Appendix 1

Supporting evidence on vehicle strategy

1) Vehicle Carbon Footprint

A measure of the amount of carbon dioxide released into the atmosphere as a result of the activities of a particular individual, organisation, or community is known as the carbon footprint.

In order to review the options available for decarbonising the waste and recycling collection, and street cleansing fleet as part of the vehicle replacement process, each vehicle would be considered separately based on its individual current carbon footprint and the service/operation it is required to perform.

2) Fuel Types

Fuels which emit zero harmful emissions are realistically limited to two options: hydrogen fuel cell electric vehicles (FCEV) and battery electric vehicles (BEV).

Hydrogen (FCEV)

Hydrogen does not occur naturally on earth in any significant quantities and therefore, must be manufactured, usually using a carbon intensive process. However, these processes can be made a renewable process by using wastes and residues (unfit for human or animal consumption) as classified by the European Union RED ll Legislation (Renewable Energy Directive (EU) 2018/2001 which aims to meet the EU target to fulfil at least 32% of its total energy needs with renewable sources by 2030).

For hydrogen fuel cells to provide a viable zero emission alternative fuel, producing hydrogen from renewable energy sources is essential. Although currently limited, there are other sustainable alternatives to fossil fuels to create the electrical energy used to produce hydrogen, such as renewable wind and solar energy which allows the hydrogen production to have a carbon neutral footprint – known as Green Hydrogen.

Hydrogen used in a fuel cells is free from any harmful emissions. The only by-product is water from the chemical reaction within the fuel cell. This reaction also produces electricity, which is stored onboard and used to power the vehicle. The range of a FCEV is not dependant on the outside temperature, so does not deteriorate in cold weather.

FCEVs are practical for heavy goods vehicles (HGV) due to higher payloads and range however, it is unclear at this stage of the costs involved in this solution as there aren't any examples currently being used in the waste industry.

Electric (BEV)

Unlike hydrogen, electricity is readily available and so with some of the major manufacturers investing heavily in battery technology for HGV's and in the waste industry, it is an alternative solution to ICE vehicles which is available now and the key benefit being reduced carbon emissions.

The refuelling/charging times for BEVs are currently long, in comparison with alternative fuels. Although, Biffa's current operations have a downtime built in during the evening, which is ideal for recharging BEVs.

However, whilst becoming more available, take-up on a BEV approach for HGV's operating on waste collection contracts in rural authorities across the country is currently very low, due to unproven operational effectiveness working in large rural areas.

Range and battery weight is an issue for some operations when using BEV, although this is becoming less of an issue as technology advances. Additional gross vehicle weights are also being introduced on some vehicles to compensate for the additional weight of the BEV. BEVs also have high purchase costs, although whole life costs may be attractive.

BEVs can also have their ethical supply issues due to the way in which precious metals are extracted and the process involved in battery manufacturing, and concerns have been raised on the source of raw materials used in the manufacture of batteries, such as cobalt. There are also carbon emissions from transportation which is necessary to deliver the raw material to the battery manufacturing sites around the world.

To understand how effective a battery powered vehicle might be when using large 26 tonne collection vehicles in rural districts such as South and Vale, the councils together with a partnering company called 'Innovative' have bid for funding to conduct a 3-month trial in autumn 2024.

HVO Biofuel

Considering the councils' current fleet vehicles, HVO biofuel (Hydrotreated Vegetable Oil) has the potential to significantly reduce 'well to wheel' carbon emissions by up to 85%.

HVO is a second-generation paraffinic biofuel. It is a drop in fuel – a fuel which doesn't require any adaption to the operational fuel infrastructure, the vehicle (where the use is approved by the manufacturer) or the vehicle maintenance regime.

Not all vehicle manufacturers initially approve the use of HVO, but a significant number do approve its use. For those which do not, a hybrid refuelling approach or individual manufacture approval is possible.

HVO supply chains are not UK wide, but do service parts of Oxfordshire however, HVO is currently 15% to 20% more expensive the traditional fossil fuel B7 diesel.

In any use of HVO, the councils would need to only source feed stock and hydrogen from renewable sources that comply with EU Legislation RED ll. The use of HVO formats which include palm oil in its manufacture would be prohibitive.

Manufacturers can identify the origin of the raw material to verify the credentials of the HVO product and provide declarations from the Renewable Fuels Assurance Scheme to the councils.

The Climate and Biodiversity Team do not recommend investment in HVO as a transition fuel due to negative overall impact and potential reputational risk.

Local examples have been mixed as Oxford City have decided not to invest in HVO fuel for short term reduction in carbon emissions as the lifecycle impact of the fuel is negative, whilst Oxfordshire County Council have recently adopted HVO for 80 per cent of their fleet.

HVO would reduce carbon emissions for South and Vale but may have a knock-on effect in supplier countries. Firstly, Used Cooking Oil stocks are not easily traceable so could contain a mix of virgin palm oils which can be used to boost supply. Secondly, there is a risk that the councils would be taking used oil from farmers in Asia where it is not a waste product, who would then need to substitute their own supplies with virgin stocks. In either case, the production of the palm oil is linked to deforestation and is therefore not a sustainable choice.

HVO update from the Energy Saving Trust in November 2023 showed the following assessment:

'*We understand the cost differential between fossil diesel and HVO has opened up very markedly recently - if you are considering HVO it would be worth seeking a quote from a supplier who supplies the fuel in your area. The whole life costs (WLC) of a HVO vehicle will in many applications likely be uncompetitive compared to electrification'.*

'The largest supplier of HVO to fuel suppliers in the UK (Green Biofuels Ltd) went into administration last month - this may have knock on effects on availability/price of HVO in the UK in the near future'.

'The future policy environment for liquid biofuels in UK road transport remains uncertain at present – the Department for Transport (DfT's) low carbon fuels strategy remains unreleased and overdue. When this strategy is released, it will help provide clarity to potential users of liquid biofuels such as HVO on the longer-term rationale/not for adopting the fuel and investing in vehicles to make use of such fuels'.

Given the mixed picture as outlined above, it is proposed that if HVO could be proven as sustainably sourced, was able to be used in the current/new vehicles and could be purchased at an affordable price point, then it could be considered as part of the vehicle strategy for the councils however, further work would need to be completed prior to recognising it as one of the carbon reduction measures the councils would use, but this would be completed as part of reviewing the options

available for vehicle replacement in line with the new process as defined in the accompanying report.

Additional Notes

Hydrogen fuel cells electric vehicles (FCEV) have not been included in the options above as the current availability and practical delivery of this solution has not yet been well-defined.

Any residual fleet generated carbon excess remaining would be treated by offsetting projects elsewhere within the councils or by participating in an off-setting scheme to achieve carbon neutrality/net zero.

As technology in alternative fuels, vehicle maintenance and vehicle components advances over future years, the councils will be advised on new and updated options and recommendations in reducing carbon from the councils' vehicle fleet as part of the annual fleet appraisal and proposal for vehicle replacements.

3) Air Quality and Euro 6 Engines

Although the councils have committed to carbon neutrality, the Westminster Commission for Road Air Quality also promotes the importance of cleaner air from vehicle emissions and it strives to promote the reduction of air pollution from vehicles.

Some of the measures being suggested to reduce carbon from vehicles will also have a co-benefit of reducing air quality pollutants from vehicle tailpipes.

Where alternative fuelled vehicles cannot be secured, the councils target should be for all new vehicles, to be at least 'Euro 6' compliant. Euro 6 is the name given to a set of limits for harmful exhaust emissions produced, by virtually all vehicles powered by petrol or diesel fuel.

It's proven that both particulate matter (PM) and nitrogen oxide (NOx) emissions from tail pipes have been significantly reduced when operating Euro 6 vehicles.

4) Route Optimisation

Biffa uses software as necessary and on behalf of the councils to help consider the most efficient routes for the front-line service operation. Collection routes can change over time with the introduction of new roads, new properties being built, and new road restrictions being implemented.

Determining the most effective route and where a property or street sits on the most efficient operational 'round' is critical to reducing mileage, efficient use of auxiliary equipment and saving fuel, thus reducing the carbon impact of a particular 'round'.

A piece of work was recently completed by Biffa to re-optimise some of the operational rounds where they had become unbalanced or had become less efficient over time. This will have delivered a benefit in building in additional capacity for the collection rounds, but route optimisation can also be used to reduce fuel usage and

associated carbon. Going forwards it will be important that the councils have efficient and effective collection rounds including trips to drop off points, which will be achieved through periodic route optimisation and will help limit/minimise the numbers of vehicles needed to perform the services.

5) Eco Driver Coaching and Development

A substantial number of waste service vehicles within the fleet are relatively high in fuel use, due to their largely rural operational activity and the more fuel used by a vehicle, the more carbon and harmful emissions are disbursed into the atmosphere.

A significant number of high fuel usage vehicles could be fitted with telematics to provide data on driver performance. This data identifies many areas of activity including excessive idling, over revving, excessive speeding, harsh acceleration, harsh breaking, and other vehicle and driver performance data; all potentially having a negative impact on the fuel used and resulting carbon emissions.

The data collated would provide the foundations for individual driver improvement programmes to be delivered and the drivers eco-driving techniques developed with successful implementation realising fuel usage reduction and a saving in carbon.

Eco-driving is also safe driving and secondary benefits include less accidents and less stress on drivers. Information isn't available from Biffa on the current costs of vehicle accidents, but under the contract extension and new open-book accounting provision, the councils should be able to see the size and scale of vehicle accidents in 2024/25 and 2025/26 which along with the fuel cost, could be used as a benchmark to measure the positive financial impacts of eco driver coaching and development, if it were to be introduced alongside the new service provider in 2026.

Feedback from a neighbouring similarly rural district authority, indicated a saving in fuel alone of circa £20,000 per annum from an eco-driving scheme, which is delivered and monitored by the local operational management team.

6) Tyres

Tyres produce carbon emissions by using a significant amount of oil when manufactured. Therefore, by reducing the number of new tyres fitted to vehicles during their lifetime, carbon is reduced.

Tyres are available in a range of options which improve their performance and/or life depending on the application which is required. The rolling resistance of tyres can improve or hinder fuel consumption and contribute to excessive carbon being emitted into the atmosphere, especially smaller faster moving vehicles. A greater rolling resistance produces a less robust tyre, so considerations around tyre application is critical.

The selection of the correct tyre tread patterns and compounds within tyre manufacture will have a positive impact of reducing carbon. It would be advantageous for the new service provider in 2026 to develop a robust tyre policy to ensure the correct tyre selection; twinned tyres when positioned on same hubs; side

wall protection banding; the re-grooving of existing tyre tread and turning the tyre on rim at optimum times to ensure maximum life and associated carbon reduction.

A significant number of the councils' service vehicles are large in physical size and operating in a restricted space e.g. refuse and recycling collection vehicles. 'Kerbing' of tyres or the load tipping environment can damage a tyre. When effectively monitored, some vehicles with these damaged tyres (and tyres worn to minimum) can be repaired and/or re-treaded, significantly reducing carbon.

It will be important from 2026 for the new service provider to work with specialist tyre manufacturers to ensure policy tyre fitments accurately reflect the operation and carbon reduction to the council's requirements.

All procurement specifications for tyre contracts would need to meet the needs of the service and the council's priorities on value for money and carbon reduction.

7) Electric Wheelie Bin Lifting

ICE Refuse and recycling collection vehicles use fuel driven hydraulics to lift and empty the wheelie bins. However, fuel and carbon savings can be achieved by changing the power source to electric from the equivalent hydraulic variant.

Electric bin-lifts can be fitted to diesel vehicles or biodiesel vehicles to improve carbon emissions and operational noise. Similarly new vehicles can be specified with electric bin lifts when ordered. Currently, electric bin lifts are expensive compared with hydraulic equivalents, but costs are likely to reduce in the future and so they should be reviewed as part of the process to agree the specifications for vehicle replacements annually.

8) Performance Monitoring

Carbon reduction savings from these measures would need to be recorded on a regular basis, in order to monitor their effectiveness and again benchmarked against the information being gather under the open book arrangements with Biffa in 2024/25 and 2025/26.