Appendix 09.34 Corporate Vehicles

RIIO-2 Spend: XXXX

Investment Decision Pack Overview

This Asset Health Engineering Justification Framework outlines the scope, costs and benefits for our proposals. We have prepared an Engineering Justification Paper (EJP) for these assets which includes a comprehensive analysis of the cost of ownership.

We have 3,108 operational vehicles in use across our four distribution networks. 82% of these vehicles are specialist and maintenance vans used by our first-line operational staff to respond to emergencies and carry out routine inspections and scheduled maintenance. These vehicles therefore enable Cadent to provide a safe and reliable service for our customers. The remaining operational vehicles are various types of wheeled plant used for specialist tasks.

We have undertaken a comprehensive review of the cost of ownership of our vehicle asset stock to identify the optimum vehicle-replacement ages. In line with good asset management practice, we have considered our service and maintenance costs, the number of vehicle-off-road days and associated lost productivity, and the residual value of our vehicles, to calculate the lowest annual cost of ownership.

By the end of RIIO-1, our vehicle asset stock will be behind its optimal replacement age. We have developed a number of options to help us recover the optimal position during RIIO-2.

Our baseline option looks to rigorously apply our optimum replacement age and recover this backlog in the first year of RIIO-2. Our preferred option (Option 1) took a more pragmatic approach to the replacement age of each vehicle, looking at individual vehicle performance and choosing to retain those with the lowest maintenance costs for one or two years longer. That is to say our replacement programme will be based on the optimised average lowest whole life cost of ownership, with a small number of lower failure rate vehichles being run for longer. This option will have recovered the vehicle replacement backlog by the end of RIIO-2 but takes a more balanced view of risk versus capex expenditure.

Our preferred option is therefore Option 1, which applies a pragmatic approach to optimum vehicle replacement ages in RIIO-2. This requires XXXX of capex expenditure in RIIO-2. We have tested the efficiency of this expenditure by market testing the unit prices of our chosen vehicle asset stock and ensuring we have the optimum ownership strategy in place to deliver the best value. Note: we have a separate output case which discusses an electric vehicle deployment during RIIO-2, to inform longer-term vehicle strategy, that reduces emissions (see Appendix 07.04.04 A carbon-neutral business). This output case includes its own incremental costs over and above this investment case.

Summary of preferred option	XXXX
RIIO-2 Expenditure	XXXX
Project NPV	Not applicable

Material Changes Since October Submission

The costs in this document have been uplifted to the 2018/19 price base

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2. Introduction

This investment case covers the renewal and maintenance of our asset stock of corporate operational vehicles (not corporate cars used by office-based staff). These include specialist vehicles, maintenance vans and plant in use across Cadent's four distribution networks.

While Cadent has been investigating the various vehicle technologies for use in the longer term, it has currently concluded that electric vehicle technology and the supporting infrastructure (charging stations) is not yet well enough developed for it to be the most cost-effective approach for implementation during early RIIO-2. However, we expect things to change through the Government's ***Road to Zero*** policy (discussed further in section 6), for this reason we have also included a separate output case for electric vehicle deployment. For this investment case, we are assuming we continue to use the current diesel technology used during RIIO-1. This separate output case discusses an electric vehicle deployment during RIIO-2 to inform a longer-term vehicle strategy. This output case includes its own incremental costs over and above this investment case (See Appendix 07.04.04: A carbon-neutral business)

This investment case has been derived using our detailed corporate database of all Cadent operational vehicles. Age, make and model, service history and maintenance costs are all captured. We have undertaken analysis to understand the optimum frequency for replacing vehicles at a programme level in order to minimise the cost of ownership. We have then looked at how changing EU emissions and the introduction of new clean air-zones and congestion charging might change our vehicle replacement strategy.

Cadent uses various strategies for vehicle ownership, as described in more detail under Section 3, equipment summary. A large proportion of the current maintenance and specialist vehicle asset stock is purchased. In comparison, much of the plant is leased or hired (i.e. short-term). A procurement event has not yet been completed for RIIO-2 to investigate any changes to this ownership strategy specifically for maintenance vans. There are clear technical reasons why the other vehicle types should continue under the same ownership strategy. This investment case therefore assumes that the current ownership strategy in RIIO-1 continues throughout RIIO-2.

We have looked at the following investment options within this investment case:

- **Baseline:** Proactively replace vehicles at the optimum replacement frequency (lowest whole life cost), clear the backlog in aged vehicles in the first year of RIIO-2.
- **Option 1:** Proactively replace vehicles at the optimum replacement frequency, clear the backlog in aged vehicles by the end of RIIO-2.

3. Equipment Summary

This investment case covers four main class of vehicle:

Type of vehicle	Description & purpose of vehicles within vehicle type
Specialist Vehicles	High-mileage or power take-off vehicles where the vehicle is not only a mode of transport to each response but also forms part of the tools and equipment once on site.
Maintenance Vans	Various classifications within this category, but generally covers first-call operatives and maintenance technicians, it includes medium-panel vans and 4x4 pickup vehicles
Plant – HGV mounted plant	Predominantly MEG (mono-ethylene glyconate) tankers and Condensate Tanker and Mobile Workshop vehicles, including 'core & vac' specialist excavators.
Wheeled Plant	Trailer and syphon-tanker trailer assets, mainly items that are task-specific and not easily hired in.

Table 1: Vehicle Types in use within Cadent

The following pictures show the sorts of vehicles in use.

Figure 1: Examples of Maintenance Vehicles

Figure 1: (from left to right): HGV mounted plant, wheeled plant

Based on the above classifications, the following table shows a breakdown of the current vehicle numbers we will have at 31st March 2021 in use across our four distribution networks. Vehicles have been grouped by type and vehicle replacement frequency.

	EoE	NL	NW	WM	Total	% of asset stock
Specialist vehicles	446	307	298	182	1,233	39.7%
Maintenance vans	392	337	316	260	1,305	42.0%
Plant – HGV mounted plant	4	5	9	3	21	0.7%
Wheeled Plant	255	79	134	81	549	17.6%
TOTAL	**1,097**	**728**	**757**	**526**	**3,108**	

Table 2: Breakdown of vehicles by vehicle type and distribution network as of October 2019

The volume of vehicles we require is forecast to be static during RIIO-2. We are predicting slight reductions in the numbers of FTE in our work execution teams, but some changes in working practices that will increase the ratio of vehicles to operatives as part of our plans to improve operational efficiency. Our forecasted FTE profile is for a reduction of around 10% in operatives during RIIO-2. In order to achieve this reduction whilst delivering our RIIO-2 commitments and maintaining compliance with Freight Transport Association (FTA) requirements we will provide more of our operatives with their own vehicle to enable them to be more flexible, productive and responsive, and to enable a reduction in 2-man working where the activities can safely be carried out by a single individual. The relevant FTA requirement is associated with vehicle weight limits. When combined with the tighter emissions standards and the on-board equipment that supports lower emissions, the payload of vehicles is and has been reducing for some time. Reduced payloads make it harder for our operatives to carry all the tools and equipment they require on a single vehicle. This is another reason why the ratio of vehicles to operatives is forecasted to continue to rise.

As an example, in our maintenance process there are many operations that require two individuals to complete and therefore the default is for ‘teams’ of two to operate together most of the time as they are constrained by sharing a vehicle. We are assessing improved work planning and organisation work as part of our transformation to a depot-centric operating model, so that one-man tasks can be executed by a lone worker, where safe to do so. Secondly, in our repair process we have historically operated 2-man teams who are served in the field by logistical support drivers, bringing signs, lighting and guarding to site on request. We are in the process of transitioning much of our networks to 2-man, 2-van repair teams who self-serve their logistical needs. This model is something that is already yielding benefits as part of our operational transformation and we will continue to embed this as we reduce overall unit costs in repair during the last years of RIIO-1 and the early years of RIIO-2.

The net effect of some headcount reductions and planned increases in the ratio of vehicles to operatives is that we will sustain the same fleet size through RIIO-2.

We also looked at the age profile of our vehicle asset stock. The following graphs show the current age profile of our asset stock (**at October 2019**). This shows that a large number of vehicles will be due a replacement in RIIO-2.

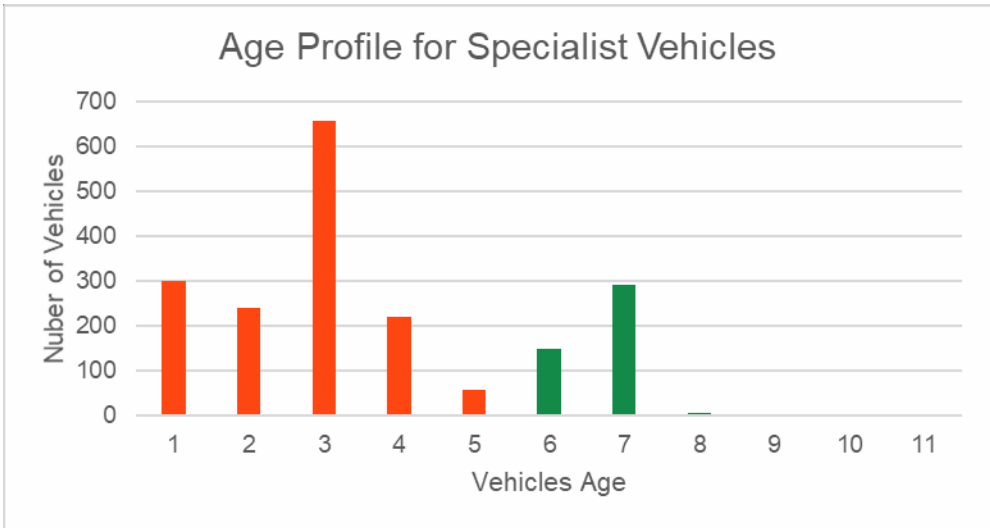

Figure 2 Age profile of Specialist Vehicles (5-year replacement frequency)

With a five-year replacement frequency, all vehicles in this cohort will require replacement during RIIO-2.

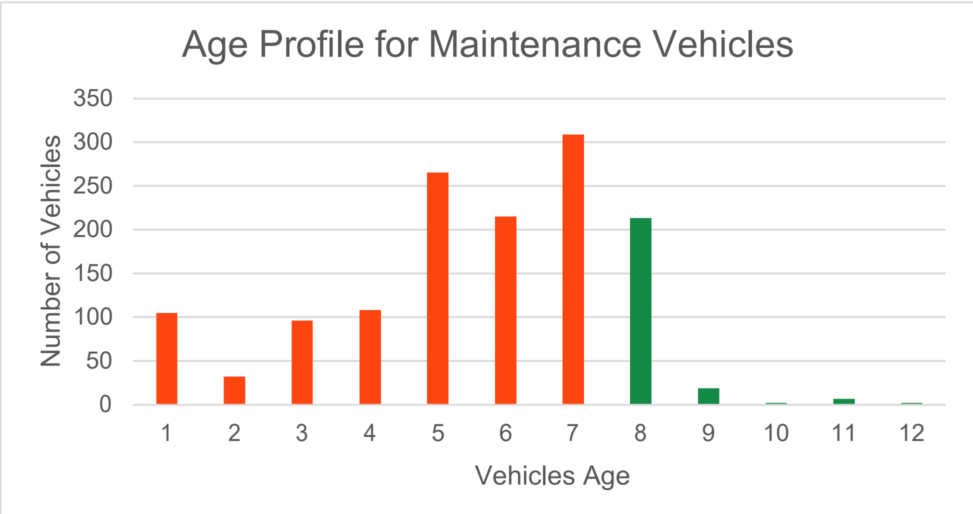

Figure 3:Age profile of Maintenance vehicles (7-year replacement frequency)

This graph shows the vehicles currently replaced every seven years, as a cohort. This shows that all vehicles over two years old will require replacement in RIIO-2.

We are also aware that our vehicle asset stock contains vehicles with varying EURO emission standards. Lower emissions standards result in our vehicles releasing high levels of CO_2 and other pollutants into the atmosphere with a resulting environmental impact.

The following graph shows the EURO emissions standards for our specialist and maintenance vehicle cohort only, as these are the vehicles which tend to travel significant mileage.

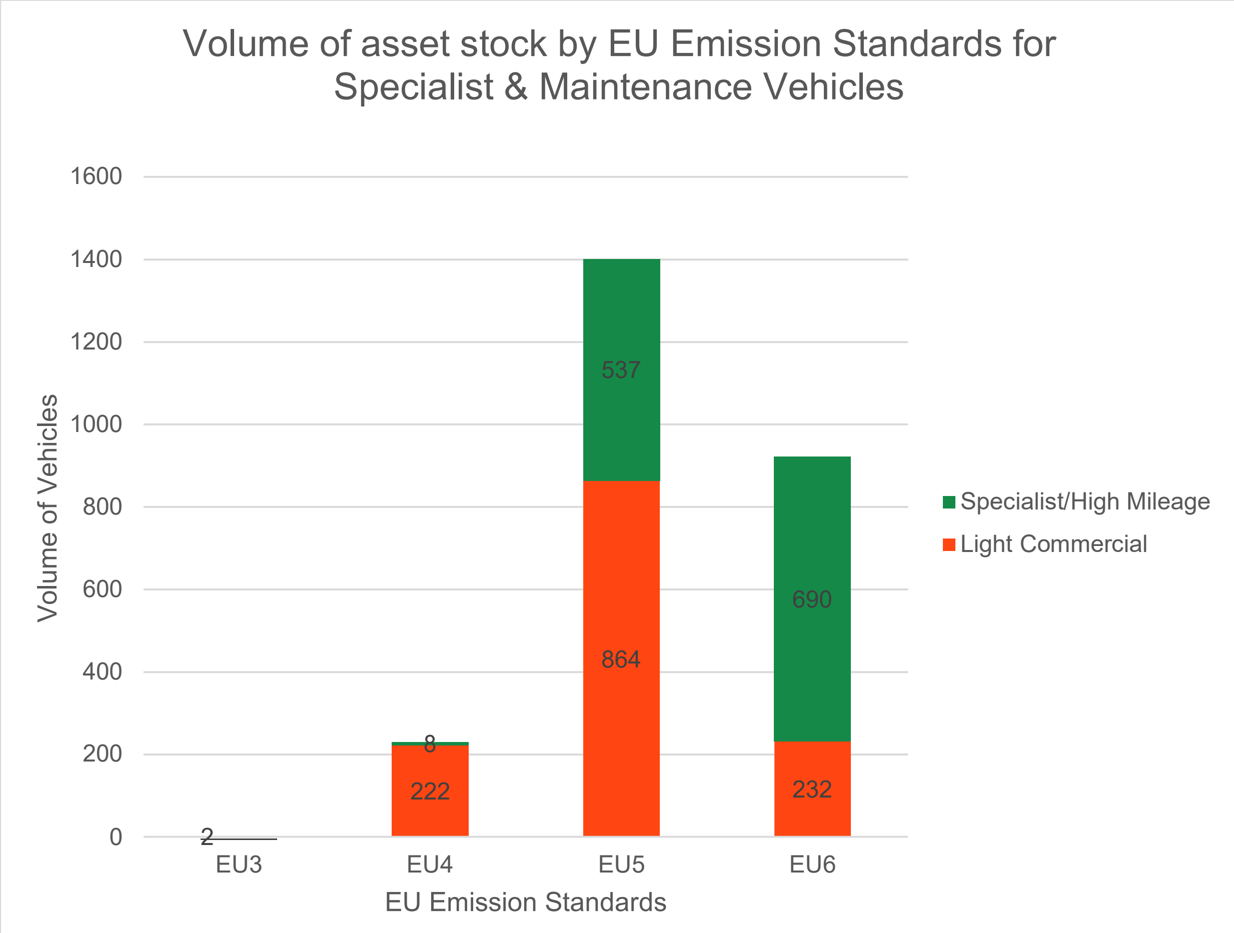

Figure 4: Vehicle asset stock by vehicle-emission standard

The EU3 to EU 5 vehicles shown in the above graph are all below the current EU-6 (EU6d-TEMP) emission standard. This equates to 70% of our vehicle asset stock as of October 2019. Each non-compliant vehicle typically emits somewhere up to 166 g/km CO2 on average, which is 30 g/km CO2 more than an EU-6 vehicle. We calculate that this equates to a societal cost of XXXX per year more (at 2019 prices) to run a non EU-6 vehicle.

During RIIO-1, we had the following ownership strategy for the above vehicle asset stock, and this has been reviewed to inform our RIIO-2 ownership strategy. For the most significant volume of our asset stock (specialist vehicles and maintenance vans), purchase options are still most cost-effective and allow us to control our maintenance and repair activities. This increased control enables us to schedule planned maintenance to minimise the impact on customers. For this reason, we expect this 'purchase' option to continue during RIIO-2, but this will be under constant review.

	Ownership strategy for RIIO-1 & RIIO-2
Specialist Vans	**Purchase**: These vehicles need significant modification and therefore are purchased. These essential modifications attract significant end-of-lease financial penalties from leasing companies, resulting in this option being more expensive. In addition, we have a higher level of control; for vehicles that are running efficiently and have low-mileage, we can choose to delay replacing them in the short term without incurring penalties from the leasing company. We also have full control over our maintenance and repair process, allowing us to increase or decrease maintenance to minimise off-road time.

Maintenance vans	**Purchase:** We expect that purchasing the vehicles will remain the most cost-effective and flexible ownership strategy through RIIO-2, although this is being regularly reviewed. The primary reason for this is higher levels of control; for vehicles that are running efficiently and have low mileage, we can choose to delay replacement in the short term without incurring penalties from the leasing company. We also have full control over our maintenance and repair process, allowing us to increase or decrease maintenance to minimise off-road time.
Plant: HGV	**Purchase:** These vehicles tend to be used infrequently for specific jobs in very specific locations around the country. We have currently found that purchasing these provides the lowest whole-life cost and allows us to extend their life without incurring penalties via the lease option. The number of these in our asset stock is low, with low-volume replacements in RIIO-2.
Plant: HGV Core and Vac	**Leased:** An initial leasing option was entered into in 2016. This decision was driven by uncertainty around the level of use and new ways of working. These items have a high upfront purchase price, and their life span was unclear. Over the last two years, they have proven to be popular. Cadent will continue to look into the viability of outright purchase in RIIO-2.
Plant Trailers/Trailered tankers	**Purchased:** Low purchase costs, as well as low resale values, for the majority of assets in this group mean there is a reluctance in the market to offer leases on this type of asset. Higher-value equipment tends to be hired in on a short-term basis.

Table 3: Vehicle ownership strategy in use during RIIO-1.

4. Problem Statement

Overview

Our fleet of corporate vehicles enables us to ensure we can carry out our critical day to day operational and business functions efficiently and effectively, to ultimately deliver a value-for-money and reliable gas service to our customers. A lack of reliable vehicles would therefore have a detrimental impact on our ability to provide a reliable service.

Investment Drivers

The investment drivers for this investment case are:

- **Providing value for money**: We need to provide a cost-effective set of vehicles and should look to minimise the cost of ownership. Excessive breakdowns and congestion charges increase the cost of ownership.
- **Ability to respond to emergencies and critical maintenance visits and delivery our other outputs:** Unexpected vehicle faults or breakdowns could have significant operational impacts. The lack of an operational vehicle with appropriate tools and spares could have an impact on our ability to deal with emergencies quickly and efficiently. This could ultimately cause a risk to customer and employee safety and to our ability to provide security of supply.
- **Minimising environmental impacts:** A proportion of our vehicle asset stock is no longer compliant with the latest EU emission standards; our vehicle asset stock is therefore having a negative impact on the environment. In some areas of the UK, these non-EU compliant vehicles will be subject to congestion charging as key towns and cities introduce new congestion charging zones (e.g. Nottingham).

Key outcomes: how we understand project success

Our aim is to provide a reliable and cost-effective fleet of operational vehicles to ensure that we can quickly and efficiently respond to planned and emergency operational work and, therefore, provide a reliable gas service to our customers.

4.1. Narrative Real-life Example of Problem

The main issue associated with an ageing vehicle asset stock is that they become less reliable and have a greater number of days off-road per year.

In most cases, this causes a small loss in productivity, while the field engineer waits for a van to be recovered. Any urgent work is transferred to another engineer. The customer may suffer a short delay due to this last-minute change. Other less-urgent work will get rescheduled for another day.

We do not keep detailed records of all of these instances within our scheduling team. However, following extensive discussion with our scheduling and dispatch teams, we have developed a typical story based on a range of real-life scenarios:

In this typical scenario, a field engineer leaves to attend a 'Priority 1' job, to investigate a reported smell of gas at a customer's property. On the way there, the engine light comes on and the van breaks down by the roadside. The breakdown is reported to the scheduling team and the job is then re-assigned to another engineer. This second engineer's scheduled maintenance work is postponed. Even though they were part way through their current job, the urgency of the Priority 1 job means that the current work will be suspended (leaving it safe and secure) and completed on another day. This has a further effect on productivity. It also means that someone else will need to revisit the site, on another day, to finish off the work. Additional travel is also required to respond to the Priority 1 job, and the customer is impacted because of this delay.

In the meantime, the engineer with the broken-down van is waiting for recovery. The van is recovered back to the depot, but the engineer is unable to respond to any further call-outs that day because there is no suitable spare van available at that particular depot on that day. The next day, they may be deployed to support a separate engineering crew and cannot be fully productive until their van is repaired and back on the road.

This scenario has the following impacts:

- Loss of productivity for both engineers – estimated at XXXX per day
- Additional mileage
- Delay and reduced service to the customer

4.2. Spend Boundaries

This investment case includes for all light goods vehicles and heavy goods vehicles operated by Cadent. It excludes leased or purchased cars. The opex expenditure for corporate cars is included in the business plan data table 2.01 “Transport & Plant”.

While Cadent has been investigating the optimum vehicle technology for use in the longer term, it has concluded that, without strong customer support, electric vehicle technology and the supporting infrastructure (charging stations) is not yet well enough developed for it to be the most cost-effective approach for implementation during RIIO-2. This investment case is therefore based on continuing to use the current diesel technology used during RIIO-1. A separate output case has been written which discusses an electric vehicle deployment during RIIO -2 to inform a longer-term vehicle strategy. This output case includes its own incremental costs over and above this investment case. (Reference Appendix 07.04.04 A carbon-neutral business).

5. Probability of Failure

We have used this section of the document to describe our analysis of the cost of ownership of our current vehicle asset stock.

Our vehicles require annual service regimes and occasionally suffer a fault of a breakdown. Any days on which the vehicle is not available to perform its operational functions are considered an off-road day (referred to as VOR or vehicle off-road)

We have looked at the average number of off-road days per year that each vehicle type suffers. The total period of vehicle downtime during a 12-month interval was recorded by our fleet manager.

The following graphs show the trends for the 'specialist and maintenance' vehicles, which make up 82% of the vehicle asset stock within this investment case.

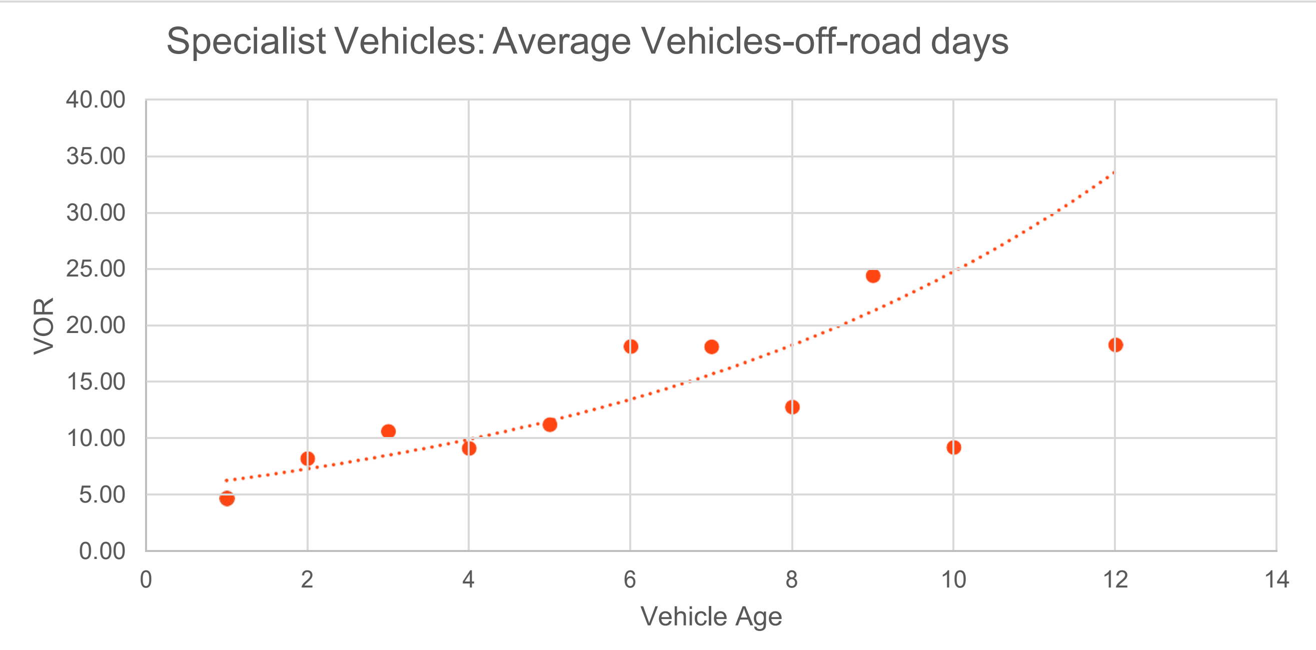

Figure 5: Number of vehicle off-road days per year (per vehicle), by age.

While there is some variance around the trend line shown, there is a definite increasing trend with age. The correlation for the above best-fit graph is 0.711; this correlation is significantly reduced due to the wider spread of data in year nine onwards and the fewer data points. For specialist vehicles, the number of days off-road doubles from a 4-year-old vehicle to a 12-year-old vehicle. A 4-year-old vehicle suffers from just greater than 10 days off-road per year. A 12-year-old vehicle has more than 20 days off-road.

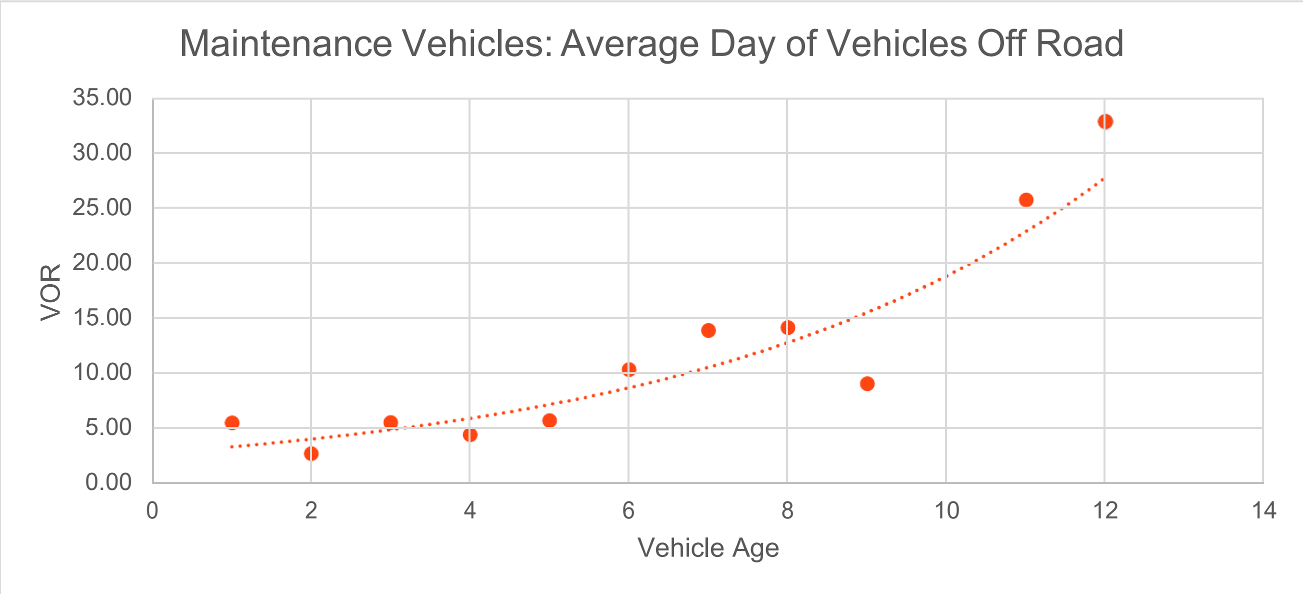

Figure 6: Maintenance vehicle off-road days per annum (per vehicle).

It was observed that the average number of VOR days for maintenance vehicles increases with age. The correlation for this best-fit graph is 0.825; again, the correlation is reduced due to the more variable data in year nine onwards and fewer data points. This graph shows that the number of off-road days approximately doubles between years three and nine. In year three, vans suffer from 9 days off-road, and in year nine this doubles to closer to 18 days off-road.

5.1 Probability of Failure data assurance

This failure data has come from a full set of vehicle records, managed by our corporate fleet manager, which show failure data and service and maintenance costs for the entire asset life of the vehicle. The records were accurate as of October 2019. The data used has been traced back to Cadent and our vehicle maintenance supplier's corporate systems (Rivus, SAP and Oracle). We are therefore confident that the failure data and failure-costs presented are accurate.

We have used the data from the current vehicle asset stock (3,000 vehicles) to estimate the 'total number of days off-road'. This provided a reasonable data set and sample size for vehicles between one to five years old, but we had limited data to inform the trend for older vehicles. Even with this slightly lower confidence in the performance of the older vehicles, the data still shows a clear, increasing trend.

6. Consequence of Failure

The consequences of failure for vehicles are the increasing cost from service, maintenance and repair as the vehicle ages, and the impact on our operations from having vehicles off-road. There is a long-term trend to reduce emissions from our vehicles as well as an environmental consequence of retaining these lower-emission standard vehicles. With the introduction of future clean air zones in cities, these non-EURO 6 compliant vehicles will attract an additional congestion charge with a resulting impact on opex. These consequences are discussed below.

Within our vehicle database, we have captured the average yearly service, maintenance and repair (SMR) costs for each vehicle type. We have then looked at how this cost increases as a vehicle ages, both for specialist and for maintenance vehicles. Our data for the SMR costs from the last nine years shows the following results.

The following graph shows the weighted average of yearly SMR costs per vehicle type.

Redacted due to commercial sensitivity

Figure 7: Average SMR costs per annum for Specialist and Maintenance vehicles

Figure 7 shows that SMR costs show a reasonably steady increase. The service, maintenance and repair costs can be observed to generally double over approximately three years.

As shown in Section 5, as vehicles age, the number of days-off road increases.

In the event of a vehicle breakdown or failure there are a number of direct consequences:

- On the day of the breakdown, the work that the field-operative would have done would have been postponed or rescheduled for another day. For any emergency job, the work would have had to have been given to another operative, which could pose a further risk due to any further delays in responding.
    - The likelihood of a van breakdown having an impact on security of supply or safety of our employees or the member of the public is very low but is credible if a vehicle breakdown occurs when responding to an emergency high-priority operational job.
- This results in some lost productivity for the field operative on the day of the failure and sometimes during the following day. Hire vehicles are not practical in many cases, due to the lack of access to the necessary tools and equipment on the vans. Often, the additional operator will accompany another crew until their vehicle is back on the road.
- Invariably spare specialist vehicles are not stocked, due to their high cost.

A typical van breakdown will have the following consequences:

Impact	Impact per breakdown
Loss of productivity	For each day of vehicle down-time, XXXX /day of lost productivity from a field operative is accrued.

Table 4: Consequences of failure of maintenance vehicles.

Environmental Impact: The EURO emission standards across all vehicle types have continued to improve over the last few years, and this trend is likely to continue. Our older vehicles are now less-clean, emitting higher CO_2 levels than the current EU-6 vehicle standards. The societal cost of CO_2 is currently XXXX per tonne of CO_2, but this is forecast to increase over time as per the data provided by Ofgem.

Each non-compliant vehicle typically emits somewhere up to 166 g/km CO_2 on average, which is 30 g/km CO_2 more than an EU-6 vehicle. We calculate that this equates to a societal cost of XXXX per year more (at 2019 prices) to run a non EU-6 vehicle.

Clean-air zones: Driven in part by the Government's ***Road to Zero*** policy, many cities in the UK are beginning to consider enforcing additional congestion charging which will further increase opex costs and potentially drive earlier replacements of some vehicles which do not comply with the latest EURO-6 emission standard. Due to the uncertainty around these clean-air zones, these have not been factored into this investment case but will increase opex costs over time unless newer vehicles are purchased, or fleet is redistributed within the network.

Our current view of future clean-air zones is summarised below.

Who	When	Vehicle Types	Notes
Central London (North Circular)	April 2019	Vans and HGVs	Confirmed Zone
Birmingham	Jan 2020	Vans and HGVs	Confirmed Zone
Derby	2019 (TBC)	HGV's	Out to consultation currently
Nottingham	2019 (TBC)	Vans and HGV's	Looking at exclusion zones rather than charging
Greater London (Inside M25)	Oct 2020	HGV's	No suggestion of including Vans but monitor in place Confirmed Zone
Sheffield	Jan 2021	Vans and HGV's	Confirmed Zone
Leicester	2026?	Vans and HGV's	City Wide

Table 5: Future clean-air zones in the UK

7. Options considered

To inform our options considered we have undertaken a whole-life cost analysis on 82% of our vehicle asset stock. This proportion of the asset stock is equivalent to 94% of the proposed capex expenditure.

Identifying the least-cost replacement frequency

We have included the results of this analysis for the two most material vehicle types (82% of the asset stock), covering Specialist vehicles and Maintenance vehicles. The remaining Plant-vehicles have been simply evaluated using expert judgement and were assigned an optimum replacement-age of 10-years. As discussed above, we have used this analysis to inform the options we have considered.

The results of this analysis are shown in Figures 9 and 10 below. Our current whole life cost analysis has considered, for each individual vehicle type:

- **Residual vehicle resale value, by vehicle age**. This is effectively the sum of money we would receive if these vehicles were sold on the open market at any given time. This is referred to in the graph below as ***Residual Value.*** When new, the residual value of the vehicle is equal to the cost of purchase.
- **Cost of maintaining and servicing each vehicle**, by vehicle age. This includes the average SMR costs per year and the cost of lost productivity due to vehicle-off-road. This is referred to in the graph below as ***Maint and Service Costs***.
- **Cost of Carbon** due to vehicle emissions.

The cumulative cost of all SMR costs, lost productivity due to vehicle off-road days, and the cost of carbon from CO2 emissions has been added together to give a total cost of owning the vehicle. The residual value of the vehicle is then subtracted from this cumulative cost. When this cumulative cost is divided by the vehicle age in years, an average cost per annum to own the vehicle is calculated; referred to below as the ***average lifecycle costs per annum***. The lowest per-annum cost is the same as the ***optimum replacement age***. A particular feature of our analysis shows that our cost of ownership graph is very flat, therefore retaining our vehicles one or two years longer (particularly those within the total population with a lower failure rate) does not have a significant impact on the cost of ownership of our vehicle asset stock.

We have also tested the sensitivity of this model to the level of CO2 emissions from our different EURO standard vehicles. This has no material impact on the optimum replacement age of our vehicles.

This analysis shows the following results for specialist and maintenance vehicles:

Redacted due to commercial sensitivity

Figure 8: Optimum replacement age: Specialist Vehicles

Redacted due to commercial sensitivity

Figure 9: Whole life cost curve: Maintenance Vehicles

The results show that the optimum age of replacement was at five and seven years for specialist and maintenance vehicles respectively. The whole-life cost curves are, however, flat, showing that vehicles could be retained for one or two years more than the optimum with limited impact on the overall annual cost of vehicle ownership. We also recognise that, as vehicle technology improves, vehicles will become more reliable, also enabling us to cost-effectively retain our vehicles for longer.

In our analysis we have found that age has been a good indicator of likely performance, reliability and overall running costs.

In our investment options, presented next, we have used a pragmatic approach to select an optimum vehicle replacement age and deliverability to derive an optimum plan. However, we are aware that as new technology emerges, and the real cost of clean-air zones and lower emissions becomes apparent, this may drive changes to this during the later years of RIIO-2.

Our separate output case, including electric vehicle deployment, would mitigate this risk as a large proportion of our vehicles would be replaced with electric alternatives in the final three years of RIIO-2. Such an output case would involve replacing our vehicles sooner than this whole-life cost analysis recommends. These additional costs from accelerated replacement have been factored into this output case.

The options considered based on optimum replacement age /condition

Having developed the analysis outlined above, we have looked to identify the optimal replacement period for our vehicles. We have then compared the age of our fleet in March 2021 to this position and identified that 36% of our specialist vehicles and 19% of our maintenance vehicles will be behind the optimal replacement curve. We have then considered how we will re-establish the optimal position.

We have looked at the following investment options within this investment case:

- **Baseline:** Proactively replace vehicles at the lowest cost of ownership; immediate compliance to replacement frequency in year 1 of RIIO-2.
- **Option 1:** Proactively replace vehicles at the lowest cost of ownership; slow recovery to full compliance with vehicle replacement frequency during RIIO-2. We have taken a more flexible approach to our replacement frequency, looking at vehicles that have lower mileage or improved reliability (compared to the average vehicle within the age bracket) and looking to delay these by one or two years to reduce capex spend.

For these options we have used the following replacement age:

Vehicle Type	Replacement frequency: Baseline option	Replacement frequency: Option 1
Specialist Vehicles	5 years	5 to 7 years
All Plant	10 years	10 to 12 years
Maintenance Vehicles	7 years	7 to 9 years

Table 6: Proposed vehicle replacement frequency

7.1 Baseline Option

This option is based on continuing with the current vehicle-replacement strategy (optimum replacement frequencies as stated in Table 6) and will result in Cadent clearing the backlog in vehicle replacements in Year 1 of RIIO-2. The following table sets out the vehicle replacements for RIIO-2.

Volume of vehicles per year							
Network	**Vehicle Type**	**21/22**	**22/23**	**23/24**	**24/25**	**25/26**	**Total**
EoE	HGV Plant						
	Light Commercial						
	Specialist/High Mileage						
	Wheeled Plant						
Lon	HGV Plant						
	Light Commercial						
	Specialist/High Mileage						
	Wheeled Plant			Redacted due to commercial sensitivity			
WM	HGV Plant						
	Light Commercial						
	Specialist/High Mileage						
	Wheeled Plant						
NW	HGV Plant						
	Light Commercial						
	Specialist/High Mileage						
	Wheeled Plant						
TOTAL							

Table 7: Vehicle replacement volumes for Baseline option

Applying the unit costs stated in Section 7.1 for different vehicle types and ownership strategy gives the following capex spend profile.

Capex costs per year							
Network	**Vehicle Type**	**21/22**	**22/23**	**23/24**	**24/25**	**25/26**	**Total**
EoE	HGV Plant						
	Light Commercial						
	Specialist/High Mileage						
	Wheeled Plant						
NL	HGV Plant						
	Light Commercial						
	Specialist/High Mileage						
	Wheeled Plant		Redacted due to commercial sensitivity				
WM	HGV Plant			[redacted]			
	Light Commercial						
	Specialist/High Mileage						
	Wheeled Plant						
NW	HGV Plant						
	Light Commercial						
	Specialist/High Mileage						
	Wheeled Plant						
TOTAL							

Table 8: Capex cost profile by vehicle-type and year: Baseline option

7.2 Option 1

This option is to flex the optimum vehicle replacement age in the early years of RIIO-2; clear backlog in vehicle-replacements by end of RIIO-2.

In this option, we take a more pragmatic approach to our vehicle replacement age, allowing some vehicles to be retained for a further one to two years, to manage the vehicle replacements to a reasonable volume for deliverability. This reduces the capex spend in the early years of RIIO-2 to more reasonable levels, without having a large impact on opex costs. We expect that this option will clear the backlog in vehicle replacements by the end of RIIO-2.

Error! Reference source not found. The following table sets out the vehicle replacement volumes expected.

Network	Vehicle type	20/21	21/22	22/23	23/24	24/25	Total
EoE	HGV Plant	Redacted due to commercial sensitivity					
	Light Commercial						
	Specialist/High Mileage						
	Wheeled Plant						
NL	HGV Plant						
	Light Commercial						
	Specialist/High Mileage						
	Wheeled Plant						
WM	HGV Plant						
	Light Commercial						
	Specialist/High Mileage						
	Wheeled Plant						
NW	HGV Plant						
	Light Commercial						
	Specialist/High Mileage						
	Wheeled Plant						
TOTAL							

Table 9: Vehicle replacement volumes for Option 1

Applying the unit costs stated in Section 7.1 for different vehicle types and ownership strategy gives the following capex spend profile.**Error! Reference source not found.** Table 10 shows a substantial decrease in capex costs for the final year of RIIO-2, where a total of approximately XXXX is required compared to an average of approximately XXXX from the previous years. This indicates that the backlog has been eliminated.

Capex costs per year

Network	Vehicle Type	21/22	22/23	23/24	24/25	25/26	Total
EoE	HGV Plant						
	Light Commercial						
	Specialist/High Mileage						
	Wheeled Plant						
NL	HGV Plant						
	Light Commercial						
	Specialist/High Mileage						
	Wheeled Plant						
WM	HGV Plant						
	Light Commercial						
	Specialist/High Mileage						
	Wheeled Plant						
NW	HGV Plant						
	Light Commercial						
	Specialist/High Mileage						
	Wheeled Plant						
TOTAL							

Redacted due to commercial sensitivity

Table 10: Capex cost profile by vehicle-type and year: Option 1

7.3 Options Cost Summary Table

	Baseline	Option 1
Option description		
First year of spend		
Last year of spend		
Volume of vehicles: Specialist Vehicles	[redacted]	
Volume of vehicles: Maintenance vans	Redacted due to commercial sensitivity	
Volume of vehicles: HGV mounted Plant	[redacted]	
Volume of vehicles: Wheeled Plant		
Total Vehicles		
Capex		
Opex		

Table 11: Option Cost Summary Table.

7.4 Unit Costs for Replacement vehicles

The unit costs for all vehicle types used in the above options are summarised in Table *12*, where EMR stands for emergency, REP for repair and OPM and ENG fall under the category for maintenance process[1]. These are based on RIIO-1 actuals from a tendering-event completed in 17/18.

<table>
<tr><th rowspan="2">Vehicle Group Code</th><th rowspan="2">Sub Group</th><th rowspan="2">Vehicle Group - New Description</th><th colspan="4">Different vehicle specifications</th></tr>
<tr><th>EMR</th><th>REP</th><th>OPM</th><th>ENG</th></tr>
<tr><td>03</td><td>Light Commercial</td><td>Medium Panel Van (Custom/Transporter/Expert/Traffic)</td><td colspan="4" rowspan="12">Redacted due to commercial sensitivity</td></tr>
<tr><td>04</td><td>Specialist/High Mileage</td><td>Large Panel Van Up To 3,500kgs - (Transit/Sprinter/Crafter)</td></tr>
<tr><td>05</td><td>Specialist/High Mileage</td><td>Dropside/Tipper Up To 3,500kgs - (Transit/Sprinter/Crafter)</td></tr>
<tr><td>14</td><td>HGV Plant</td><td>Specialist Vehicle - (Syphon Tankers/Core & Vac units/Unimogs)</td></tr>
<tr><td>15</td><td>Light Commercial</td><td>Motor Cycles</td></tr>
<tr><td>16</td><td>Light Commercial</td><td>4x4 Vehicles</td></tr>
<tr><td>23</td><td>Light Commercial</td><td>All Wheel Drive (AWD) Medium Panel Van</td></tr>
<tr><td>24</td><td>Specialist/High Mileage</td><td>Panel Van Up To 3,500kgs with On Board Ancillary (OBE/OBP)</td></tr>
<tr><td>26</td><td>Specialist/High Mileage</td><td>Panel Van 3,501 - 7,000kgs with On Board Ancillary (OBE/OBP)</td></tr>
<tr><td>28</td><td>HGV Plant</td><td>7,000 - 10,000kgs Flatbed/Tipper/Box Body with On Board Ancillary (OBE/OBP)</td></tr>
<tr><td>80</td><td>Wheeled Plant</td><td>Wheeled Plant - Trailer</td></tr>
<tr><td>84</td><td>Wheeled Plant</td><td>Wheeled Plant - Syphon Tank/Bowser</td></tr>
</table>

Table 12: Unit costs for all vehicle types used.

We are confident that the above unit costs for each vehicle type are efficient and reflect actual market values. We undertake regular competitive tendering events when vehicles need replacing. We also carry out industry benchmarking to ensure our vehicle purchase prices are efficient. The above prices have been uplifted to an 18/19 price base.

[1] EMR, REP, OPM and ENG are all slightly different specifications of vehicle within each vehicle sub-group but demonstrate there are small variations in purchase prices for a small number of variations.

Our RIIO-2 forecasts, as well as adjusting for workload and work mix factors, also include ongoing efficiencies flowing from our transformation activities including from updating and renewing our contracting strategies. Our initiatives are outlined in Appendix 09.20 Resolving our benchmark performance gap. We have not applied an additional efficiency to this investment area.

For Vehicles and Mobile Plant our confidence is defined as being within “*Construction stage*” with a range of +/-5%. Costain were commissioned to audit our costing methodologies for several projects. Elements from this project were assessed which has also provided a cost confidence at “*Construction stage*” with a range of +/-5%.

8. Business Case Outline and Discussion

Our RIIO-2 investment case for our vehicles and mobile plant has been based on a whole-life cost model, which has helped us identify the optimum replacement age of each vehicle-type, to achieve the lowest whole life cost of ownership.

We have then developed two options which apply this optimum vehicle replacement age:

Baseline rigorously applies the optimum replacement age, with a resulting peak in capex in the first few years of RIIO-2, due to the slightly over-aged asset stock at the end of RIIO-1.

Option 1 takes a more pragmatic approach and flexes the optimum vehicle replacement age by one or two years (e.g. specialist vehicles will be replaced at either five, six or seven years of age rather than just at five years). This flexible approach does not materially impact on opex because the whole life cost analysis shows the cost of ownership to be relatively flat for three or more years. This reduces the capex spend required in RIIO-2 considerably, while still managing vehicle risk effectively.

8.1. Key Business Case Drivers Description

The key business case driver for Vehicles is the lowest whole-life cost of ownership which factors in the costs of ongoing service, maintenance and repair and the loss of productivity from each vehicle-off-road day.

The cost of CO_2 emissions was included in the calculations to test the sensitivity of the results from changing our van stock to more-efficient vehicles. This had no material impact on the optimum replacement frequency.

8.2. Business Case Summary

The following table summarises the two options considered.

	Baseline	Option 1
Description	Redacted due to commercial sensitivity	
Total vehicles		
Total Capex		
Total Opex		

Table 13: Business Case Summary

Option 1, is our preferred option, because it takes a pragmatic approach to replacing our vehicle asset stock, and varies the vehicle replacement age by one or two years, rather than rigorously applying the five-, seven- or ten-year frequency. This means our vehicles could be retained by one or two years more, but with careful management, this should have a minimal impact on vehicle off-road days and SMR costs. This flexible approach does not materially impact on opex (as shown in Section 7), because the whole life cost analysis shows the cost of ownership to be relatively flat for three or more years. This reduces the capex spend required in RIIO-2 considerably, while still managing vehicle risk effectively.

9. Preferred Option Scope and Project Plan

9.1. Preferred option

Our preferred option is Option 1.

9.2. Asset Health Project Spend Profile

The capex spend profile for the preferred option (Option 1), is shown below.

Network	21/22	22/23	23/24	24/25	25/26	Grand Total
EoE						
Lon						
NW						
WM						
Grand Total						

[redacted] Redacted due to commercial sensitivity

Table 14: Capex Profile for 2020/2021 financial year (last year of RIIO-1): Option 1

9.3. Investment Risk Discussions

Replacing vehicles and wheeled plant is a business-as-usual activity. The volumes of vehicle replacements in RIIO-2 is comparable to those in RIIO-1.

We do, however, recognise that vehicle technology is evolving rapidly, and unit prices are therefore changing to reflect this. There is therefore a risk associated with a higher-than-RPI increase to our vehicle prices; this has not been factored into this base case.

A larger number of clean-air zones in cities could also emerge during RIIO-2, which would result in an increased opex impact across the programme.

Our separate output case would help mitigate the impact of these changing environmental standards.

Reference	Risk Description	Impact	Likelihood	Mitigation /Control
09.34 - 001	Stretching efficiency targets may not be deliverable (unit costs increase)	Outturn costs are not met increasing overall programme costs.	Low	Established marketplace - ability to manage the known commodity market
09.34 - 002	Unexpected / uncommunicated obsolescence during RIIO-2 period of equipment components	Inability to maintain equipment at full capacity with risk of impact upon supply	Low	Maintain a close relationship with equipment supply chain and manage a proactive early warning system where spares / replacements become at risk.

Reference	Risk Description	Impact	Likelihood	Mitigation /Control
09.34 - 003	Introduction of Clear Air Zones	Access to city areas / fines / early obsolescence of vehicles	Med	Management of fleet and distribution of "clean" vehicles to affected areas
09.34 - 004	EURO engine legislative changes, increasing unit costs above RPI	Early obsolescence of vehicles - unit costs - management and fleet replacement	Med	Management of fleet and assessment of needs and changes to minimise impact

Table 15: Risk Register

9.4. Regulatory Treatment

This investment will not be processed through the NARMs reporting tool.

Cost variance for low materiality projects such as this will be managed through the Totex Incentive Mechanism (TIM).

This investment is accounted for in the Business Plan Data Table 3.07 Transport & Plant across all Sub-tables of the Data Table as appropriate.