised by owners of underground assets related to security, commercial sensitivities, liabilities and safety need to be addressed.

## Rationale for intervention

### Market Failures

20. Despite the value that improved access to underground asset data could bring, there is a clear need for government intervention as the market has failed to overcome commercial, security and other barriers. These barriers must be overcome to take full advantage of the benefits that could be available through effective use of data and data sharing via a centralised platform with data from all asset owners. The key market failures are:

- **Economic externalities:** No single asset owner bears the full economic cost of the problems. Costs of utility strikes are recovered from the offending party or from insurance, whereas the potential loss of life, injury, project delays and traffic disruption is borne by wider society.
- **Coordination failure:** The full value of a robust data sharing platform like NUAR requires participation from a high proportion of the estimated 700+ underground asset owners<sup>7</sup>, which is a large coordinated task that is a disincentive to individual change and difficult to achieve by the private sector alone. Government intervention can ensure participation of asset owners, enabling the full benefits of the solution to the economy and society to be realised.

21. Additionally, there are other barriers preventing the market from reaching a viable solution:

- **National security:** Some underground assets are sensitive and must be safeguarded for the purposes of national security. This has acted as a disincentive for asset owners to share data widely, whereas HMG has the knowledge, skills and resources to address these concerns. Asset owners are also more trusting of a government-led initiative where security experts are involved and helping to refine the requirements.
- **Commercial sensitivities:** Private companies (particularly telecoms) are hesitant to share the details of their buried assets without guarantees their data will not be used by competitors to gain a commercial advantage while they are continuing to build out their fibre broadband networks. A government-led initiative is able to establish the programme on non-commercial grounds while setting out clear terms

<sup>6</sup> Geospatial Commission, [NUAR Project Update](#), 2020

<sup>7</sup> Estimated number of buried asset owners in England, Wales and Northern Ireland based on analysis of publicly available data and information from industry representatives and professional bodies.



and conditions of use, safeguards and activity monitoring to prevent abuse in this manner.

- **Liabilities:** Organisations have different risk appetites in relation to the level of contingent liability they are willing to take on when sharing, storing, publishing or accessing data. This makes it extremely difficult for any one organisation, or group of organisations, to agree a legal framework for data sharing that is suitable to all. However, Government is well positioned to take a holistic, proportionate view, ensuring liabilities are apportioned appropriately across all organisations involved and that those assumed by the organisation(s) managing the service do not result in higher costs to asset owners.
- **Set up and ongoing costs:** Although set up costs are very low in the context of the total industry cost-saving generated over the longer term, no single asset owner / intermediary is able to generate a sustainable total funding source for the solution and the barriers suggest that without government intervention the current situation is very unlikely to change.

22. Government is well placed to provide a solution to these barriers as it:

- a. Considers the wider societal costs and benefits as part of its decision making, design and scope;
- b. Has the resources and levers to centrally coordinate a solution and encourage participation;
- c. Sets out clear positions on liabilities and can use its influence to ensure all participating organisations are aligned in this respect;
- d. Is already providing the build costs, and separately considering a sustainable future funding model;
- e. Can provide a service linked to public, social, and economic outcomes rather than a commercial target;
- f. Considers national security considerations a priority and takes a security minded approach to delivery.

23. Findings from the programme's discovery and pilot phases, previous failed attempts outside of government, feedback received on the emerging service, submissions received in response to the 2022 Public Consultation on the future of NUAR, and learnings from comparable services internationally and domestically in Scotland further emphasise the need for a government-run intervention, supported by updated legislation.

## Policy objectives

24. The Geospatial Commission (part of the Department for Science, Innovation & Technology) is building a digital map of underground pipes and cables that will revolutionise the way we install, maintain, operate and repair our buried infrastructure - the National Underground Asset Register (NUAR).
25. NUAR will provide secure access to privately and publicly owned location data from 700+ organisations about the pipes and cables beneath our feet. The digital map gives planners and excavators standardised access to the data they need, when they need it,

to carry out their work effectively and safely. It also includes features to keep data secure and improve its quality over time.

26. The policy objectives are as follows:
- a. Increased efficiency of data sharing;
  - b. Reduced asset strikes;
  - c. Reduced disruptions for citizens and businesses; and
  - d. Expedited delivery of projects like new roads, new houses and broadband roll-out.
27. The NUAR service is estimated to deliver £491 million (2021 prices) per year of economic benefits through:
- a. Savings from reduced utility strikes, £194 million per year
  - b. Reduced cost of sharing data, saving £271 million per year
  - c. On-site efficiency improvements for projects, saving £26 million per year
28. These cover a number of benefits from NUAR such as reduced traffic delays and disruption, programme overruns, costs to local businesses and costs to local highways from closing/redirecting traffic, environmental benefits, as well as improved worker safety.
29. Further, additional benefits may be possible in the future should wider access to NUAR data be allowed in support of additional use cases such as the improved coordination of street works including the promotion of 'dig once' policies<sup>8</sup>, emergency response, flood risk planning, resilience planning, alternative energy production and distribution, and the rollout of electric vehicle charge points. As these opportunities are theoretical at this stage, and depend on a fully operational NUAR before feasibility can be confirmed to a sufficient degree of confidence, we have not sought to quantify these benefits in this impact assessment due to lack of data.

### Activity to date

30. To validate assumptions and test the feasibility of creating NUAR, the Commission spent £2.4m in FY 2019/20 for two pilots (one led by the Greater London Authority in six local authorities in London, the other by Ordnance Survey in North East England). These pilots concluded in April 2020 and following this, the Commission launched a short 'preparation phase' which allowed time for findings from the pilots to be reviewed and to carry out other required work including appointment of a prime supplier and their supply chain. This phase was completed in August 2021.
31. Approval by HM Treasury was given and with the appointment of a prime supplier and associated supply chain, the NUAR programme entered its 'build phase' in September 2021.
32. Early access to the first NUAR data was made available in April 2023 (the 'minimum viable product' (MVP)) testing delivery of the core functionality to meet the intended 'safe dig' use case, covering North East England, Wales and London; future releases will cover the rest of England and Northern Ireland by Spring 2024.

<sup>8</sup> WEF, [How Dig Once Policies Can Democratize Digital Connectivity](#), 2022

33. It is envisaged that NUAR will enter its operational or 'run' phase by the end of 2025, subject to required primary and relevant secondary legislation being in place.

### **NUAR progress<sup>9</sup>**

34. The MVP release in April 2023 included data from 82 organisations (out of a potential 262). Data from a further 40 organisations (out of a potential 450+) is ready to be shared via the test service once the geographic area that they fall within is added.
35. The Geospatial Commission published a public consultation paper '[The National Underground Asset Register](#)' on 7th April 2022. It invited views to shape the future operating model of NUAR.
36. The consultation period closed on 2nd June 2022 with a total of 164 responses received. In the '[Government response to the NUAR consultation](#)', the responses were summarised as follows:
- a. Large utility companies reported some of the highest costs for sharing data with statutory undertakers, whilst local authorities reported some of the lowest;
  - b. The majority of respondents stated that it takes several days following the initial request to access the data to receive all the information they require from asset owners;
  - c. Most respondents agreed that legislation is likely to be required to achieve 100% participation;
  - d. There is a preference for the database containing all of the data to be controlled by government due to significant commercial and security risks of any data misuse or breach, but an understanding of potential roles for the private sector in other elements;
  - e. Respondents noted a potential opportunity for non-statutory users to be charged for access to NUAR data, e.g. conveyancers / property developers;
  - f. There is no consensus on who should fund NUAR in the operational phase but general agreement that those who benefit from the service should contribute.
37. The new primary legislation being sought has been determined through our extensive work to date. It is required to operationalise the service and maximise the benefits to the UK economy, achieved through full participation of asset owners in the service and by maximising use of the data, as well as ensuring that the service is funded by those that benefit from it directly.
38. Delivery to date has been based on the voluntary participation of asset owners with funding provided by government. However, in order to transition the emerging service into a sustainable operation that maximises the value of the new asset over time, the following outcomes must be achieved:
- All utilities, telecoms and transport / local authorities with buried assets are sharing their data through NUAR in a consistent manner. This will ensure workers have access to all the data they need, when they need it, and in a standardised, digital form to carry out their work safely and efficiently.

<sup>9</sup> Figures correct as of 13/07/2023.

- A sustainable charging regime is in place, resulting in no ongoing costs to the taxpayer.
- An enforcement mechanism is in place which promotes data sharing compliance and payment of fees.
- The services are provided by the public body(ies) best positioned to run and manage them.
- NUAR data can be used to support other use cases beyond excavation planning and safe digging or by a wider pool of end users, thus maximising the value of the Crown asset over time.

39. To achieve the above outcomes, regulatory reform is required. Through new primary legislation, workers will have access to complete and comprehensive data from all asset owners across England, Wales and Northern Ireland. A sustainable (cost-recovery) charging regime will be introduced to guarantee funding and reduce the burden on the taxpayer. NUAR will also have legal powers to expand the use cases of the data beyond safe digging in the future, subject to agreement from relevant parties, helping to maximise the value of this data, whilst potentially unlocking opportunities for the private sector to provide value-add services.

## Description of options considered

40. This section describes the two options that were considered to achieve the policy objectives:

- a. **Option 0:** Do nothing - This is the scenario in which no changes are made to the current legislation and the NUAR MVP is not operationalised. All analysis carried out is compared to this baseline scenario.
- b. **Option 1:** Create a new service - supported by updated government legislation (preferred option). Build NUAR and create powers in legislation to support a sustainable service.

41. This final-stage impact assessment does not consider any non-regulatory alternatives to these options. However, as part of the longlisting process a potential voluntary approach to NUAR was considered and discounted due to the lack of a sustainable operating model for NUAR in the absence of the desired legislative powers outlined below. The outcome of this is therefore the same as Option 0.

### Other scenarios considered

42. The NUAR MVP is based on voluntary participation - both with regards to asset owners sharing their data with NUAR, and allowing NUAR to provide secure access to their data for 3rd parties. There are c.150 asset owners, out of the 700+, who are currently engaged on this basis. Some economic benefit can be achieved without the participation of all asset owners - with a large proportion of benefit coming from users having access to data from the major energy, water and telecommunications organisations. Given this, and that most of those organisations are already voluntarily participating in NUAR, it was considered whether NUAR could achieve its envisaged / any benefits from continued voluntary participation only, i.e. not new legislative measures.

43. Whilst the MVP is based on voluntary participation, the development costs of NUAR are being met by the Government rather than industry, and a Ministerial decision has been made that the future operation of NUAR should be funded by those that benefit from it,

rather than the taxpayer. Therefore, the operating costs of NUAR would need to be met by asset owners. The estimated operating costs have little variation based upon the number of asset owners participating, and without the participation of all asset owners these operating costs would be spread across a significantly smaller number of these. This would result in a charge per asset owner that is deemed to be unacceptable - as it would be greater than the costs borne by those organisations today in meeting their existing legislative obligations, for little additional individual benefit. Asset owners being unwilling to pay these charges would result in NUAR operating costs higher than the income received, and therefore NUAR being unable to operate sustainably.

44. This conclusion is supported by findings from the programme's discovery and pilot phases, previous failed attempts to deliver NUAR outside of government, and feedback received on the emerging MVP service. Additionally, we have used learnings from comparable services internationally and domestically in Scotland to discount this option due to similar legislative measures being required to ensure a sustainable operating model.
45. Given the option has been assessed as not feasible, and would lead to the same end scenario as option 0 where no benefits are generated, we have not included it as an option. Further, it was judged that whilst there could theoretically be other scenarios which influenced ongoing voluntary participation, such as a group of major utilities or multiple sector bodies using their convening influence to encourage others to participate, such scenarios are highly speculative and unlikely, and any analysis of them would be based largely on particularly uncertain assumptions. It was not believed, therefore, that any further development of these scenarios is proportionate.
46. However, to ensure we are not over estimating benefits in comparison with the do nothing counterfactual, we have conducted sensitivity analysis and applied optimism bias of 50% (a very conservative assumption) to the low, medium and high estimates of our benefits to account for the potential of such scenarios.

**Option 0:** Do nothing - This is the scenario in which no changes are made to the current legislation. All analysis carried out is compared to this baseline scenario.

47. This option is the benchmark counterfactual and describes a scenario in which the current regime is continued without change. This is equivalent to the continuation, unchanged, of legislation that governs the undertaking of works in and along the street - principally, the New Roads and Street Works Act (NRSWA) 1991 for England, Wales & Scotland and The Street Works (Northern Ireland) Order 1995 for Northern Ireland.
48. As highlighted previously, although the current regime is effective in promoting some data sharing, the complexity and nature of current practices to meet the regulatory regime (due to limitations in the existing legislation) means that firms and public sector organisations are not able to take full advantage of the benefits that could be available to them through effective use of data and data sharing.
49. If no changes are made to the legislation, there is no mechanism for enabling a sustainable service. As a result, NUAR is not operationalised and the estimated £491m per annum benefits are not realised.
50. This option is not preferable as it would not solve the market failures previously highlighted, nor resolve the issues faced by planners and excavators who do not have standardised access to data regarding underground assets.

**Option 1:** Government regulation (preferred option) - Create powers to ensure the full participation by all owners of underground assets in NUAR and enable a sustainable charging regime.

51. The NUAR programme requires the provision of data from asset owners and for a membership fee to be levied to ensure sustained operations. This ensures the benefits can be fully realised and those who benefit most from NUAR, namely asset owners, contribute to its running.
52. Primary legislation that updates the existing legislative requirements will allow the policy ambitions to be achieved. This includes ensuring value of the service, through the provision of asset owner data as well as implementing a sustainable charging mechanism.
53. The criticality of improved legislation in achieving the envisaged benefits are further supported by evidence from services similar to NUAR, such as VAULT in Scotland<sup>10</sup>, KLIP in the Netherlands and KLIC in Flanders (Belgium), who have utilised legislation to make clear the obligations on asset owners and ensure the service has appropriate powers. Further, 70% of respondents to the NUAR consultation stated that reformed legislation would be required for 100% participation. Finally, lessons learned from NUAR's rollout thus far has shown some organisations have delayed engagement / not engaged at all in part because they have no obligation to do so and as such, do not currently consider it a business priority.
54. The powers sought are described in detail below:
  - a. Ability to require asset owners (both public and private sector) to share relevant asset data in a prescribed manner through the NUAR platform and to keep it up-to-date (data sharing requirements);
  - b. Require payment from asset owners for membership of the service (charging);
  - c. Provide government with the ability to fine asset owners for not complying with certain obligations (enforcement);
  - d. Provide government with the ability to determine access to NUAR data including on commercial terms (licensed access);
  - e. Provide government with the ability to appoint a delivery body with appropriate powers (delegation of running NUAR);
  - f. Provide Government with clear spending powers for the operationalisation of NUAR (spending powers).

## Summary and preferred option with description of implementation plan

55. The paragraphs below set out how each of the powers sought in legislation will achieve the intended outcome and objectives:

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<sup>10</sup> The office of the Scottish Road Works Commissioner runs and manages the Scottish Community Apparatus Data Vault (known as VAULT), an appendage to the Scottish Road Works Register which makes data available to planners and excavators through a web map interface.

- a. **Data sharing requirements** - In order to ensure workers have complete, up-to-date, digital access to data about buried assets, providing data to NUAR in a prescribed way will be a statutory obligation on asset owners. Currently asset owners must maintain their records and share these free of charge (at a cost to asset owners) with parties specified in existing regulation. However, this provision of law does not currently define how this data should be shared (e.g. method, format, timescales, etc). The new provisions will require asset owners to share relevant data with NUAR and prescribe the manner in which it is to be done, which is believed to save these organisations money over time.
- i. Onus will be placed on individual assets owners to ensure data shared with NUAR is in a permissible format and is structured in a manner whereby it can be ingested into the NUAR database without requiring the body managing the NUAR service to vectorise it or conduct data transformation activities on its behalf (other than to validate the data conforms to what has been prescribed).
  - ii. This approach recognises that individual asset owners will have a variety of uses for their data (the sharing of data for the purposes of excavation planning and safe digging being only one) and that there is value in maintaining flexibility for asset owners to hold and structure data in accordance with their own individual needs and sector requirements. Asset owners will therefore not be required to re-format or restructure data at source, rather they will only be required to do this when it is shared with NUAR (though we do expect some to do this voluntarily to align with emerging data standards and feedback that may be provided by the NUAR service over time).
  - iii. Placing the onus on asset owners to share data in a prescribed manner also recognises the high degree of heterogeneity between organisations in terms of capacity, capability and the operations they choose to outsource. Were the core NUAR service to continue to conduct data transformation on behalf of asset owners, some organisations would be required to pay for a service they could carry out themselves or through a commercial supplier.
  - iv. A compulsory NUAR transformation service could also distort market competition as there are multiple commercial enterprises who are already providing data services to asset owners and have the capacity to continue to do so.
  - v. Placing the onus on individual asset owners will empower them to take their own decisions based on their own individual needs and capacities. This will also ensure asset owners are not paying costs associated with other organisations (which would otherwise be reflected in the membership fee).
  - vi. The obligation will be enacted in a manner that ensures data provided to NUAR is at least of equal quality to data each asset owner currently makes available for the purposes of safe digging, giving end users confidence in the data made available through NUAR.
  - vii. Ultimately, this measure will ensure planners and excavators have immediate access to complete and up-to-date data, in a standardised

digital format, as and when they need it. It will also enable them to streamline processes related to data acquisition and data preparation.

- b. **Charging** - Asset owners will benefit directly from the NUAR service through data exchange efficiencies. As such, they will be required to contribute to ongoing costs of the service, which will be limited to cost recovery. These charges will be in the form of a tiered annual membership fee levied on asset owners on the basis that the NUAR platform will meet their current obligation to share data.
- i. Details of the exact model are being refined but the main principle will be to maintain proportionality: those who benefit most, i.e. those that currently have to deal with the most enquiries, pay most. Additionally, some organisations, such as local authorities and small and micro businesses, may pay a nominal fee or be exempt from the charging scheme completely.
  - ii. Asset owners may also be subject to a charge for data transformation in the event they fail repeatedly to provide their data in the prescribed structure.
  - iii. Charging will ensure the service is financially sustainable on an ongoing basis without relying on public funds. Its implementation will also give data providers and consumers confidence to introduce efficiencies in how they share or access data without risk of needing to re-introduce existing processes at a later date should the NUAR service be withdrawn or paused due to inadequate funding.
- c. **Enforcement** - As part of the above requirement to share and update data with NUAR, enforcement mechanisms similar in effect to those currently in use for non-compliance under s.79 of the New Roads and Street Works Act 1991 will be used, including making non-compliance subject to a penalty fine. A proportionate approach to enforcement would be taken to be commensurate with the significance, duration or extent of any non-compliance identified.
- i. Civil proceedings will be used for non-payment of membership fees and any fees for the transformation of data where an asset owner has failed repeatedly to provide their data in a compliant manner.
  - ii. These measures are required to ensure data contained within the platform is complete and remains up-to-date. It will also ensure those who benefit from the platform continue to contribute to costs, rather than the taxpayer.
- d. **Licensed access** - Whilst the core use case for NUAR is 'safe digging', a number of potential future expansions for NUAR beyond this core use or current user base have been identified which the Geospatial Commission has committed to exploring with the asset owner community, stakeholders and the wider commercial market in the future. Where the opportunities have been tested and validated, both in terms of feasibility and their value, and have the support of the asset owner community, access to NUAR data may be expanded to maximise value of the asset to business and the UK economy. We believe such opportunities will deliver value far exceeding the existing estimation of £491m pa.
- e. **Delegation of running NUAR** - The development and set up of the NUAR service is currently being led and managed by the Geospatial Commission, in line with its mission to drive greater use of geospatial applications and insights across the economy. Critical to this work has been overseeing development of the service's



core infrastructure and implementation of features and processes for safeguarding data.

A key finding from the 2022 public consultation on the future of NUAR was a strong preference for the database containing asset data to be controlled by Government due to significant commercial and security risks of any data misuse or breach. This provision of law will make it possible for the Geospatial Commission to retain policy ownership over the service, while delegating the day-to-day running of the services to the organisation(s) best positioned to run and manage them. It will ensure the NUAR database and core services remain in government control, while leveraging the capabilities and capacity of others to effectively and efficiently run them.

- f. **Spending powers** - This measure will give the Secretary of State authority to use public funds, exercised in line with the wider spending framework set by HMT, when it is necessary to do so to achieve government outcomes related to NUAR.

56. The policies included in this package will be primary legislation and some will be followed up by further secondary legislation.

## Impact analysis

### Rationale and evidence to justify the level of analysis used in the IA (proportionality approach)

57. Analysis on the potential costs and benefits of the introduction of NUAR was undertaken prior to and [published](#) shortly after the commencement of the NUAR programme (i.e. the 'build phase').
58. Since then, the analysis has been updated to reflect our new expected timelines in relation to the onboarding of asset owners as data providers and the adoption of the service by end users due to the impact of legislation, as well as assumptions on strike mitigations and the costs of transforming data. The assumptions about uptake of the NUAR service are based on new information gleaned from our consultation responses, discussions with cross government experts and external consultants and information and experiences from the onboarding of asset owners to date, as well as roll out of the minimum viable product (MVP) in April 2023.
59. Where evidence exists from these sources and elsewhere (referenced throughout), these have allowed us to quantify the impacts of NUAR. In order to explore some of the uncertainties surrounding the data used, sensitivity analysis has been employed to consider variability in data and assumptions. Where quantitative evidence is not available, qualitative analysis of impacts has been undertaken.
60. This section begins by providing an overview of the direct benefits and costs that are likely to be faced by businesses as a result of the introduction of legislation, in the form of the Equivalent Annual Net Direct Cost to Business (EANDCB) assessment. Direct benefits to business cover the back-office efficiencies and on-site efficiencies. Direct costs to business consist of data transformation costs, vectorisation costs, and familiarisation costs (for both asset owners and data users) as the new system is introduced.

61. No businesses currently provide a service that is the same or similar to the service that NUAR would provide. There are a small number of businesses which provide services to asset owners to fulfil existing legislative obligations.
62. The section after this then looks at the wider monetised cost-benefit analysis of implementing the legislation required to deliver NUAR (assessing impacts on businesses, public sector and wider society). This includes the estimated benefits of avoiding accidental asset strikes, improving the efficiency of works and enabling better data sharing. Costs include the costs to business such as data transformation costs, vectorisation costs, and familiarisation costs (for both asset owners and data users) as the new system is introduced, as well as the fees that will be charged for asset owners who benefit from the service.
63. We also describe some of the non-monetised benefits of improved data driven decision making, including reduced disruption through better planning and coordination of roadworks between organisations and access to NUAR data for wider use cases

### EANDCB Assessment

64. As we are able to provide an assessment of the Equivalent Annual Net Direct Cost to Business (EANDCB) figures for the entire policy, this impact assessment is being submitted under RPC Scenario 1a<sup>11</sup> - where the RPC is able to validate an EANDCB figure for the whole policy at the primary legislation stage, where the appropriate direct costs and benefits to business are known. An EANDCB assessment does not consider the wider impacts outside of those on business (these are covered as part of the wider cost-benefit analysis in the next section).
65. The categorisation of NUAR Direct impacts in the EANDCB follows the [RPC Case Histories](#) guidance for direct and indirect impacts. This guidance sets out three distinct criteria that can determine whether an impact is direct (summarised below):
- a. The measure affects the cost of business activity & if the impact falls on those businesses subject to the regulation and accountable for compliance.
  - b. The impacts are generally immediate and unavoidable (“first round”)...or there are relatively few ‘steps in the logic chain’ between introduction of the measure of the impact taking place.
    - i. Impacts that occur subsequent to the adjustment e.g from significant reallocation of resources or innovation are likely to be **indirect**. This includes “pass through” for example such as higher prices for consumers.
  - c. The impacts are in the market being regulated (‘partial equilibrium effect’).
    - i. Impacts which spillover into related/other markets are likely to be indirect.
66. Table 3 sets out an assessment of the relevant direct impacts to be included EANDCB including: their description, estimated value and rationale for categorising the impact on business as “Direct”, based on the criteria above.

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<sup>11</sup>

[https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment\\_data/file/827907/RPC\\_case\\_histories\\_-\\_Primary\\_legislation\\_\\_August\\_2019.pdf](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/827907/RPC_case_histories_-_Primary_legislation__August_2019.pdf)

67. There is an important distinction to make when considering the role of Asset Owners - they are both providers of data (labelled as “Asset Owner” in Table 3) and consumers of data (covered as “Data Consumer” in Table 3). We have separated the impacts for each respective role they hold and note there are no double counting of benefits/costs.
68. This is because the benefits experienced by asset owners as providers of data are captured in the “Asset Owners” section, whilst the benefits they experience as user/consumers of this data are captured under the “Data Consumer”.
69. Furthermore, it’s important to note that “Data Consumer” also covers other Statutory Undertakers who are contracted by some Asset Owners to do digs on their behalf, as they will also request and use underground asset data to plan and execute safe digs.

**Table 3: EANDCB by type of costs and benefit (10 year appraisal period, 2021 prices, discounted)**

Benefits	
Impact	Rationale for categorising impact on business as “Direct” (with reference to most relevant RPC criteria)
<b>Asset owners</b>	
(1) Benefits of back office efficiency:  Savings outside of digs due to increased efficiencies of NUAR compared to previous systems  (£343m)	<p><b>Criteria (a) - the measure affects the cost of business activity and falls on those businesses subject to the regulation.</b></p> <p>When preparing excavations, planners have to source data on the location and characteristics of the underground assets (position, depth etc). Asset owners must provide this information, either by directly responding to requests or through third party services, as part of their normal business activity (organisations are required to make data about underground assets available to others for the purposes of safe digging per section 79 of the NRSWA 1991).</p> <p>There are costs associated with this process for asset owners, including: (i) the time and admin costs of providing this data themselves, (ii) paying commercial fees for third party services to share this data on their behalf.</p> <p>NUAR resolves these costs directly by removing or limiting the need for asset owners to respond and share their data via traditional means, as NUAR legislation ensures all asset owner data is available to use on the platform, and those requesting data from asset owners can directly do so on via the platform saving the admin and fee costs. The exception to this is with “risky assets”<sup>12</sup>, where direct requests and responses are still required irrespective of NUAR being in place, because of potential safety and National Security risks of making this data available. Risky asset data efficiencies have therefore not been included as a benefit.</p> <p>These benefits are an immediate or near-immediate saving, as a result of NUAR. <b>These are therefore considered to be a direct impact, given that it is decreasing the cost of the data sharing activity which</b></p>

<sup>12</sup> Risky assets are defined as those which are a particular safety and security risk if tampered with. These include intermediate-to-high pressure gas pipes, high-voltage electricity cables, as well as underground assets directly serving sites of particular security risk e.g airports, military bases and ports.

	<p><b><i>allows for an increase in the supply of asset owner data.</i></b></p>
<p>(2) Benefits of on site efficiencies:</p> <p>Savings during digs due to increased efficiencies of NUAR compared to previous systems</p> <p>(£66m)</p>	<p><b><i>Criteria (a) - the measure affects the cost of business activity and falls on those businesses subject to the regulation.</i></b></p> <p><b><i>Criteria (b) - impact are generally immediate and unavoidable (“first round”) or there are relatively few steps in the logic chain.</i></b></p> <p>When undertaking excavations, personnel on-site need to accurately identify the location of the underground assets (incl width, depth) within the area of interest.</p> <p>Under BaU, data comes in multiple formats and scales, making orientation and mobilisation of workers more time consuming and inefficient, resulting in a higher risk for misinterpretation.</p> <p>NUAR resolves this issue directly by removing the need for workers on-site to interpret and harmonise data of different scales and formats themselves, instead being able view all underground assets in a single integrated interactive digital map that is in one common scale that can be oriented and manipulated swiftly and easily, saving significant time and resources.</p> <p>These were evident from our NUAR Pilot user surveys in 2020, where the NUAR prototype saved around 30 minutes from on-site orientations for ‘standard jobs’, defined as those not relating to large multiple street projects. This evidence is also used in our cost-benefit analysis.</p> <p><b><i>Because these savings are either an immediate or near-immediate contribution of NUAR, these are categorised as a direct impact. It is also decreasing the cost of on-site activity, enabling a decrease in the number of on-site works needed that come from speculative digs.</i></b></p>
<p><b>Data Consumers</b></p> <p>Covering both Asset Owners as consumers of this data, as well as other Statutory Undertakers who are contracted by some AOs to undertake digs on their behalf.</p>	
<p>(3) Benefits of back office efficiency:</p> <p>Savings outside of digs due to increased efficiencies of NUAR compared to previous systems</p> <p>(£1,564m)</p>	<p><b><i>Criteria (a) - the measure affects the cost of business activity and falls on those businesses subject to the regulation.</i></b></p> <p>From a data consumer perspective, when preparing excavations, site planning teams have to source data on the location and characteristics of the underground assets (position, depth etc) by contacting relevant asset owners, third party providers and/or external search firms, often through a bilateral and fragmented processes, which can take significant time (often ranging between a few hours to a few days - as found in our surveys to industry).</p> <p>Through this process, responses from multiple sources then need to be aggregated and collated by the data consumer and formed into a “site-pack” for on-site teams. The data comes in multiple formats and scales, making the preparation of site packs time consuming and</p>

	<p>inefficient for planning teams.</p> <p>Both of these result in significant admin time and costs, which can be removed as the site planning teams no longer need to provide these site packs, or at least not to the same level and extent, given that site teams have direct access to the NUAR platform, being able view all underground assets in a single integrated interactive digital map that is in one scale and can be oriented swiftly and easily, saving significant time and resources.</p> <p>Therefore, as a direct and immediate consequence of NUAR, these are savings for the data consumer.</p> <p>Evidence from surveys of industry found that the average time taken for these site planning teams to obtain data from searches was 2.9 working days, with an additional 12 person hours to collate those outputs from stat pack providers. With NUAR, we conservatively assume these site planning teams take up to 1 person hour to obtain data from NUAR (despite evidence from our pilots suggesting a range between 3 and 7 minutes, depending on whether the job pack was large or small).</p> <p><b><i>Therefore, this is considered a direct impact, given that it is decreasing the cost of the data sharing activity which enables an increase in demand for asset owner data.</i></b></p>
<b>Costs</b>	
<p>(4) Transition Costs:</p> <p>Includes data transformation costs, costs of vectorisation and familiarisation costs (this includes for both Asset Owners and Data Consumers)</p> <p>(£16m)</p>	<p><b><i>Criteria (a) - the measure affects the cost of business activity and falls on those businesses subject to the regulation.</i></b></p> <p>These are costs that asset owners will directly bear as part of the NUAR programme, under the proposed legislation.</p> <p>These include:</p> <ul style="list-style-type: none"> <li>(i) Vectorisation costs (where asset owner's with data currently stored in non-digital formats and will need to converted to digital format),</li> <li>(ii) Transformation costs (converting digital format data from one format to the NUAR Data Model format);</li> <li>(iii) Familiarisation costs (including time taken to understand new legislation and changing current business practices accordingly. Familiarisation costs fall on both providers and users of data, and so are included in the EANDCB and cost-benefit accordingly.</li> </ul> <p><b><i>Given this, it is assessed that these costs are included as a Direct impact on businesses.</i></b></p>
<p>(5) Ongoing Costs:</p> <p>Continually adhering to new legislative</p>	<p><b><i>Criteria (a) - the measure affects the cost of business activity and falls on those businesses subject to the regulation.</i></b></p> <p>These are costs that asset owners will directly bear as part of the NUAR programme, under the proposed legislation.</p>

<p>requirements and implement organisational administrative changes</p> <p>(£51m)</p>	<p>This covers the time and resource required for organisations to continually adhere to new legislative requirements and implement organisational administrative changes to align with the legislation - including administrative costs and ongoing data transformations as asset data gets updated over time</p> <p><b><i>Given this, it is assessed that these costs are included as a Direct impact on businesses.</i></b></p>
<p><b>EANDCB</b></p> <p>[(4)+(5)] - [(1)+(2)+(3)]</p>	<p><b>-£1,906m</b></p> <p>The Equivalent Annual Net Direct Cost to Business (EANDCB) is -£1,906m, showing that NUAR legislation delivers significantly more benefits to businesses than costs.</p>

70. Lastly, we considered including the benefits of reducing asset strikes (£46m) within the EANDCB given that the costs associated with a strike are considered to directly accrue to asset owners within the academic literature - see Makana et al (2019)<sup>13</sup> & Metje et al (2015)<sup>14</sup>. Any action taken that can reduce these strikes could potentially be seen as a direct impact that benefits these same asset owners. Indeed, the direct costs (which include asset repair costs, admin costs, planning and redesign costs and replanned works supervision) are an immediate and unavoidable consequence once a strike takes place, which NUAR can mitigate a proportion of (circa. 15% in the cost-benefit analysis).
71. NUAR would resolve these by providing data in a standardised format in a singular digital map that is to a common scale, reducing the risks of data interpretation error which can lead to strikes (and therefore result in costs accruing to asset owners). Use of NUAR is attractive because of the direct efficiencies it brings the organisation in question (particularly the back-office and on-site savings, as set out above).
72. We note examples from the RPC Case Histories where businesses acting on new information were counted as direct - for example with the Gas Safety (Installation and Use) Regulations 1998, where the proposal introduced flexibility around the timing of annual gas safety checks by allowing landlords to carry out checks up to two calendar months before the due date, without bringing the due date forward and shortening the safety check cycle.
- a. Programme slippage savings, which are savings to landlords as a result of having to undertake gas safety checks less frequently, were classed as a direct impact. These savings however would only come about if landlords made an active behavioural decision to undertake their gas safety checks earlier within the allowed two month window as per legislation.
  - b. A similar example can be found for the Universal Service Obligation (USO) of broadband speeds, giving individuals and businesses the right, but not the obligation, to request these speeds from providers. The choice of whether or not to request these speeds still lies with the individuals, however, given how

<sup>13</sup> Makana, L., Metje, N., Jefferson, I., Sackey, M. and Rogers, C. 2019. Cost Estimation of Utility Strikes: Towards Proactive Management of Street Works, Infrastructure Asset Management

<sup>14</sup> Metje, N., Bilal, A. and Crossland, S. 2015. Causes, impacts and costs of strikes on buried utility assets. Institution of Civil Engineers. Proceedings Municipal Engineer. 168. 165-174

attractive the proposition is, it's unlikely not to be taken up. Costs such as providing these faster speeds are borne by the provider, and benefits from time savings accrued by businesses. These costs and benefits were both classed as direct impacts despite depending on a behavioural decision by individuals, as there is no logical reason why rational actors would not act given the incentives they face.

73. Despite this precedence, we have taken a conservative interpretation of the three criteria for direct impacts - impacts that depend on businesses acting on new information could potentially be counted as indirect. On this basis, we have taken the conservative step of not including the benefits of reducing asset strikes in the EANDCB. Were the reduction in asset strikes to be classified as direct rather than indirect, the EANDCB would be -£1,952m.

**Table 4: Inclusion and exclusion of costs and benefits from the EANDCB**

<b>Cost or benefit category</b>	<b>Included in EANDCB?</b>
<b>COSTS</b>	
<b>Public Sector</b>	
–Central Government	No
–Local Authorities	No
<b>Private Sector</b>	
–Asset Owners	Yes
–Data Consumers	Yes
–Local Businesses affected by asset strikes	No
<b>Society</b>	
–Society	No
<b>BENEFITS</b>	
<b>Public Sector</b>	
–Central Government	No
–Local Authorities	No
<b>Private Sector</b>	
–Asset Owners	Yes
–Data Consumers	Yes
–Local Businesses affected by asset strikes	No
<b>Society</b>	
–Society	No

74. In all cases the costs and benefits are split by beneficiary organisation and are assessed over a period of 10 years from 2024/25 to 2033/34.

## Wider Cost-Benefit Analysis

### Benefits

#### Direct benefits

75. Total direct and indirect benefits of the introduction of legislation will be £4.91bn over 10 years, discounted and in 2021 prices. The direct benefits are described in turn below.

76. On-site efficiencies

- a. On-site personnel undertaking excavations will need to accurately identify the location of all underground assets (and their relevant attributes, such as width and depth) in the area of interest. This is often made more challenging by the fact that data comes in multiple formats and scales, making orientation by personnel on-site more time consuming and inefficient.
- b. Furthermore, some excavations may find, but not necessarily strike, an asset that may not be present on a map or personnel may struggle to interpret the poor quality data and maps on hand. These situations have resource and inefficiency implications ranging from either having to abandon the site, or conduct additional due diligence to determine whether the dig site is still viable for the planned works, before resuming activity or changing plans entirely. These often happen when assets are not on record, or when they are not in the place shown by the plans, but can also happen with otherwise accurate plans that are difficult to align with those from other asset owners.
- c. A unified platform such as NUAR provides a single, integrated view of all the underground assets, saving on-site teams from having to interpret multiple maps.
- d. To estimate these on-site savings, an assessment of the potential costs from abandonment, resumption and field time needed to interpret maps was estimated. This was based on literature and industry information where possible, and where information was missing, was supplemented through interviews and discussions with industry experts and practitioners.
- e. The assessment splits out the potential cost of abandoning or resuming excavations associated with small projects and large projects. Small project costs are based on the rework costs of a 2 day delay, covering project manager labour to replan works and equipment rental to re-survey the site. Large project costs are based on interviews and industry expert engagement.
- f. The number of incidents per year were assumed to occur in the same proportions as “low-severity strikes” as identified in the Utility Strike Avoidance Group (USAG) (2014) report. Low-severity strikes are likely to do minimal damage to assets - aligning with the process of finding, but not necessarily striking an asset. The number of incidents that could be affected by NUAR was assumed to be the proportion of projects that use searches (2.2m searches on Linesearch



BeforeUdig (LSBUD) platform compared to 4m excavations overall)<sup>15</sup>, that is around 61% of these excavations were in scope of being affected by NUAR, of which 2%<sup>16</sup> are likely to be a low severity strike.

- g. For field efficiencies, we used the findings from the NUAR regional pilots in North East England and London to understand both the time taking to interpret multiple maps currently, and the time savings that were achieved through the NUAR pilot prototype, valued at the trade rate for such site projects.
- h. A step-by-step of the calculation of these benefits is given in Annex B.

#### 77. Enabling better data sharing/Back-office efficiencies

- a. When preparing for an excavation a planner has to source data on the location and position of underground assets which may be impacted by the excavation. This is collected by (1) manually contacting each subsurface asset owner, (2) using a commercial third party service, and/or (3) paying an external search firm to provide a data compilation service.
- b. Responses from multiple sources need to be aggregated and collated by the requester to be in a suitable form for passing on to site teams. Even responses from aggregation services will be in the form of multiple individual responses from asset owners which need collation. This existing process for accessing, requesting and sharing underground asset information between asset owners, third party intermediaries and project planning teams is fragmented and results in multiple administrative time and cost burdens for all parties involved.
- c. NUAR, as a single platform with comprehensive data of all underground assets in England, Wales and Northern Ireland, will lead to efficiencies in this existing process by removing many of the steps currently required.
- d. Evidence was gathered from a survey commissioned by the Geospatial Commission across a range of stakeholders involved in excavation activities. This ranged from those undertaking digs (e.g. site teams from Tier 1 contractors<sup>17</sup>, highways authorities, utility asset owners) to those who hold underground asset data (e.g. utility asset owners, other infrastructure asset owners). Overall, 84 stakeholders of varying sizes, asset classes and regional spread were surveyed:
  - i. Highways authorities - 24
  - ii. Utility asset owners - 29
  - iii. Other infrastructure asset owners - 2; and
  - iv. Tier 1 contractors - 29.
- e. The surveys identified and quantified the key time and cost drivers involved in the requesting data and responding in “business-as-usual” and “NUAR” scenarios. These drivers included (but were not limited to): the number of data requests involved in one excavation, average cost per search (both internal and outsourced to external providers), number of data requests sent and received and average time spent collating and analysing the data and putting it into site-packs for the site team.

<sup>15</sup> LSBUD (2018)

<sup>16</sup> 60,000 strikes as a proportion of approx. 4m excavations.

<sup>17</sup> Tier 1 contractors use a range of different operating models to deliver large infrastructure projects and programmes, in part to be able to respond effectively to different client requirements. This includes choosing between directly employing project staff, sub-contracting work or a combination of the two.

- f. These results from the sample were then scaled up to national level using national level statistics on: no. of excavations per year in the UK of 4,000,000<sup>18</sup>, national water and electricity mains kilometres<sup>19</sup> and population density estimates (ONS). These results were sense-checked with input from sector experts.
- g. The difference in time and costs between the “business-as-usual” (without a central data sharing platform) and “NUAR” scenarios yields the data exchange and back-office efficiency savings.
- h. As a sense-check of our results, we looked at results from Project Iceberg (a collaborative research project into above/below ground planning conducted by the Future Cities Catapult, the British Geological Survey and Ordnance Survey, which reported its findings in 2017) which collected a number of useful statistics and estimates that contextualised our analysis potential scale of the overall economic impact. International exemplars, such as KLIP in Belgium, also provided references for estimates of the data exchange savings<sup>20</sup> (Daems, 2017).
- i. A step-by-step of the calculation of these benefits is given in Annex B.

#### Specific data sharing benefit to local authorities

- j. A significant proportion of assets are owned by public sector bodies, including approximately 368 local government organisations, 32 transport authorities, and 12 other bodies. The data held by these organisations relates to assets which could have serious safety and cost implications if discovered unexpectedly or damaged by mistake. They include:
  - i. Illuminated signs
  - ii. Traffic lights
  - iii. Street Lights
  - iv. Electric vehicle charging points
  - v. Parking metres
  - vi. CCTV cabling
  - vii. District heating
  - viii. Other buried cables
- k. As with utilities and telecommunication companies, these organisations are also required to make data about underground assets available to others for the purposes of safe digging per section 79 of the NRSWA 1991. However, these organisations - in particular local authorities - have unique challenges in doing this as data is often held across different departments.
- l. A survey of 100 local government organisations commissioned by the Geospatial Commission in 2021 found only 31% of organisations manage these datasets via a ‘central GIS Team’, with 43% reporting a mix with some data managed centrally and others managed by individual departments / teams within their organisation. This compares with 54% and 11% for utility companies respectively.

<sup>18</sup> LSBUD, Digging Up Britain Report, 18 2020

<sup>19</sup> Metje, N., Bilal, A. and Crossland, S. 2015. Causes, impacts and costs of strikes on buried utility assets. Institution of Civil Engineers. Proceedings Municipal Engineer. 168. 165-174

<sup>20</sup> Daems, J., [KLIP goes digital](#), 2017

- m. This means local government organisations often have an added step of liaising across departments/teams for data in order to respond to requests or data requestors having to contact different parts of the same organisation for complete data. NUAR will help address this by enabling public bodies to upload data how they see fit. Organisations with central teams could assign one user to share all updates with NUAR. Alternatively, where data is held separately, different departments could be responsible for sharing different datasets, eliminating the need for this to be coordinated centrally. Furthermore, these organisations will no longer require the use of in-house teams or procured services to respond to requests for data for the purposes of safe digging, they could refer all requests to the NUAR service.
- n. A step-by-step of the calculation of these benefits is given in Annex B.

## Indirect benefits

### 78. Reduced utility strikes:

- a. When preparing ground investigation and excavation work, every construction project seeks information on all possible buried utilities in the area of interest to avoid costly damage and disruption. Despite this, asset strikes still occur and some are a result of data-related issues, including consistency and format (for example, some are provided in different scales, in pdf or paper form, against different base maps, have varying levels of accuracy and/or provided across varied timelines).
- b. These underground asset strikes have an associated cost, both direct and indirect, which can range from administrative costs and the cost of repair, to wider business disruption, traffic delays and programme overrun costs.
- c. NUAR, which standardises data and makes it available when needed via an interactive digital map, will support the reduction in asset strikes by reducing the likelihood of potential interpretation errors that stem from these various data-related issues.
- d. As part of the benefits appraisal, a comprehensive academic and industry literature review was undertaken to understand the scale and potential costs of strikes. The average cost of a utility strike also varies across different utility categories - for example, strikes to high voltage cables and high pressure gas pipelines have a far higher cost than strikes to fibre optic cables.
- e. Direct costs include the cost of repair, material and construction costs, administrative costs, planning and redesign costs and the cost of supervising construction works, when utility strikes occur.
- f. These variations in cost are used to model the average direct cost per strike, which we estimate to be £3,371 per strike (in 2021 prices), which we use directly in our analysis. The cost per strike ranges depending on the type of asset struck, from c£680 for the mean Telecoms strike, to £5,375 for the mean water infrastructure strike. This in-line with benchmarks from industry reports from 2014-2019<sup>21</sup>, which, through annual industrial surveys, have estimated the direct

<sup>21</sup> USAG, Strike Damages Reports, (2014 - 2019)

cost per strike at being approximately £3,600. Indirect benefits methodology is set out in the next section. This methodology accounts for the range in costs per strike, and for the relative frequency of each strike type.

- g. A widely reported industry statistic of 60,000 strikes per year<sup>22</sup> on buried service pipes and cables per year was used as the basis of the strike reduction benefits. The total economic costs of utility strikes are therefore estimated at £2.4bn a year.
- h. A significant challenge has been identifying what proportion of strikes could be avoided with better data. Those same industry reports<sup>23</sup> categorise strikes based on the cause of the incident. Those linked to inadequate plans and on-site procedures for using data made up around 30% of total incidents: this is the central estimate for the proportion which could be avoided, yielding an economic benefit of £392m per year (2021 prices). This analysis conservatively assumes that a 15% reduction in asset strikes could be achieved if (a) all asset owners are onboarded to NUAR and (b) all excavations use NUAR on digs. These effects are factored into the benefits analysis, see section “*Apportioning benefits across the appraisal period*”.
- i. However, once NUAR is fully operational, this percentage could increase as the user feedback mechanism in NUAR could encourage asset owners to improve their data quality in response to user feedback, enabling the full 30% of causes to be mitigated.
- j. A step-by-step of the calculation of these benefits is given in Annex B.

79. For the other indirect benefits of reducing strikes, the reviewed literature<sup>24</sup> estimated the indirect costs of strikes based on a series of industry case studies. Indirect costs include (but are not limited to) programme overruns and costs to local highways from closing/redirecting traffic.

80. The study found that these indirect strike costs are, on average, 29 times larger<sup>25</sup> than direct costs, so this scale factor is applied to estimate the full scale of utility strike costs. This gives us the full direct and indirect strike costs of £2.4bn (2021 prices) - made up of £0.2bn direct, and £2.2bn indirect.

81. For the purposes of this impact assessment, all of these benefits due to strike avoidance are treated as indirect. A breakdown of how these indirect benefits are distributed amongst beneficiaries is set out further into this impact assessment - particularly to the public sector (Central Government and Local Authorities), business and wider society. For example reducing traffic delays are considered a wider societal impact. The general reductions in costs to commercial enterprises (for example, by not needing to close business for the day if there are burst water mains or damaged gas supply) are considered a business impact. A step-by-step of the calculations are set out in Annex B.

## Unquantified Indirect Benefits

<sup>22</sup> USAG, Strike Damages Reports, (2014 - 2019)

<sup>23</sup> USAG, Strike Damages Reports, (2014 - 2019)

<sup>24</sup> Makana, L., Metje, N., Jefferson, I., Sackey, M. and Rogers, C. 2019. [Cost Estimation of Utility Strikes: Towards Proactive Management of Street Works, Infrastructure Asset Management](#)

<sup>25</sup> Makana, L., Metje, N., Jefferson, I., Sackey, M. and Rogers, C. 2019. Cost Estimation of Utility Strikes: Towards Proactive Management of Street Works, Infrastructure Asset Management

82. There are also a number of indirect benefits that have not been quantified due to the dependencies involved in realising these benefits beyond the provision of NUAR, or because of a lack of data. Underground asset location data are one of multiple inputs required for better subsurface management to be realised, such as technical solutions and expertise and local planning policy.
83. Instead, these indirect benefits are qualitatively assessed. One such indirect benefit is better subsurface planning, coordination and management that comes from having a more complete understanding of the underground spaces that are most and least occupied/densely located. This use case extends beyond excavation planning and safe digging, and supports users to better optimise the use of underground spaces, improve above ground planning, and infrastructure resilience planning. Key users might be local transport authorities and local housing and development planning who can assess the relative density of underground assets by requesting and compiling data more efficiently and having a more complete picture of the subsurface environment.
84. Additionally, the NUAR service can also contribute to further improving data quality in the future. For example, as data will need to be provided in a prescribed form based on the NUAR data model (which itself will align with an internationally recognised standard), details of the requirement will give asset owners objective information which could be used to define focus areas for data quality improvements. Furthermore, the NUAR service also allows excavators to report inaccuracies back to data owners to correct at source, which will also improve the quality of data over time. These data quality improvements can help reduce some of the other the known data issues to realise additional strike reductions, which might be because the data itself isn't accurate.
85. There are also likely to be environmental benefits by reducing the amount of carbon and other pollutants (such as particulate matter levels, PM10, and oxides of Nitrogen, NOx) that result from excess roadworks - for example thrown up during excavations, or from skip loader trucks ferrying materials and machinery between dig sites, coming from reducing the number of speculative or abandoned digs. However, given that the volume of material and travel varies based on location, size and scale of the dig, and with limited data available, it is not currently feasible to robustly quantify these impacts.
86. Finally, if prescribed as part of the details of the secondary legislation, access to the NUAR database might be expanded for use by a broader set of stakeholders (such as non-statutory users and third parties). These users could include developers and local planners when assessing the suitability of a parcel of land, which can ensure the right developments are built on the most viable land, supporting local level house building. Other value add services might also be enabled in the commercial sector. However, it should be noted that this is theoretical at this stage, as it relies on NUAR being operationalised in the first instance before feasibility can be confirmed to a sufficient level of confidence.

### Apportioning benefits across the appraisal period

87. The full scale of benefits described above will be achieved once NUAR is fully operational. To apportion the benefits over a 10 year period, we have scaled the benefits on the assumption of two curves:
- a. **Timeline (a) Onboarding profile** - our best estimates of the timelines by which asset owners will be onboarded (i.e share their data with the NUAR platform) between 2024/25 and 2033/34. This is based on our latest data on the live minimum product roll out, as well as best estimates of future year onboarding.

Assumptions on commencement timings relate to the legislative reforms set out in Option 1.

The more data is uploaded onto NUAR, the more information is available to users, and therefore the more potential benefits that could be realised.

- b. **Timeline (b) usage profile** - expected uptake and usage of the NUAR platform by data consumers between 2024/25 and 2033/34.

The more data consumers there are using NUAR, the more likely it is that NUAR benefits materialise.

88. **Timeline (a) Onboarding profile** has been estimated by combining the known (to date) and projected onboarding dates of asset owners into NUAR and each asset owner's total network length and number of connections.

- a. Asset owners were then weighted proportionally to their network length and number of connections to reflect the fact that asset owners with larger networks will contribute a higher value to the total NUAR database.
- b. For smaller asset owners, where there is no publicly available data on their total network length or number of connections, these have been estimated by fitting an exponential distribution curve to the remaining asset owners. This method assumes that:
  - i. The number of times an asset owner's dataset is requested through NUAR will be proportional to some combination of the length of the asset owner's network and the number of connections it has;
  - ii. There is no significant geographic variance in the location of NUAR requests, when compared to the geographic spread of underground assets;
  - iii. For asset owner's where we have data on their network length and number of connections, the asset owner sector/type has no influence on how often it is requested via NUAR.

89. **Timeline (b) usage profile** has been estimated by assuming that the uptake of NUAR's usage in digs will reach full use (approximated at 99% of digs) in 2031/32. Rather than following a linear upward trend, the profile has been based on a Rogers<sup>26</sup> diffusion of innovation curve, which sees uptake of innovations following an s-shaped curve over its full adoption. Due to the mandate of NUAR for asset owners, we expect this usage to go from a low base (4% in 2024/25) to a high ceiling (99%) in 2031/32.

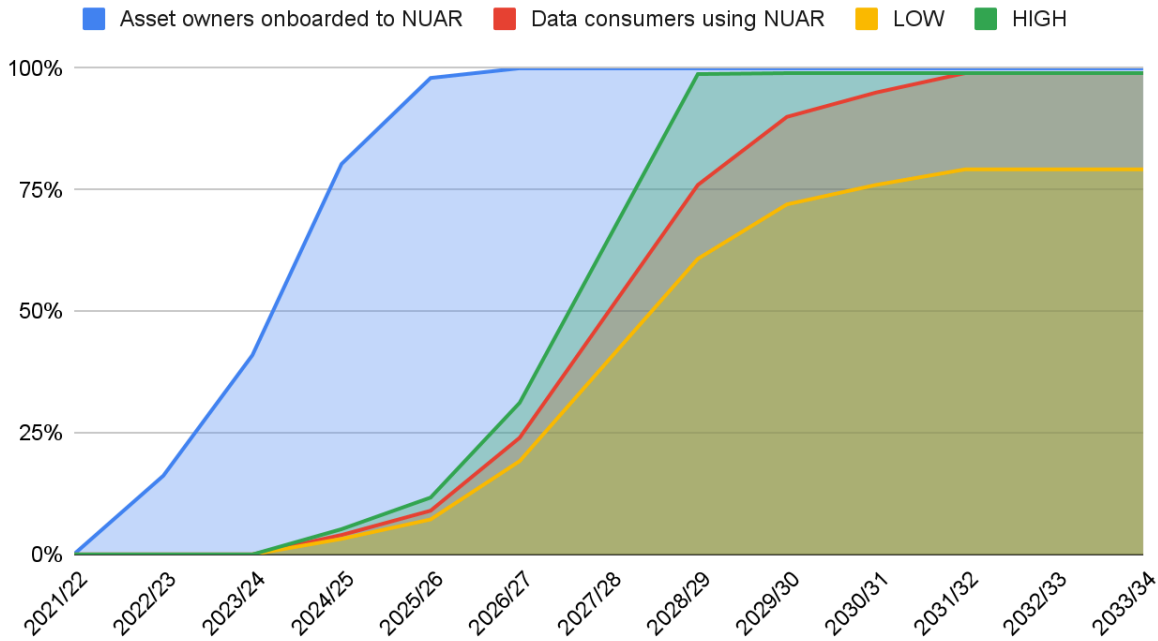
90. The direct benefits due to strike avoidance will only be achieved once data consumers start using the NUAR service to support safe digging. It is only then that data providers are able to discontinue existing processes for making their data available for the purposes of safe digging (thus releasing efficiency savings) and data requestors will be able to access complete standardised, digital data as and when they need it.

91. The shape of the two profile curves are shown in the chart below (note - "Low" and "high" are variations of the data consumers using NUAR).

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<sup>26</sup> [Rogers Everett, M. \(1995\). Diffusion of innovations. New York, 12.](#)

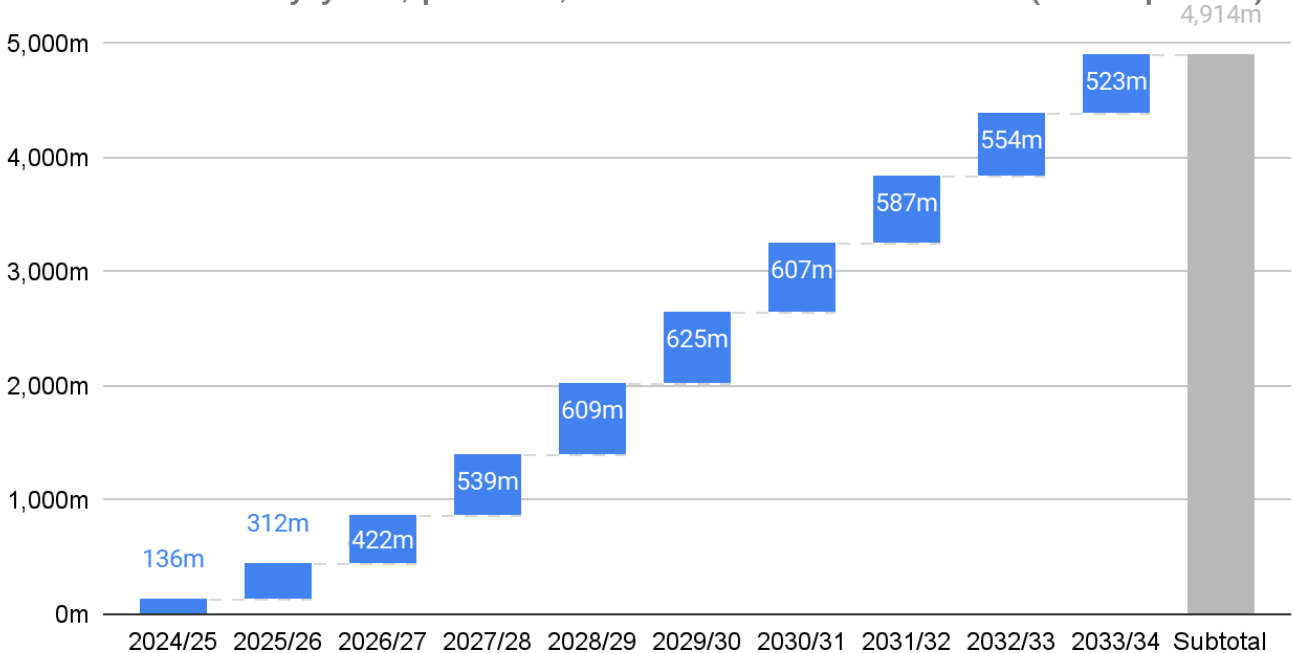
**Figure 2: The profile curves of the estimate uptake rate of NUAR by data consumers (red) and the proportion of asset owners onboarded to NUAR weighted by data value (blue)**



92. The total benefits by year after profiling, discounting and deflating are shown in the chart below (2021 prices)

**Figure 3: total benefits by year after profiling, discounting and deflating (2021 prices)**

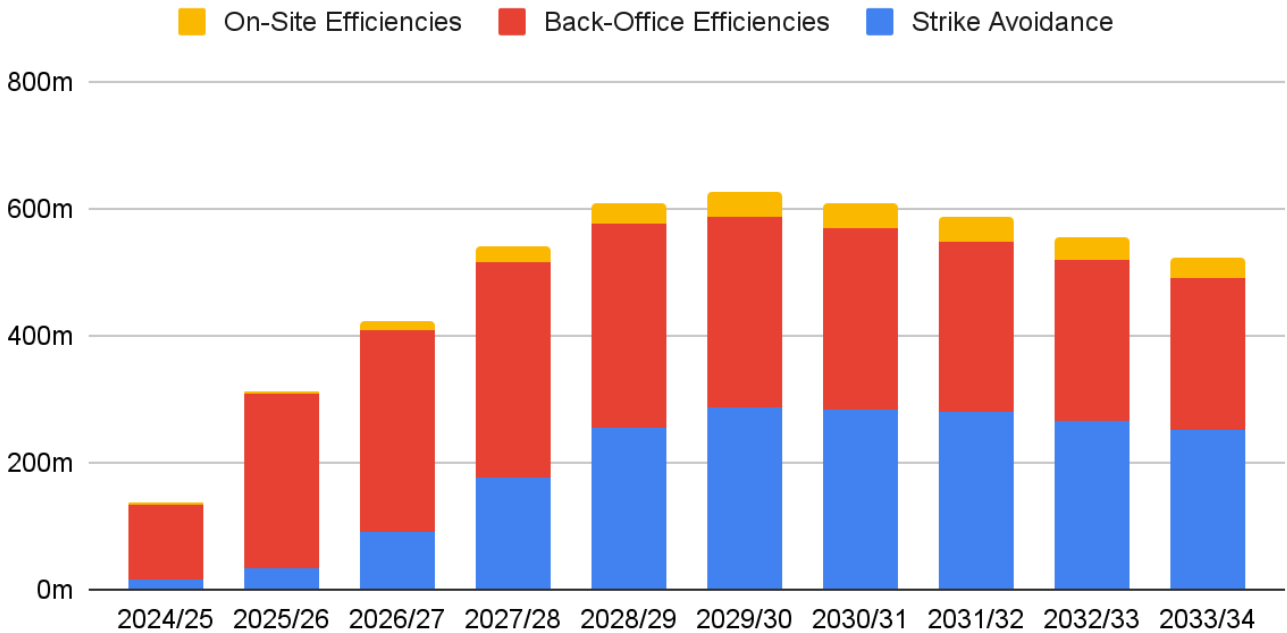
Total benefits by year, profiled, deflated and discounted (2021 prices)



93. The benefits in each year, split out by broad category of benefit are shown in the chart below. The figures in this chart have also been profiled, discounted and deflated (2021 prices). Note that the annual benefits slightly decrease in later years - this is only due to the effects of discounting.

**Figure 4: benefits in each year, split out by broad category of benefit (2021 prices)**

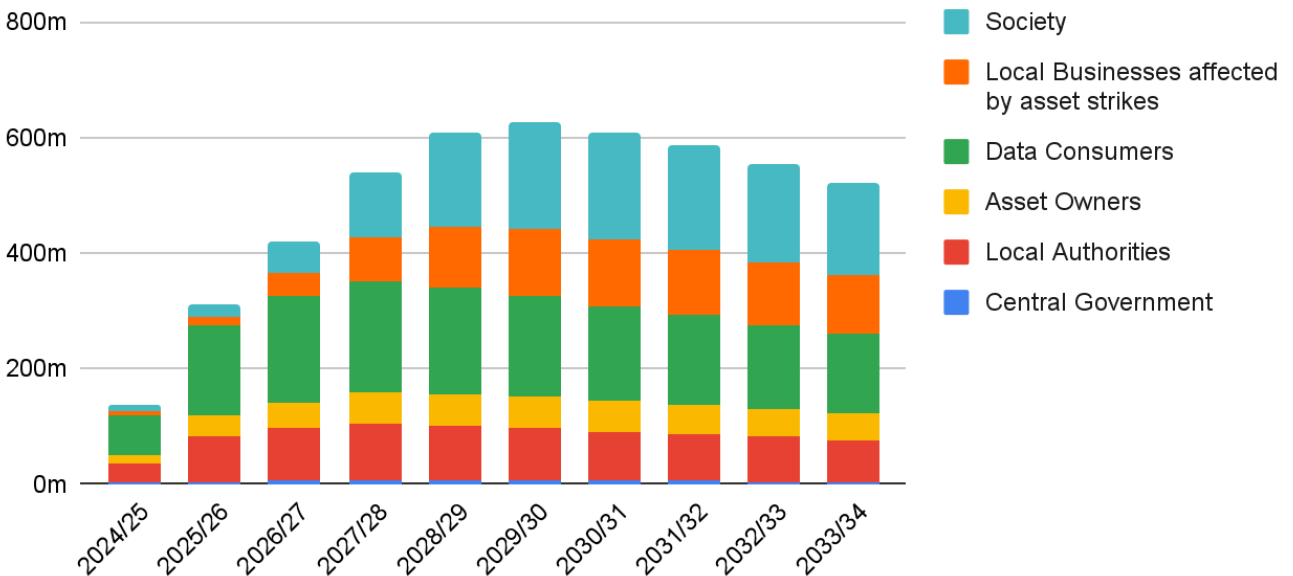
Total benefits by year, by type of benefit. Profiled, deflated and discounted (2021 prices)



94. The benefits in each year, split out by organisation bearing the benefit are shown in the chart below. The figures in this chart have also been profiled, discounted and deflated (2021 prices).

**Figure 5: benefits in each year, split out by organisation bearing the benefit (2021 prices)**

Benefits per year by organisation. Profiled, deflated and discounted (2021 prices)



**Monetised costs**



95. Total direct costs of the introduction of legislation will be £262m over 10 years, discounted and in 2021 prices. This includes data transformation costs and familiarisation costs faced by businesses and charges levied on asset owners.
96. The full list of compliance activities, estimated costs and sources are summarised below:
- a. **Vectorisation of data** - Some asset owners hold data in a non-vector format (such as PDF, JPEG and PNG). These organisations may be required to convert data into a vector format prior to sharing it with NUAR in the future (specifically, image files that detail the location of features such as pipes and cables).

To date, the NUAR team has held 'data workshops' with 311 organisations, representing 44% of total known asset owners as of July 2023. Of these organisations, 18 reported owning location data related to features in a non-vector format (12 energy, 2 local government, 2 water, 1 pipeline, 1 transport). Using this finding, we project there to be approximately 50 organisations across all organisations who may be impacted should this requirement be enacted, the majority being within the energy sector, particularly Independent Distribution Network Operators (IDNOs).

During the NUAR Pilot and Preparation Phase (2019-21), work was commissioned to test the feasibility and costs of 'vectorising' raster datasets. This work involved a local authority and two energy companies. Findings from this work demonstrated that there are a variety of options available to asset owners who may need to convert their data. Options range from using in-house or specialist staff to convert the data manually using off the shelf software, to procuring commercial data services on the open market. The findings also found the resource, capabilities and technology used depended heavily on the size and condition of the data requiring conversion.

The pilot's findings demonstrate a range in costs. For example, one of the participating energy companies introduced new internal systems for vectorising data and deployed these systems to convert all their data for the London region at a cost of £84k. Likewise, the participating local authority vectorised 8 disparate datasets at a cost of £55k. As the actions taken by these organisations (and thus the cost occurred) mirror the action any non-compliant organisations will need to take should this requirement be enacted, and as their data is likely to be similar, we estimate costs to be between £55k (low) and £84k (high). However, as costs depend largely on the size and condition of the data held, we have also applied sensitivity analysis to account for uncertainty.

- b. **Initial data transformation costs** - This cost involves a one-off activity to map source AO data with the NUAR data model and to setup tools to automate data transformation processes (e.g. FME workbench creation, etc). Asset owners completing onboarding activities by 30 September 2024 will have had this work completed on their behalf as part of the Build Phase of delivery, funded by the Geospatial Commission. As such they will not incur additional costs. We have therefore assumed that this will fall to 25% of asset owners, as approximately 75% asset owners will have had their data transformed through the initial roll out.
- c. **Data refresh** - Asset owners will be required to keep the data they share with NUAR up-to-date by providing regular refreshes or change only updates.

In addition, from time-to-time the tools used to carry out transformation activities may need to be reconfigured where changes are made to their own / NUAR data schema. Though the costs of these activities will fall to asset owners, the quantity and frequency of work will vary by organisation. Costs will also vary by the tools and systems individual asset owners deploy and the quality of their data.

- d. **Familiarisation costs** - As with any new regulation, some resource in the form of staff time is required for each organisation to understand the new obligations and how they apply to their organisations. These costs apply to all asset owners as a result of the relevant proposals being implemented, with low, central and high values representing the range of uncertainty.
- e. **Administration costs** - Resource in the form of staff time will also be required to oversee and support successful completion of new obligations.

97. A step-by-step of the calculation of these costs are given in Annex B.

a. **Charges levied on businesses** -

- i. Primary legislation will include a power to enable asset owners to be charged for use of the NUAR platform. The details of the charging scheme will be set out in secondary legislation.
- ii. Broad, initial principles are that charges would be split across asset owners in the following way:
  1. Asset owners, in their capacity as data providers, would be charged a membership fee based on the anticipated level of benefit they receive from sharing data through NUAR.
  2. Asset owners would be assigned a charging tier based upon their predicted level of estimated benefit. This could be based on proxy metrics (such as an organisation's network size and total number of connections) used to predict the frequency their data will appear in search requests. Asset owners, whose data is likely to appear most frequently to NUAR end users, would be placed in the changing tier with the highest charge, reflecting the high number of requests they will no longer need to reply to directly (or via a commercial service) as a result of sharing it with NUAR. Those whose data is likely to appear less, would be assigned a charging tier subject to a lower fee.
  3. The level of charges in different tiers is likely to be a significant reduction in the current costs for asset owners to manage the requirements of the existing legislation. This is supported by findings from the programme's discovery and pilot phases, consultation responses, and feedback received on the emerging MVP service. Additionally, we have used learnings from comparable services internationally and domestically in Scotland.
  4. Some organisations, such as public sector bodies and SMBs may be assigned a tier with a nominal charge or no charge at all. In all cases, the basis of the fees will be cost recovery, meaning the fees

in aggregate are to cover the cost of the service only and thus capped on that basis.

- iii. Note that as per the Better Regulation Framework, Section 22 of the [Small Business, Enterprise and Employment Act \(2015\)](#), charges are excluded from the definition of regulatory provision, and so do not feature in the EANDCB.

**Table 5: Summary of transition and ongoing costs to businesses**

(10 year average annual, 2021 prices, discounted)

Activity	Description	Estimated annual cost per activity across all businesses,	Number of organisations potentially impacted	Estimated effect £/year per business on average
Vectorisation	Organisations who hold data in a non-vector format (PDF, JPEG, PNG) may need to convert their data prior to sharing it with NUAR. This is a one-off cost.	£3.5m	50	£70k (these costs will fall during the transition period)
Initial data Transformation	Activities involved in mapping source AO data with the NUAR data model and setup of tools to automate data transformation processes (e.g. FME workbench creation, etc)	£1.7m	176	£9.6k (these costs will fall during the transition period)
Ongoing data refresh	Executing data transformation activities to provide updates to NUAR where data or the data model has changed.	£11.6m	705	£16k
Familiarisation costs	Resource in the form of staff time required to	£137k	705	£200 (these costs will fall during the transition period)

	understand the new regulatory requirements.			
Administration costs	Resource in the form of staff time required to oversee and support successful completion of new obligations.	£44k	705	£63
Charges levied on businesses	Membership fee charged to asset owners, as data providers, for the service of making data available to data requestors through NUAR.	£4.9m <sup>27</sup>	305	£16k

**b. Other costs**

i. Enforcement activity

1. Costs of running the enforcement regime will only fall on non-compliant organisations and are not included in the EANDCB. Organisations who fail to share their data as prescribed will be subject to a fine which will be enforced by Crown Prosecution Service (CPS). Late payment of the membership fee will be subject to a late payment charge, enforced by the organisation responsible for charging. Given the benefits to asset owners of using NUAR we do not expect non-compliance to be high, though it is not possible to estimate likelihood at this stage given the innovative nature of the programme.
2. Income from fines and late payment fees will be used to cover costs associated with running the enforcement regime.

ii. Wider costs

1. This section of analysis provides an outline of the wider impacts of the package of reforms being sought that do not fall into the cost or

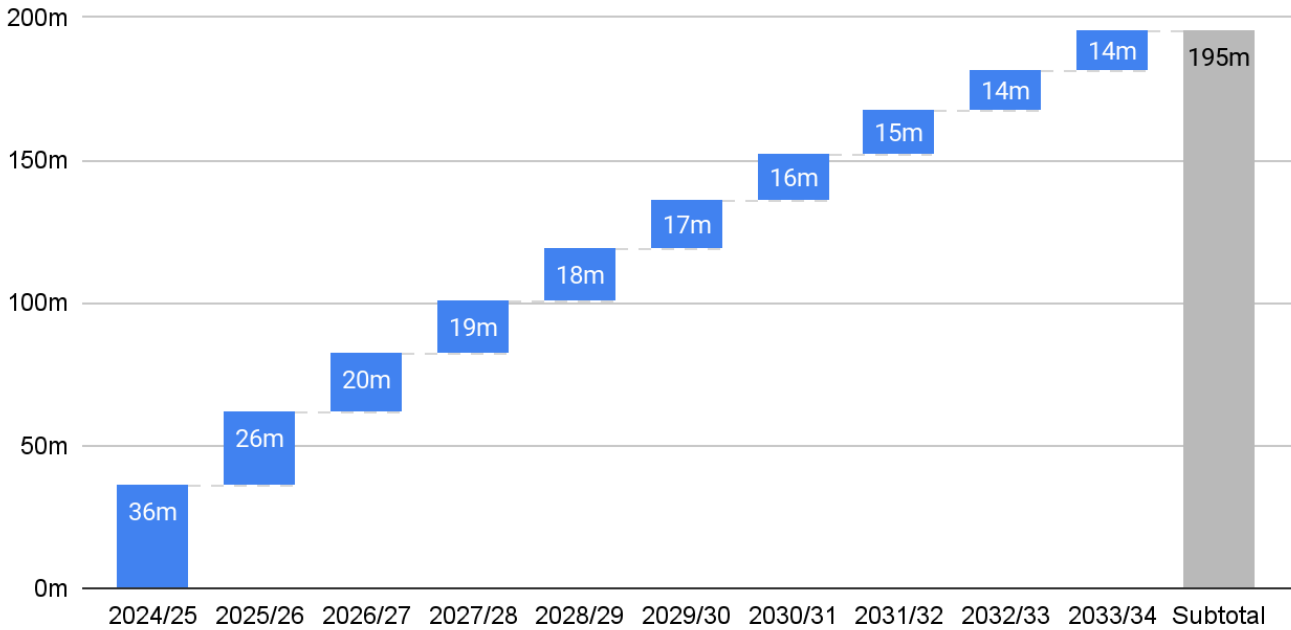
<sup>27</sup> This is the average annual operational costs of running NUAR across the ten year appraisal period. See Annex B for details on how this has been profiled. These average **annual running costs have included a 10% Optimism Bias adjustment** (i.e increase the estimated run costs beyond our initial estimate by 10% to account for future uncertainty, but also reflect our increasingly developed understanding of the programme run costs since programme launch). To further account for uncertainty, this assumption is subject to scenario testing, varying the initial estimated costs by +/- 50% as part of the the sensitivity analysis. These scenarios also have 10% optimism bias included.

benefit categories. These focus on factors that impact on competition.

98. The total costs by year after profiling, discounting and deflating are shown in the chart below (2021 prices).

**Figure 6: total costs by year after profiling, discounting and deflating (2021 prices)**

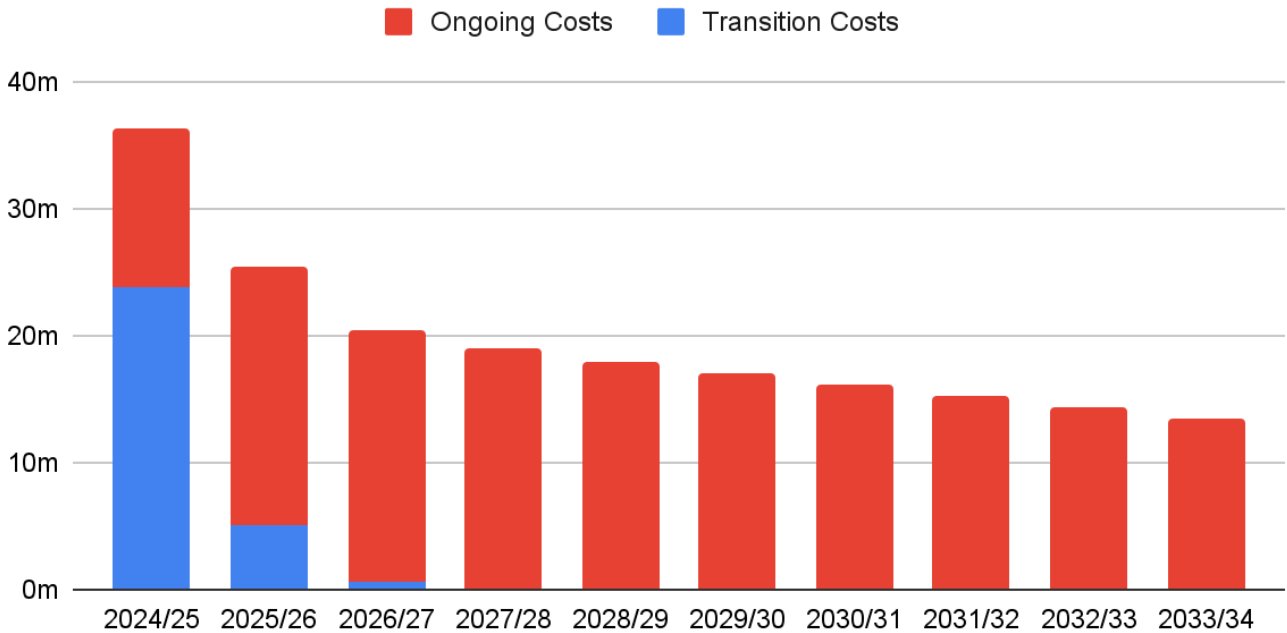
Total costs by year, profiled, deflated and discounted (2021 prices)



99. The costs in each year, split out by broad category of cost are shown in the chart below. The figures in this chart have also been profiled, discounted and deflated (2021 prices).

**Figure 7: total costs by year after profiling, discounting and deflating (2021 prices)**

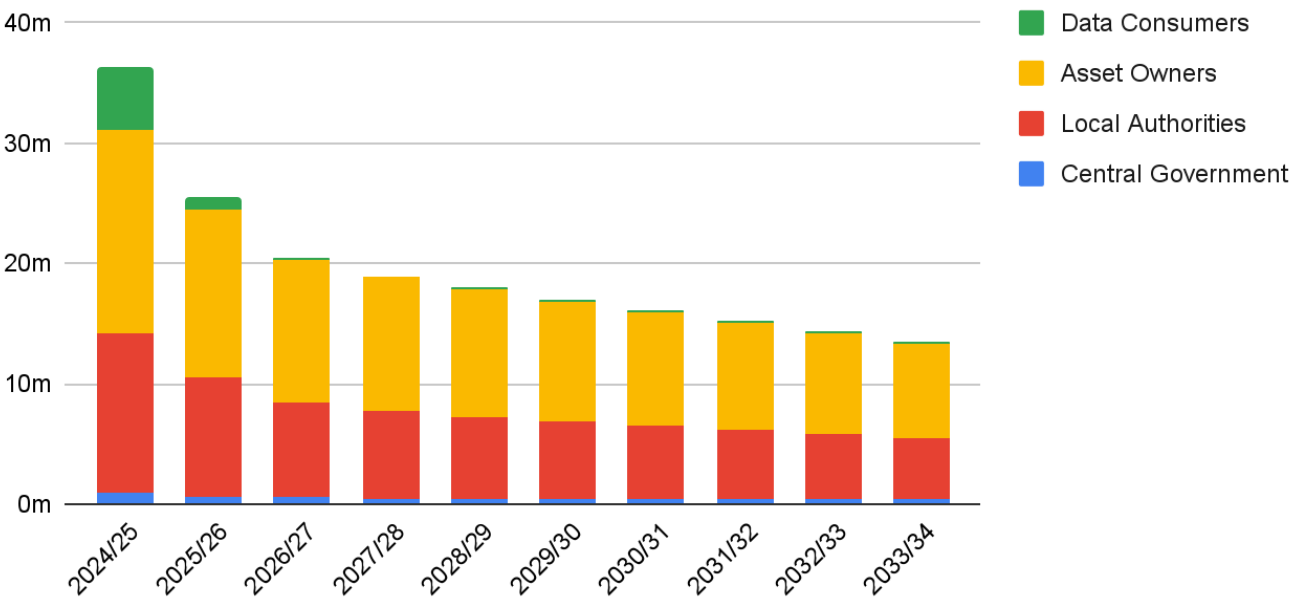
Total costs by year, by type of cost. Profiled, deflated and discounted (2021 prices)



100. The costs in each year, split out by organisation bearing the cost are shown in the chart below. The figures in this chart have also been profiled, discounted and deflated (2021 prices).

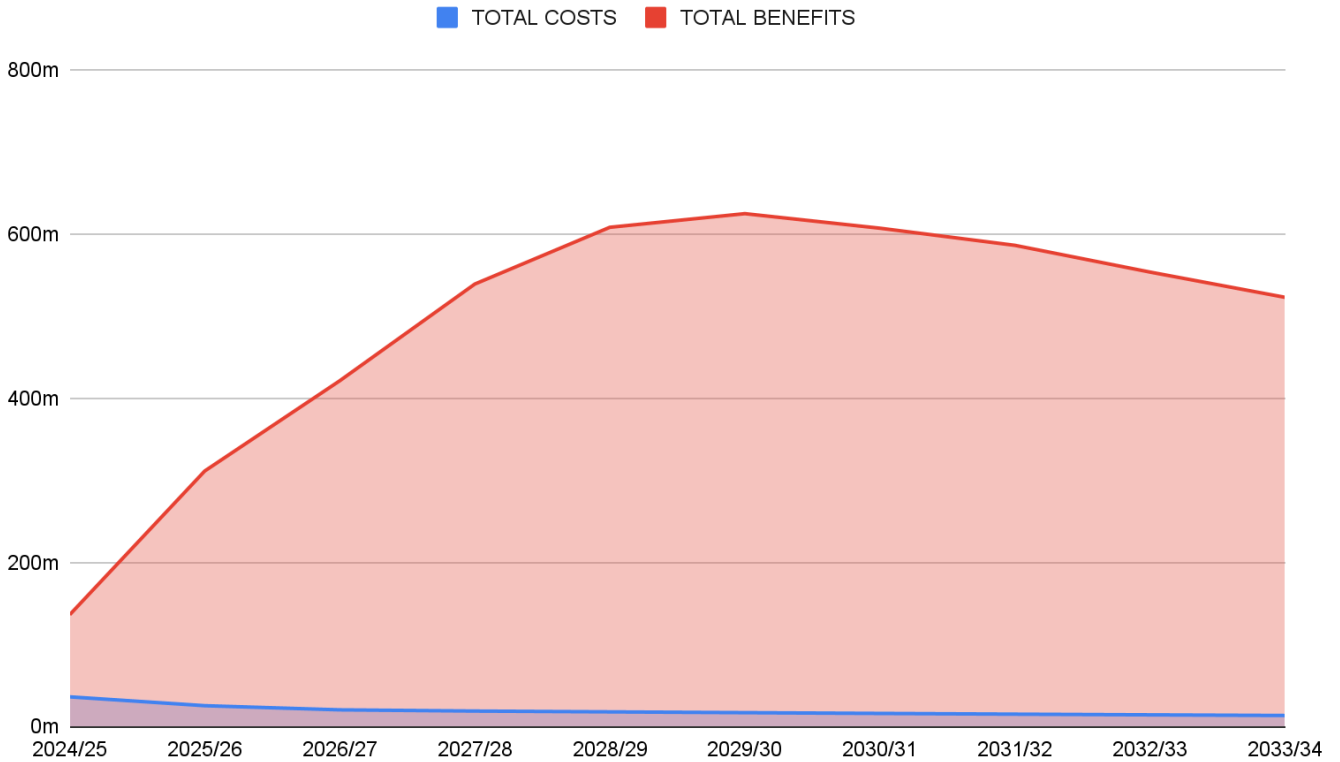
**Figure 8: costs in each year, split out by organisation bearing the cost (2021 prices)**

Costs per year by organisation. Profiled, deflated and discounted (2021 prices)



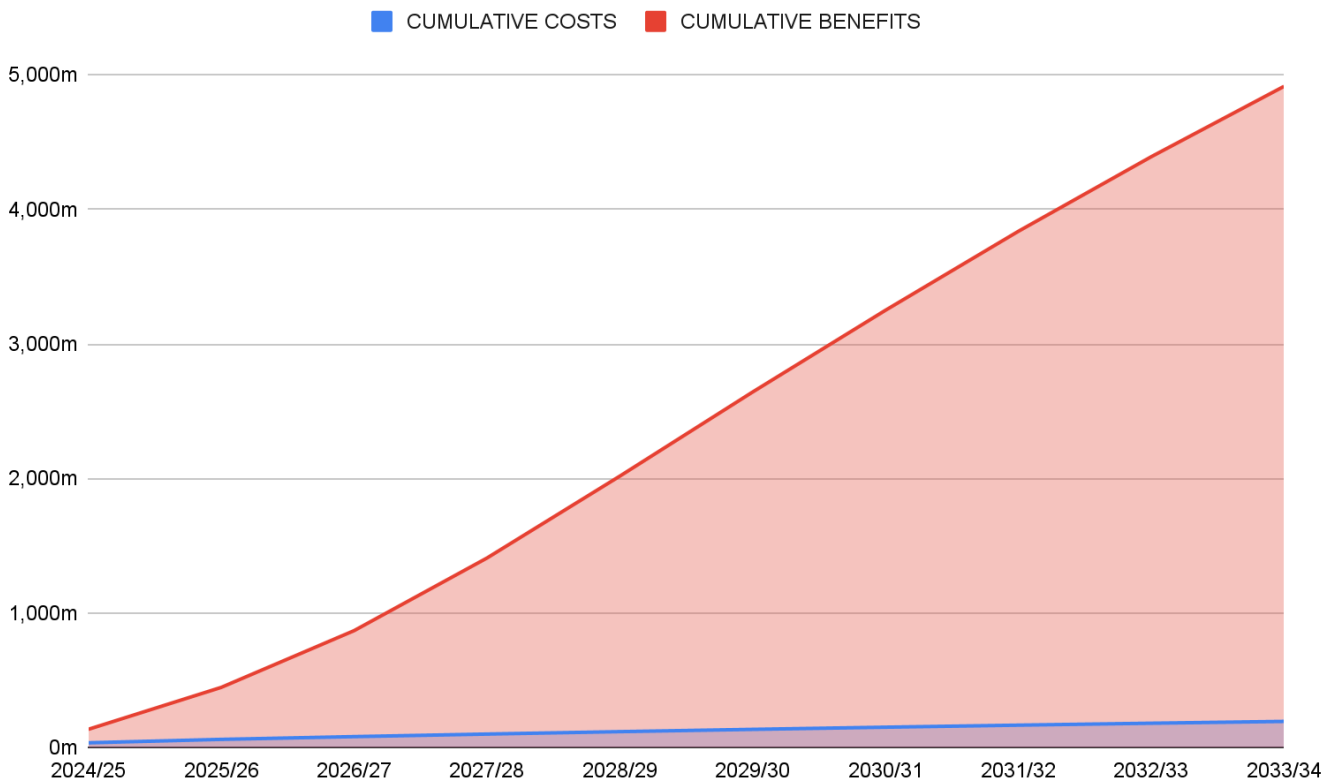
101. The total costs and benefits over time are shown in the chart below. The figures in this chart have also been profiled, discounted and deflated (2021 prices).

**Figure 9: total costs and benefits per year over time (2021 prices)**



102. The total cumulative costs and benefits over time are shown in the chart below. The figures in this chart have also been profiled, discounted and deflated (2021 prices).

**Figure 10: cumulative total costs and benefits over time (2021 prices)**



## Impact on Competition

103. No businesses currently provide a service that is the same or similar to the service that NUAR would provide. There are a small number of businesses which provide services to asset owners to fulfil existing legislative obligations. Services include relaying a request for information on behalf of a data requestor to the relevant asset owner(s), providing data requestors with a list of asset owners who may operate in a given area and providing details on how to contact them, and making some data available directly to data requestors, typically in the form of PDFs. As NUAR will ensure data is available from all asset owners, streamline the way data is shared and accessed for the purposes of excavation planning and safe digging, and may support additional use cases or user bases in the future, such organisations could be impacted by the service.
104. There are also a small number of commercial enterprises who request and consolidate data on behalf of organisations who are planning to carry out works. Though it may be possible for these organisations to access NUAR in the future, the nature of their work may be impacted through delivery of the new digital service where data from all asset owners can be accessed immediately through a single web map interface, rather than maps being received separately.
105. To maximise the value of NUAR while leveraging the wider commercial market in delivering additional value, the legislative reforms being sought will make it possible to widen licensed access to NUAR data where propositions are tested, feasibility and value is confirmed, and the proposal is supported by the wider asset owner community. This could include granting access for commercial entities acting as third party intermediaries to NUAR data which would allow these organisations to adapt their service offerings should they choose to do so. Offerings could include making NUAR data securely available to other use groups or to support other use cases.
106. However, as these opportunities are theoretical at this stage, this impact assessment only considers the potential for immediate impact on these businesses.
107. As asset owners will be required to share data in a form that will be prescribed, NUAR could also create market opportunities as it is likely organisations lacking either the skills or capacity to carry out data transformation activities in-house or share data using in-house staff, will procure services to complete these activities on their behalf.
108. Competition checklist (based on the assessment above):
- a. Will the measure directly or indirectly limit the number or range of suppliers?
    - i. No.
  - b. Will the measure limit the ability of suppliers to compete?
    - i. No.
  - c. Will the measure limit suppliers' incentives to compete?
    - i. No.
  - d. Will the measure affect consumers' ability to engage with the market and make choices that align with their preferences?
    - i. No.
  - e. Will the measure affect suppliers' ability and/or incentive to introduce new technologies, products or business models?
    - i. No.

## Trade implications of measure



109. We do not anticipate there being any direct implications for trade. NUAR will primarily change the costs for domestic activities. However, as the reforms will directly benefit owners of underground assets through reduced utility strikes, back office efficiencies and enabling better data sharing, it could over time make the utility and telecoms sector in the UK a more attractive place for inward investment, compared to other economies which have not yet taken action to improve data sharing in this manner. This could include the attractiveness of investing in new developments or major projects given the data contained and made available in NUAR will help reduce risk of project overruns and delays. As these benefits are speculative at this stage, they have not been quantified.

### **Impact on small and micro businesses**

110. Due to the policy objective of achieving a fully complete and comprehensive underground assets map, small and micro businesses (SMBs) will be expected to comply with the new requirements, just as they are for existing legislation to share data. Inclusion of data from all organisations, regardless of their size, is important as it only takes late discovery of a single asset - or accidental damage to one - for a project to incur significant delays / costs, abandonment or for worker safety to be put at risk. It will also directly benefit SMBs who may be less able to maintain teams to respond to requests for their data or pay a service provider to do it on their behalf.

111. Therefore, the legislation being sought is expected to have an impact on some SMBs, specifically asset owners. We have estimated there to be an expected 47 SMBs within the 705 AOs (7%). Whilst no data exists on their market share or the size of their networks, larger asset owners tend to have greater levels of data use than micro businesses and so the legislation will not place a disproportionate burden on small and micro businesses.

112. In this section we have analysed the estimated impacts of the reforms on SMBs. Asset owners, including SMBs will incur the following costs; familiarisation costs, admin costs and data transformation costs.

### **Mitigations**

113. We acknowledge that compliance costs for SMBs represent a higher proportion of their total capacity and resources than larger companies, but that the overall benefit to SMBs is still net positive. To further mitigate impact, we are envisaging making SMBs exempt from the annual fee charged. This will allow full direct savings through efficiencies to be used for compliance costs.

114. Table showing average Costs and Benefits for SMBs, per firm:

**Table 6: SaMBA summary of costs and benefits**

	Small and Micro (0-49 employees) (2021 prices)
Benefits	
Reduced costs of searches	£172k
Costs	
Familiarisation Costs	£1.5k
Admin Costs	£210 - £320
Data transformation Costs	£16k
Charges for using NUAR	£0

115. We also considered impacts on medium-size businesses (defined as those businesses with 50 to 499 employees). However, due to data coverage limitations (data on employment is sourced from Companies House, however not every company fully reports their employment data) this assessment is not proportionate to approach robustly.
116. The compliance costs for medium-sized businesses will be a smaller proportion of their total capacity/resources. Medium-sized businesses will also benefit from the data-exchange savings/back-office efficiencies resulting from NUAR, as they typically either maintain teams to respond to requests for their data or pay a service provider to do it on their behalf. NUAR reduces the need for them to do this.
117. Given this, it is deemed disproportionate to conduct a medium-size business impact assessment.

## Risks and assumptions

118. This Impact Assessment is based on a detailed and robust assessment of the costs of introducing the legislation. Where numerical evidence is not yet available we have provided a qualitative assessment of the costs and benefits of the preferred option.
119. However, some analysis relies on assumptions that are open to debate. Therefore sensitivity analysis and testing has been carried out to make sure that these potential risks have been accounted for. In this section a breakdown of the key risks identified and the sensitivity analysis carried out are described. This analysis can be found in Annex A.

### Analytical risks and assumptions

120. Key driving assumptions are subject to sensitivity analysis in the following section.
121. Strike avoidance:

- a. 60,000 underground asset strikes per year - a widely reported industry statistic used in multiple industry reports, academic papers and journals<sup>28</sup>.
- b. Direct costs per asset strike - £3,371 based on studies by Makana et al (2019) and Metje et al (2015) which covered the cost of asset strikes by asset type. These covered: electric - low voltage: £2,637; electric - high voltage: £10,000; gas - low pressure: £2,238; gas - high pressure: £6,400; water: £5,375; and telecoms: £680; fibre optic (known to be more costly than traditional telecoms): £2,800.
- c. 4 million excavations per year - quoted in a number of different reports, but sourced from Beck, A.R., Fu, G., Cohn, AG et al., (2007) A framework for utility data integration in the UK & LSBUD Digging Up Britain Report (2020).
- d. 1:29 ratio of direct to indirect cost of asset strikes - based on the study by Makana et al (2019) which assessed 16 fully detailed case studies in the UK to look at the scale and type of direct costs and indirect costs that result from utility asset strikes. The treatment of this finding is described in the 'Indirect Benefits' section of the IA.
- e. 15% reduction in utility asset strikes - based on strike causes in the USAG survey reports 2014 - 2018, that maximum of 30% of strikes could be avoided through better data and easier access to it. A central estimate of 15% has been used for this analysis (based on assessment of causes outlined below). This is a conservative estimate, as a fully functioning version of NUAR could prevent up to 30% of strikes either directly or indirectly related to data issues.
  - i. The USAG report breaks strike causes into planning and execution-related causes. The planning-related reasons we assumed can be resolved through the data platform are "Assets not on relevant plans", "Plan of asset damaged not present", "Inaccuracy of plans", "Inadequate assessment of works", and "Inadequate survey." Of these, about 15% of these cases could be resolved through NUAR directly, with the remaining percentage resolved indirectly.
  - ii. For example, the NUAR feedback and reporting function will allow these data quality gaps to be identified, addressed and improved over time, as feedback is given directly from users on the ground to asset owners themselves. The more easily accessible the data is to project teams, the more it should improve planning processes and output, resolving some of these utility strike causes.
  - iii. We also included one execution related reason, "Not following procedure", because increasing the ease and speed of accessing data, as well as the interpretation and orientation of data on-site should increase compliance with safe digging procedures.
  - iv. These reasons collectively make up approximately 30% of utility strikes.

## 122. On-site project savings:

- a. Found (but not struck) assets per year from small digs (hereby referred to as 'incidents') estimated to be 36,635, based on the 0.9% rate of low severity strikes as set out in the USAG 2014 reports on the incidence of low severity strikes, which are deemed most comparable to found (but not struck) assets, multiplied by the number of small scale excavations (4 million digs, but 1,500 of which are assumed to be large in scale, as per industry experts, meaning the remaining are small digs).

<sup>28</sup> This statistic was reported in USAG 2014 report, Beck et al (2007) and the Civil Engineering Contractors Association (CECA).

- b. Rework cost per incident of small digs - based on 2 day delay (cited in interviews with industry experts), covering project manager labour to re-plan works and equipment rental to re-survey site. Labour cost and rental rates taken from (Sealand Survey and Safety Equipment) and (Totaljobs).
- c. Indirect cost ratio from small digs - assumed to be 25% of the indirect cost ratio given by Makana (2019) - so ratio becomes 7 for small incidents (which reflects smaller scale disruptions).
- d. Percentage of incidents reduced - Assumed to impact all projects that use searches, based on ~2.2 million searches on LSBUD platform relative to total ~4 million excavations. See (LSBUD, 2018).
- e. Found (but not struck) assets per year from large digs - estimated to be 150, based on an estimated 1,500 large scale digs, with an assumed incident rate of 10%.
- f. Cost per incident from large digs - estimated to be around £40,000 based on user interviews and industry engagement.
- g. Abandonment rate following incidents - assumed to be 0.5% based on user interviews and industry engagement.
- h. Cost per abandoned excavation - assumed to be £300 based on user interviews and industry engagement.
- i. Time needed to interpret maps - assumed to be 30 minutes based on User Survey findings from NUAR's Pilot Phase.
- j. Trade rate for site projects - £24/hr from applying lowest user interview estimate.

123. Better data sharing:

- a. Searches undertaken on behalf of statutory undertakers - estimated to be 89%, based on the annual number of searches recorded on behalf of utilities and highway authorities, as a proportion of total searches (2.8 million) from Linesearch BeforeUdig (LSBUD) (2018).
- b. Total searches in England, Wales and Northern Ireland - 3.85m. Based on 4m excavations per year in the UK, minus the number of searches in Scotland (146,094).
- c. Total searches undertaken on behalf of statutory undertakers in England, Wales and Northern Ireland - 3.4m, based on 89% of 3.85m total searches.
- d. Ratio between Searches and Enquiries - assumed to be 5 enquiries for every 1 search. Search is defined as the number of times excavation planners are interested in finding information about underground assets. Is the same as the number of excavations done by statutory undertakers. Enquiries are the number of lines of requests made either directly to asset owners or to third party intermediaries to collect this data. Assumed to be 5 to cover the 5 main utility categories - Gas, Electricity, Telecom, Water/Sewerage, and Infrastructure.
- e. Percentage of risky assets - assets defined as those where special permissions ('Intention-to-Dig') need to be sought as information about this asset, if insecurely shared, could have devastating consequences for society (both in terms of disruption and fatalities). Gas is most likely to fall into this category, hence being 1 out of 5 main assets, assumed to be 20%.
- f. Turnaround time per outsourced search - estimated to be 2.9 work days, with an 8-hours work day, based on surveys commissioned by the Geospatial Commission.
- g. Time spent collating outputs from stat pack providers - 12 person hours, based on surveys commissioned by the Geospatial Commission.

- h. Weighted average cost per outsourced search - £32<sup>29</sup> based on surveys commissioned by the Geospatial Commission.
- i. Weighted average turnaround time per in-house search - 3.1 days, based on surveys commissioned by the Geospatial Commission.
- j. Project Management Offices (PMOs) - Operational team size - 4.3 persons, based on surveys commissioned by the Geospatial Commission.
- k. PMOs - Supervisory team size - 3.1 persons, based on surveys commissioned by the Geospatial Commission.
- l. Weighted average time spent submitted searches to search providers - 0.6 per hours, based on surveys commissioned by the Geospatial Commission.
- m. Weighted average time spent collating outputs from search providers - 10.3 person hours, based on surveys commissioned by the Geospatial Commission.
- n. Weighted average time spent acquiring data from non-member asset owners - 1.5 hours, based on surveys commissioned by the Geospatial Commission.
- o. Weighted average time spent collating data from non-member asset owners - 4.8 hours, based on surveys commissioned by the Geospatial Commission.
- p. Asset Owners - Operational Team size - 15.8 persons, based on surveys commissioned by the Geospatial Commission.
- q. Asset Owners - Supervisory Team size - 2.8 persons, based on surveys commissioned by the Geospatial Commission.
- r. Weighted average charge per request - £11. Though this data is usually provided for free, some asset owners charge to cover the cost of providing access to their data.
- s. Weighted weekly hours managing third party intermediaries (where asset owners pay third party services to respond on their behalf) - 30 person hours per week. based on surveys commissioned by the Geospatial Commission.
- t. Weighted hours spent on responding to one request (for those who do not use third party services) - 0.5 person hours per week. Based on surveys commissioned by the Geospatial Commission.
- u. PMO average time taken to obtain data from NUAR - 1 person hour - this was initially reported as a matter of minutes (ranging between 3 minutes and 17 minutes based on feedback from stakeholders during the NUAR pilots). This has been conservatively rounded to the next hour.
- v. Initial data transformation cost - 10 people 10 weeks (assuming 7.5 hour days) involved from the asset owner side. Multiplied by the average hourly wage of IT architects, systems designers and business analysts (£24.73 - ONS Annual Survey of Hours and Earnings (ASHE) Database - 2020 Provisional).
- w. Ongoing data refresh cost - either absorbed in-house by asset owners or outsourced to external suppliers. For simplicity, we conservatively assume the cost of these are the same. Top-end cost per externally contracted person of £1,250 a day. We assume it takes 10 working days to transform the data (but conversations with stakeholders suggest that this would only be a matter of minutes once the process is established). We also assume that the optimal update frequency to NUAR is quarterly (this is yet to be determined as part of the transformation workstream) and that the number of people involved halves from 10 to 5 people. Therefore, the per annum cost per organisation is £16,392 in the NUAR scenario.

## Monitoring and Evaluation

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<sup>29</sup> This is much lower than expected (fees were expected to be £120 or more) but this was due to heavy weighting towards a particular PMO team in the survey which has a significant volume of outsourced searches at low cost due to economies of scale.

## Role of Evaluation in NUAR

124. Evaluation is the systematic assessment of the design, implementation and outcomes of an intervention. In this case, assessing the success of the NUAR programme.
125. The main reasons for conducting an evaluation for NUAR are:
- a. **Learning:** support the management of risk and uncertainty associated with NUAR implementation and improve future decision making and design of similar interventions. This will enable broad understanding of what aspects of NUAR and legislation work best, for whom and when.
  - b. **Accountability:** Spending decisions and legislative changes by government should be responsible. Evaluation findings can demonstrate NUAR's impact or wider outcomes to justify decisions taken.

## Post implementation review

126. Given the estimated scale and scope of the project we will complete a Post Implementation Review (PIR), within 5 years of implementation, as required by the [PIR Principles of Best practice](#). The PIR will provide us with the opportunity to review whether the legislation has met the intended objectives highlighted in this impact assessment and to successfully measure these impacts. This aligns with the timelines of the Data Protection and Digital Information (DPDI) commitment to a Post Implementation Review.
127. The NUAR programme has a full monitoring and evaluation plan, described below, which captures a number of metrics at various frequencies that track progress and impact of NUAR over the next 10 years, relative to baseline data collected in April 2023. This evaluation will also be used to track the impact of the new requirements introduced through this legislation.
128. The plan explains how we will conduct an impact evaluation to assess the scale of effects caused by the planned changes, compared to the initial ambition of the legislation.

## Key Evaluation Questions

129. The 3 key themes that will be captured are: Engagement with & completeness of NUAR, Efficiencies & Strike impacts, and finally Broader Impacts resulting from NUAR. Each of these themes contains a set of evaluation questions including:
- a. To what extent have Asset Owners/excavators engaged with NUAR and supported completeness/accuracy?
  - b. To what extent has NUAR led to improvements in data exchange and administrative efficiencies?
  - c. To what extent has NUAR led to on-site project savings?
  - d. To what extent has NUAR led to an improvement in utility strike impacts?
  - e. To what extent has NUAR led to broader changes and improvements in the wider infrastructure ecosystem?

130. Each of these questions will have a set of indicators which will support the demonstration of success.

**Theory of Change**

131. A Theory of Change (ToC) captures the theory of how the intervention is expected to work, setting out the steps involved in achieving the desired outcomes, the assumptions made and wider contextual factors.

132. The Magenta Book states that developing a ToC typically involves considering the proposed inputs (such as the investment, regulation and actions that will take place) and the causal chain that leads from these inputs through to the expected outputs and outcomes. These causal pathways are based on the gathering and synthesis of evidence. This essentially summarises how NUAR is expected to achieve its objectives and have impact.

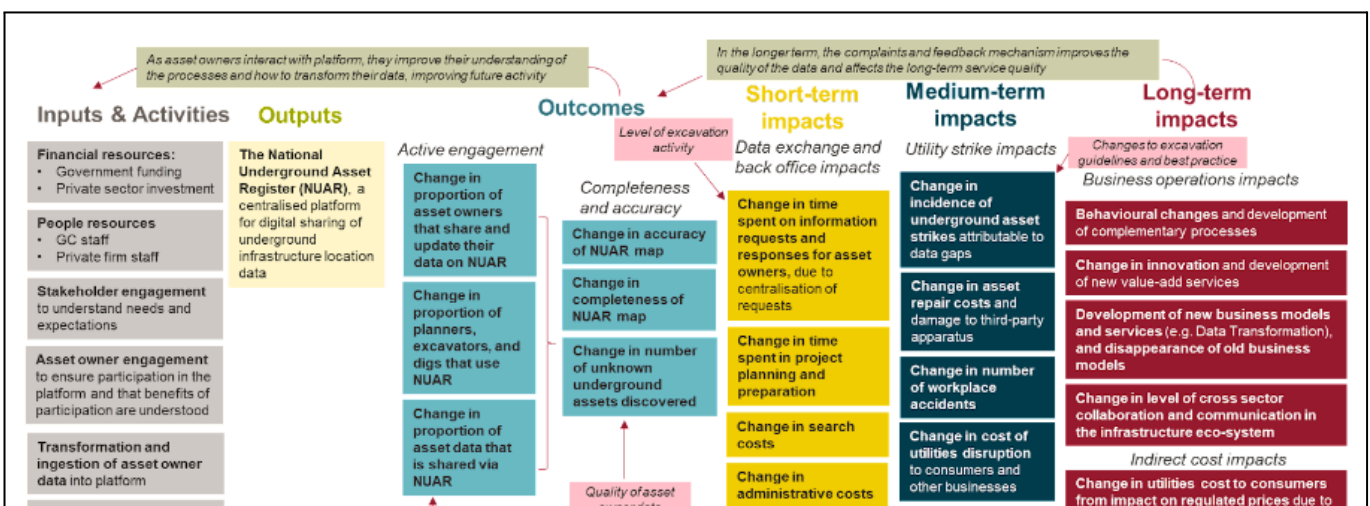
133. This evaluation plan also includes a comprehensive theory of change and logic model setting out how the key activities of NUAR will lead to outcomes and impacts in the short, medium and long-term, as well as to what extent external barriers, enabling factors and feedback loops that might affect the delivery and success of the programme.

134. Some examples of these external barriers and enabling factors are:

- a. Data expertise of asset owners and NUAR users
- b. Existing quality of asset owner data (and the scale of difference to the NUAR data model)
- c. Level of excavation activity over time (this can increase or decrease over time depending on e.g the number of infrastructure or construction projects in England, Wales and Northern Ireland.
- d. Changes to existing excavations guidelines and best practice
- e. Technological developments that change how excavations are carried out.
- f. Other legislative and political changes - which could affect the rate of deployment of things like electric vehicle charge points or fibre roll out, in turn affecting the number of searches and excavations.

135. These can potentially impact NUAR at different time frames, including the short, medium and long-term. This is set out below:

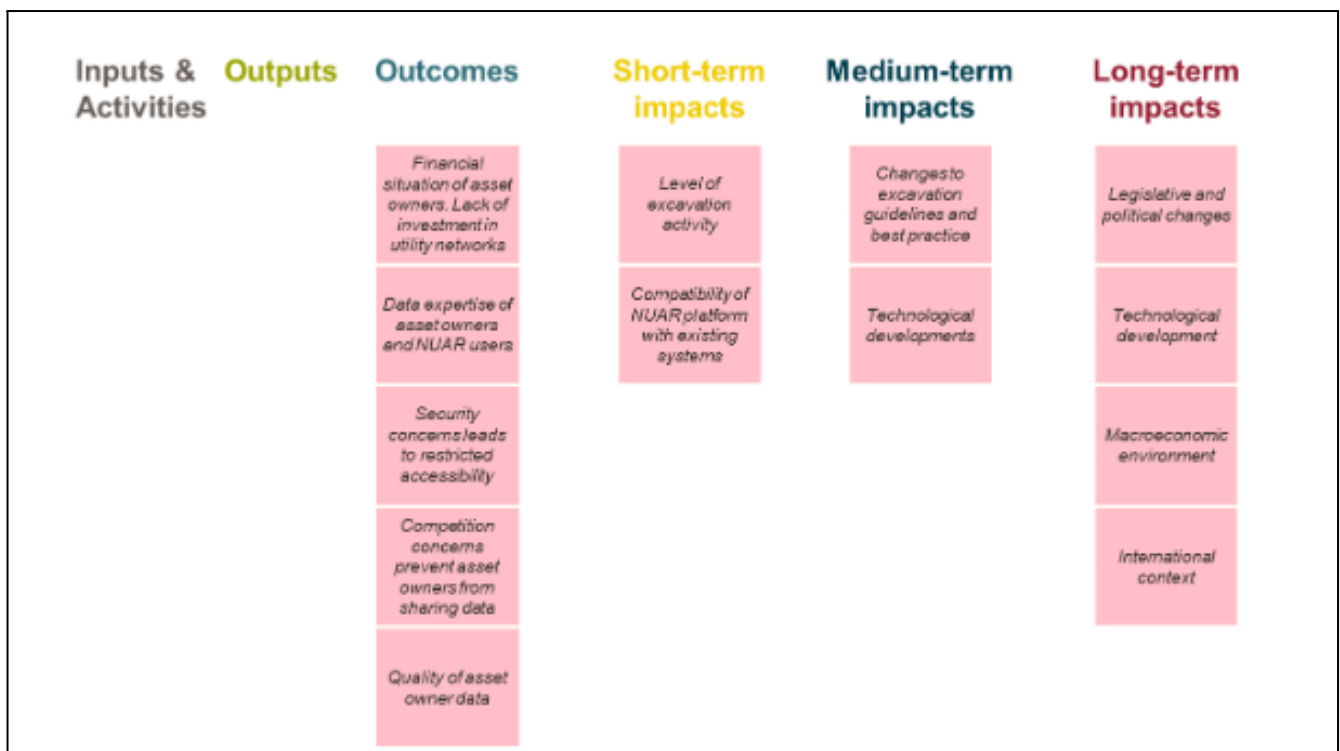
**Figure 11: Logic model**



136. As shown above, we have identified a number of long-term impacts on business operations. Though these can only be qualitatively assessed at this stage (due to lack of data as NUAR has not yet been operationalised), we expect business operations to be positively impacted in a variety of ways.

- a. For example, activities carried out to adopt the new service are likely to identify other long standing processes which may require updating or innovative practices that minimise costs while delivering value to consumers. The service also stands as an example of effective cross-sector collaboration (including through built-in features which allow end users to share findings with users in other sectors) which could serve as a model for collaboration in other areas.
- b. Furthermore, access to standardised data could provide insights in other areas, such as identifying opportunities to make networks more resilient or how to deploy them more quickly. The programme's benefits realisation plan will seek to assess such benefits.

**Figure 12 - External barriers and enabling factors:**





## Metrics and indicators

For each of the key evaluation questions, a key set of indicators, the type of data collected, as well as the data source, has been assessed.

**Question 1** - To what extent have asset owners/excavators engaged with NUAR and supported completeness/accuracy?

**Table 7: Question 1 indicators and data sources**

#	Indicator	Type of Data	Data Sources
1	Proportion of asset owners that have shared their data on NUAR	Number of asset owners that use NUAR and estimate of total number of asset owners, by sector.	<ul style="list-style-type: none"> <li>■ Internal NUAR data sources and/or market intelligence</li> </ul>
2	Proportion of asset owners that have updated their data on NUAR	Proportion of asset owners on NUAR that have updated their data during the recommended time period.	<ul style="list-style-type: none"> <li>■ Internal NUAR data sources</li> </ul>
3	Proportion of excavations that use NUAR	Proportion of excavations that use NUAR (from survey data).	<ul style="list-style-type: none"> <li>■ Responses to NUAR surveys</li> </ul>
4	Proportion of searches that use NUAR	Proportion of searches that are (i) partially and (ii) wholly done using NUAR.	<ul style="list-style-type: none"> <li>■ Responses to NUAR surveys</li> </ul>
5	Change in accuracy and completeness of NUAR	Number of reported data inaccuracies / complaints; proportion of these reports that are transmitted to asset owners.	<ul style="list-style-type: none"> <li>■ Internal NUAR data sources</li> <li>■ Stakeholder engagement</li> </ul>
6	Change in user confidence in NUAR	Reported confidence in the completeness of NUAR (in terms of coverage of asset data) and reported confidence in the relative temporal accuracy of information on NUAR compared to other plans available directly from asset owners.	<ul style="list-style-type: none"> <li>■ Responses to NUAR surveys</li> <li>■ Stakeholder engagement</li> </ul>

**Question 2** - To what extent has NUAR led to improvements in data exchange and administrative efficiencies?

**Table 8: Question 2 indicators and data sources**

#	Indicator	Type of Data	Data Sources
7	Change in time spent by PMOs requesting and compiling data from asset owners for entirely in-house searches	Proportion of searches that are entirely in-house; proportion of in-house searches that use (and do not use) NUAR; time spent requesting and compiling data from in-house searches that use (and do not use) NUAR; value of search time.	<ul style="list-style-type: none"> <li>■ Responses to NUAR surveys</li> <li>■ Stakeholder engagement / case studies</li> </ul>

#	Indicator	Type of Data	Data Sources
			<ul style="list-style-type: none"> <li>■ Third party estimates</li> <li>■ Annual Survey of Hours and Earnings (ASHE) database<sup>30</sup></li> </ul>
8	Change in time spent by PMOs processing data collected via entirely in-house searches	Proportion of searches that are entirely in-house; proportion of in-house searches that use (and do not use) NUAR; time spent processing data from in-house searches that use (and do not use) NUAR; value of processing time.	<ul style="list-style-type: none"> <li>■ Responses to NUAR surveys</li> <li>■ Stakeholder engagement / case studies</li> <li>■ Third party estimates</li> <li>■ ASHE database</li> </ul>
9	Change in cost of in-house searches (for PMOs) that are assisted by search providers	Proportion of searches that are assisted by search providers; proportion of search provider assisted searches that use (and do not use) NUAR; cost of search provider assisted searches that use (and do not use) NUAR.	<ul style="list-style-type: none"> <li>■ Responses to NUAR surveys</li> <li>■ Third party estimates</li> </ul>
10	Change in time spent requesting and compiling data from asset owners (for PMOs) for search provider assisted in-house searches	Proportion of searches that are assisted by search providers; proportion of search provider assisted searches that use (and do not use) NUAR; time spent requesting and compiling data from search provider assisted searches that use (and do not use) NUAR; value of search time.	<ul style="list-style-type: none"> <li>■ Responses to NUAR surveys</li> <li>■ Stakeholder engagement / case studies</li> <li>■ Third party estimates</li> <li>■ ASHE database</li> </ul>
11	Change in time spent processing data collected (for PMOs) via search provider assisted in-house searches	Proportion of searches that are assisted by search providers; proportion of search provider assisted searches that use (and do not use) NUAR; time spent processing data from search provider assisted searches that use (and do not use) NUAR; value of processing time.	<ul style="list-style-type: none"> <li>■ Responses to NUAR surveys</li> <li>■ Stakeholder engagement / case studies</li> <li>■ Third party estimates</li> <li>■ ASHE database</li> </ul>

<sup>30</sup> The Annual Survey of Hours and Earnings (ASHE), carried out in April each year, is the most comprehensive source of information on the structure and distribution of earnings in the UK. ASHE provides information about the levels, distribution and make-up of earnings and paid hours worked for employees in all industries and occupations. The ASHE tables contain estimates of earnings for employees by sex and full-time or part-time status. Further breakdowns include by region, occupation, industry, age group and public or private sector. Gross earnings by granular occupation is included in ASHE Table 14:

<https://www.ons.gov.uk/employmentandlabourmarket/peopleinwork/earningsandworkinghours/datasets/occupation4digitsoc2010ashtable14>

#	Indicator	Type of Data	Data Sources
12	Change in cost of third-party searches undertaken by stat providers on behalf of data users (Project Management Offices)	Proportion of searches that are outsource to stat providers; proportion of stat provider assisted searches that use (and do not use) NUAR; cost of stat provider assisted searches that use (and do not use) NUAR	<ul style="list-style-type: none"> <li>■ Responses to NUAR surveys</li> <li>■ Stakeholder engagement / case studies</li> <li>■ Third party estimates</li> </ul>
13	Change in time spent processing data from stat provider assisted searches for data users (Project Management Offices)	Proportion of searches that are outsourced to stat providers; proportion of stat provider assisted searches that use (and do not use) NUAR; time spent processing data from stat provider assisted searches that use (and do not use) NUAR; value of processing time.	<ul style="list-style-type: none"> <li>■ Responses to NUAR surveys</li> <li>■ Stakeholder engagement / case studies</li> <li>■ Third party estimates</li> <li>■ ASHE database</li> </ul>
14	Change in overall time elapsed from search initiation to start of excavation	Average time elapsed between initiating a search and starting excavation work for searches that use and do not use NUAR, for the three different types of searchers (in-house, search provider, and stat provider assisted)	<ul style="list-style-type: none"> <li>■ Stakeholder engagement / case studies</li> </ul>
15	Change in time spent on responses to information requests for asset owners	Number of enquiries per year that relate to assets covered (and not covered) by NUAR; time spent responding to enquiries on assets covered (and not covered) by NUAR; disbursement costs; average monetary value of data response time	<ul style="list-style-type: none"> <li>■ Responses to NUAR surveys</li> <li>■ Stakeholder engagement / case studies</li> <li>■ Third party estimates</li> <li>■ ASHE database</li> </ul>
16	Change in time spent uploading data to NUAR for asset owners	Time spent uploading data to NUAR; time spent updating data and responding to feedback; average monetary value of data upload time	<ul style="list-style-type: none"> <li>■ Responses to NUAR surveys</li> <li>■ ASHE database</li> </ul>

**Question 3** - To what extent has NUAR led to on-site project savings?

**Table 9: Question 3 indicators and data sources**

#	Indicator	Type of Data	Data Sources
17	Change in frequency of site abandonments from the discovery of unknown assets, and as a result a change in the total cost of abandonments	Rate (and number) of site abandonments due to discovery of unknown assets / assets in the wrong location for excavations that use (and do not use) NUAR; cost of site abandonment.	<ul style="list-style-type: none"> <li>■ Responses to NUAR surveys</li> <li>■ Stakeholder engagement / case studies</li> <li>■ Third party estimates</li> </ul>

18	Change in frequency of site delays and re-workings, and as a result a change in the total cost of re-workings (resumption costs)	Rate (and number) of site delays due to discovery of unknown assets for excavations that use (and do not use) NUAR; average length of delay due to discovery of unknown assets; direct monetary cost (per hour/day) of delay to excavation team / project managers; indirect monetary cost (per hour/day) of delay in terms of wider disruption.	<ul style="list-style-type: none"> <li>■ Responses to NUAR surveys</li> <li>■ Stakeholder engagement / case studies</li> <li>■ Third party estimates such as Street Manager.<sup>31</sup></li> <li>■ Academic literature</li> </ul>
19	Change in time spent on on-site orientation and planning, and the resulting costs	Average time spent on on-site orientation and planning (e.g. time required to interpret maps, initial on-site survey work before a dig) for excavations that use (and do not use) NUAR; cost of orientation and site planning time.	<ul style="list-style-type: none"> <li>■ Responses to NUAR surveys</li> <li>■ Stakeholder engagement / case studies</li> <li>■ Third party estimates</li> <li>■ ASHE database</li> </ul>

**Question 4 - To what extent has NUAR led to an improvement in utility strike impacts?**

**Table 10: Question 4 indicators and data sources**

#	Indicator	Type of Data	Data Sources
20	Change in rate of unknown underground assets discovered <i>[Note – unknown assets include both entirely unknown assets, as well as assets that are in an unexpected place]</i>	Rate of unknown underground assets discovered by type of asset; stakeholder feedback.	<ul style="list-style-type: none"> <li>■ Responses to NUAR surveys</li> <li>■ Stakeholder engagement / case studies</li> </ul>
21	Change in rate of strikes due to information gaps	Proportion of excavations that involve an asset strike by type of asset strike, for excavations that use (and do not use) NUAR; Average number of strikes per excavation, for excavations that do involve a strike; proportion of asset strikes that are due to poor information for excavations that use (and do not use) NUAR.	<ul style="list-style-type: none"> <li>■ Responses to NUAR surveys</li> <li>■ Stakeholder engagement / case studies</li> <li>■ Insurance provider data</li> <li>■ NUAR reporting system data</li> <li>■ USAG reports<sup>32</sup></li> </ul>

<sup>31</sup> Street Manager provides data for England on every utility street work and local highway authority road work. This data is added by utility companies and highway authorities. Proposed start and end dates of the work as well as actual start and end dates are included as variables. Data on activity type is also included (so the Geospatial Commission can focus on relevant road works).

<sup>32</sup> USAG collect data from members on utility strikes via a survey and standardised data collection template. This survey includes a question on the root causes of asset strikes which can be used in this evaluation. Further detail on data collection is available here:

#	Indicator	Type of Data	Data Sources
22	Change in asset repairs costs, due to a change in the rate of strikes caused by data related issues	Average cost per strike in terms of asset damage, by type of strike (both overall, and for NUAR excavations specifically); Change in rate of strikes due to information gaps	<ul style="list-style-type: none"> <li>■ Responses to NUAR surveys</li> <li>■ Stakeholder engagement</li> <li>■ USAG reports</li> </ul>
23	Change in number of workplace accidents and health and safety incidents, due to a change in the rate of strikes caused by data related issues	Number of injuries per strike, by type of strike (both overall, and for NUAR excavations specifically); cost of injuries; change in rate of strikes due to information gaps.	<ul style="list-style-type: none"> <li>■ Third party estimates, either from academic sources such as Metje et al. 2019,<sup>33</sup> or based on HSE reports on serious workplace accidents (RIDDOR data)<sup>34</sup> from utility strikes. HSE will be able to process this information on the Geospatial Commission's behalf.</li> <li>■ Stakeholder engagement</li> <li>■ Standard methodologies on QALY / cost of injury from UK Government Guidance</li> </ul>
24	Change in cost of traffic disruption from information gap related strikes	Average traffic disruption from asset strikes, by type of strike (both overall, and for NUAR excavations specifically); cost of traffic disruption; carbon cost of traffic disruption.	<ul style="list-style-type: none"> <li>■ Third party estimates</li> <li>■ Surveys of local authorities</li> <li>■ Stakeholder engagement</li> <li>■ Data on cost of carbon per road mile from DfT.</li> </ul>
25	Change in cost of utilities disruption from information gap related strikes	Ratio of utilities disruptions to asset strikes, by type of strike (both overall, and for NUAR excavations specifically); average cost per utilities disruption.	<ul style="list-style-type: none"> <li>■ Third party estimates</li> <li>■ Stakeholder engagement</li> </ul>

[https://www.utilitystrikeavoidancegroup.org/uploads/1/3/6/6/13667105/usag\\_2020\\_utility\\_strike\\_damages\\_report.pdf](https://www.utilitystrikeavoidancegroup.org/uploads/1/3/6/6/13667105/usag_2020_utility_strike_damages_report.pdf)

33

<https://research.birmingham.ac.uk/en/publications/cost-estimation-of-utility-strikes-towards-proactive-management-o>

34 <https://www.hse.gov.uk/statistics/tables/index.htm>

**Question 5** - To what extent has NUAR led to broader changes and improvements in the wider infrastructure ecosystem?

**Table 11: Question 5 indicators and data sources**

#	Indicator	Type of Data	Data sources
26	Change in wider business practices or business models of excavators and asset owners as a result of NUAR	Qualitative responses on: <ul style="list-style-type: none"> <li>- The extent to which NUAR has changed their behaviour</li> <li>- Any new business models that have emerged as a result of NUAR</li> <li>- Any old business models that have disappeared as a result of NUAR</li> <li>- Specific examples of innovation or new products linked to NUAR or partially facilitated by NUAR</li> </ul>	<ul style="list-style-type: none"> <li>■ Stakeholder engagement and case studies</li> </ul>
27	Change in network resilience	Qualitative responses on: <ul style="list-style-type: none"> <li>- Impact of NUAR on asset and network resilience</li> <li>- Impact of NUAR on subsurface and natural resource management (e.g. flood risk)</li> </ul> Number of asset strikes that involve different types of networks	<ul style="list-style-type: none"> <li>■ Stakeholder engagement and case studies</li> </ul>
28	Change in utilities costs to consumer from impact on regulated prices	Qualitative responses	<ul style="list-style-type: none"> <li>■ Stakeholder engagement and case studies</li> </ul>
29	Change in cost of network deployment (for high-speed electronic communications, hydrogen, etc.)	Qualitative responses on: <ul style="list-style-type: none"> <li>- Impact of NUAR on speed of deployment of high-speed electronic communication networks</li> <li>- Impact of NUAR on speed of deployment of hydrogen networks</li> </ul>	<ul style="list-style-type: none"> <li>■ Stakeholder engagement and case studies</li> </ul>

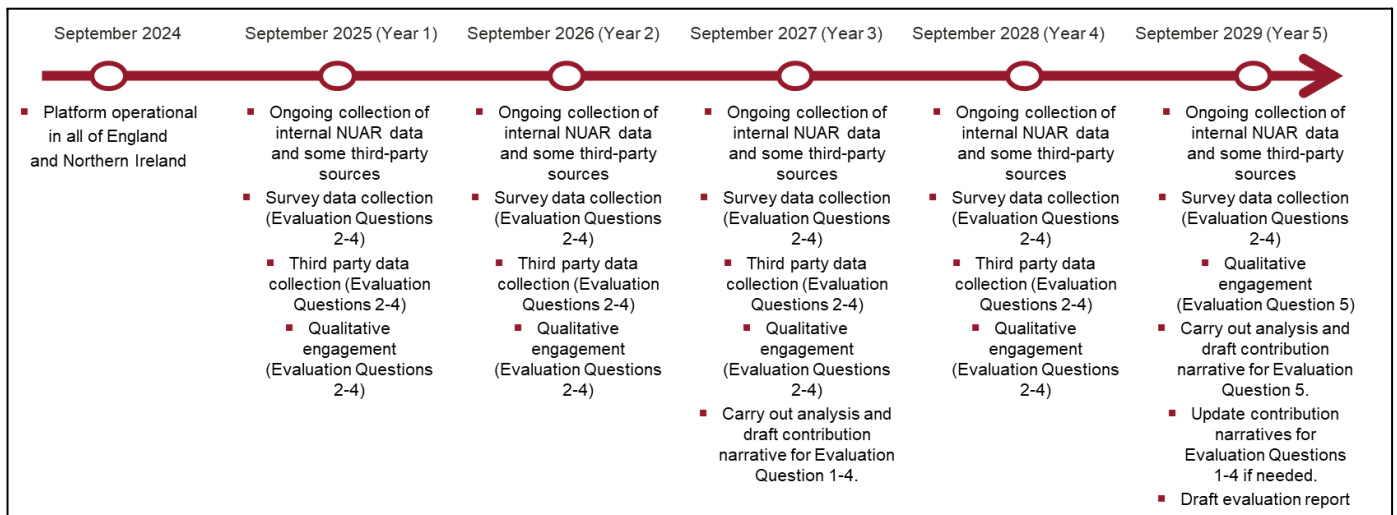
## Timelines

137. Collection of indicators will happen at varying frequencies (reflecting the practicalities and proportionality of collecting this information and the current update frequencies of third party sources). For example, some data will be collected on an ongoing basis (such as those that are directly reported on the NUAR platform), whereas other primary information will need to be sought through annual surveys and stakeholder interviews (such as the proportion of excavations that use NUAR and the time spent by PMOs requesting data). Furthermore, the risk of survey fatigue means that there is a need to balance the need for collecting consistent, comparable data at regular periods over time as the risk that trying to collect data too frequently can lead to low response rates.
138. Sources include primary data collected directly from the platform, surveys, third party information and through deep-dive interviews with key stakeholders in the sector.

Baseline information has already been collected as of April 2023. Future monitoring data will be compared against this baseline to assess the extent to which NUAR has met its key objectives and its core performance. This ongoing monitoring will also allow HMG to assess the delivery and impact of NUAR, allowing for opportunities to modify or change the programme if required.

139. The overall timeline for assessing each evaluation question is set out below. There are three different frequencies of data collection:
- Ongoing collection.** While analysis of this data will only need to be undertaken annually, some internal NUAR data should be tracked on an ongoing basis.
  - Annual.** This applies to collection of third party data (e.g. insurance data on number of strikes), primary data collection (surveys and stakeholder interviews) should be collected every year on NUAR’s short and medium-term impacts.
  - Every 5 years.** Qualitative data on NUAR’s long-term impacts should be collected every 5 years.
140. The full evaluation timeline is set out below:

**Figure 13: Evaluation timeline**



141. The indicator collection timeline is set out below:

**Table 12: Evaluation indicator data collection timeline**

Indicator	Timeline for collection
Proportion of asset owners that have shared their data on NUAR	Ongoing
Proportion of asset owners that have updated their data on NUAR	Ongoing
Proportion of excavations that use NUAR	Every year
Proportion of searches that use NUAR	Every year
Change in accuracy and completeness of NUAR	Ongoing (internal NUAR data)



Indicator	Timeline for collection
	<b>Every year</b> (survey data and stakeholder interviews)
Change in time spent by PMOs requesting and compiling data from asset owners for entirely in-house searches	<b>Every year</b>
Change in time spent by PMOs processing data collected via entirely in-house searches	<b>Every year</b>
Change in cost of in-house searches (for PMOs) that are assisted by search providers	<b>Every year</b>
Change in time spent requesting and compiling data from asset owners (for PMOs) for search provider assisted in-house searches	<b>Every year</b>
Change in time spent processing data collected (for PMOs) via search provider assisted in-house searches	<b>Every year</b>
Change in cost of third-party searches undertaken by stat providers on behalf of data users (Project Management Offices)	<b>Every year</b>
Change in time spent processing data from stat provider assisted searches for data users (Project Management Offices)	<b>Every year</b>
Change in overall time elapsed from search initiation to start of excavation	<b>Every year</b>
Change in time spent on responses to information requests for asset owners	<b>Every year</b>
Change in time spent uploading data to NUAR for asset owners	<b>Every year</b>
Change in frequency of site abandonments from the discovery of unknown assets, and as a result a change in the total cost of abandonments	<b>Every year</b>
Change in frequency of site delays and re-workings, and as a result a change in the total cost of re-workings (resumption costs)	<b>Every year</b>
Change in time spent on on-site orientation and planning, and the resulting costs	<b>Every year</b>
Change in rate of unknown underground assets discovered	<b>Every year</b>
Change in rate of strikes due to information gaps	<b>Annual</b> (insurance data and USAG data on strike prevalence and root causes) <b>Every year</b> (survey data and stakeholder interviews)
Change in asset repairs costs, due to a change in the rate of strikes caused by data related issues	<b>Every year</b>
Change in number of workplace accidents and health and safety incidents, due to a change in the rate of strikes caused by data related issues	<b>Every year</b>
Change in cost of traffic disruption from information gap related strikes	<b>Every year</b>
Change in cost of utilities disruption from information gap related strikes	<b>Every year</b>



Indicator	Timeline for collection
Change in wider business practices or business models of excavators and asset owners as a result of NUAR	<b>Every 5 years</b>
Change in network resilience	<b>Every 5 years</b>
Change in utilities costs to consumer from impact on regulated prices	<b>Every 5 years</b>
Change in cost of network deployment (for high-speed electronic communications, hydrogen, etc.)	<b>Every 5 years</b>
Change in UK reputation with respect to geospatial data and underground asset maintenance	<b>Every 5 years</b>
Unforeseen impacts	<b>Every 5 years</b>

## Stakeholders involved

142. The development of this evaluation plan involved discussion with a number of key stakeholders to ensure the plan covered a wide range of considerations - including:
- a. Sector representative groups;
  - b. Academics;
  - c. Sectoral experts; and
  - d. Asset owners
  - e. Insurance companies
  - f. Project Management Offices from asset data consumers.
143. Furthermore, to inform the baseline, we surveyed asset owners from across the country covering the core utility sectors - gas, water, electric, sewerage, heat networks and telecoms. Respondents included individuals involved in the Project Management Office function who request and prepare asset data site packs for on-site teams and on-site personnel involved in excavations.
144. We will continue to engage with these asset owners on a regular basis as part of the ongoing monitoring of the programme.

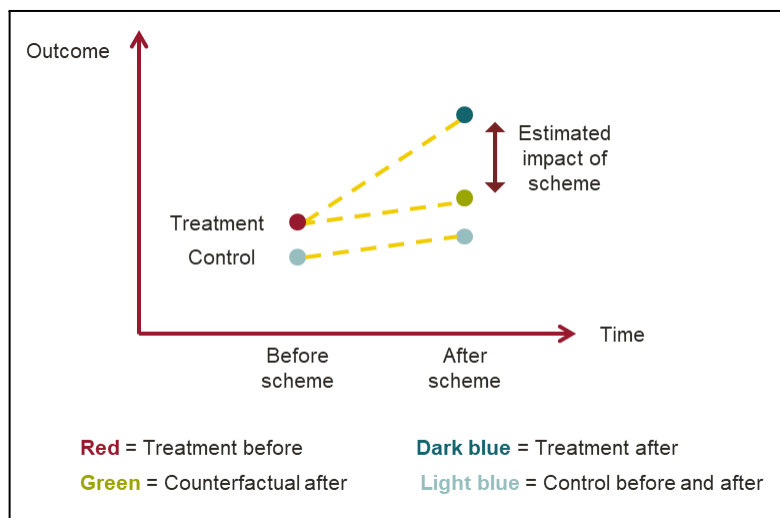
## Analytical Methodologies

145. Lastly, the evaluation plan covers the analytical methodologies that will be used to robustly assess the impact of NUAR - covering both theory-based evaluation methods as well as quasi-experimental approaches, in-line with the best-practice set out in the [HM Treasury's Magenta Book](#), the central government guidance on evaluation.
146. Given (1) the complexity of the environment in which NUAR operates, and (2) the resources available for evaluation, we propose a theory-based methodology, namely Contribution Analysis (CA).
147. Theory based approaches are particularly well-suited to an intervention like NUAR. They rely on a well-defined ToC (as set out above) and seek to assemble evidence using mixed methods to test and verify the logic. Theory-based methods are particularly useful for interventions operating in complex environments, with multiple interlinked impacts, where experimental approaches (e.g. randomisation of treatment and control group

areas) to evaluation are unlikely to be possible for all evaluation questions. However, as we have detailed below, a quasi-experimental approach (e.g. difference-in-difference analysis) does form a key component of our overall CA framework (alongside other methods detailed below).

148. As noted in the Magenta Book, a CA: ‘... refers to methods which are used to understand the likelihood the intervention has contributed to an outcome observed, or not ... through a step-by-step process which explores how the contribution would have come about and uses a broad range of evidence to test this. Contribution Analysis can ... be used for all types of interventions no matter how complex the theory of change is’.<sup>35</sup>
149. Our approach is grounded in the ToC for NUAR and the evaluation questions and indicators which we established on the basis of the programme logic. When carrying out the evaluation in future, the Geospatial Commission will assemble evidence and data to develop a ‘contribution narrative’ for each of the evaluation questions. This contribution narrative can be reviewed to understand the strength of the evidence for each question and extent to which the programme logic is or is not being realised. This will also allow the Geospatial Commission to explicitly test whether the assumptions underpinning the ToC are being met and measure the influence of external factors.
150. Combined with this, we will make use of a quasi-experimental approach in the form of difference-in-difference analysis. Difference-in-difference analysis is a quasi-experimental approach that compares the changes in outcomes over time between a population impacted by NUAR (the treatment group) and a population that is not impacted by NUAR (the comparison group). Difference-in-difference analysis is well-suited to evaluating NUAR’s impacts on a number of specific indicators where it is possible to define a control group and collect appropriate data. This analysis will draw largely on primary survey data sources (to be collected as part of baselining and again during the impact evaluation).
151. This approach allows us to explicitly account for external influences (via controls), potential deadweight and trends in outcomes between baseline and the impact evaluation (by including a control group).

**Figure 14: Difference-in-difference analysis:**



152. The primary difference-in-difference specification proposed for this evaluation relies on there being a group that uses NUAR and a group that does not use NUAR, with the latter group serving as the control.
153. The approach assumes that in the absence of the scheme, outcomes in the treatment group would follow the same trend as the control group. This assumption implies that if NUAR did not exist, outcomes from those excavations which used NUAR would have evolved in the same way as outcomes from excavations which did not use NUAR. This will not hold if:
  - a. the excavations which do not use NUAR are systematically different from those that do use NUAR (e.g. they are less likely to follow best practice or adopt emerging technologies); and
  - b. it is not possible to control for these differences within the difference-in-differences model.

## Annex A: Sensitivities Analysis

### Methodology

154. The sensitivities analysis has been performed by:

- a. Identifying which input variables in the costs and benefits analysis carry the most uncertainty.
- b. Where possible, using alternative sources for these variables. Where this is not possible, low and high inputs have been estimated.
- c. The cost benefit analysis was then performed by varying each of these input variables individually to demonstrate the individual effect of each variable.
- d. The cost benefit analysis was then performed by varying all of these input variables simultaneously to demonstrate the whole range of uncertainty. These are the results which inform the overall low and high scenarios on the summary sheet.

155. The table below lists the variables which were identified as uncertain and details how they were varied for the sensitivities analysis.

**Table 13: Variables tested in sensitivity analysis**

#	Input variable	Description of uncertainty and chosen range for low and high scenarios
1	Strikes per year	This statistic is reported in USAG 2014, Beck et al (2007) and the Civil Engineering Contractors Association. A widely reported industry statistic of 60,000 strikes per year on buried service pipes and cables per year was used as the basis of the strike reduction benefits. In our sensitivities analysis, this has been varied +/- 30% to become 42,000 - 78,000
2	Reduction in strikes	This figure is calculated by aggregating the proportions of strikes that occur due to factors that would be addressed by NUAR, with each aspect taken from the USAG Report. The central estimate is 15%. For the sensitivities analysis than has been varied to 0-30%.
3	Number of excavations	Central estimate of 3.96m. This was estimated from Street manager's open data which gives 3.3m digs per year in England-uplifted to include NI and Wales proportionally to each country's road length to give 3.96m. This is similar to a figure from <a href="#">Beck, Fu and Cohen (2007)</a> . For the sensitivities analysis than has been varied to 3.6m - 4.4m dig per year.
4	Found asset factor	Based on the <a href="#">USAG Strikes Analysis from the 2014 report</a> (latter reports are far less detailed than this, hence why the proportions from the report tend to be the basis of the analysis - and then are uprated using the absolute scale from latter reports).  61% is used for the on-site abandonment and resumption costs. It is simply the proportion of ALL STRIKES that were classed as "LOW SEVERITY" i.e  (LOW SEVERITY = 365 (PLANNED) + 84 (UNPLANNED/REACTIVE) + 3 (EMERGENCY) / (ALL STRIKES =

		<p>636 (PLANNED) + 89 (UNPLANNED/REACTIVE) + 15 (EMERGENCY) = 61%.</p> <p>For the sensitivities analysis than has been varied +/- 30% to become 43% - 79%</p>
5	Public : Private Ratio	<p>Data from Street Manager shows that digs from Public Sector were about 30%, with Private sector about 70% (central estimate). However, manual calculation based on LSBUD report of 2.8m searches on their platform. 2.5m are done on behalf or by Statutory Undertakers, of which 2.1m are utilities (assumed to be private sector mainly or wholly), and 400k is Highways Authorities (assumed to all be public). This gives us around 16% public, and 84% private (low estimate). A high estimate of 35% public, 65% private has also been made.</p>
6	Administration time cost (hours)	<p>These costs account for the time resource required by affected organisations to implement the organisational administrative changes (training and briefing material production) to bring the organisation in line with the legislation.</p> <p>These costs primarily occur in the year of legislation introduction and then repeat each year at a substantially lower cost (20% of initial cost)</p> <p>Our central estimate is 10 hours of a STEM professional's time per affected organisation, with a range of 5-15 hours.</p>
7	Familiarisation time cost (hours)	<p>These costs account for the time resource required by affected organisations to read and understand the legislation.</p> <p>These costs only occur in the year of legislation introduction</p> <p>Our central estimate is 37 hours of a Corporate managers or director's time per affected organisation, with a range of 18.5-55.5 hours.</p>
8	Transformation time cost (hours)	<p>Assumed that it would require 10 staff working 80 hours in total to undertake initial transformation in addition to contracting an external supplier.</p> <p>The transformation costs have dropped significantly from the FBC due to real-world values now being available from the build-phase.</p> <p>As it is assumed that 100% of asset owners will have transformed their data using the free at point of use service provided by NUAR during the build phase, there will be no cost falling to asset owners for initial transformation.</p> <p>Our central estimate is 80 hours of 10 STEM professionals' time per organisation, with a range of 40 - 120 hours.</p>
9	Vectorisation costs per organisation	<p>Using total costs from the pilots of the two organisations who carried out work most likely to resemble what will be required by the 50 and averaged them. This resulted in £70k. The range was £55k - £84k, which has been used for the sensitivities analysis.</p>
10	Profile of asset owner onboarding	<p>For the onboarding profile sensitivities assessment, the central profile has been varied. In the low scenario, the profile is set to track at 20% lower than the central scenario in all years (i.e. caps</p>

		out at 80%). In the high scenario, it is set to track at 10% higher than the central scenario in all years, capped at 100%.
11	Profile of data consumer usage of NUAR	For the data usage profile sensitivities assessment, the central profile has been varied. In the low scenario, the Rogers curve is set to cap out at 79% rather than 99% over the same period. In the high scenario, it is set to reach 99% in 2028/29 rather than 2031/32.
12	NUAR running costs	The central estimate of £6.1m per annum (when all asset owners are onboarded) has been varied to £3.1m in the low costs scenario and £9.2m in the high scenario. This is a variance of +/- 50% to demonstrate the effect of varying the running cost in the absence of other information.

156. The table below shows the effect each variable has on the final NPV of the costs and benefits analysis. These figures are taken before any optimism bias is applied.

**Table 14: Variables tested in sensitivity analysis, with effect on final NPV shown**

#	Input variable	Central	Low	High	Effect on NPV (Difference in low and high scenario)	RAG
1	Strikes per year	60000	42000	78000	-18% / +18%	A
2	Reduction in strikes	15%	0%	30%	-33% / + 33%	A
3	Number of excavations	3,960,428	3,564,385	4,356,471	-0.1% / +0.1%	G
4	Found asset factor	61.08%	42.76%	79.41%	-0.3% / +0.5%	G
5	Public : Private Ratio	30 : 70	16 : 84	35 : 65	-0% / +0% (Although the public/private split of costs and benefits and EANDCB is affected)	A
6	Administration time cost (hours)	10	5	15	-0.003% / +0.003%	G
7	Familiarisation time cost (hours)	37	18.5	55.5	-0.04% / +0.04%	G
8	Transformation time cost (hours)	80	40	120	-0.4% / +0.4%	G
9	Vectorisation costs per organisation	£70,000	£55,000	£84,000	-0.014% / +0.015%	G
10	Profile of asset owner onboarding	See previous table	See previous table	See previous table	-1.3% / +1.3%	A
11	Profile of data consumer usage of NUAR	See previous table	See previous table	See previous table	-6.8% / +6.8%	A

12	NUAR running costs	£6.1m	£3.1m	£9.2m	-4.3% / + 4.3%	A
	OVERALL	NA	NA	NA	-43.4% / +84.4%	A

157. The table below shows the overall effect of the low and high scenarios on the costs, benefits and NPV in 2021 prices (cover sheet differs as it shows 2019 prices, 2020 present value).

**Table 15: NPV summary of sensitivities analysis, 2021 prices and present value**

Net Benefit (Present Value (PV)) (£m)					
Low:	2,629.0	High:	8,687.5	Best Estimate	4,718.3

Costs	Total Transition (constant price)	Average Annual (excl. Transition, constant price)	Total Cost (present value)
Low	14.7	11.6	114.0
High	40.5	24.9	254.9
Best Estimate	29.5	19.3	195.3

Benefits	Total Transition (constant price)	Average Annual (excl. Transition, constant price)	Total Benefit (present value)
Low	0.0	339.0	2,884.0
High	0.0	1,057.6	8,801.5
Best Estimate	0.0	588.6	4,913.6

## Annex B.1: Calculations of costs and benefits

Figure 15: Data transformation costs flow diagrams

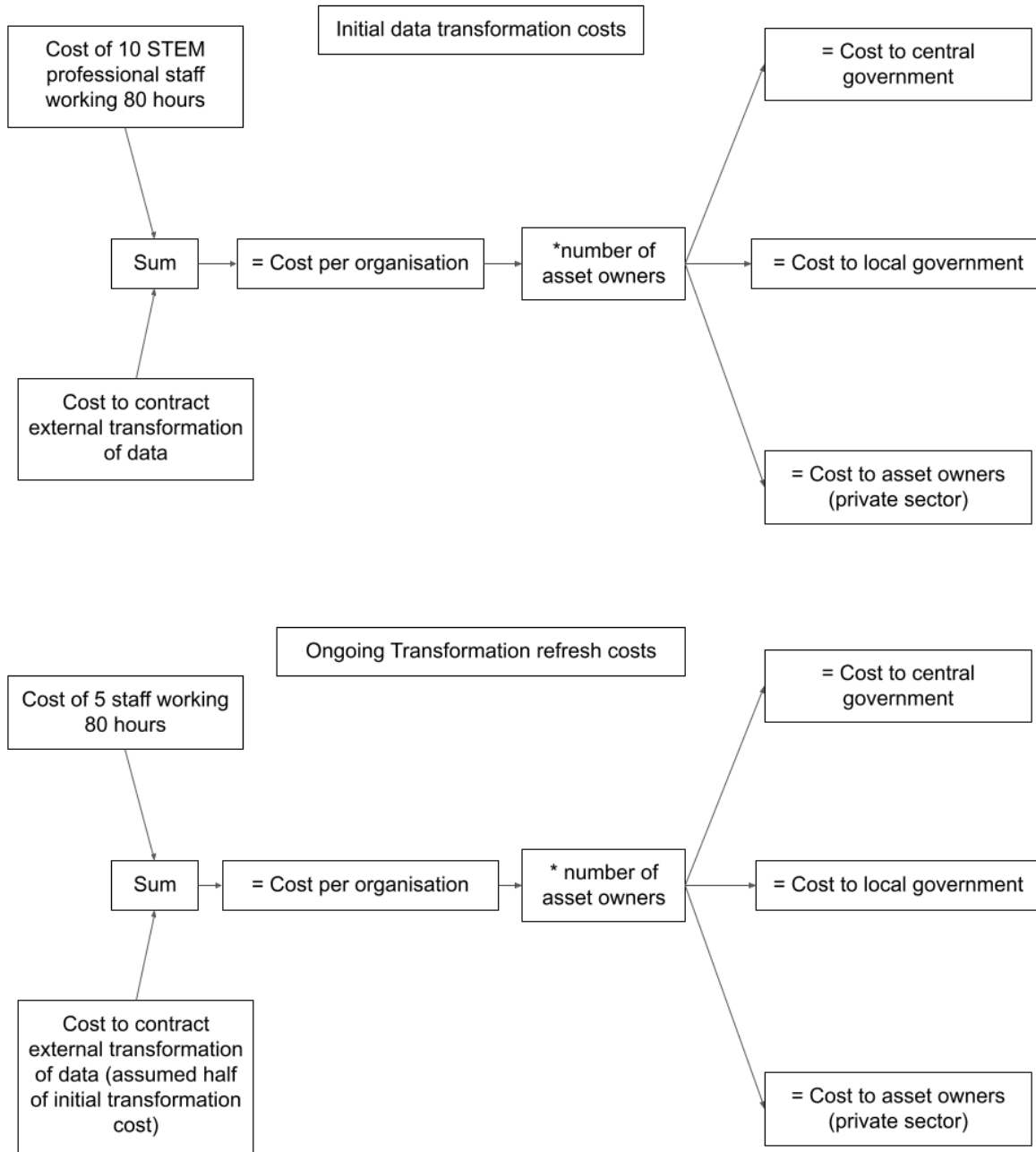


Table 16: Transformation costs

Variable	Value	Commentary	Source
<b>Initial Transformation</b>			
AO Internal Resource Time (Hours)	80	Assume 8hrs per working day and 10 working days	
AO Internal Staff Working	10		
ASHE 2022 Hourly Wage STEM Professional	16.27		ONS Annual Survey of Hours and Earnings



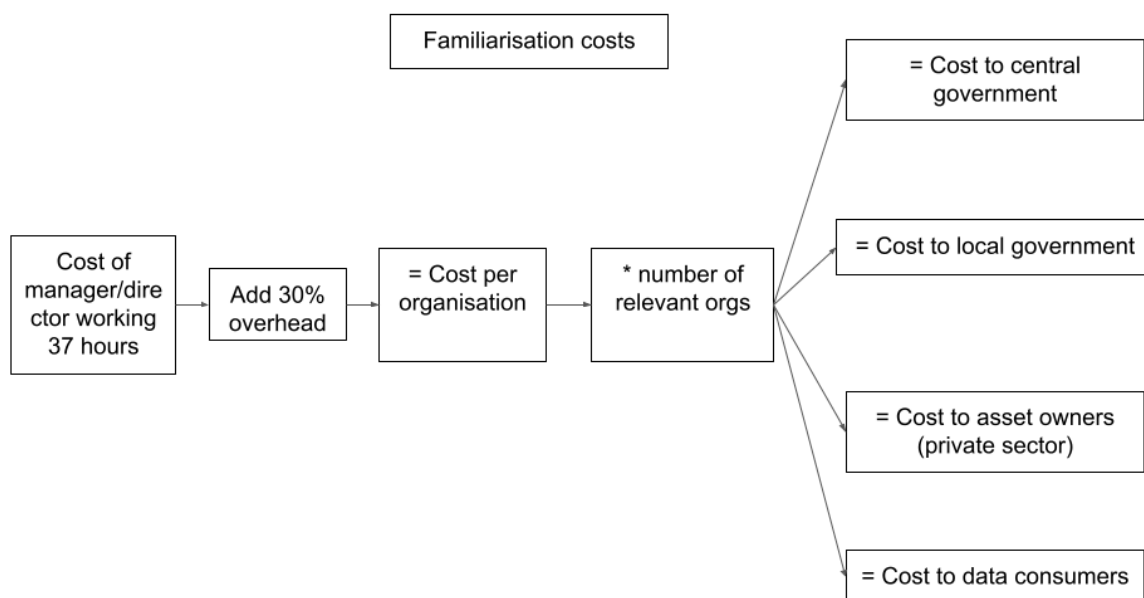
Cost to contract external transformation of data	£4,942		Real-world values now being available from the build-phase.
Cost per organisation	£17,958	Product of the four values above	
Total cost	£12,660,390	Above multiplied by the total number of asset owners (705)	
Cost to Central Government	<b>£454,475.54</b>	Cost per organisation multiplied by the total number of asset owners in central govt (25)	
Cost to Local Authorities	<b>£6,735,976.73</b>	Cost per organisation multiplied by the total number of asset owners in local authorities (375)	
Cost to Asset Owner (Private Sector)	<b>£5,469,937.73</b>	Cost per organisation multiplied by the total number of asset owners in private sector (305)	
Notes	<p>Assumed that it would require 10 staff working 80 to undertake initial transformation in addition to contracting an external supplier.</p> <p>The transformation costs have dropped significantly from the FBC due to real-world values now being available from the build-phase.</p> <p>As it is assumed that 100% of asset owners will have transformed their data using the free at point of use service provided by NUAR during the build phase, there will be no cost falling to asset owners for initial transformation.</p>		
<b>Ongoing Transformation (Refresh)</b>			
AO Internal Resource Time (Hours)	80		
AO Internal Staff Working	5	Same as initial transformation	
ASHE 2022 Salary STEM Professional	16.27		
Cost to contract external transformation (per refresh)	£2,471		
Refreshes per year	4	Assumed that data is refreshed every quarter	
Cost to contract external transformation (per annum)	£9,884		
Cost to organisation	£16,392	Product of the values above (internal time and cost + external cost)	
Total cost	£11,556,360	Above multiplied by the total number of asset owners (705)	
Cost to Central Government	<b>£414,844</b>	Cost per organisation multiplied by the total number of asset owners in central govt (25)	
Cost to Local Authorities	<b>£6,148,576</b>	Cost per organisation multiplied by the total number of asset owners in local authorities (375)	
Cost to Asset Owners (private sector)	<b>£4,992,940</b>	Cost per organisation multiplied by the total number of asset	

	owners in private sector (305)
Notes	<p>The ongoing data transformation is assumed to require 50% of the workload of the initial transformation.</p> <p>It is currently assumed that no further support will be available to asset owners during the build phase and so the full extent of these ongoing data transformation costs fall to them.</p>

**Table 17: Vectorisation costs**

Variable	Value	Source
Asset Owners requiring vectorisation to date (27th July 2023)	18	The NUAR team has held 'data workshops' with 311 organisations, representing 44% of total known asset owners as of July 2023. Of these organisations, 18 reported owning location data related to features in a non-vector format (12 energy, 2 local government, 2 water, 1 pipeline, 1 transport). Using this finding, we project there to be approximately 50 organisations across all organisations who may be impacted should this requirement be enacted, the majority being within the energy sector, particularly IDNOs.
Asset Owners engaged (specifically about whether their data needs vectorisation)	311	
Proportion of AOs impacted	5.8%	
Total number of AOs	705	
Expected AOs requiring vectorisation	40.80	
Rounding to nearest 50	50	
<b>Vectorisation Costs per AO</b>	<b>£70,000</b>	Based on a central estimate of vectorisation costs reported from two organisations
<b>Notes</b>	<p>AOs in Scope of Vectorisation: Estimated there to be approximately 50 organisations in scope of vectorisation:  18 impacted out of 311 spoken to to date. This yield a proportion of 5.8%.</p> <p>Applying this proportion to known 705 AOs to date (as per 27th July 2023), gives 40.80 AOs. This is rounded up to 50.</p> <p>Vectorisation Costs per AO: Using total costs from the pilots of the three organisations who carried out work most likely to resemble what will be required by the 50 and averaged them. This resulted in £70k.</p>	

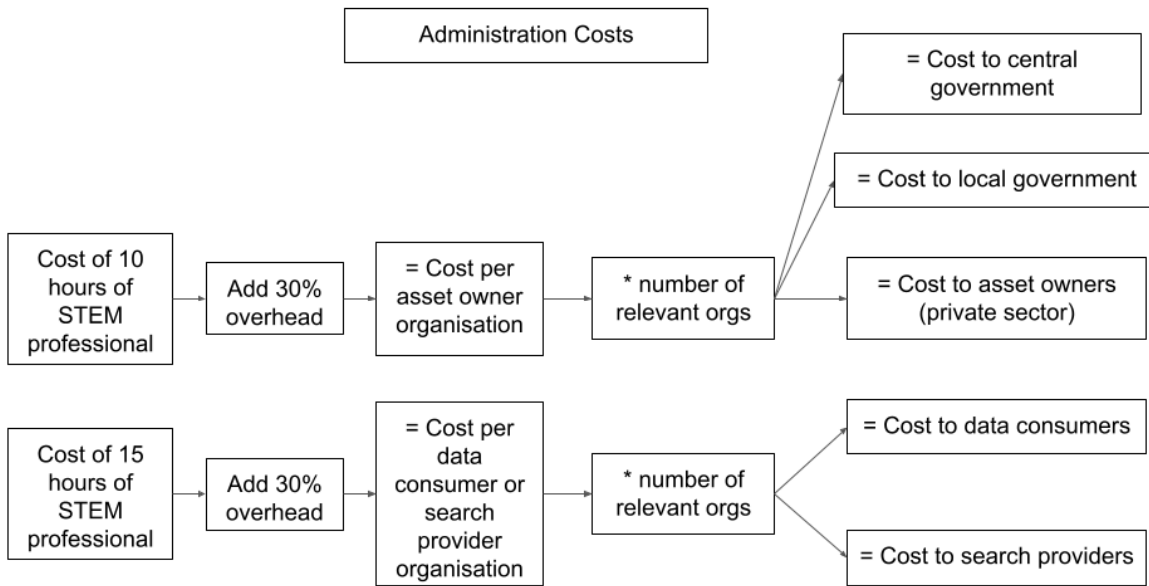
**Figure 16: Familiarisation costs flow diagram**



**Table 18: Familiarisation costs**

Variable	Value	Commentary	Source
Time required (hours)	37		Estimate based on engagement with asset owners and data consumers
ASHE 2022 Hourly Wage Corporate managers and directors	£30.23		ONS Annual Survey of Hours and Earnings
Overheads	30%		Estimate based on engagement with asset owners and data consumers
Cost per organisation	£1,454.06	The product of the time required and hourly wage, uplifted by the overheads estimate	
Total cost to asset owners	£1,025,114	As above, multiplied by the number of asset owners.	
Cost to Central Government	<b>£36,799</b>	Cost per organisation multiplied by the total number of asset owners in central govt (25)	
Cost to Local Authorities	<b>£545,413</b>	Cost per organisation multiplied by the total number of asset owners in local authorities (375)	
Cost to private sector Asset Owner	<b>£442,902</b>	Cost per organisation multiplied by the total number of asset owners in private sector (305)	
Cost to private sector Data Consumer	<b>£4,676,267</b>	Cost per organisation multiplied by the total number of data consumers in the private sector (3216)	
Total familiarisation costs	£5,701,381	Sum of the costs across asset owners and data consumers	

**Figure 17: Administration costs flow diagram**



**Table 19: Administration costs**

Variable	Value	Commentary	Source
Asset Owners time required (hours)	10		Estimate based on engagement with asset owners
Data consumer time required (hours)	15		Estimate based on engagement with data consumers
Search provider time required (hours)	15		Estimate based on engagement with asset owners and data consumers
Hourly Wage	16.27		ONS Annual Survey of Hours and Earnings
Overheads	30%		Estimate based on engagement with asset owners and data consumers
Cost per AO organisation	£211.51	Product of the time required for asset owners, the hourly wage, uplifted by the overhead estimate	
Cost to Data Consumer organisation	£317.27	Product of the time required for data consumers, the hourly wage, uplifted by the overhead estimate	
Cost to Search Provider organisation	£317.27	Product of the time required for search providers, the hourly wage, uplifted by the overhead estimate	
Total cost to AOs	£149,115	The cost per asset owner multiplied by the total number of asset owners (705)	

Cost to Central Government	<b>£5,353</b>	Cost per organisation multiplied by the total number of asset owners in central govt (25)	
Cost to Local Authorities	<b>£79,337</b>	Cost per organisation multiplied by the total number of asset owners in local authorities (375)	
Cost to Asset Owner	<b>£64,425</b>	Cost per organisation multiplied by the total number of asset owners in private sector (305)	
Cost to all Data Consumers	<b>£986,059.62</b>	Cost per organisation multiplied by the total number of data consumers in the private sector (3216)	
Cost to all Search Providers	<b>£634.53</b>	Cost per organisation multiplied by the total number of search providers in the private sector (2)	
Total administration costs	£1,135,809	Sum of administration costs	
Notes	These costs account for the time resource required by affected organisations to implement the organisational administrative changes (training and briefing material production) to bring the organisation in line with the legislation. These costs primarily occur in the year of legislation introduction and then repeat each year at a substantially lower cost (20% of initial cost)		

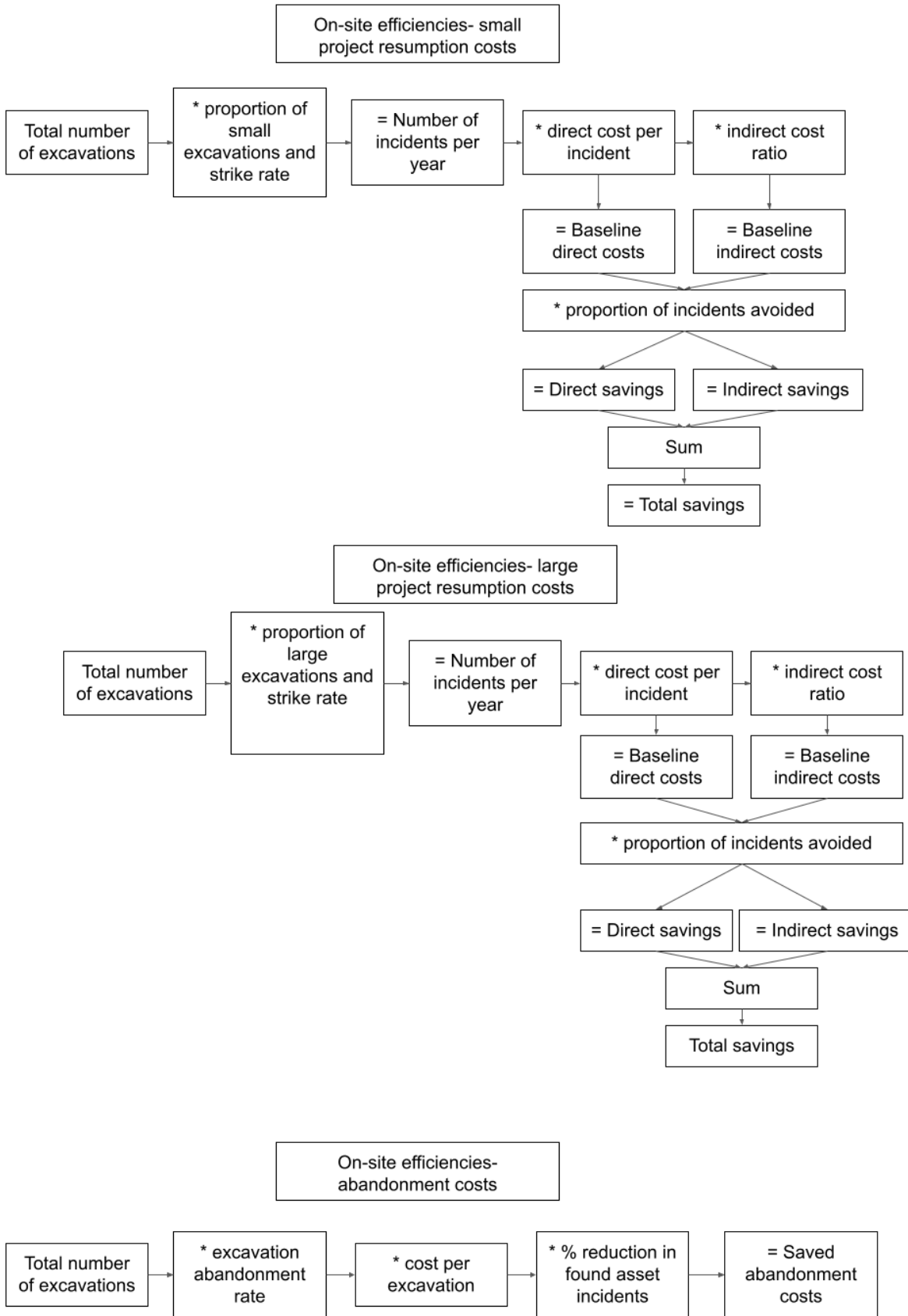
### **NUAR running costs (annual fee across non-SMB NUAR asset owners)**

The estimated running costs of NUAR are £6.1m per annum when 100% of asset owners are onboarded to the system. This is an estimate based on costs arising due to:

- Personnel costs
- Overheads, including accommodation and IT
- Platform and database costs
- Other costs, including marketing and enforcement

The central estimate of £6.1m per annum (when all asset owners are onboarded) has been varied to £3.1m in the low costs scenario and £9.2m in the high scenario. This is a variance of +/- 50% to demonstrate the effect of varying the running cost in the absence of other information. Later on as part of the cost-benefit analysis (in the main body of this impact assessment), we apply 10% optimism bias to all running costs.

### **Figure 18: On-site efficiencies flow diagrams**



**Table 20: on-site efficiency savings (benefits)**

Note: these are values prior to profiling according to usage, which follows the Roger’s curve of adoption. This is done in the cost-benefit analysis, as set out in the main body of the impact assessment. Profiles also set out in Annex B.

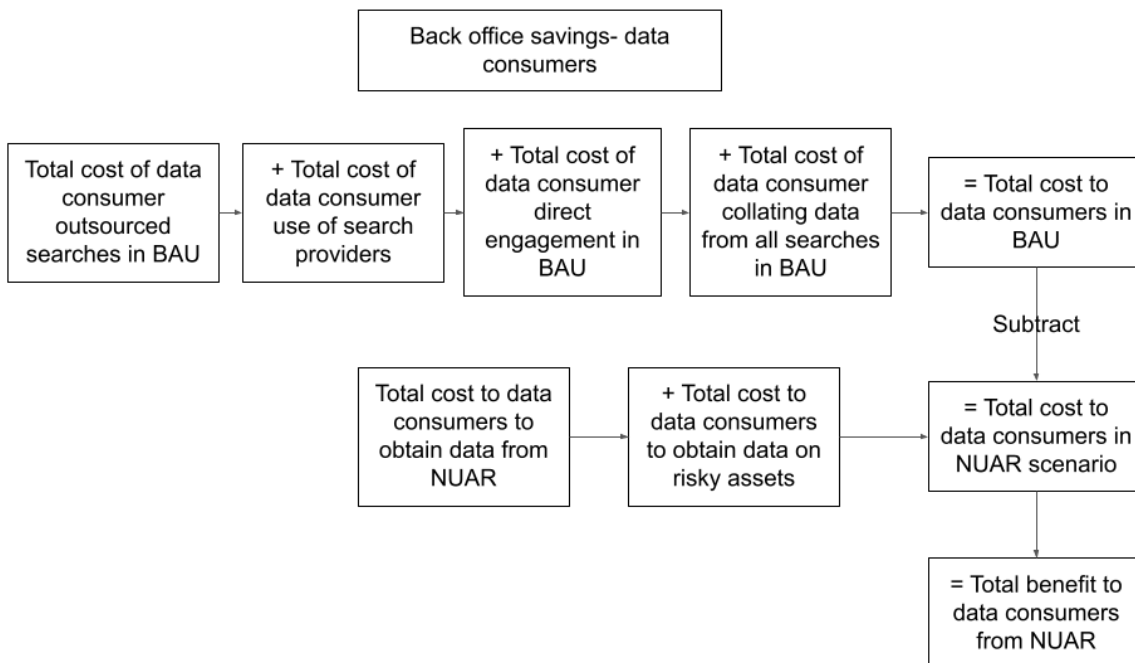
Variable	Value	Commentary	Source
<b>Total on-site efficiencies</b>	£121,312,203	Sum of saved resumption costs, saved abandonment costs and savings due to shorter map interpretation time. (Calculations below)	
<b>Resumption Costs - Small Projects</b>			
Number of excavations	3,960,428		Street Manager
% of which are small	99.9621%		
Number of small excavations	3958928	Product of the above two numbers	
Found asset incidents per year	36649	Product of the number of excavations per year and the calculated strike rate (based on a central estimate of 6000 asset strikes per year)	
Incident rate	0.93%	Proportion of the above figure and the number of excavations per year.	
Number of incidents per year	36634.7681	Product of the above number and the number of small excavations per year.	
Direct cost per incident	£520		
Incident indirect cost ratio	7.25		
Indirect cost per incident	£3,770.0000	Product of the above two numbers	
Total cost per incident	£4,290.0000	Sum of the above number and the direct cost per incident	
% of incidents avoided	56%		This accounts for the cost of resuming projects after discovering unexpected underground assets
Baseline direct costs	£19,050,079.40	Product of the direct cost per incident and number of incidents per year	
Baseline indirect costs	£138,113,075.68	Product of the indirect cost per incident and number of incidents per year	Small project resumption costs are based on the labour and equipment cost of a 2-day replanning and re-surveying delay
Baseline total costs	£157,163,155	Sum of the two above	
Direct savings	£10,668,044	Total direct costs multiplied by the percentage of incidents avoided	These workings are taken directly from the final business case published on gov.uk. A breakdown in the working of these can be found in the published economic case for NUAR.
Indirect savings	£77,343,322	Total indirect costs multiplied by the percentage of incidents avoided	
Total savings	£88,011,367	Sum of the two above	
<b>Resumption Costs - Large Projects</b>		Same methodology as above, but with a high estimated cost of resumption on large projects.	
Number of excavations	3,960,428		
% of which are large	0.04%		
Number of large excavations	1,500		

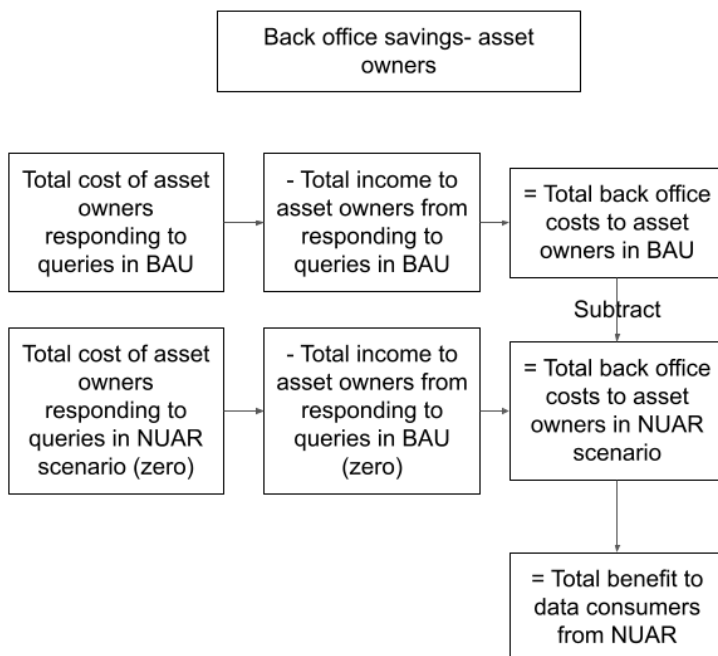
Found asset incidents per year	36,649		
Incident rate	10%		
Number of incidents per year	150		
Direct cost per incident	£40,000		
Incident indirect cost ratio	0		
Indirect cost per incident	£0		
Total cost per incident	£40,000		
% of incidents avoided	56%		
Baseline direct costs	£6,000,000		
Baseline indirect costs	£0		
Baseline total costs	£6,000,000		
Direct savings	£3,360,000		
Indirect savings	£0		
Total savings	£3,360,000		
Total Direct Resumption Savings	£14,028,044		
Total Indirect Resumption Savings	£77,343,322		
Total Resumption Savings	£91,371,367		
<b>Abandonment costs</b>			
Number of excavations	3,960,428		
Excavation abandonment rate	0.50%		
Cost per excavation	£300		
Reduction in found asset incidents	56%		
Baseline total abandonment costs	£5,940,642	Product of the number of excavations, excavation rate and the cost	
Saved abandonment costs (direct)	£3,326,760	Product of the above and the % reduction in found asset incidents	
<b>Planning efficiencies</b>			
Number of excavations	3,960,428		
Data interpretation time saved (mins)	30		
Trade rate for site projects	£24		
Potential savings of map interpretation	£47,525,136	Product of the above three numbers	



% of projects affected	56%		
Total savings of map interpretation	£26,614,076	Product of the above two	
<b>On-site efficiencies</b>			
Society (indirect savings)	£77,343,322		
Direct savings (Public & Private)	£43,968,880		
Public : Private Strike Split	30 : 70		
Public sector direct savings	£13,058,757		
Central Government direct savings	<b>£825,384</b>		
LA direct savings	<b>£12,233,373</b>		
Private sector Asset Owner direct savings	<b>£30,910,123</b>		
Electric	£12,248,758		
Gas	£5,854,054		
Telecoms	£5,850,474		
Fibre optic	£1,267,483		
Water (excl. sewer/drainage)	£5,345,629		
Sewer/drainage	£343,724		
Total on-site efficiencies	£121,312,203		

**Figure 19: Back-office savings flow diagrams**





**Table 21: Back-office savings (benefits)**

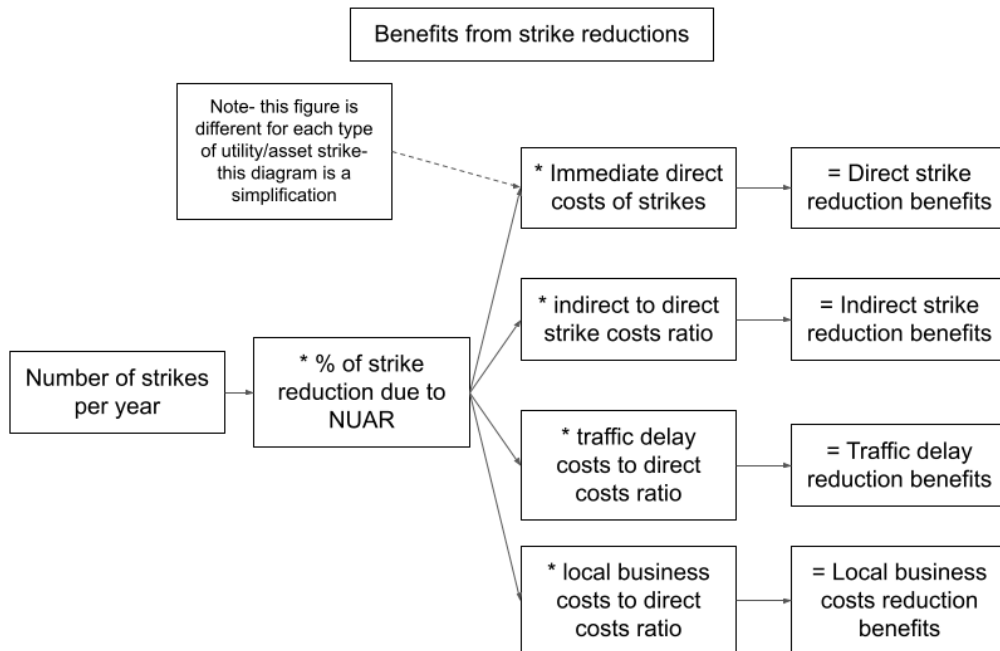
Note: these are values prior to profiling according to onboarding forecasts, enabled by legislation. This is done in the cost-benefit analysis, as set out in the main body of the impact assessment. Profiles also set out in Annex B.

Variable	Value	Commentary	Source
<b>Baseline (No NUAR)</b>			
Data Consumer outsourced searches	£17,645,617	Data consumers spend 343,121 hours a year managing 378,442 outsourced searches. Monetary value of the time spent is £5,667,342. Financial cost to the Data consumers for the outsourced searches is £11,978,275.	These workings are taken directly from the final business case published on gov.uk. A breakdown in the working of these can be found in the published economic case for NUAR.
Data Consumer use search providers	£29,311,184	Data consumers spend 1,774,601 hours a year approaching owners via search providers in 3,055,480 searches. Monetary value of the hours spent is £29,311,184.	
Data Consumer direct engagement	£75,095,485	3,031,027 of the above searches involve engaging owners with Direct-Line Enquiry Teams which take another 4,546,541 hours. Monetary value of the hours spent is £75,095,485	
Data Consumer collating data from all searches	£833,964,744	Annual time spent by data consumers on collating data from Stat Providers, Search Providers and owners' Direct-Line Enquiry Teams is worth £74,701,208, £519,446,503 and £239,817,034, respectively.	

AO cost of responding to queries	£150,724,417	Calculation of the time spent responding to queries.	
AO income from responding to queries	-£20,778,633	Estimates total disbursement charge to stat providers from asset owners	
Total Cost	£1,085,962,814	Sum of the BAU costs	
<b>Modelled NUAR Reduction</b>			
Data Consumer obtain data from NUAR	£56,718,296	Assume to take as long as using the search providers portal (without the need to collate data)	These workings are taken directly from the final business case published on gov.uk. A breakdown in the working of these can be found in the published economic case for NUAR.
Data Consumer aggregate data of risky assets	£166,792,949		
AO Cost of responding to queries	£0		
	£223,511,245		There remains a resource cost to data consumers in obtaining data from NUAR. Additionally, there is a cost to data consumers to account for ...  The cost to AOs for responding to queries is set to zero as NUAR will handle these queries.  NUAR will not cover risky assets where official Permission-to-Dig must be sought with each asset owner. Risky assets are defined as those which are a particular safety and security risk if tampered with. These include intermediate-to-high pressure gas pipes, high-voltage electricity cables, as well as underground assets directly serving sites of particular security risk e.g airports, military bases and ports.
Total Cost			
<b>Back Office Savings</b>			
Data Consumer	£732,505,785	Calculated as the difference	

		between the BAU scenario and the NUAR scenario	
Asset Owner	£129,945,784	Calculated as the difference between the BAU scenario and the NUAR scenario	
Total	<b>£862,451,569</b>	Sum of the above two	
<b>Split by stakeholder group</b>			
Public : Private Strike Split	30 : 70		
Public sector	£256,148,116	Total savings multiplied by the weighted % of asset owners in public sector (30%)	
Central Gov direct savings	<b>£16,189,949</b>	As above but multiplied by the ratio of central govt asset owners to LA asset owners	
LA direct savings	<b>£239,958,167</b>	As above but multiplied by the ratio of LA asset owners to central govt asset owners	
Private sector	£606,303,453	Total savings multiplied by the weighted % of asset owners in private sector (70%)	
Electric	£240,259,946	As above but multiplied by the ratio of electric asset owners to all private asset owners	
Gas	£114,827,539	As above but multiplied by the ratio of gas asset owners to all private asset owners	
Telecoms	£114,757,308	As above but multiplied by the ratio of telecoms asset owners to all private asset owners	
Fibre optic	£24,861,742	As above but multiplied by the ratio of fibre asset owners to all private asset owners	
Water (excl. sewer/drainage)	£104,854,750	As above but multiplied by the ratio of water asset owners to all private asset owners	
Sewer/drainage	£6,742,167	As above but multiplied by the ratio of sewage asset owners to all private asset owners	
Private sector data consumers	<b>£497,289,443</b>	As above but multiplied by the proportion of data consumers to all AOs	
Private sector asset owners	<b>£109,014,010</b>	As above but multiplied by the proportion of AOs to all data consumers	

**Figure 20: Strike reduction flow diagram**



**Table 22: Strike reduction benefits**

Note: these are values prior to profiling according to usage, which follows the Roger’s curve of adoption. This is done in the cost-benefit analysis, as set out in the main body of the impact assessment. Profiles also set out in Annex B.

Variable	Value	Commentary	Source
Number of strikes			
Strikes per year	60,000		USAG 2014, Beck et al (2007) and the Civil Engineering Contractors Association
Strikes on electricity infrastructure	23,776	This is the number of strikes per year, multiplied by the proportion of each type of strike according to USAG.	USAG 2014-2019 reports
Strikes on gas infrastructure	11,363		
Strikes on telecoms infrastructure	11,356		
Strikes on fibre optic infrastructure	2,460		
Strikes on water (excl. sewage / drainage) infrastructure	10,376		
Strikes on sewage / drainage infrastructure	667		
Direct Costs			
Annual direct cost of electric strikes	£82,157,364	This is the number of each strike per year multiplied by the direct cost of each strike according to Makana et al 2019.	Makana et al 2019
Annual direct cost of gas strikes	£49,075,568		

Annual direct cost of telecoms strikes	£7,722,368		
Annual direct cost of fibre optic strikes	£6,888,915		
Annual direct cost of water (excl. sewage / drainage) strikes	£55,773,485		
Annual direct cost of sewage / drainage strikes	£655,865		
<b>Total direct costs</b>	<b>£202,273,564</b>	Sum of the above costs	
Indirect Costs			
Annual indirect cost of electric strikes	£2,382,563,567	These are the direct costs multiplied by the ratio of indirect/direct costs adapted from Makana et al 2019. (3.68)	Makana et al 2019
Annual indirect cost of gas strikes	£1,423,191,460		
Annual indirect cost of telecoms strikes	£223,948,662		
Annual indirect cost of fibre optic strikes	£199,778,524		
Annual indirect cost of water (excl. sewage / drainage) strikes	£1,617,431,078		
Annual indirect cost of sewage / drainage strikes	£19,020,076		
<b>Total indirect costs</b>	<b>£5,865,933,368</b>		
Annual costs			
Annual cost of electric strikes	£2,464,720,931	Sum of direct and indirect	
Annual cost of gas strikes	£1,472,267,028		
Annual cost of telecoms strikes	£231,671,030		
Annual cost of fibre optic strikes	£206,667,439		
Annual cost of water (excl. sewage / drainage) strikes	£1,673,204,564		
Annual cost of sewage / drainage strikes	£19,675,941		
<b>Total cost</b>	<b>£6,068,206,933</b>		
Savings			
Modelled reduction in strikes	15%	This figure is calculated by aggregating the proportions of strikes that occur due to factors that would be addressed by NUAR, with each aspect taken from the USAG Report (30%) and then taking a conservative estimate of 15%.	
Modelled direct savings	£30,341,035	The above direct savings multiplied by the reduction in strikes	

Modelled total indirect savings	<b>£879,890,005</b>	The above indirect savings multiplied by the reduction in strikes	
Modelled savings	£910,231,040	The sum of the two above	
Savings split by Stakeholder group			
<b>Society (indirect savings)</b>	£879,890,005	Equal to the indirect savings	
Public : Private Strike Split for direct savings	30 : 70		
Public sector	£9,011,287	Total savings multiplied by the weighted % of asset owners in public sector (30%)	
Central Gov direct savings	£569,562	As above but multiplied by the ratio of central govt asset owners to LA asset owners	
LA direct savings	£8,441,725	As above but multiplied by the ratio of LA asset owners to central govt asset owners	
Private sector	£21,329,747	Total savings multiplied by the weighted % of asset owners in private sector (70%)	
Electric	£8,452,342	As above but multiplied by the ratio of electric asset owners to all private asset owners	
Gas	£4,039,631	As above but multiplied by the ratio of gas asset owners to all private asset owners	
Telecoms	£4,037,161	As above but multiplied by the ratio of telecoms asset owners to all private asset owners	
Fibre optic	£874,636	As above but multiplied by the ratio of fibre asset owners to all private asset owners	
Water (excl. sewer/drainage)	£3,688,789	As above but multiplied by the ratio of water asset owners to all private asset owners	
Sewer/drainage	£237,189	As above but multiplied by the ratio of sewage asset owners to all private asset owners	
<b>Summary of indirect benefits</b>			
Modelled indirect savings due to reduction of traffic delays	<b>£401,108,478</b>	These are the direct savings multiplied by the ratio of traffic delay/direct costs adapted from Makana et al 2019. (13.22)	Makana et al 2019
Modelled indirect savings due to reduction of costs to	<b>£375,622,009</b>	These are the direct savings multiplied by the ratio of local	

businesses		business/direct costs adapted from Makana et al 2019. (12.38)	
Remaining indirect savings	<b>£103,159,518</b>	This is the total indirect savings (£879.9m from above) subtracted by the savings due to traffic delays and reduced costs to businesses.	Makana et al 2019



## **Annex B.2: Profiling of costs and benefits for input into the BIT calculator**

The costs and benefits shown in bold in Annex B.1 were then profiled to reflect (a) how many asset owners are predicted to be onboarded to NUAR in each appraisal year and (b) what proportion of data consumers are using NUAR in each appraisal year.

This section explicitly demonstrates how each cost and benefit is calculated for each appraisal year of the policy. Each table shows how the figures derived in Annex B.1 (inputs) and multiplied by their relevant profiling factors to arrive at the 'output' for the BIT calculator at the bottom of the table. This has been shown for the central estimate value only, the same process applies for the high and low scenarios. The outputs are given in £m for consistency and simpler cross-referencing with the BIT calculator.

There is one table for each cost (18 total) and benefit (14 total) which is eventually used in the BIT calculator. Due to limitations in the BIT calculator template, the transition costs for each stakeholder category were summed prior to entry into the BIT calculator. This is taken at the sum of "Data Transformation (Initial)", "Familiarisation costs" and "Vectorisation costs"- this has been done separately for central government, local government, asset owners and data consumers.

The profiling variables are summarised in the table below:

Financial Year	2024/25	2025/26	2026/27	2027/28	2028/29	2029/30	2030/31	2031/32	2032/33	2033/34
Proportion of AOs onboarded	80%	98%	100%	100%	100%	100%	100%	100%	100%	100%
–Note	The proportion of asset owners onboarded to NUAR. This is described in section ‘Apportioning benefits across the appraisal period’ of the IA- used to calculate costs and benefits associated with being on the NUAR system									
New AOs onboarded	80%	18%	2%	0%	0%	0%	0%	0%	0%	0%
–Note	The % of newly onboarded asset owners onboarded to NUAR- used to calculate where transition costs fall									
Users running dual systems	50%	25%	10%	0%	0%	0%	0%	0%	0%	0%
Net NUAR Only usage	30%	73%	90%	100%	100%	100%	100%	100%	100%	100%
–Note	This is calculated as ‘Proportion of AOs onboarded’ MINUS ‘Users running dual systems’ to give the proportion of AOs which are exclusively using NUAR. Used to calculate back office efficiencies.									
Usage in digs by data consumers	4%	9%	24%	50%	76%	90%	95%	99%	99%	99%
–Note	The proportion of data consumers using NUAR. This is described in section ‘Apportioning benefits across the appraisal period’ of the IA- used to calculate costs and benefits associated with using NUAR.									
Optimism bias- costs	150%	150%	150%	150%	150%	150%	150%	150%	150%	150%
–Note	All costs are uplifted by 50% for optimism bias.									
Optimism bias- benefits	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%
–Note	All benefits are reduced by 50% for optimism bias.									

Costs

Financial Year	2024/25	2025/26	2026/27	2027/28	2028/29	2029/30	2030/31	2031/32	2032/33	2033/34
Appraisal year	1	2	3	4	5	6	7	8	9	10
Input: Central Government-Data Transformation (Initial)	£454,476	£454,476	£454,476	£454,476	£454,476	£454,476	£454,476	£454,476	£454,476	£454,476
GDP Deflator - 2021 PRICES - Discount Factor	0.90	0.89	0.88	0.87	0.85	0.83	0.81	0.79	0.77	0.76
New AOs onboarded	80%	18%	2%	0%	0%	0%	0%	0%	0%	0%
Optimism bias- costs	150%	150%	150%	150%	150%	150%	150%	150%	150%	150%
Output: Central Government-Data Transformation (Initial) (£m)	£0.493	£0.108	£0.012	£0.000	£0.000	£0.000	£0.000	£0.000	£0.000	£0.000

Financial Year	2024/25	2025/26	2026/27	2027/28	2028/29	2029/30	2030/31	2031/32	2032/33	2033/34
Appraisal year	1	2	3	4	5	6	7	8	9	10
Input: Central Government-Data Transformation (Refresh)	£207,422	£414,844	£414,844	£414,844	£414,844	£414,844	£414,844	£414,844	£414,844	£414,844
GDP Deflator - 2021 PRICES - Discount Factor	0.90	0.89	0.88	0.87	0.85	0.83	0.81	0.79	0.77	0.76
Proportion of AOs onboarded	80%	98%	100%	100%	100%	100%	100%	100%	100%	100%
Optimism bias- costs	150%	150%	150%	150%	150%	150%	150%	150%	150%	150%
Output: Central Government- Data Transformation (Refresh) (£m)	£0.225	£0.544	£0.549	£0.540	£0.528	£0.516	£0.504	£0.493	£0.482	£0.471

OFFICIAL - SENSITIVE - COMMERCIAL

Financial Year	2024/25	2025/26	2026/27	2027/28	2028/29	2029/30	2030/31	2031/32	2032/33	2033/34
Appraisal year	1	2	3	4	5	6	7	8	9	10
Input: Central Government-Familiarisation costs	£36,799	£36,799	£36,799	£36,799	£36,799	£36,799	£36,799	£36,799	£36,799	£36,799
GDP Deflator - 2021 PRICES - Discount Factor	0.90	0.89	0.88	0.87	0.85	0.83	0.81	0.79	0.77	0.76
New AOs onboarded	80%	18%	2%	0%	0%	0%	0%	0%	0%	0%
Optimism bias- costs	150%	150%	150%	150%	150%	150%	150%	150%	150%	150%
Output: Central Government-Familiarisation costs (£m)	£0.040	£0.009	£0.001	£0.000	£0.000	£0.000	£0.000	£0.000	£0.000	£0.000

Administration costs are assumed to continue at a rate of 20% of the initial cost.

Financial Year	2024/25	2025/26	2026/27	2027/28	2028/29	2029/30	2030/31	2031/32	2032/33	2033/34
Appraisal year	1	2	3	4	5	6	7	8	9	10
Input: Central Government-Administration costs	£5,353	£1,071	£1,071	£1,071	£1,071	£1,071	£1,071	£1,071	£1,071	£1,071
GDP Deflator - 2021 PRICES - Discount Factor	0.90	0.89	0.88	0.87	0.85	0.83	0.81	0.79	0.77	0.76
Proportion of AOs onboarded	80%	98%	100%	100%	100%	100%	100%	100%	100%	100%
Optimism bias- costs	150%	150%	150%	150%	150%	150%	150%	150%	150%	150%
Output: Central Government-Administration costs (£m)	£0.006	£0.001	£0.001	£0.001	£0.001	£0.001	£0.001	£0.001	£0.001	£0.001

OFFICIAL - SENSITIVE - COMMERCIAL

Financial Year	2024/25	2025/26	2026/27	2027/28	2028/29	2029/30	2030/31	2031/32	2032/33	2033/34
Appraisal year	1	2	3	4	5	6	7	8	9	10
Input: Local Authorities- Data Transformation (Initial)	£6,735,977	£6,735,977	£6,735,977	£6,735,977	£6,735,977	£6,735,977	£6,735,977	£6,735,977	£6,735,977	£6,735,977
GDP Deflator - 2021 PRICES - Discount Factor	0.90	0.89	0.88	0.87	0.85	0.83	0.81	0.79	0.77	0.76
New AOs onboarded	80%	18%	2%	0%	0%	0%	0%	0%	0%	0%
Optimism bias- costs	150%	150%	150%	150%	150%	150%	150%	150%	150%	150%
Output: Local Authorities- Data Transformation (Initial) (£m)	£7.314	£1.595	£0.178	£0.000	£0.000	£0.000	£0.000	£0.000	£0.000	£0.000

Financial Year	2024/25	2025/26	2026/27	2027/28	2028/29	2029/30	2030/31	2031/32	2032/33	2033/34
Appraisal year	1	2	3	4	5	6	7	8	9	10
Input: Local Authorities- Data Transformation (Refresh)	£3,074,288	£6,148,576	£6,148,576	£6,148,576	£6,148,576	£6,148,576	£6,148,576	£6,148,576	£6,148,576	£6,148,576
GDP Deflator - 2021 PRICES - Discount Factor	0.90	0.89	0.88	0.87	0.85	0.83	0.81	0.79	0.77	0.76
Proportion of AOs onboarded	80%	98%	100%	100%	100%	100%	100%	100%	100%	100%
Optimism bias- costs	150%	150%	150%	150%	150%	150%	150%	150%	150%	150%
Output: Local Authorities- Data Transformation (Refresh) (£m)	£3.338	£8.068	£8.135	£8.003	£7.823	£7.647	£7.475	£7.307	£7.143	£6.983

OFFICIAL - SENSITIVE - COMMERCIAL

Financial Year	2024/25	2025/26	2026/27	2027/28	2028/29	2029/30	2030/31	2031/32	2032/33	2033/34
Appraisal year	1	2	3	4	5	6	7	8	9	10
Input: Local Authorities- Familiarisation costs	£545,413	£545,413	£545,413	£545,413	£545,413	£545,413	£545,413	£545,413	£545,413	£545,413
GDP Deflator - 2021 PRICES - Discount Factor	0.90	0.89	0.88	0.87	0.85	0.83	0.81	0.79	0.77	0.76
New AOs onboarded	80%	18%	2%	0%	0%	0%	0%	0%	0%	0%
Optimism bias- costs	150%	150%	150%	150%	150%	150%	150%	150%	150%	150%
Output: Local Authorities- Familiarisation costs (£m)	£0.592	£0.129	£0.014	£0.000	£0.000	£0.000	£0.000	£0.000	£0.000	£0.000

Administration costs are assumed to continue at a rate of 20% of the initial cost.

Financial Year	2024/25	2025/26	2026/27	2027/28	2028/29	2029/30	2030/31	2031/32	2032/33	2033/34
Appraisal year	1	2	3	4	5	6	7	8	9	10
Input: Local Authorities- Administrative costs	£79,337	£15,867	£15,867	£15,867	£15,867	£15,867	£15,867	£15,867	£15,867	£15,867
GDP Deflator - 2021 PRICES - Discount Factor	0.90	0.89	0.88	0.87	0.85	0.83	0.81	0.79	0.77	0.76
Proportion of AOs onboarded	80%	98%	100%	100%	100%	100%	100%	100%	100%	100%
Optimism bias- costs	150%	150%	150%	150%	150%	150%	150%	150%	150%	150%
Output: Local Authorities- Administrative costs (£m)	£0.086	£0.021	£0.021	£0.021	£0.020	£0.020	£0.019	£0.019	£0.018	£0.018

OFFICIAL - SENSITIVE - COMMERCIAL

Financial Year	2024/25	2025/26	2026/27	2027/28	2028/29	2029/30	2030/31	2031/32	2032/33	2033/34
Appraisal year	1	2	3	4	5	6	7	8	9	10
Input: Asset Owners- NUAR Annual fee	£6,100,000	£6,100,000	£6,100,000	£6,100,000	£6,100,000	£6,100,000	£6,100,000	£6,100,000	£6,100,000	£6,100,000
GDP Deflator - 2021 PRICES - Discount Factor	0.90	0.89	0.88	0.87	0.85	0.83	0.81	0.79	0.77	0.76
Optimism bias- costs	110%	110%	110%	110%	110%	110%	110%	110%	110%	110%
Output: Asset Owners- NUAR Annual fee (£m)	£6.047	£5.990	£5.919	£5.823	£5.692	£5.564	£5.439	£5.316	£5.197	£5.080

Financial Year	2024/25	2025/26	2026/27	2027/28	2028/29	2029/30	2030/31	2031/32	2032/33	2033/34
Appraisal year	1	2	3	4	5	6	7	8	9	10
Input: Asset Owners- Data Transformation (Initial)	£5,469,938	£5,469,938	£5,469,938	£5,469,938	£5,469,938	£5,469,938	£5,469,938	£5,469,938	£5,469,938	£5,469,938
GDP Deflator - 2021 PRICES - Discount Factor	0.90	0.89	0.88	0.87	0.85	0.83	0.81	0.79	0.77	0.76
New AOs onboarded	80%	18%	2%	0%	0%	0%	0%	0%	0%	0%
Optimism bias- costs	150%	150%	150%	150%	150%	150%	150%	150%	150%	150%
Output: Asset Owners- Data Transformation (Initial) (£m)	£5.939	£1.295	£0.145	£0.000	£0.000	£0.000	£0.000	£0.000	£0.000	£0.000

OFFICIAL - SENSITIVE - COMMERCIAL

Financial Year	2024/25	2025/26	2026/27	2027/28	2028/29	2029/30	2030/31	2031/32	2032/33	2033/34
Appraisal year	1	2	3	4	5	6	7	8	9	10
Input: Asset Owners- Data Transformation (Refresh)	£2,496,470	£4,992,940	£4,992,940	£4,992,940	£4,992,940	£4,992,940	£4,992,940	£4,992,940	£4,992,940	£4,992,940
GDP Deflator - 2021 PRICES - Discount Factor	0.90	0.89	0.88	0.87	0.85	0.83	0.81	0.79	0.77	0.76
Proportion of AOs onboarded	80%	98%	100%	100%	100%	100%	100%	100%	100%	100%
Optimism bias- costs	150%	150%	150%	150%	150%	150%	150%	150%	150%	150%
Output: Asset Owners- Data Transformation (Refresh) (£m)	£2.711	£6.552	£6.606	£6.499	£6.353	£6.210	£6.070	£5.934	£5.801	£5.670

Financial Year	2024/25	2025/26	2026/27	2027/28	2028/29	2029/30	2030/31	2031/32	2032/33	2033/34
Appraisal year	1	2	3	4	5	6	7	8	9	10
Input: Asset Owners- Familiarisation costs	£442,902	£442,902	£442,902	£442,902	£442,902	£442,902	£442,902	£442,902	£442,902	£442,902
GDP Deflator - 2021 PRICES - Discount Factor	0.90	0.89	0.88	0.87	0.85	0.83	0.81	0.79	0.77	0.76
New AOs onboarded	80%	18%	2%	0%	0%	0%	0%	0%	0%	0%
Optimism bias- costs	150%	150%	150%	150%	150%	150%	150%	150%	150%	150%
Output: Asset Owners- Familiarisation costs (£m)	£0.481	£0.105	£0.012	£0.000	£0.000	£0.000	£0.000	£0.000	£0.000	£0.000



Administration costs are assumed to continue at a rate of 20% of the initial cost.

Financial Year	2024/25	2025/26	2026/27	2027/28	2028/29	2029/30	2030/31	2031/32	2032/33	2033/34
Appraisal year	1	2	3	4	5	6	7	8	9	10
Input: Asset Owners- Administrative costs	£64,425	£12,885	£12,885	£12,885	£12,885	£12,885	£12,885	£12,885	£12,885	£12,885
GDP Deflator - 2021 PRICES - Discount Factor	0.90	0.89	0.88	0.87	0.85	0.83	0.81	0.79	0.77	0.76
Proportion of AOs onboarded	80%	98%	100%	100%	100%	100%	100%	100%	100%	100%
Optimism bias- costs	150%	150%	150%	150%	150%	150%	150%	150%	150%	150%
Output: Asset Owners- Administrative costs (£m)	£0.070	£0.017	£0.017	£0.017	£0.016	£0.016	£0.016	£0.015	£0.015	£0.015

Financial Year	2024/25	2025/26	2026/27	2027/28	2028/29	2029/30	2030/31	2031/32	2032/33	2033/34
Appraisal year	1	2	3	4	5	6	7	8	9	10
Input: Data Consumers- Familiarisation costs	£4,676,267	£4,676,267	£4,676,267	£4,676,267	£4,676,267	£4,676,267	£4,676,267	£4,676,267	£4,676,267	£4,676,267
GDP Deflator - 2021 PRICES - Discount Factor	0.90	0.89	0.88	0.87	0.85	0.83	0.81	0.79	0.77	0.76
New AOs onboarded	80%	18%	2%	0%	0%	0%	0%	0%	0%	0%
Optimism bias- costs	150%	150%	150%	150%	150%	150%	150%	150%	150%	150%
Output: Data Consumers- Familiarisation costs (£m)	£5.077	£1.107	£0.124	£0.000	£0.000	£0.000	£0.000	£0.000	£0.000	£0.000

Administration costs are assumed to continue at a rate of 20% of the initial cost.

Financial Year	2024/25	2025/26	2026/27	2027/28	2028/29	2029/30	2030/31	2031/32	2032/33	2033/34
Appraisal year	1	2	3	4	5	6	7	8	9	10
Input: Data Consumers- Administrative costs	£986,060	£197,212	£197,212	£197,212	£197,212	£197,212	£197,212	£197,212	£197,212	£197,212
GDP Deflator - 2021 PRICES - Discount Factor	0.90	0.89	0.88	0.87	0.85	0.83	0.81	0.79	0.77	0.76
Usage in digs by data consumers	4%	9%	24%	50%	76%	90%	95%	99%	99%	99%
Optimism bias- costs	150%	150%	150%	150%	150%	150%	150%	150%	150%	150%
Output: Data Consumers- Administrative costs (£m)	£0.053	£0.024	£0.063	£0.128	£0.191	£0.221	£0.228	£0.232	£0.227	£0.222

Financial Year	2024/25	2025/26	2026/27	2027/28	2028/29	2029/30	2030/31	2031/32	2032/33	2033/34
Appraisal year	1	2	3	4	5	6	7	8	9	10
Input: Central Government- Vectorisation costs	£125,641	£125,641	£125,641	£125,641	£125,641	£125,641	£125,641	£125,641	£125,641	£125,641
GDP Deflator - 2021 PRICES - Discount Factor	0.90	0.89	0.88	0.87	0.85	0.83	0.81	0.79	0.77	0.76
New AOs onboarded	80%	18%	2%	0%	0%	0%	0%	0%	0%	0%
Optimism bias- costs	150%	150%	150%	150%	150%	150%	150%	150%	150%	150%
Output: Central Government- Vectorisation costs (£m)	£0.136	£0.030	£0.003	£0.000	£0.000	£0.000	£0.000	£0.000	£0.000	£0.000

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Financial Year	2024/25	2025/26	2026/27	2027/28	2028/29	2029/30	2030/31	2031/32	2032/33	2033/34
Appraisal year	1	2	3	4	5	6	7	8	9	10
Input: Local Authorities- Vectorisation costs	£1,862,179	£1,862,179	£1,862,179	£1,862,179	£1,862,179	£1,862,179	£1,862,179	£1,862,179	£1,862,179	£1,862,179
GDP Deflator - 2021 PRICES - Discount Factor	0.90	0.89	0.88	0.87	0.85	0.83	0.81	0.79	0.77	0.76
New AOs onboarded	80%	18%	2%	0%	0%	0%	0%	0%	0%	0%
Optimism bias- costs	150%	150%	150%	150%	150%	150%	150%	150%	150%	150%
Output: Local Authorities- Vectorisation costs (£m)	£2.022	£0.441	£0.049	£0.000	£0.000	£0.000	£0.000	£0.000	£0.000	£0.000

Financial Year	2024/25	2025/26	2026/27	2027/28	2028/29	2029/30	2030/31	2031/32	2032/33	2033/34
Appraisal year	1	2	3	4	5	6	7	8	9	10
Input: PRIVATE SECTOR- Asset Owners, Vectorisation costs	£1,512,179	£1,512,179	£1,512,179	£1,512,179	£1,512,179	£1,512,179	£1,512,179	£1,512,179	£1,512,179	£1,512,179
GDP Deflator - 2021 PRICES - Discount Factor	0.90	0.89	0.88	0.87	0.85	0.83	0.81	0.79	0.77	0.76
New AOs onboarded	80%	18%	2%	0%	0%	0%	0%	0%	0%	0%
Optimism bias- costs	150%	150%	150%	150%	150%	150%	150%	150%	150%	150%
Output: PRIVATE SECTOR- Asset Owners, Vectorisation costs (£m)	£1.642	£0.358	£0.040	£0.000	£0.000	£0.000	£0.000	£0.000	£0.000	£0.000

## Total transition costs- central government

Financial Year	2024/25	2025/26	2026/27	2027/28	2028/29	2029/30	2030/31	2031/32	2032/33	2033/34
Appraisal year	1	2	3	4	5	6	7	8	9	10
Central Government- Data Transformation (Initial) (£m)	£0.493	£0.108	£0.012	£0.000	£0.000	£0.000	£0.000	£0.000	£0.000	£0.000
Central Government- Familiarisation costs (£m)	£0.040	£0.009	£0.001	£0.000	£0.000	£0.000	£0.000	£0.000	£0.000	£0.000
Central Government- Vectorisation costs (£m)	£0.136	£0.030	£0.003	£0.000	£0.000	£0.000	£0.000	£0.000	£0.000	£0.000
<b>Central Government- total transition costs</b>	<b>£0.670</b>	<b>£0.146</b>	<b>£0.016</b>	<b>£0.000</b>	<b>£0.000</b>	<b>£0.000</b>	<b>£0.000</b>	<b>£0.000</b>	<b>£0.000</b>	<b>£0.000</b>

## Total transition costs- local authorities

Financial Year	2024/25	2025/26	2026/27	2027/28	2028/29	2029/30	2030/31	2031/32	2032/33	2033/34
Appraisal year	1	2	3	4	5	6	7	8	9	10
Local Authorities- Data Transformation (Initial) (£m)	£7.314	£1.595	£0.178	£0.000	£0.000	£0.000	£0.000	£0.000	£0.000	£0.000
Local Authorities- Familiarisation costs (£m)	£0.592	£0.129	£0.014	£0.000	£0.000	£0.000	£0.000	£0.000	£0.000	£0.000
Local Authorities- Vectorisation costs (£m)	£2.022	£0.441	£0.049	£0.000	£0.000	£0.000	£0.000	£0.000	£0.000	£0.000
<b>Local Authorities- total transition costs</b>	<b>£9.928</b>	<b>£2.165</b>	<b>£0.242</b>	<b>£0.000</b>	<b>£0.000</b>	<b>£0.000</b>	<b>£0.000</b>	<b>£0.000</b>	<b>£0.000</b>	<b>£0.000</b>

## Total transition costs- asset owners

Financial Year	2024/25	2025/26	2026/27	2027/28	2028/29	2029/30	2030/31	2031/32	2032/33	2033/34
Appraisal year	1	2	3	4	5	6	7	8	9	10
Asset Owners- Data Transformation (Initial) (£m)	£5.939	£1.295	£0.145	£0.000	£0.000	£0.000	£0.000	£0.000	£0.000	£0.000
Asset Owners- Familiarisation costs (£m)	£0.481	£0.105	£0.012	£0.000	£0.000	£0.000	£0.000	£0.000	£0.000	£0.000
PRIVATE SECTOR- Asset Owners, Vectorisation costs (£m)	£1.642	£0.358	£0.040	£0.000	£0.000	£0.000	£0.000	£0.000	£0.000	£0.000
<b>Asset Owners- total transition costs</b>	<b>£8.062</b>	<b>£1.758</b>	<b>£0.196</b>	<b>£0.000</b>	<b>£0.000</b>	<b>£0.000</b>	<b>£0.000</b>	<b>£0.000</b>	<b>£0.000</b>	<b>£0.000</b>

## Total transition costs- data consumers

Financial Year	2024/25	2025/26	2026/27	2027/28	2028/29	2029/30	2030/31	2031/32	2032/33	2033/34
Appraisal year	1	2	3	4	5	6	7	8	9	10
Data Consumers- Familiarisation costs (£m)	£5.077	£1.107	£0.124	£0.000	£0.000	£0.000	£0.000	£0.000	£0.000	£0.000
<b>Data Consumers- total transition costs (£m)</b>	<b>£5.077</b>	<b>£1.107</b>	<b>£0.124</b>	<b>£0.000</b>	<b>£0.000</b>	<b>£0.000</b>	<b>£0.000</b>	<b>£0.000</b>	<b>£0.000</b>	<b>£0.000</b>

Benefits

Financial Year	2024/25	2025/26	2026/27	2027/28	2028/29	2029/30	2030/31	2031/32	2032/33	2033/34
Appraisal year	1	2	3	4	5	6	7	8	9	10
Input: Central Government- Strike Avoidance	£569,562	£569,562	£569,562	£569,562	£569,562	£569,562	£569,562	£569,562	£569,562	£569,562
GDP Deflator - 2021 PRICES - Discount Factor	0.90	0.89	0.88	0.87	0.85	0.83	0.81	0.79	0.77	0.76
Usage in digs by data consumers	4%	9%	24%	50%	76%	90%	95%	99%	99%	99%
Optimism bias- benefits	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%
Output: Central Government- Strike Avoidance (£m)	£0.010	£0.023	£0.060	£0.124	£0.184	£0.213	£0.219	£0.223	£0.218	£0.213

Financial Year	2024/25	2025/26	2026/27	2027/28	2028/29	2029/30	2030/31	2031/32	2032/33	2033/34
Appraisal year	1	2	3	4	5	6	7	8	9	10
Input: Central Government- Back office efficiency	£16,189,949	£16,189,949	£16,189,949	£16,189,949	£16,189,949	£16,189,949	£16,189,949	£16,189,949	£16,189,949	£16,189,949
GDP Deflator - 2021 PRICES - Discount Factor	0.90	0.89	0.88	0.87	0.85	0.83	0.81	0.79	0.77	0.76
Net NUAR Only Usage	30%	73%	90%	100%	100%	100%	100%	100%	100%	100%
Optimism bias- benefits	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%
Output: Central Government- Back office efficiency (£m)	£2.212	£5.275	£6.427	£7.025	£6.867	£6.712	£6.561	£6.414	£6.270	£6.129

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Financial Year	2024/25	2025/26	2026/27	2027/28	2028/29	2029/30	2030/31	2031/32	2032/33	2033/34
Appraisal year	1	2	3	4	5	6	7	8	9	10
Input: Central Government- On site efficiency	£825,384	£825,384	£825,384	£825,384	£825,384	£825,384	£825,384	£825,384	£825,384	£825,384
GDP Deflator - 2021 PRICES - Discount Factor	0.90	0.89	0.88	0.87	0.85	0.83	0.81	0.79	0.77	0.76
Usage in digs by data consumers	4%	9%	24%	50%	76%	90%	95%	99%	99%	99%
Optimism bias- benefits	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%
Output: Central Government- On site efficiency (£m)	£0.015	£0.033	£0.087	£0.179	£0.266	£0.308	£0.318	£0.324	£0.316	£0.309

Financial Year	2024/25	2025/26	2026/27	2027/28	2028/29	2029/30	2030/31	2031/32	2032/33	2033/34
Appraisal year	1	2	3	4	5	6	7	8	9	10
Input: Local Authorities- Strike Avoidance	£8,441,725	£8,441,725	£8,441,725	£8,441,725	£8,441,725	£8,441,725	£8,441,725	£8,441,725	£8,441,725	£8,441,725
GDP Deflator - 2021 PRICES - Discount Factor	0.90	0.89	0.88	0.87	0.85	0.83	0.81	0.79	0.77	0.76
Usage in digs by data consumers	4%	9%	24%	50%	76%	90%	95%	99%	99%	99%
Optimism bias- benefits	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%
Output: Local Authorities- Strike Avoidance (£m)	£0.152	£0.339	£0.894	£1.831	£2.721	£3.150	£3.250	£3.311	£3.236	£3.164

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Financial Year	2024/25	2025/26	2026/27	2027/28	2028/29	2029/30	2030/31	2031/32	2032/33	2033/34
Appraisal year	1	2	3	4	5	6	7	8	9	10
Input: Local Authorities- Back office efficiency	£239,958,167	£239,958,167	£239,958,167	£239,958,167	£239,958,167	£239,958,167	£239,958,167	£239,958,167	£239,958,167	£239,958,167
GDP Deflator - 2021 PRICES - Discount Factor	0.90	0.89	0.88	0.87	0.85	0.83	0.81	0.79	0.77	0.76
Net NUAR Only Usage	30%	73%	90%	100%	100%	100%	100%	100%	100%	100%
Optimism bias- benefits	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%
Output: Local Authorities- Back office efficiency (£m)	£32.779	£78.184	£95.250	£104.113	£101.772	£99.485	£97.247	£95.061	£92.924	£90.835

Financial Year	2024/25	2025/26	2026/27	2027/28	2028/29	2029/30	2030/31	2031/32	2032/33	2033/34
Appraisal year	1	2	3	4	5	6	7	8	9	10
Input: Local Authorities- On site efficiency	£12,233,373	£12,233,373	£12,233,373	£12,233,373	£12,233,373	£12,233,373	£12,233,373	£12,233,373	£12,233,373	£12,233,373
GDP Deflator - 2021 PRICES - Discount Factor	0.90	0.89	0.88	0.87	0.85	0.83	0.81	0.79	0.77	0.76
Usage in digs by data consumers	4%	9%	24%	50%	76%	90%	95%	99%	99%	99%
Optimism bias- benefits	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%
Output: Local Authorities- On site efficiency (£m)	£0.221	£0.491	£1.295	£2.654	£3.943	£4.565	£4.710	£4.798	£4.690	£4.585

Financial Year	2024/25	2025/26	2026/27	2027/28	2028/29	2029/30	2030/31	2031/32	2032/33	2033/34
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Appraisal year	1	2	3	4	5	6	7	8	9	10
Input: PRIVATE SECTOR, Asset Owners- Strike Avoidance	£21,329,747	£21,329,747	£21,329,747	£21,329,747	£21,329,747	£21,329,747	£21,329,747	£21,329,747	£21,329,747	£21,329,747
GDP Deflator - 2021 PRICES - Discount Factor	0.90	0.89	0.88	0.87	0.85	0.83	0.81	0.79	0.77	0.76
Usage in digs by data consumers	4%	9%	24%	50%	76%	90%	95%	99%	99%	99%
Optimism bias- benefits	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%
Output: PRIVATE SECTOR, Asset Owners- Strike Avoidance (£m)	£0.384	£0.857	£2.258	£4.627	£6.875	£7.959	£8.212	£8.365	£8.177	£7.994

Financial Year	2024/25	2025/26	2026/27	2027/28	2028/29	2029/30	2030/31	2031/32	2032/33	2033/34
Appraisal year	1	2	3	4	5	6	7	8	9	10
Input: PRIVATE SECTOR, Asset Owners- Back office efficiency	£109,014,010	£109,014,010	£109,014,010	£109,014,010	£109,014,010	£109,014,010	£109,014,010	£109,014,010	£109,014,010	£109,014,010
GDP Deflator - 2021 PRICES - Discount Factor	0.90	0.89	0.88	0.87	0.85	0.83	0.81	0.79	0.77	0.76
Net NUAR Only Usage	30%	73%	90%	100%	100%	100%	100%	100%	100%	100%
Optimism bias- benefits	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%
Output: PRIVATE SECTOR, Asset Owners- Back office efficiency (£m)	£14.892	£35.519	£43.273	£47.299	£46.236	£45.196	£44.180	£43.187	£42.216	£41.267

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Financial Year	2024/25	2025/26	2026/27	2027/28	2028/29	2029/30	2030/31	2031/32	2032/33	2033/34
Appraisal year	1	2	3	4	5	6	7	8	9	10
Input: PRIVATE SECTOR, Asset Owners- On site efficiency	£30,910,123	£30,910,123	£30,910,123	£30,910,123	£30,910,123	£30,910,123	£30,910,123	£30,910,123	£30,910,123	£30,910,123
GDP Deflator - 2021 PRICES - Discount Factor	0.90	0.89	0.88	0.87	0.85	0.83	0.81	0.79	0.77	0.76
Usage in digs by data consumers	4%	9%	24%	50%	76%	90%	95%	99%	99%	99%
Optimism bias- benefits	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%
Output: PRIVATE SECTOR, Asset Owners- On site efficiency (£m)	£0.557	£1.242	£3.272	£6.706	£9.963	£11.534	£11.901	£12.123	£11.850	£11.584

Financial Year	2024/25	2025/26	2026/27	2027/28	2028/29	2029/30	2030/31	2031/32	2032/33	2033/34
Appraisal year	1	2	3	4	5	6	7	8	9	10
Input: PRIVATE SECTOR, Data Consumers- Back office efficiency	£497,289,443	£497,289,443	£497,289,443	£497,289,443	£497,289,443	£497,289,443	£497,289,443	£497,289,443	£497,289,443	£497,289,443
GDP Deflator - 2021 PRICES - Discount Factor	0.90	0.89	0.88	0.87	0.85	0.83	0.81	0.79	0.77	0.76
Net NUAR Only Usage	30%	73%	90%	100%	100%	100%	100%	100%	100%	100%
Optimism bias- benefits	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%
Output: PRIVATE SECTOR, Data Consumers- Back office efficiency (£m)	£67.931	£162.028	£197.397	£215.765	£210.913	£206.172	£201.536	£197.005	£192.576	£188.247

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Financial Year	2024/25	2025/26	2026/27	2027/28	2028/29	2029/30	2030/31	2031/32	2032/33	2033/34
Appraisal year	1	2	3	4	5	6	7	8	9	10
Input: PRIVATE SECTOR- indirect savings due to reduction in costs to business	£375,622,009	£375,622,009	£375,622,009	£375,622,009	£375,622,009	£375,622,009	£375,622,009	£375,622,009	£375,622,009	£375,622,009
GDP Deflator - 2021 PRICES - Discount Factor	0.90	0.89	0.88	0.87	0.85	0.83	0.81	0.79	0.77	0.76
Usage in digs by data consumers	4%	9%	24%	50%	76%	90%	95%	99%	99%	99%
Optimism bias- benefits	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%
Output: PRIVATE SECTOR- indirect savings due to reduction in costs to business (£m)	£6.771	£15.089	£39.760	£81.488	£121.076	£140.157	£144.616	£147.317	£144.006	£140.768

Financial Year	2024/25	2025/26	2026/27	2027/28	2028/29	2029/30	2030/31	2031/32	2032/33	2033/34
Appraisal year	1	2	3	4	5	6	7	8	9	10
Input: SOCIETY- remaining Indirect Strike Savings	£103,159,518	£103,159,518	£103,159,518	£103,159,518	£103,159,518	£103,159,518	£103,159,518	£103,159,518	£103,159,518	£103,159,518
GDP Deflator - 2021 PRICES - Discount Factor	0.90	0.89	0.88	0.87	0.85	0.83	0.81	0.79	0.77	0.76
Usage in digs by data consumers	4%	9%	24%	50%	76%	90%	95%	99%	99%	99%
Optimism bias- benefits	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%
Output: SOCIETY- Indirect Strike Savings (£m)	£1.859	£4.144	£10.920	£22.379	£33.252	£38.492	£39.717	£40.459	£39.549	£38.660

OFFICIAL - SENSITIVE - COMMERCIAL

Financial Year	2024/25	2025/26	2026/27	2027/28	2028/29	2029/30	2030/31	2031/32	2032/33	2033/34
Appraisal year	1	2	3	4	5	6	7	8	9	10
Input: SOCIETY- Indirect On-site efficiencies	£77,343,322	£77,343,322	£77,343,322	£77,343,322	£77,343,322	£77,343,322	£77,343,322	£77,343,322	£77,343,322	£77,343,322
GDP Deflator - 2021 PRICES - Discount Factor	0.90	0.89	0.88	0.87	0.85	0.83	0.81	0.79	0.77	0.76
Usage in digs by data consumers	4%	9%	24%	50%	76%	90%	95%	99%	99%	99%
Optimism bias- benefits	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%
Output: SOCIETY- Indirect On-site efficiencies (£m)	£1.394	£3.107	£8.187	£16.779	£24.930	£28.859	£29.778	£30.334	£29.652	£28.985

Financial Year	2024/25	2025/26	2026/27	2027/28	2028/29	2029/30	2030/31	2031/32	2032/33	2033/34
Appraisal year	1	2	3	4	5	6	7	8	9	10
Input: SOCIETY- indirect savings due to reduction in traffic delays	£401,108,478	£401,108,478	£401,108,478	£401,108,478	£401,108,478	£401,108,478	£401,108,478	£401,108,478	£401,108,478	£401,108,478
GDP Deflator - 2021 PRICES - Discount Factor	0.90	0.89	0.88	0.87	0.85	0.83	0.81	0.79	0.77	0.76
Usage in digs by data consumers	4%	9%	24%	50%	76%	90%	95%	99%	99%	99%
Optimism bias- benefits	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%
Output: SOCIETY- indirect savings due to reduction in traffic delays (£m)	£7.230	£16.112	£42.458	£87.017	£129.291	£149.667	£154.429	£157.313	£153.777	£150.319