ANNEX A

FLEET MANAGEMENT STRATEGY

North West Leicestershire District Council

Zero Carbon Roadmap

August 2021

Contents

1. PURPOSE

The council committed to produce a fleet management strategy report to demonstrate how its fleet can transition to a zero carbon/low carbon solution by 2030.

This report focuses on the first three years due to quickly changing technology. It considers vehicles, fuels, infrastructure and summarises the approach and the key outputs. It outlines the strategy, financial implications, and action plan.

2. BACKGROUND

The council owns and maintains its fleet for all services within the council. The fleet replacement plan helps the council to ensure that all vehicles are replaced in a timely manner but previously has not considered vehicle emissions and environmental impact.

The council's fleet is made up of 114 vehicles which is a mixture of refuse collection vehicles, parks maintenance vehicles, medium sized panel vans and smaller vehicles alongside more specialist equipment, such as sweepers and mowers. The predominant users are Waste Services (39) and the Housing team which has a home-based fleet of medium panel vans (44).

Vehicles are generally kept for a seven year period, based on expected life cycle of the vehicle. Since 2018 only one vehicle has been replaced so 53 vehicles in the fleet have now passed their expected life cycle, driving additional maintenance costs or temporary vehicle hire.

In late 2020 it was agreed that no further vehicles would be purchased until a fleet management strategy had been created to demonstrate how the council's fleet could transition to zero carbon by 2030.

3. FLEET FORUM

A fleet forum was created to bring together representatives from waste services and main fleet user groups along with finance, procurement and zero carbon, to understand current and future challenges and concerns and to develop early fleet management strategy thinking.

It included a review of the current status of the fleet, fleet data availability and updates on associated activities (e.g., fleet optimisation, tracker data policy) as well as insight to customer requirements of vehicles. A number of opportunities were identified pending the arrival of a new fleet manager and it provided the foundation for the fleet management strategy.

4. ZURICH RISK ASSESSMENT

Governance and legal compliance forms an element of a fleet management strategy. The council's insurers offer a motor fleet risk assessment service and this exercise was undertaken in Q2 2021 with the report and results expected in Q3. It comprises a number of elements:

Results are expressed both in qualitative and quantitative terms and risks are rated from A to D, with A being low risk.

Excellent:	Overall Score ≤ 50
Good:	50 < Overall Score ≤ 100
Fair:	100 < Overall Score ≤ 150
Poor:	Overall Score >150

The council has an aspiration to achieve a rating of “good” and officers plan to implement any recommended improvements.

5. TECHNICAL FLEET ASSESSMENT

In April 2021, Cenex, consultants specialising in low emission transport and associated energy infrastructure, were commissioned to undertake the development of a fleet management strategy, considering the fleet and infrastructure, and to recommend how the council could transition to a zero carbon fleet by 2030. Cenex has undertaken similar projects for Nottingham City Council, Derbyshire County Council and Severn Trent Water.

Given the wide range of vehicles in operation, Cenex advised that it was unlikely that there would be a single technological solution to reduce the council’s carbon footprint and that some technologies are not yet considered mainstream solutions. They considered all the

available technology in their review and noted that the harder task for fleet decarbonisation relates to the heavier duty vehicles.

The council provided detailed fleet information and tracker data which Cenex supplemented with the results of independent vehicle testing, independent cost, fuel, and emissions data along with council team interviews to gain insight to operational practices. Cenex categorised the council's individual vehicles into relevant operational vehicle segments before baselining the current fleet composition, operations, and emissions profile.

Cenex carried out a review of current low emission vehicle technologies and considered which options would be available immediately as well as future opportunities. The outputs were presented from maximum emissions savings (at any cost) and total cost of ownership (TCO) parity or better within each vehicle segment. The final technology selection was applied based primarily on wider operational suitability, low emission vehicle maturity and viability of infrastructure.

Cenex's reports are listed in below. The specialised fleet and equipment (e.g., tractors, mowers, fork trucks) is reported separately from the main fleet.

Cenex Report 1	Fleet Management Strategy (main technical report)
Cenex Report 2	Specialist Fleet report (e.g., tractors, mowers)
Cenex Report 3	Home Charging Review

6. CURRENT FLEET STATUS

There are 100 vehicles in the main operational fleet, dominated by light commercial vehicles with medium vans being the largest vehicle segment (48%). The remainder of the fleet consists mainly of heavy goods vehicles, dominated by 3-axle rigid trucks (16%).

The emissions and air quality contribution of each vehicle type is illustrated in the table below:

		Number of Vehicles	Percentage of Total Fleet	% Contribution to Total WTW CO_2e Emissions	% Contribution to Total NO_X Emissions	% Contribution to Total PM Emissions
Car	**Small Car**	4	4%	1%	3%	1%
LCV	**Large Commercial SUV**	2	2%	1%	3%	0%
	Small Van	7	7%	1%	6%	3%
	Medium Van	48	48%	20%	60%	69%
	Large Van (< 3.5t GVW)	11	11%	5%	10%	2%
HGV	**Large Van (> 3.5t GVW)**	1	1%	0%	0%	0%
	Rigid Truck - 2 axles (7.5t GVW)	4	4%	3%	0%	1%
	Rigid Truck - 2 axles (18t GVW)	7	7%	15%	1%	2%
	Rigid Truck - 3 axles (26t GVW)	16	16%	54%	16%	22%
	Total	**100**	**100%**	**1,130 tonnes**	**1,100 kg**	**10 kg**

TTW	Tank to Wheel	The amount of CO_2 (derived from fossil fuels) which is released from a vehicle's tailpipe
WTW	Well to Wheel	A more complete method of looking at CO_2 emissions. It represents the amount of CO_2 emitted during the fuel's life cycle. This includes the upstream emissions associated with fuel extraction, processing, transportation and dispensing as well as the emissions from final fuel combustion
CO_2e	Carbon Dioxide Equivalent	A standard unit which accounts for carbon dioxide and all other greenhouse gases (e.g., methane, nitrous oxide)
NO_x	Nitrogen Oxides	A generic term for nitrogen oxides - a main air quality pollutant emission which can contribute to several health issues
PM	Particulate Matter	The term used for mixture of solid particles and liquid droplets found in the air - a main air quality pollutant emission which can contribute to several health issues.

The medium van segment produces the highest proportion of air quality emissions on the fleet, amounting to 60% and 69% of NO_X and PM emissions respectively. The high NO_X and PM emissions are impacted by the large proportion of older Euro 4 diesel vehicles currently in operation.

The rigid truck 3-axles segment contributes 54% of CO_2e emissions despite only accounting for 16% of the total fleet. This is a result of the high fuel consumption of these vehicles and associated high energy usage due to the use of bin lifts and compaction units.

7. TECHNOLOGY OPTIONS

Three main technologies were identified based on current UK vehicle availability and supplier/ market maturity.

- A zero-tailpipe emission vehicle or **ZEV** is a vehicle which does not emit greenhouse gas (e.g., carbon dioxide/CO_2) or air quality pollutant emissions from the vehicle exhaust/tailpipe. These include Battery Electric vehicle (BEV), Fuel Cell Range Extended Electric Vehicle (FC REEV) and Fuel Cell Electric Vehicle (FCEV).

- An ultra-low emission vehicle **ULEV** is currently defined as any car or van that emits less than 75 g/km of CO_2 from the exhaust/tailpipe. Due to advances in technology, it is expected that from 2021 an ULEV will be defined as a car or van that emits less than 50 g/km with a minimum required zero emission range. These include Range Extended Electric Vehicle (REEV) and Plug-in Hybrid Electric Vehicle (PHEV).

- Low emission vehicle **LEV** technologies include all ULEVs and ZEVs in addition to internal combustion engine vehicles capable of using renewable fuels. This includes compressed natural gas (CNG), biodiesel (FAME) and renewable diesel (HVO) each have different levels of supplier maturity and different economic models.

Note: Hydrogen fuel cell vehicles (FCEVs) and dual-fuel hydrogen vehicles (DFH_2) have not been assessed. Cenex advised that hydrogen powered vehicles are not yet market ready and it is not possible to purchase series production hydrogen powered vehicles within any of the NWLDC vehicle segments. Early trials of such vehicles are underway, but vehicle

manufacturers are not expected to release series produced vehicles until at least 2023. As such no costs or verified test data is available and the technology cannot be assessed to the same standard as the others.
Below are examples of currently available ZEV technologies:

Technology	Example	Description
Battery Electric Vehicle (OEM)		A battery electric vehicle (BEV) stores energy in a battery and delivers its power to the wheels through an electric motor. Original equipment manufacturer (OEM) vehicles are supplied by mainstream vehicle suppliers.
Battery Electric Vehicle (low volume)		A new vehicle 'glider' chassis is taken from the production line and a battery electric drivetrain is fitted. Low volume (and re-powered) BEVs are available from the likes of Emoss, Magtec and Tevva.
Battery Electric Vehicle (re-power)		A new electric drivetrain is fitted into a reconditioned second-hand vehicle. Re-power units are often used for trucks to help reduce the capital cost of an electric truck and improve payback time.
Fuel Cell Range Extended Electric Vehicle (FC REEV)		A BEV which also has an onboard hydrogen fuel cell to recharge the battery on the go. The wheels are always powered by the electric motor. The battery can also be recharged by plugging the vehicle into a mains power source.
Fuel Cell Electric Vehicle (FCEV)		Hydrogen is taking its first steps to becoming commercially available as a road transport fuel in the UK. Compressed hydrogen can be used to power an electric motor by generating electricity through a fuel cell. A small battery is often used for peak power requirements and for regenerative braking only.

To highlight which technologies may have the potential to deliver emissions savings, Cenex completed a high-level assessment of options based on current UK availability and supplier maturity.

The vehicles identified in the chart below are examples only and not a recommended manufacturer.

OEM product with a high level of maturity and aftersales support
Re-power or retrofit product with a lower supplier maturity
Technology has been demonstrated but is currently unavailable in the UK
Technology has not been demonstrated or is currently unavailable in the UK

		BEV (OEM)	BEV (low volume)	BEV (re-power)	REEV	PHEV	FCEV	FC REEV	FAME (~B30)	FAME (B100)	HVO	CNG
Car	Small Car	Renault Zoe										
LCV	Large Commercial SUV		Rivian									
	Small Van	Renault Kangoo ZE						Renault Kangoo ZE H2				
	Medium Van	Mercedes eVito			Ford Transit Custom							
	Large Van (< 3.5t GVW)	LDV EV80	Arrival					Renault Master ZE H2				Iveco Daily
HGV	Large Van (> 3.5t GVW)	Iveco Daily Electric	EMOSS	Magtec								Iveco Daily
	Rigid Truck – 2 axles (7.5t GVW)	FUSO eCanter	EMOSS	Magtec	Tevva				DAF LF			
	Rigid Truck – 2 axles (18t GVW)	Volvo FL Electric	EMOSS	Magtec	Tevva				DAF LF	Volvo FL		Iveco Eurocargo
	Rigid Truck – 3 axles (26t GVW)	Volvo FE Electric	EMOSS	Magtec					DAF CF	Volvo FE		Scania

8. LOW EMISSION VEHICLE (LEV) REVIEW

A LEV performance review was completed based on the combined fleet average vehicle for small car, medium van, large van, and rigid truck to demonstrate potential operational impact of using the identified technologies and to identify the most appropriate technology based on the individual vehicle requirements. This was followed by an individual vehicle assessment exercise.

8.1. Metrics and Assumptions

The following metrics and assumptions were used in the evaluation (prices exclude VAT):

- Annual mileage and number of used days per week
- Fuel economy and driving environment of 30% urban, 50% rural, 20% A-road (mostly regional)
- Planned ownership period
- Diesel = £1.00/ litre, Petrol = £0.96 / litre
- Electricity = £0.14 / kWh
- Bio-LPG = £0.53 / kg, CNG = £0.70 / kg (public gas station)
- FAME (B20) = £1.00/ litre
- HVO = £1.15/ litre

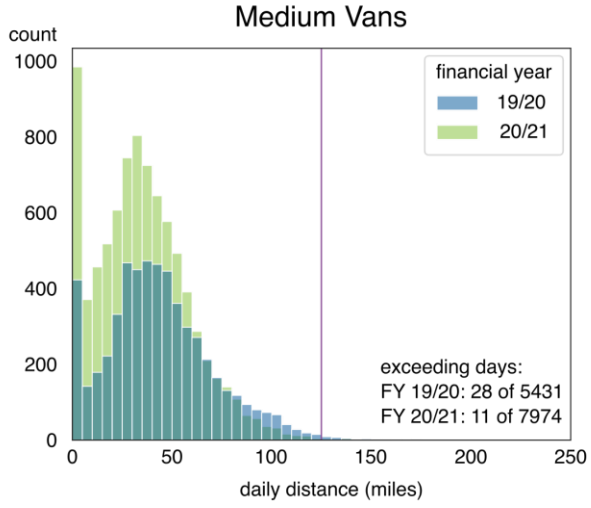
Note: All vehicle costs in the Cenex reports are based on industry standard information and the average of the top three best-selling models from each vehicle segment, where available. For waste vehicles, costs are based on chassis cost only, not the additional cost of purchasing and fitting the RCV body and bin lift as these costs are similar across all vehicles and are therefore not assessed as part of the vehicle TCO. Infrastructure costs assume that no grid upgrades are required.

8.2. Operational Considerations

Engagement sessions were held with user groups to assess potential constraints in terms of vehicle specification.

		Potential Operational Constraint
Car	**Small Car**	No operational restrictions identified.
LCV	**Large Commercial SUV**	Some vehicles may require 4x4/ off road capabilities.
	Small Van	No operational restrictions identified.
	Medium Van	Vehicles currently running at weight limit; all vehicles must be able to undertake maximum potential daily mileages due to need to cover emergency shift patterns.
	Large Van (< 3.5t GVW)	Some vehicles running at weight limit; some vehicles identified as being required to tow. One vehicle identified as having a crane. Charging of electric hand tools required.
HGV	**Large Van (> 3.5t GVW)**	Some vehicles running at weight limit; some vehicles identified as being required to tow.
	Rigid Truck - 2 axles (7.5t GVW)	Some vehicles identified as being required to tow. Some identified as having tail lifts. One identified as being trial food waste vehicle.
	Rigid Truck - 2 axles (18t GVW)	High energy operation due to refuse collection requirements (bin lifts, compaction); up to three loads per day requiring round trip to Loughborough waste site for disposal.
	Rigid Truck - 3 axles (26t GVW)	High energy operation due to refuse collection requirements (bin lifts, compaction); up to three loads per day requiring round trip to Loughborough waste site for disposal.

Housing raised operational concerns around BEV and range leading to a detailed analysis being undertaken of the daily mileages of the housing fleet. In the graph below, the vertical line represents 125 miles which is considered the average daily range for a medium van with a battery capacity of 68 kWh – fewer than 0.5% of daily mileages for 2019/20 and 0.14% for 2020/21 exceeded this range, which suggests that battery electric technology can be considered a suitable option.



8.3. Battery Electric Vehicle (BEV) Assessment

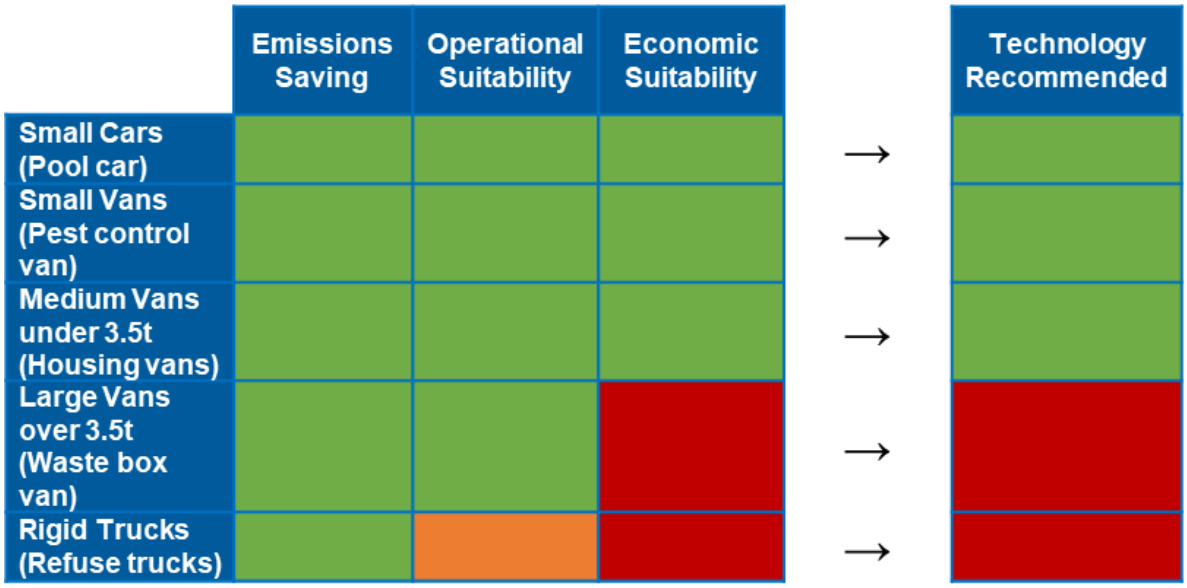
Underlying the assessment were three key measures:

- Does it lead to a carbon saving compared to diesel?
- Does it have the range to complete the average daily journeys?
- Does it lead to a total cost of ownership saving compared to a new diesel vehicle?

The analysis demonstrated that BEV is suitable for small cars, small vans, and medium vans across all three measures.

	The **small car** results show that BEV is the recommended technology to use. It covers the range, has a TCO saving and zero tailpipe emissions.
	The **medium van** results show that BEV operating range is over twice the average daily mileage and provides zero tailpipe emissions, a 69% reduction in WTW CO2e emissions and is TCO neutral. All other technologies increase TCO.
	The **large van** results show that BEV is the most expensive technology and does not provide the range that other technologies do.
	The **rigid truck** results show that BEV is the most expensive technology and does not provide the range required to complete the work.

The chart below indicates that whilst BEV is suitable for smaller vehicles, it is not considered an appropriate technology for larger vehicles over 3.5 tonnes.



8.4. Renewable Fuel Outcome

As part of the assessment, the following alternative fuels to diesel were considered in detail:

Technology	Example	Description
Compressed Natural Gas* (CNG)		CNG is the compressed form of natural gas. It is stored on vehicles in pressurised cylinders at 200 to 250 bar and consumed via a dedicated gas engine.
Biodiesel (FAME)	BIODIESEL	Biodiesel, also known as Fatty Acid Methyl Esters (FAME) is primarily produced from waste plant products and is a low carbon, sustainable alternative to mineral diesel. Biodiesel is already present in regular diesel at up to 7%. High blend biodiesel contains at least 20% biodiesel (B20), most truck manufacturers warranty vehicles up to B20. It is possible to run on B100, but this requires additional equipment, fuel management and is not covered by all warranties.
Renewable Diesel (HVO)	NESTE MY Renewable Diesel	Renewable diesel, such as Hydrotreated Vegetable Oil (HVO) is chemically identical to fossil diesel but produced from waste feedstock and vegetable oil. It is classed as a 'drop-in' fuel, which means it can be substituted for conventional fossil fuel diesel with no impact on maintenance and warranty conditions.

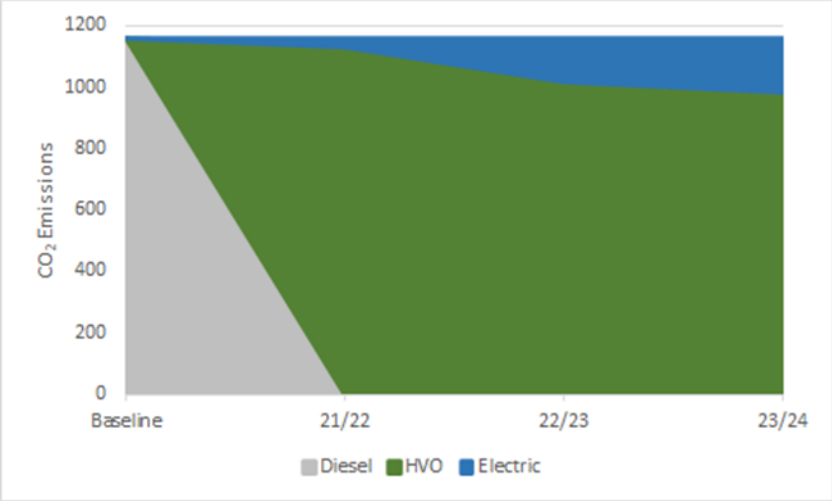
The table below shows the annual (WTW) CO_2e emissions savings and annual NOx emissions savings achievable for each fuel.

Annual WTW CO_2e Emissions Savings (% of total fleet)

	ZEV		ULEV	LEV		
	BEV (OEM)	BEV (low volume)	REEV	Bio-CNG	B100	HVO
Small Car	1%					
Large Commercial SUV					1%	1%
Small Van	1%				1%	1%
Medium Van	15%		8%		17%	18%
Large Van (< 3.5t GVW)	4%			4%	4%	4%
Large Van (> 3.5t GVW)	0%			0%	0%	0%
Rigid Truck - 2 axles (7.5t GVW)	1%		2%		3%	3%
Rigid Truck - 2 axles (18t GVW)	12%	1%		3%	12%	13%
Rigid Truck - 3 axles (26t GVW)	10%	0%		43%	44%	47%
Total	**44%**	**1%**	**11%**	**56%**	**81%**	**86%**

HVO fuel was identified as an alternative to diesel and a method of achieving an immediate removal of CO_2e emissions pending vehicle replacement across the fleet or where alternative technology is not yet viable. It was recommended to check individual vehicle manufacturer warranties and no concerns were identified by the council's fleet manager for the existing fleet.

The emissions benefit is illustrated in the chart below; emissions drop to zero with the move to a mix of BEV (blue) and HVO (green).



As demonstrated by the chart below, whilst there is a strong emission reduction case and operational suitability, financially, Cenex advised that there is an on-cost of c15 pence per litre (noting that market rates for both diesel and HVO fluctuate).

Whilst HVO reduces CO_2e emissions by 86% and is a good interim solution, it does not address air quality issues (NOx and PM). It is a "drop-in" fuel so can be added directly to the existing diesel tank.

The Linden Way depot has a single fuel tank, and it is currently used to fuel all vehicles except Housing, who use a Key Fuels system and fuel up at garages. A move to HVO fuel would mean housing vehicles would also fuel up at the depot. Housing cannot move to HVO fuel without the depot based fuel supply.

Based on HVO 15p premium versus diesel price, the estimated additional costs are:

Additional costs from using HVO	2021-22	2022-23	2023-24	2024-25	Total
General Fund	£21,685	£65,056	£63,964	£62,536	£213,241
HRA	£6,286	£18,858	£17,072	£6,733	£48,949
Special Expenses	£322	£967	£967	£539	£2,794
Total	**£28,293**	**£84,880**	**£82,003**	**£69,808**	**£264,985**
Emission savings (tCO_2e)	376	1,129	1,093	933	3,531

9. INFRASTRUCTURE

Cenex assessed the infrastructure required to facilitate the uptake of those vehicles identified as being suitable for replacement with ZEV, ULEV and LEV alternatives.

Existing sites for publicly available electric and natural gas infrastructure were identified. They concluded that relying only on publicly available electric vehicle infrastructure would not be appropriate given its limited availability. However, their view was that there are currently enough public charge points such that a vehicle would not have to travel far if it required a top-up charge during the day.

In terms of natural gas refuelling, there is one major liquified natural gas refuelling station in North West Leicestershire near the A42 and East Midlands Airport although this fuel is more relevant to long haul transit. The nearest public compressed natural gas stations are in Erdington (near Birmingham) and Newark.

A BEV charge point assessment was carried out and the most suitable selected with estimated costs:

7 kW AC (230V, 32A single phase) – Home-based infrastructure only, £1000 each
22 kW AC (400V, 32A three phases, dual output) – £7103 (2 vehicle charging points)
50 kW DC (400V, 32A three phases) – £24,087(2 vehicle charging points)

Since a majority of the housing fleet vehicles are currently taken home, identifying options to allow drivers to charge their vehicles overnight at their homes would reduce the need for the installation of additional depot-based or on-street/public charging infrastructure and have minimal impact on current operational practices.

Cenex provided a separate report outlining what best practice would look like for a home charging scheme and provided recommendations for how such a scheme could work within NWLDC. This document will be used to agree reimbursement processes.

Grid upgrades can be significant, the funding model that distribution network operators (DNOs) operate under means the customer making the request shoulders the cost burden. The below table shows indicative costs and timescales for various upgrades ranging from small (70 kVA) to large (1,000+ kVA).

	Small	Medium	Large
Power	Up to 70 kVA	200 to 1,000 kVA	Above 1,000 kVA
Number of charge points	• 1-3 fast, or • 1 rapid	• 10-50 fast, • 4-20 rapid, or • 1-6 ultra-rapid	• 50+ fast, • 20+ rapid, or • 6+ ultra-rapid
Approximate connection time	8-12 weeks	8-12 weeks	6 months +
Approximate connection cost	£1,000 - £3,000	£4,500 - £75,000	£75,000 - £2 million

Cenex considered charging powers, charge point providers, types of parking, reimbursement mechanisms, grant support, tax implications, ensuring installation readiness and liability for home charge points. The actions suggested by this study are included in the Action Plan.

Waste Services is rapidly outgrowing Linden Way depot, due to the increase of properties in the district producing more waste, needing more vehicles and staff to service them. Adding the fleet expansion to include food waste vehicles there is no capacity for a large fleet of electric vehicles to charge at the same time (overnight). With the potential to run the HGV

fleet on Hydrogen or another technology in a few years, provision needs to be considered for alternative fuel tanks. It is proposed that a project board is established to assess the requirements and if agreed, source a location for a new depot meeting the future requirements of the service and enabling long term infrastructure investment.

10. FLEET REPLACEMENT PROPOSAL

Based on the results of the LEV technology selection process and LEV infrastructure review, Cenex identified those vehicles which could be replaced by ZEV, ULEV and LEV technologies with minimal changes to the fleet's current operating patterns and planned ownership periods.

The recommended replacement vehicles focus on two technologies

- BEV - battery electric vehicles
- HVO - a renewable 'drop-in' replacement fuel for fossil diesel

Across the fleet, there are opportunities to introduce BEV's within the small car, small van, and medium van vehicle segments.

It is recognised that the market and technology is changing quickly, and it is anticipated that there will be further options available for the larger fleet over future years. Cenex advises repeating the analysis in 2024 to identify whether there are any viable options to replace HVO with BEV or alternative technology, such as hydrogen.

11. 3 YEAR FLEET REPLACEMENT PLAN

The table below illustrates the fleet replacement plan for the next three years.

3 Year Replacement Plan (in line with vehicle lifecycle)

Fuel	Team	What	Notes	Year 1 (29)	Year 2 (37)	Year 3 (20)
Electric	Environmental Protection (EP) HR	Small Car (A)	Car parks Pool cars	3 EP 2 HR		
Electric	Parks Waste	Small van (B)			1 Parks 2 Waste	1 1 Waste
Electric	Housing	Medium Van (C)	Phased approach	6 (1 per trade)	29	2
Electric	Waste EP	Medium Van (C)		1 Waste		1 Waste 1 EP
Diesel/HVO	Waste	Large Van (D)	Waste collection	1		
Diesel/HVO	Waste	Large van (D)	Food waste vehicles (pending approval)	5		
Diesel/HVO	Waste	Rigid Truck (E)	Waste collection vehicles	6		4
Diesel/HVO	Waste/Parks	Rigid Truck (F)	Reach truck	1		
Electric	Parks Waste	Large van (G)			4 Parks	3 Waste 2 Parks
Diesel/HVO	Parks EP	Large SUV	4 x 4 pick up		1 Parks	1 EP
Diesel/HVO	Waste	Specialist	Forklift truck	1		
Gas oil	Parks Waste	Specialist	Chipper, mowers, boxing off machine, sweepers	3 Parks		2 Parks 2 Waste

The vehicle and infrastructure costs are outlined in section 13.

12. SPECIALIST FLEET

Non-operational vehicles (e.g., tractors and mowers) were reviewed in a separate Specialist Fleet review.

Low emission options for specialist equipment and plant are at a lower level of product maturity and availability than those used in road vehicles. Therefore, a higher level analysis was taken than that used for other operational road vehicles (e.g., small car, small van, medium van, large van, rigid truck).

There are 20 specialist fleet vehicles on the NWLDC fleet, dominated by mowers, sweepers, telehandlers, and tractors. The specialist fleet operates primarily on diesel, with fuel consumption data provided on a per vehicle basis where available, outlined in the table below.

	Number	Fuel Consumption (litres/ annum)
Ride on Mower	6	3,234
Tractor	3	3,748
Mini Excavator	1	318
Telehandler	3	16,632
Wheeled Loader	1	895
Sweeper	4	15,454
Chipper	1	470
Forklift	1	500
Total	**20**	**41,251**

This fleet category emits 91 tonnes of Tank to Wheel (TTW) and 117 tonnes of Well to Wheel (WTW) CO_2 emissions. The majority of emissions are associated with the use of telehandlers (reach truck used at the depot) and sweepers due to a combination of high usage patterns and high fuel consumption.

The completed Low Emission Technology Options review has indicated that biodiesel, hydrotreated vegetable oil (HVO), electric and alternative hydrocarbon fuels such as compressed natural gas (CNG) and biomethane (bio-CNG) have some applicability across the identified groups of specialist fleet vehicles.

While electric is significantly more expensive, in terms of capital expenditure, than the equivalent diesel variant, with some operational changes required, these should be outweighed by the emission reduction, and operational expenditure benefits of this technology.

With HVO there is an operating expenditure increase compared to diesel, however this is expected to be outweighed by the emission reduction, and operational benefits of this fuel coupled with no impact on capital expenditure.

A ‘Traffic Light’ approach was utilised to summarise alternative technology review. This approach rates the suitability of the identified alternative technology options in the following areas: Operational, Emissions, Capital Expenditure (CapEx) and Operational Expenditure (OpEx) in a **RED AMBER GREEN** traffic light matrix, as shown in the table below.

Fuel	Factor	Sweeper	Mowers	Telehandler	Tractor
Biodiesel	Operational				
	Emissions				
	CapEx				
	OpeEx				
HVO	Operational				
	Emissions				
	CapEx				
	OpeEx				
Diesel-Electric Hybrid	Operational				
	Emissions				
	CapEx				
	OpeEx				
Electric	Operational				
	Emissions				
	CapEx				
	OpeEx				
Alternative Hydrocarbon-based Fuels	Operational				
	Emissions				
	CapEx				
	OpeEx				
Hydrogen	Operational				
	Emissions				
	CapEx				
	OpeEx				

Following the review, it is recommended that officers further investigate the options to trial electric variants of the following specialist fleet equipment:

- Ride-on mowers
- Tractors
- Telehandlers
- Compact & truck mounted sweepers

Where electric variants prove incompatible with existing working practices within NWLDC the use of HVO is recommended as an alternative.

13. FINANCE AND EMISSIONS

The total capital cost of the three year replacement plan is £5.2 million. This along, with the costs of adopting HVO, is expected to increase the average annual revenue costs of running our fleet by £322,000. This section sets out the financial impact of each decision, along with the emissions saved and how the decision contributes to the Council's objective.

13.1. Financial and emission implications from revised fleet renewal programme

The Council has previously approved the replacement of vehicles totalling £2.5 million. The anticipated fleet replacement programme for 2022-23, prior to this report, was £0.5 million, bringing the total three-year replacement programme previously reported to Council to £3.0 million. The new replacement programme, set out in section 11, will replace the existing capital programme and result in £5.2 million programme over three years if it is approved. This reflects the latest anticipated fleet requirements as well as changes resulting from our zero carbon objective.

The cost of purchasing electric vehicles is currently higher than their diesel or petrol equivalents. The table below shows that, of the £5.2 million programme, the council will pay additional costs of £618,000 for the 59 electric vehicles and £43,000 for charging infrastructure that would not be incurred if adopting diesel engines. These additional costs will be partially offset by anticipated lower running costs, as well as higher residual values when the vehicles are sold. This brings the net anticipated costs over and above diesel equivalents down to £118,000.

	Small Car	Small Van	Medium Van	Large Van	al Programme
Additional capital costs	£32,033	£30,873	£312,800	£242,097	**£617,803**
Charging Infrastructure Costs	£0	£0	£36,000	£7,100	**£43,100**
Lifetime revenue savings	-£19,952	-£19,176	-£315,428	-£69,396	**-£423,952**
Additional value when sold	-£12,575	-£2,663	-£25,761	-£77,468	**-£118,467**
Net additional lifetime costs/(savings)	**-£493**	**£9,034**	**£7,611**	**£102,333**	**£118,484**

The above shows that the electric small cars are expected to be cheaper over their life than their diesel equivalent, whilst all other categories of battery electric vehicle are expected to increase the lifetime costs of owning the vehicle.

The lifetime additional costs of £118,000 is dependent upon estimates of the running costs and residual values of battery electric vehicles compared to their diesel comparators. Over time these figures could vary. An optimistic scenario, where savings in running costs and the value of the vehicle are 10% higher than set out above, would see the additional lifetime costs of running the vehicles reduce to £64,000. Alternatively, in a pessimistic scenario where the savings and residual value are 10% lower, the additional lifetime costs increase to £173,000.

Purchasing the electric vehicles will bring the carbon emissions from the vehicles down to zero, which is an estimated lifetime reduction in well to wheel emissions of 1,221 tCO_2e when compared to using diesel vehicles, representing a cost of £97 per tCO_2e saved. Of the 1,221 tCO_2e saved, 54 tCO_2e (4.4%) is saved in the years 2030 or beyond – the council's target date to be zero carbon – before the vehicle is due to be replaced. This represents a cost of £2,197 per tCO_2e saved in the 2030 period. Adopting electric vehicles will also save 1,264 kg of nitrous oxide and 5kg of particulate matter from being emitted over the life of the vehicle. The table below summarised the emissions savings from the vehicles purchased in each year.

Vehicles purchased in:	2021-22	2022-23	2023-24	Total
Additional lifetime costs/(savings) from electric vehicles	£5,498	£69,679	£43,307	£118,484
Lifetime well to wheel emissions savings from adopting electric vehicles (tCO2e)	203	772	246	1,221
Cost per tonne CO2e of saved (£/tCO2e)	£27	£90	£176	£97
Amount of emission savings that occur from 2030 (tCO2e)	-	28	26	54
Cost per tonne CO2e saved in 2030 and beyond (£/tCO2e)	Not Applicable	£2,526	£1,643	£2,197
Lifetime nitrous oxide emissions savings from adopting electric vehicles (kg)	252	803	209	1,264
Lifetime particulate matter savings from adopting electric vehicles (kg)	1	3	1	5

The three-year fleet replacement programme will be funded by unsupported borrowing, which results in an annual charge back to the general fund for the vehicles, known as the Minimum Revenue Provision. The annual minimum revenue provision charge is expected to increase by £297,000 as a result of this new programme. of which £71,000 relates to the additional charges from adopting electric vehicles. Approximately £171,000 of the minimum revenue provision will be recharged to the HRA, with the remaining £559,000 being charged to the general fund.

13.2. Financial and emission implications from adopting HVO

Using renewable diesel (HVO) in the remaining fleet is expected to cost around 15 pence per litre more than diesel, although this will vary as the costs of both HVO and diesel vary - including potentially being cheaper than diesel at times.

The table below shows the anticipated cost per year of using HVO, along with the anticipated carbon dioxide savings, based on the vehicles that remain diesel over three years. It shows that the total cost over the next four financial years is anticipated to be £265,000, assuming that HVO costs 15 pence per litre more than diesel. This will prevent emissions totalling 3,531 tCO_2e from being emitted from our fleet over the 3.5 years, at a cost of £75 per tonne of CO_2e saved. No reduction to nitrous oxide or particulate matter emissions is expected from the adoption of HVO over diesel.

	2021-22	2022-23	2023-24	2024-25	Total
Additional costs from using HVO	£28,293	£84,880	£82,003	£69,808	£264,985
Emission savings (tCO_2e)	376	1,129	1,093	933	3,531
Cost per tCO_2e saved	£75	£75	£75	£75	£75

This proposal is currently unfunded, and so represents an additional cost pressure to the council's finances over the medium term. Savings will need to be made through subsequent budget setting processes, in addition to the already planned Journey to Self Sufficiency Savings, to fund this proposal. However, the costs decrease over time as more vehicles are replaced with battery alternatives. The costs will affect the council's general fund the most, as less of the fleet will convert to electric in the medium term and this is shown in the split of figures below.

Additional costs from using HVO	2021-22	2022-23	2023-24	2024-25	Total
General Fund	£21,685	£65,056	£63,964	£62,536	£213,241
HRA	£6,286	£18,858	£17,072	£6,733	£48,949
Special Expenses	£322	£967	£967	£539	£2,794
Total	**£28,293**	**£84,880**	**£82,003**	**£69,808**	**£264,985**

This proposal goes beyond the Council's stated objective of making the Council carbon zero by 2030 by making the fleet zero carbon as soon as the proposal is adopted, which is likely to be later this year if members approve the proposal. This does, however, risk reducing funding available to reduce our carbon footprint in the longer term.

13.3. Approvals

The latest capital programme, approved by full council in February 2021, noted that the results of the fleet review would be reported to Cabinet and further approval sought from Council if required. Of the new programme, 19 vehicles have already been approved at a cost of £1.3 million – meaning they can be ordered if Cabinet approves the fleet strategy and 3-year fleet replacement programme.

The remaining 67 vehicles, totalling £3.9 million, requires further approval from full Council as the replacement has not previously been approved. This includes 5 vehicles needed for the rollout of food waste collections, which will be subject to a separate report.

Vehicle Type	Replacement Fuel	2021-22		2022-23		2023-24		Total	
		Number	Cost £'000	Number	Cost £'000	Number	Cost £'000	Number	Cost £'000
Elements of the programme already approved by Council									
Rigid Trucks	HVO	5	£920	0	£0	N/A	£0	5	£920
Large Commercial 4x4s	HVO	0	£0	1	£41	N/A	£0	1	£41
Large Vans	Electric	0	£0	0	£0	N/A	£0	0	£0
Medium Vans	Electric	4	£133			N/A	£0	4	£133
Small Car	Electric	3	£71	0	£0	N/A	£0	3	£71
Small Van	Electric	1	£24	1	£24	N/A	£0	2	£48
Specialist	Various	4	£98	0	£0	N/A	£0	4	£98
Total already approved		**17**	**£1,246**	**2**	**£65**	**0**	**£0**	**19**	**£1,311**
Elements of the programme requiring Council approval									
Rigid Trucks	HVO	8	£920	0	£0	4	£840	12	£1,760
Large Commercial 4x4s	HVO	0	£0	0	£0	1	£41	1	£41
Large Vans	Electric	0	£0	5	£269	5	£269	10	£538
Medium Vans	Electric	3	£100	29	£964	4	£133	36	£1,197
Small Car	Electric	1	£24	0	£0	0	£0	1	£24
Small Van	Electric	0	£0	1	£24	2	£48	3	£72
Specialist	Various	0	£0	0	£0	4	£285	4	£285
Total to be approved by full Council		**12**	**£1,044**	**35**	**£1,258**	**20**	**£1,616**	**67**	**£3,918**

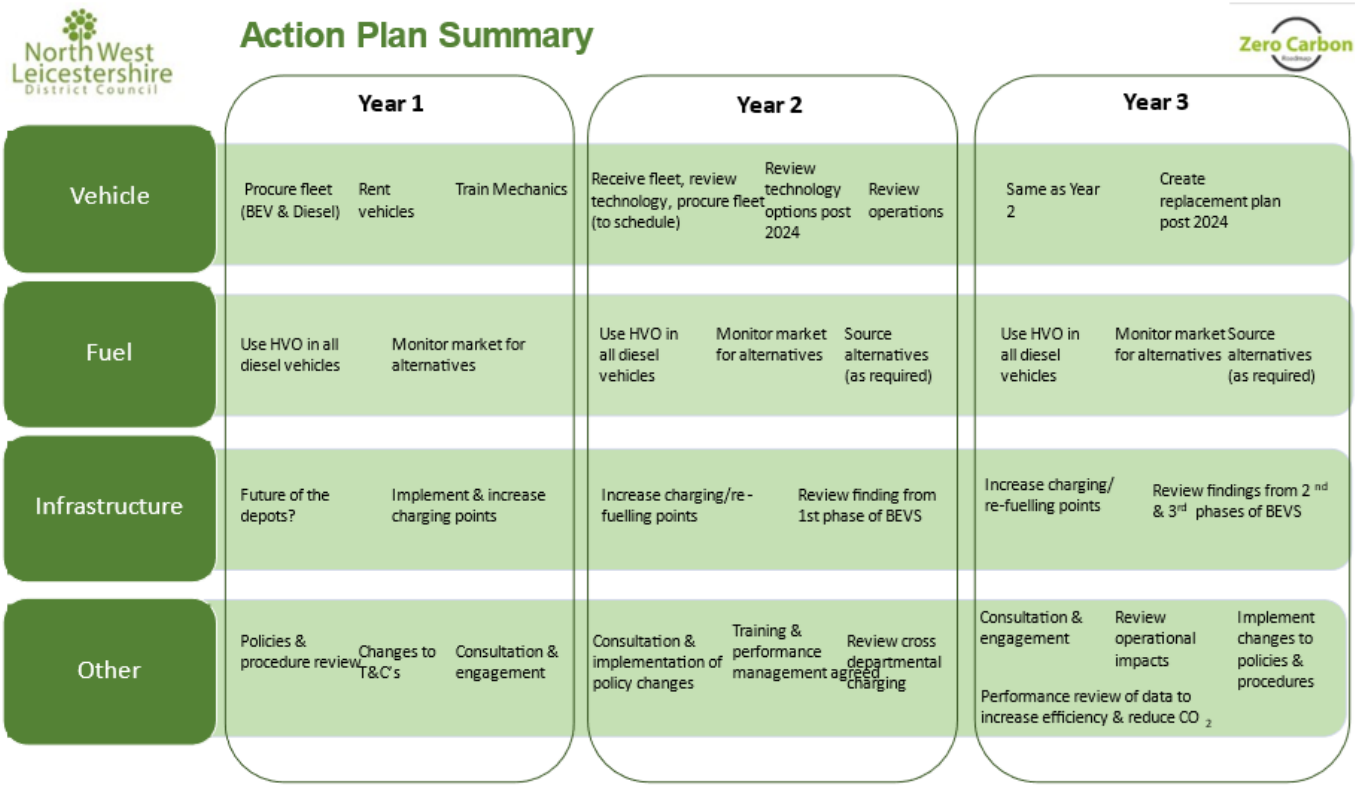
14. FLEET MANAGEMENT STRATEGY SUMMARY

15. NEXT STEPS

- Agree the three year fleet replacement plan and supporting infrastructure and action plan
- Purchase battery electric vehicles for all fleet that are below 3.5 tonne, with a phased approach for Housing to allow time to review and assess
- Purchase diesel vehicles for all identified fleet above 3.5 tonne
- Use renewable diesel (HVO) as an interim solution across all remaining vehicle segments
- Set up a Fleet Programme Board to monitor and feedback challenges and success
- Officers to monitor the vehicle and fuel market and review technologies
- Review operations in order to make improvements that could increase the uptake of BEVS
- Refresh the fleet assessment process in 2024
- Work with Zurich insurance company to achieve a “Good” Fleet Risk Assessment score
- Infrastructure & Other
- Prepare and execute an infrastructure plan, including feasibility studies, home, and depot/office charging
- Set up a project governance structure to agree the future of the Waste and Parks depots
- Review T&Cs and corporate policies and procedures to include new technologies such as BEV

- Create a training and performance management plan to build capability and measure success
- Continue consultation and engagement with all stakeholders

16. ACTION PLAN



Year 2021/22

Theme one	Aim	Action
1 Vehicles	1.1 Implement **battery electric cars** and light commercial vehicles (**medium vans**) in line with replacement schedule (appendix XX)	1.1.1 Work with service users to specify vehicle requirement
		1.1.2 Send specification to TPPL framework (phased approach for Medium vans)
		1.1.3 Specify vehicles with optional on-board AC chargers with increased power ratings.
		1.1.4 Framework go to market
		1.1.5 Evaluate responses and award contracts
	1.2 Implement replacement of **none BEV HGV's** in line with replacement schedule (appendix XX)	1.2.1 Work with service users to specify vehicle requirement
		1.2.2 Send specification to TPPL framework
		1.2.3 Framework go to market
		1.2.4 Evaluate responses and award contracts
	1.3 Implement procurement of **Food Waste** vehicles in line with replacement schedule (appendix XX)	1.3.1 Work with service users to specify vehicle requirement
		1.3.2 Send specification to TPPL framework
		1.3.3 Framework go to market
		1.3.4 Evaluate responses and award contracts

	1.4 Procure rental vehicles required until new fleet is delivered	1.4.1 Through TPPL framework
	1.5 Confirm specific towing requirements of **specialist fleet**	1.5.1 Investigate the feasibility of introducing operational changes to reduce this requirement for potential ULEV replacement vehicles
	1.6 Maintain BEV vehicles	1.6.1 Confirm requirements and plan training for mechanics to maintain BEV fleet

Theme two	Aim	Action
2 Fuel	2.1 Use HVO as stop gap on existing fleet	2.1.1 Contact fleet operators currently using HVO to discuss operational experiences, implications and to verify potential cost increases.
		2.1.2 Contact relevant vehicle manufacturers to discuss and verify any potential warranty and maintenance changes to existing fleet
		2.1.3 Send specification to framework to procure fuel
		2.1.4 Framework go to market
		2.1.5 Evaluate responses and award contract
		2.1.6 Review weekly fuel prices for HVO and diesel
		2.1.7 Recalibrate fuel tank
		2.1.8 Inform insurance regarding changes to fuel in vehicles and depot
		2.1.9 Confirm requirements and if necessary plan training for mechanics to maintain fleet using HVO
	2.2 Monitor the market for alternative 'drop in' fuels to diesel and HVO	2.2.1 Regular meetings with experts to identify alternatives
		2.2.2 Change fuel type if all conditions are met

Theme three	Aim	Action
3 Infrastructure	3.1 Confirm the future of Linden Way waste transfer station and London Road parks depot	3.1.1 Initiate a project board to review the requirements of the waste transfer station
	3.2 Implement electric charging points where required	3.2.1 Confirm grid capacity and explore upgrade options for all identified locations used by NWLDC fleet
		3.2.2 Develop a plan to home charging to include first phase installation
		3.2.3 Send specification to framework to procure and install 22 kw AC charge points at new office location and 7kw home charge points
		3.2.4 Framework go to market
		3.2.5 Evaluate Reponses and award contract
		3.2.6 Identify 6 volunteers to take the first phase of BEV's for home charging
		3.2.7 Consider an industry partner who may want to support home charge points scheme
		3.2.8 Select hardware and back office system
		3.2.9 Reimbursement mechanism for home

		charging
		3.2.10 Arrange for home charging points to be installed for phase one staff
		3.2.11 Consider what more infrastructure is required to suit operational needs
	3.3 To increase charging/re-fuelling points across the district	3.3.1 Identify alternate charging areas for BEV's, working with partners such as LCC (Snibson)

Theme four	Aim	Action
4 Other	4.1 Transition operating model to make the service fit for the future	4.1.1 Agree actions required to implement changes to ways of working
		4.1.2 Create Home Charging Scheme policy and guidelines
		4.1.3 Change T's and C's for all staff to include requirements to plug in vehicles when finished
		4.1.4 Review all driving relating policies and expectations regarding the use of electric vehicles
		4.1.5 Consult with staff and unions

Theme five	Aim	Action
5 Communication	5.1 To engage with staff, members, unions and residents	5.1.1 Create a plan to be used in all communications
		5.1.2 Execute communications plan

Year 2022/23

Theme one	Aim	Action
6 Vehicles	6.1 Implement **battery electric cars** and light commercial vehicles (**medium vans**) in line with replacement schedule (appendix XX)	6.1.1 Take delivery of new BEV vehicles
		6.1.2 Dispose of old vehicles
		6.1.3 Analyse and review the first phase of medium vans
		6.1.4 Monitor the market
		6.1.5 Procure second phase of vans
		6.1.6 Monitor and analyse journey profiles to optimise power usage
	6.2 Implement replacement of none BEV **HGV's** in line with replacement schedule (appendix XX)	6.2.1 Take delivery of new HGV vehicles
		6.2.2 Dispose of old vehicles, inform insurance and update O Licence
		6.2.3 Monitor the market
		6.2.4 Start procurement process of HGV's due for replacement next year
	6.3 Implement procurement of **Food Waste** vehicles in line with replacement schedule (appendix XX)	6.3.1 Take delivery of Food Waste vehicles
		6.3.2 Monitor and analyse journey profiles to optimise power usage

	6.4 Implement procurement of BEV for Specialist fleet in line with replacement schedule (appendix xx)	6.4.1 Identify vehicles which can be transitioned to BEV in line with replacement schedule
	6.5 Implement procurement of Specialist fleet not suitable for BEV in line with replacement schedule (appendix xx)	6.5.1 Identify vehicles which can't be transitioned to BEV in line with replacement schedule
	6.6 Consider operational improvements that could increase the uptake of ULEVs	6.6.1 Monitor and analyse journey profiles to optimise power usage
	6.7 Review ULEV options for HGV fleet	6.7.1 Prepare for introduction beyond 2025 when a much wider selection of ZEVs including BEV, FC REEV and FCEV will be available
	6.8 Investigate the potential to reduce the ownership period of the remaining non-BEV vans from 7 years to 4 years	6.8.1 To ensure that the fleet can be transitioned as quickly as possible
	6.9 Review technology options for fleet past 23/24	6.9.1 To ensure that the fleet can be transitioned as quickly as possible

Theme two	Aim	Action
7 Fuel	7.1 Increase alternative fuel supply	7.1.1 Source alternative fuel (as required) suppliers
	7.2 Use HVO as stop gap on existing fleet and replacement diesel (Euro 6) vehicles	7.2.1 Review weekly fuel prices for HVO and diesel
	7.3 Monitor the market for alternative 'drop in' fuels to diesel and HVO	7.3.1 Regular meetings with experts to identify alternatives
		7.3.2 Change fuel type if all conditions are met

Theme three	Aim	Action
8 Infrastructure	8.1 To increase charging/re-fuelling points across the district	8.1.1 Secure new waste transfer station
		8.1.2 Increase electric charging points where it has been identified that they are required
		8.1.3 Review charging infrastructure at Parks depot
		8.1.4 Organise a feasibility study for electric charging points at the parks depot
		8.1.5 To discuss alternative fuel filling stations with providers
	8.2 Communicate findings of first phase of medium vans	8.2.1 Throughout the organisation and secure funding for wider deployment.
	8.3 Implement electric charging points where required	8.3.1 Wider deployment

Theme four	Aim	Action

9 Other	9.1 Transition operating model to make the service fit for the future	9.1.1 Consult with staff and Unions
		9.1.2 Review the operational impact of phase one
		9.1.3 Implement changes to policies
	9.2 Training, compliance, reporting and performance management	9.2.1 Arrange training required for staff working with and using new technologies
		9.2.2 To ensure all procedures are correct and compliant
		9.2.3 Create performance reporting schedule to report to project board and monitor
		9.2.4 Work with insurers on fleet risk assessment to achieve a GOOD rating
	9.3 Review departmental cross charging	9.3.1 To ensure charging for fleet is consistent

Theme five	Aim	Action
10 Communication	10.1 To continue to engage with staff, members, unions and residents	10.1.1 Follow communications plan with regular updates, consultations, surveys, competitions

2023/24

Theme one	Aim	Action
11 Vehicles	11.1 Implement **battery electric cars** and light commercial vehicles (**medium vans**) in line with replacement schedule (appendix XX)	11.1.1 Take delivery of new BEV vehicles
		11.1.2 Dispose of old vehicles
		11.1.3 Analyse and review the second and third phase of medium vans
		11.1.4 Monitor the market and prepare for introduction beyond 2025 when a much wider selection of ZEVs including BEV, FC REEV and FCEV will be available
		11.1.5 Start procurement process of HGV's due for replacement next year
		11.1.6 Monitor and analyse journey profiles to optimise power usage
	11.2 Implement replacement of none BEV **HGV's** in line with replacement schedule (appendix XX)	11.2.1 Take delivery of new HGV vehicles
		11.2.2 Dispose of old vehicles, inform insurance and update O Licence
		11.2.3 Monitor the market
		11.2.4 Start procurement process of HGV's due for replacement next year
	11.3 Implement procurement of BEV for Specialist fleet in line with replacement schedule (appendix xx)	11.3.1 Identify vehicles which can be transitioned to BEV in line with replacement schedule
	11.4 Implement procurement of Specialist fleet not suitable for BEV in line with replacement schedule (appendix xx)	11.4.1 Identify vehicles which can't be transitioned to BEV in line with replacement schedule
	11.5 Consider operational	11.5.1 Monitor and analyse journey profiles to

	improvements that could increase the uptake of ULEVs	optimise power usage
	11.6 Review ULEV options for HGV fleet	11.6.1 Monitor the market and prepare for introduction beyond 2025 when a much wider selection of ZEVs including BEV, FC REEV and FCEV will be available
	11.7.1 Investigate the potential to reduce the ownership period of the remaining non-BEV vans from 7 years to 4 years	11.7.1 To ensure that the fleet can be transitioned as quickly as possible
	11.8 Create replacement plan for vehicle replacements due after 23/24	
	11.9 Review technology options for fleet past 23/24	11.9.1 To ensure that the fleet can be transitioned as quickly as possible
	11.10 Commence procurement of vehicles for next year based on findings from the fleet review	11.10.1 Hydrogen, electric or alternative

Theme two	Aim	Action
12 Fuel	12.1 Increase alternative fuel supply	Source alternative fuel (as required) suppliers
	12.2 Use HVO as stop gap on existing fleet and replacement diesel (Euro 6) vehicles	Review weekly fuel prices for HVO and diesel
	12.3 Procure alternate fuel	Hydrogen?
	12.4 Monitor the market for alternative 'drop in' fuels to diesel and HVO	12.4.1 Regular meetings with experts to identify alternatives
		12.4.2 Change fuel type if all conditions are met

Theme three	Aim	Action
13 Infrastructure	13.1 To increase charging/re-fuelling points across the district	13.1.1 Increase electric charging points where it has been identified that they are required
		13.1.2 To discuss alternative fuel filling stations with providers
	13.2 Communicate findings of second and third phases of medium vans	
	13.3 Continue to implement electric charging points where required	

Theme four	Aim	Action
14 Other	14.1 Transition operating model to make the service fit for the future if changes made	14.1.1 Consult with staff and Unions
		14.1.2 Review the operational impact of phased implementation of Housing fleet
		14.1.3 Implement changes to policies

Theme five	Aim	Action
15 Communication	15.1 To continue to engage with staff, members, unions and residents	15.1.1 Follow communications plan with regular updates, consultations, surveys, competitions

APPENDIX A – Financial Summary

	3-year Capital Position			Estimated Annual Revenue Position		
	3 year Fleet Replacement Programme	**Charging Infrastructure**	**Total capital costs**	**Changes in fleet running costs**	**Capital Financing Costs**	**Net Revenue Cost/ (Saving) from new**
Previous Budget	**£3,029,320**	**£0**	**£3,029,320**	**£0**	**£432,760**	**£432,760**
Changes as a result of this report:						
1) Amendments to fleet programme	£1,582,342	£0	**£1,582,342**		£226,049	**£226,049**
2) Adopting electric vehicles	£617,803	£43,100	**£660,903**	-£60,565	£77,491	**£16,926**
3) Using HVO			**£0**	£78,897		**£78,897**
New Budget Position	**£5,229,465**	**£43,100**	**£5,272,565**	**£18,333**	**£736,300**	**£754,632**
Net Increase/ (decrease) in costs	£2,200,145	£43,100	**£2,243,245**	£18,333	£303,540	**£321,872**

Apportionment of these costs

General Fund	£5,229,465	£43,100	**£5,272,565**	£57,796	£557,822	**£615,617**
HRA	£0	£0	**£0**	-£40,288	£176,117	**£135,830**
Special Expenses	£0	£0	**£0**	£824	£2,361	**£3,185**
Total	**£5,229,465**	**£43,100**	**£5,272,565**	**£18,332**	**£736,300**	**£754,632**