Southwark Council
southwark.gov.uk

CARBON REDUCTION ASSESSMENT

for the Future Neighbourhoods Programme

November 2022

Anthesis

EXECUTIVE SUMMARY

Anthesis were commissioned to carry out a carbon reduction assessment for four distinct projects as part of the London Borough of Southwark's Future Neighbourhoods programme, which included:

- Taking the buildings across the study area that are proposed for connection to the **SELCHP DHN network, assess CO_{2e} savings** against current proposed operation. This is assumed to be over the course of a 25-year period, using future carbon intensity projections. The connecting buildings will have a range of counterfactuals ranging from Business As Usual (existing plant) to proposed Air Source Heat Pump (ASHP) for new developments. Energy statements for Tustin Estate and Ledbury Estate along with the retrofit of Manor Grove have also been included in the calculation.

- Conducting a **static heat loss assessment** to determine carbon savings for retrofitted insulated buildings across the study area. These are assumed to be limited to 35 buildings in total.

- Modelling savings from the **retrofit of the Brimmington Park sports hub**. We have included any savings from removal of hardstanding and its replacement with soft landscaping.

- **Transport infrastructure savings.** Modelling modal transport improvements in-line with the proposed interventions across the study area including EV charging infrastructure.

EXECUTIVE SUMMARY

Following the carbon reduction assessment that was possible with the information provided, the below carbon savings have been estimated. Project specific carbon savings have been listed as each project contains differences in terms of the timeframe in which the savings occur. The cumulative carbon savings to 2030 have also been calculated where possible. Totals savings have been calculated for each project where there are multiple workstreams (projects 1, 2 and 3).

Project	Project workstream	Project specific carbon saving (tCO_2e)	Timeframe and comment	Cumulative carbon savings to 2030 (tCO_2e).
1. Connection to SELCHP DHN network	Counterfactual scenario (Phased ASHP deployment)	117,000	Over 25 years when compared to business-as-usual (BAU)	N/A - deployment occurs after 2030
	Target scenario	185,000	Over 25 years when compared to BAU	39,000
Total for Project 1		**185,000**	**Total for Project 1**	**39,000**
2. Static heat loss assessment	Counterfactual ASHP	135	Per annum	1,080
	Connecting to SELCHP	146	Per annum	1,168
Total for Project 2		**281**	**Total for Project 2**	**2,248**
3. Brimmington Park	Tree planting	0.01 (planted) -0.02 (removal)	Saving per tree, per annum Cost per removal of one tree	N/A - current tree planting plans are unknown
	Sports hub retrofit	2.8 (retrofit only) 0.6 (retrofit and extension)	Per annum	22.4 (retrofit only) 4.8 (retrofit and extension)
Total for Project 3		**2.8 (sports hub retrofit)** **0.6 (sports hub retrofit and extension)**	**Total for Project 3**	**22.4** **4.8**
4. Transport infrastructure	Scenario 1	0 to 5,631	The difference in emissions between the 2019 modal split and 2030 modal split.	0 to 16,128
4. Transport infrastructure	Scenario 2	0 to 3,709	The difference in emissions between the 2019 modal split and 2030 modal split.	0 to 10,624

The methodology and assumptions have been detailed within each section of this report. Where applicable, it has been advised if further work or investigations are required.

CONTENTS

01 SELCHP DHN network

CONTENTS

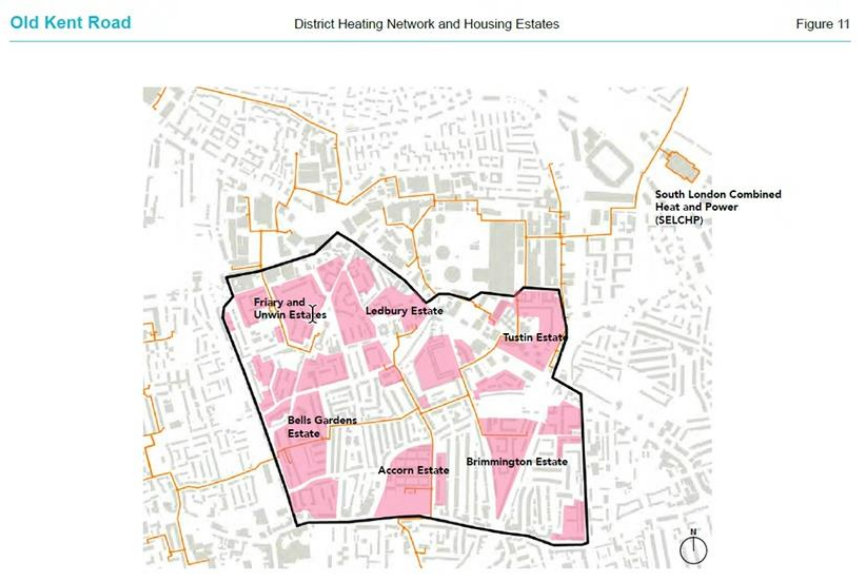
DRAFT

Anthesis

01.a Overview of the estates

AREA COVERED

Area map



List of assets assessed

- Tustin Estate (redeveloped)
- Brimmington Estate
- Ledbury Estate (redeveloped)
- Acorn Estate
- Bells Gardens Estate
- Lindley Estate
- Camelot Primary School
- John Donne School

Note: Friary and Unwin Estates have been omitted due to the lack of data.

ESTATE OVERVIEW

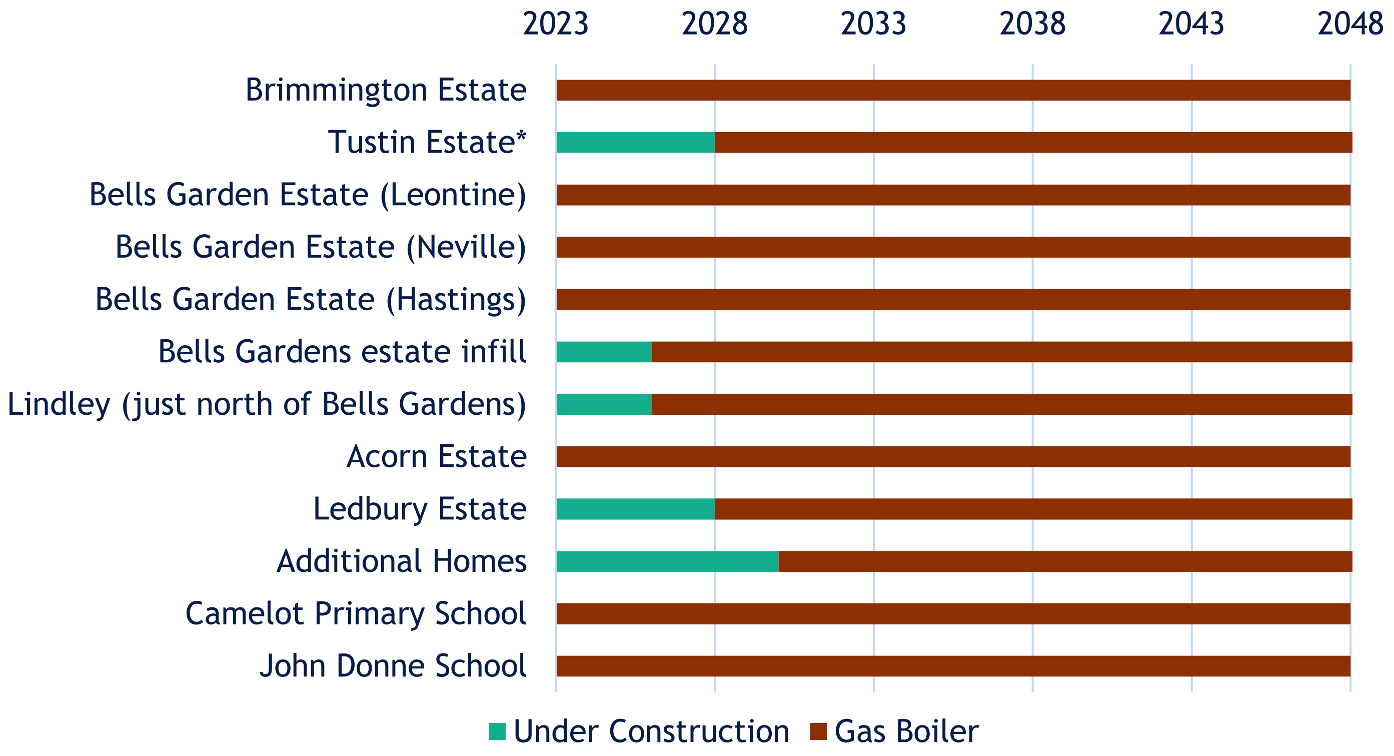
Estate	Age (yrs)	Annual heat demand (MWh_{th}/a)	Building type	Notes
Tustin Estate	53-62 (to be redeveloped by 2028)	4,912	Residential and commercial buildings, and primary school	690 low- and mid-rises redeveloped in 2028, 217 high-rises flats modelled from 2023 (energy statement provided for 690 low- and mid-rises and 18 houses in Manor Grove)
Brimmington Estate	63-72	9,070	Residential buildings	Over 1500 homes
Ledbury Estate	63-72 (to be redeveloped by 2028)	1,486	Residential buildings	13 storeys high, 224 flats. (Energy statement providing updated demand was provided for the baseline and future energy demand).
Acorn Estate	NA	5,224	Residential buildings	266 homes
Bells Garden Estate (Leontine)	46	2,913	Residential buildings	6 storeys 119 homes
Bells Garden Estate (Neville)	46	2,568	Residential buildings	6 storeys 103 homes
Bells Garden Estate (Hastings)	46	2,568	Residential buildings	5 storeys 58 homes
Bells Gardens estate infill	(to be redeveloped by 2026)	388	Residential buildings	NA
Lindley Estate infill	73 (to be redeveloped by 2026)	176	Residential buildings	NA
Additional Homes (non-council)	To be constructed by 2028	11,550	Residential Houses	2,125 residential homes. (No energy data; assumed future energy demand is the same as redeveloped Tustin estates)
Camelot Primary School	3-10	698	Primary School	525 students
John Donne School	3-10	254	Primary School	460 students

01.b Scenarios considered

SCENARIOS FORMULATION

This scenario shows the trajectory based on current equipment obtained from historic boiler room surveys.

Baseline schedule



Assumptions:

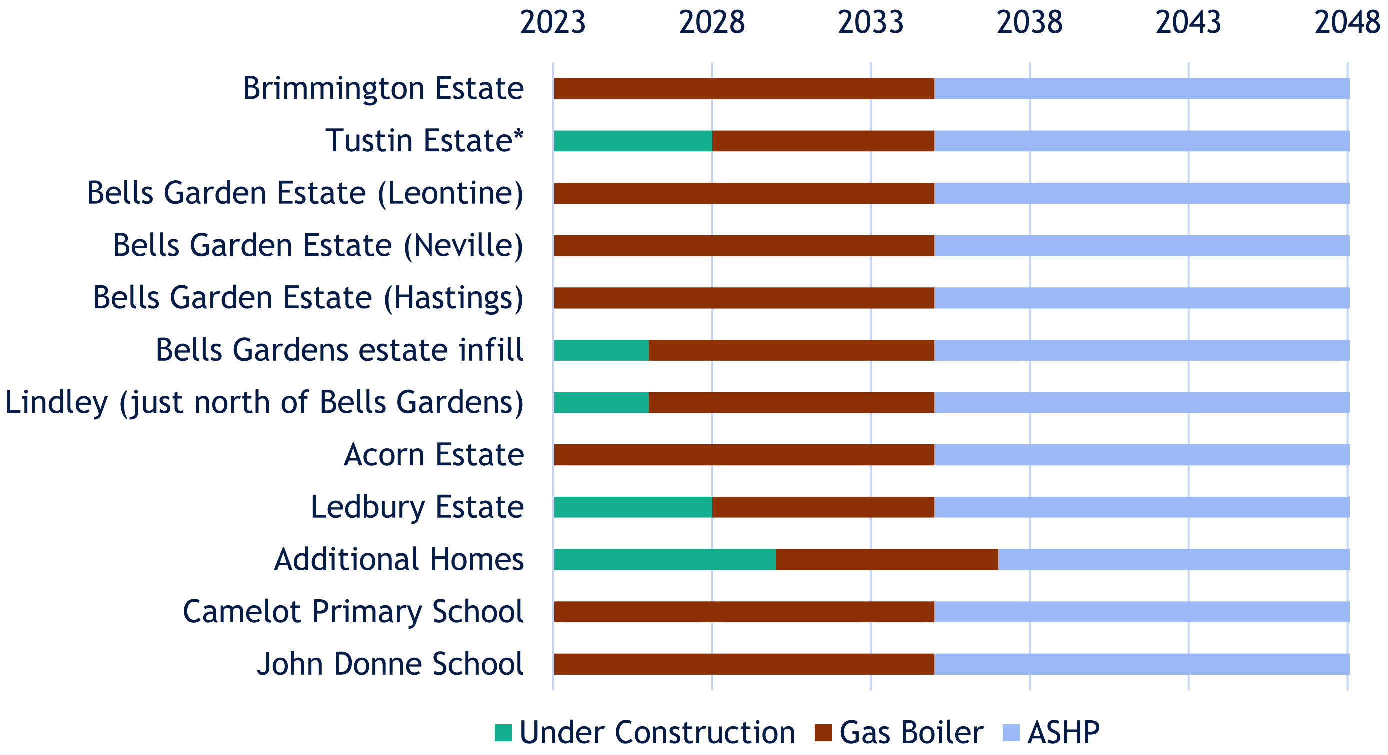
- Baseline model assumes that all estates will be running gas boilers between 2023 and 2048
- Tustin and Ledbury estates will be under construction starting in 2023. The assumed completion date is 2028
- Bells Garden estate infill and Lindley estate infill developments are currently under construction and assumed to connect to DHN in 2026
- Ledbury operates on temporary oil boilers but is treated as gas fired in this model

* Only demands from Tustin high rises (Windmere, Grasmere and Ambleside point) were modelled from 2023. Remaining Tustin Estate will be connected in 2028.

SCENARIOS FORMULATION

Modernisation counterfactual scenario considering a path of lowest organisational resistance.

Counterfactual Schedule



Assumptions:

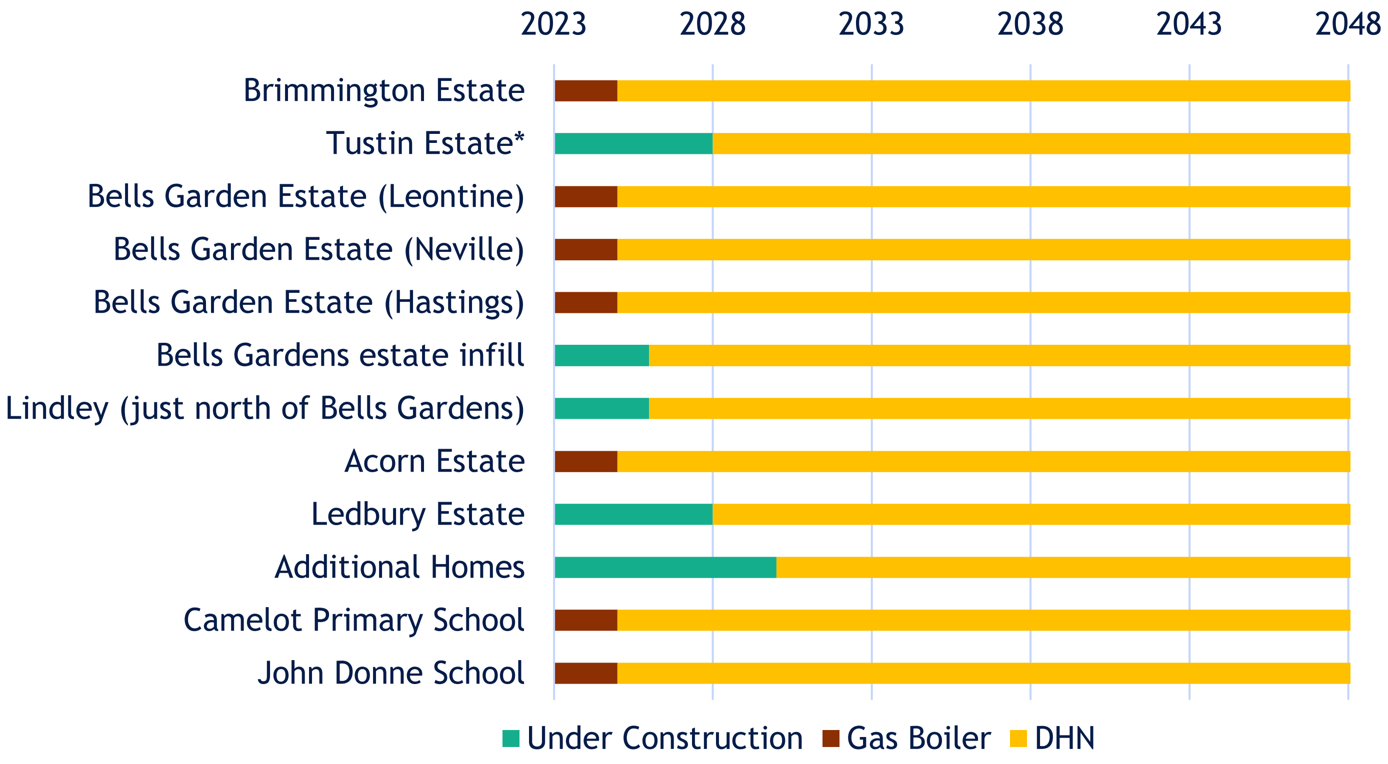
- All estates will be running on gas boilers as in the baseline scenario until 2035
- In 2035 all boilers are replaced by Air Source Heat Pumps (ASHP)
- Heat Pump performance was based on a commercially available ASHP with a design COP of 2.45
- Thermal store was added in this scenario to help reduce peak demand, level the demand and reduce response time during peak loads.

* Only demands from high rises (Windmere, Grasmere and Ambleside point) were modelled from 2023. Other Estate will be connected in 2028.

SCENARIOS FORMULATION

District heating network providing low carbon heat from Energy from Waste (EfW) plant.

Target Scenario



Assumptions

- DHN connections occur in 2026 (except for Tustin and Ledbury estates which are connected in 2028 post-construction).
- Energy centre (EC) is the SELCHP site operated by Veolia
- An additional heat loss is modelled to account for transmission losses
- The network losses were assumed to be 10% of the total heat demand per annum

* Only demands from high rises (Windmere, Grasmere and Ambleside point) were modelled from 2023 and connects to the DHN in 2035. Other Estate will be connected in 2028.

01.c Model description

ENERGY PRO

HEAT DEMAND PROFILES

Temperature profile: CIBSE Test Reference Year (TRY) data was used, composed of 12 separate, 'average' months. The TRY is used for energy analysis and compliance with the UK Building Regulations (Part L)

Methodology:

1. Provided annual heat demands for each estate were split into three categories: space heating, hot water and losses.
2. Demand ratios for categories were calculated based on a degree day analysis.
3. An hourly profile was constructed for each building type following CIBSE guidelines.

Connection name	Annual heat demand (MWh_{th}/a)	Construction completion year	SH Load (MWh_{th}/a)	DHW Load (MWh_{th}/a)	Losses Load (MWh_{th}/a)
Brimmington Estate	9,070	Existing	5,922	1,158	1,990
Tustin Estate	4,912	2028	2,807	1,659	447
Bells Garden Estate (Leontine)	2,913	Existing	1,902	372	639
Bells Garden Estate (Neville)	2,568	Existing	1,677	328	563
Bells Garden Estate (Hastings)	841	Existing	1,677	328	563
Bells Gardens estate infill	388	2026	253	50	85
Lindley (just north of Bells Gardens)	176	2026	115	22	39
Acorn Estate	5,224	Existing	3,411	667	1,146
Ledbury Estate	1,487	2028	660	692	135
Additional Homes (non-council)	9,154	266 per annum from 2023 to 20230	3,766	4,556	832
Camelot Primary School	698	Existing	621	78	-
John Donne School	254	Existing	171	83	-
Network Losses	2,213	2026	-	-	-
Network Losses	4,008	2028	-	-	-

ENERGY PRO

ENERGY CONVERSION UNITS

Baseline (Gas Boiler)		Counterfactual (ASHP)		Target (DHN)
Thermal Capacity (MW)	Efficiency (%)	Output Capacity (MW)	Weather compensated COP	Network Capacity (MW)
20	80	20	2.31	28

Baseline scenario:

Natural gas heat generation was modelled with a gas boiler heat source.

- Information on boilers comes from technical surveys conducted within previous projects.
- Due to a lack of exact performance data, efficiency was assumed to be 80% for all of the modelled capacity.

Counterfactual scenario:

For the counterfactual a phased transfer to a ASHP source was modelled.

- The ASHP design specification was based on a commercially available model with a COP of 2.45.
- Thermal storage was included to help manage peak loads for the ASHPs, as is anticipated in the deployment of this equipment.

Target scenario:

Heat demands are met by SELCHP heat network supplied by EfW plant with a total capacity of 28 MW_{th}.

- Parasitic electrical energy consumption of 2,000 MWh/year to account for pumps operation.
- Network losses introduced and phased in according to the timing schedule.

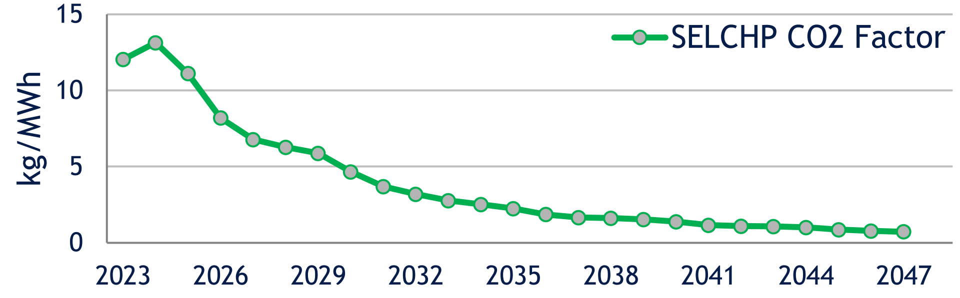
ENERGY PRO EMISSION FACTORS

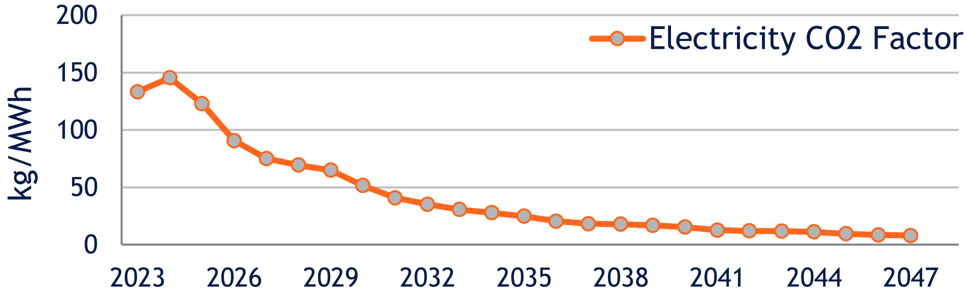
Emission Factors	Green Book 2022 values (kg/MWh)	SAP 10.2 values (kg/MWh)	Constant / Varies	Source
SELCHP Emission CO_2	12.5	15	Varies	Treasury Green Book tables 1-19
Gas Emission CO_2	184	210	Constant	
Electricity Emission CO_2	140	136	Varies	

Natural Gas Emission Factor: These are constant values over the 25-year period for both SAP and from the Treasury Green Book.

Electricity Emission Factor: The emission factor varies from year to year due to the decarbonisation of the UK electrical grid. This is accounted for by using the Treasury Book Table to forecast future emission factors for grid-average domestic based consumption.

SELCHP EfW Emission Factor: The methodology was obtained from the SELCHP design sheet. Slight deviation was made by assuming a varying electricity grid factor instead of a fixed value. This varying electricity grid factor was obtained from Treasury Book Table for grid-average generation.





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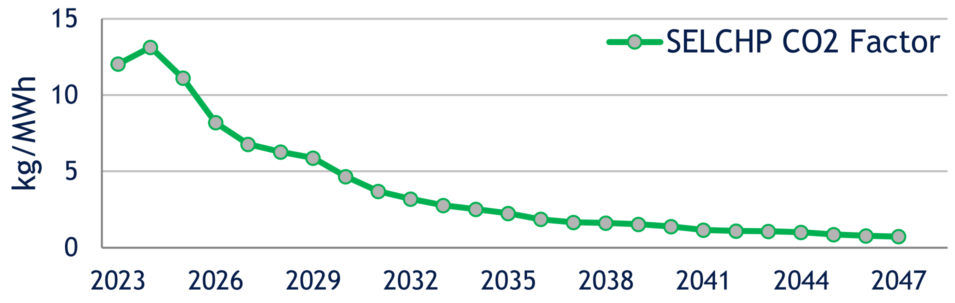
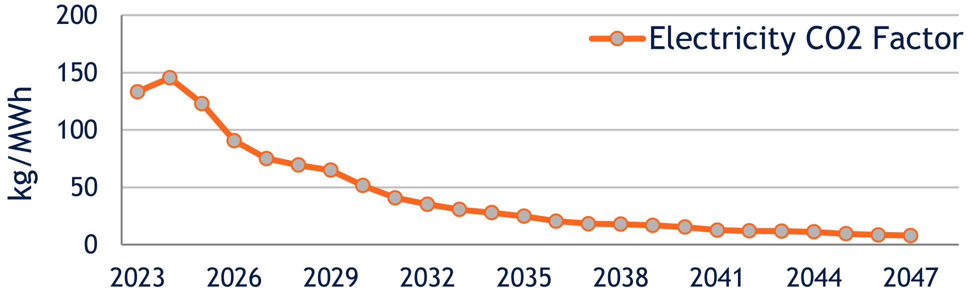
Electricity Emission CO_2	140	136	Varies	

Treasury Green book values were used to account for cumulative carbon emissions over time. This captures the changing relationship of carbon over time owing to electrical decarbonisation and is the recommended approach for government business cases when assessing carbon savings. The respective carbon trajectories for electricity and SELCHP are displayed to the left.

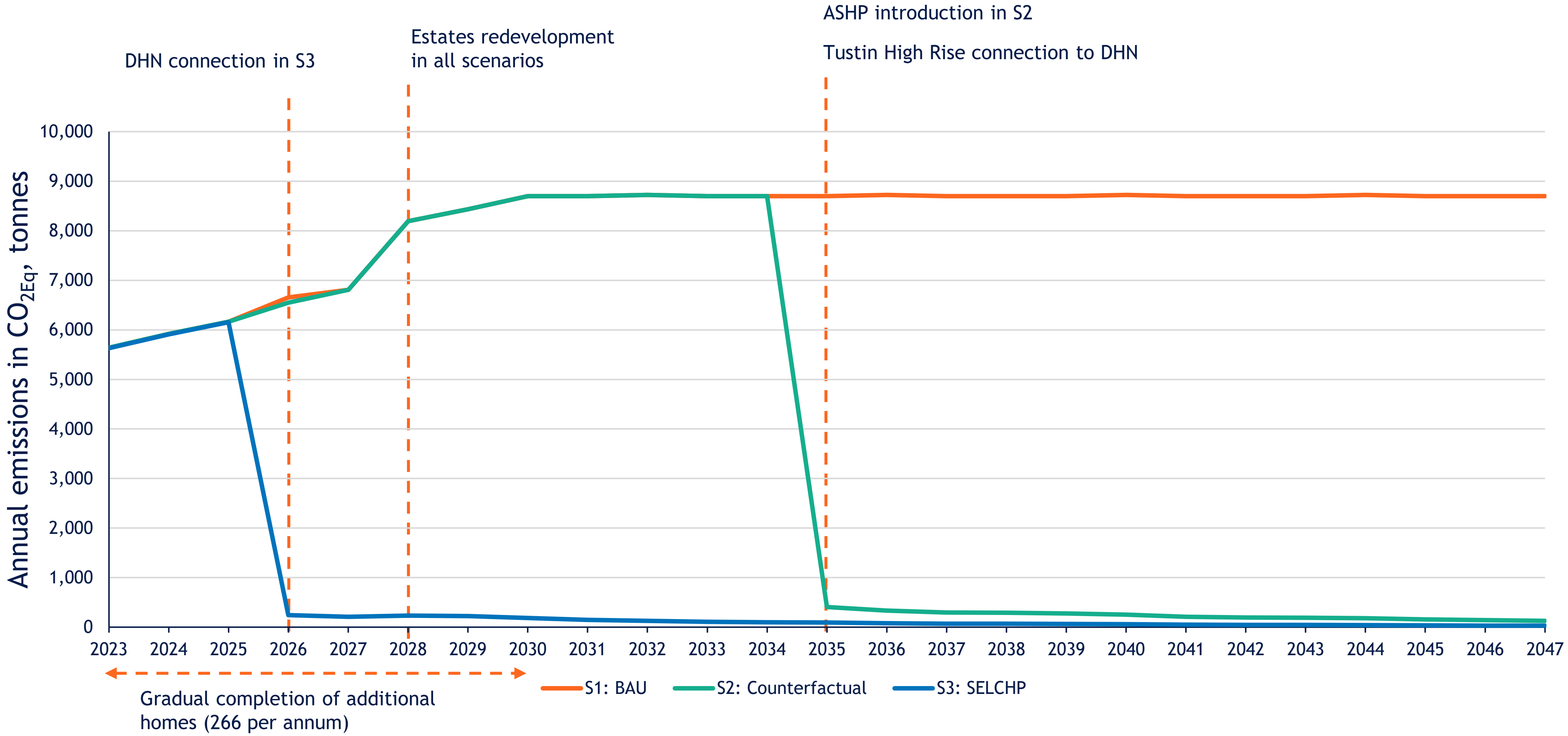
A comparison is made with Building Regulation carbon factors (SAP) which are fixed values (i.e. do not vary with time). These are used when assessing new build and retrofit construction for compliance purposes, and differ from the treasury values.





01.d Results

ESTIMATED TRAJECTORIES OF EMISSIONS FOR ANALYSED SCENARIOS



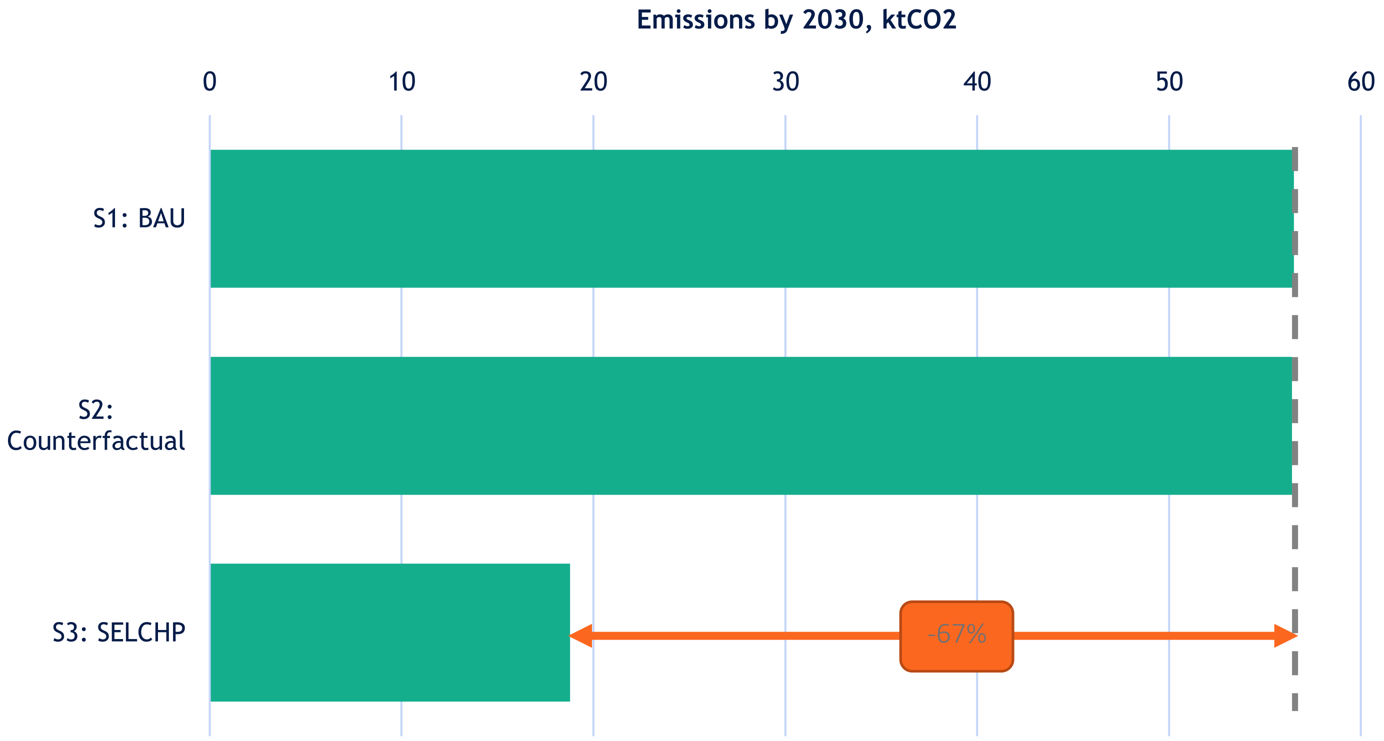
MAGNITUDE OF EMISSIONS BY 2030 FOR ANALYSED SCENARIOS.

- In the counterfactual scenario, ASHP is not introduced until 2035, thus follows the same trend as the BAU scenario resulting in the same cumulative emissions between 2023 and 2030 (56 $ktCO_2$).
- The SELCHP scenario offers a significant emission reduction in 2030 (98%) compared to the BAU and Counterfactual scenarios.
- Cumulatively, the SELCHP scenario has proven to offer substantial carbon savings of 67% (39 $ktCO_2$) over a 7 year period compared to the other two scenarios.

Annual emission (2030)

Yearly Emissions	S1: BAU	S2: Counterfactual	S3: SELCHP
Emissions in 2030 (tonnes CO2)	8,698	8,698	184

Cumulative emissions

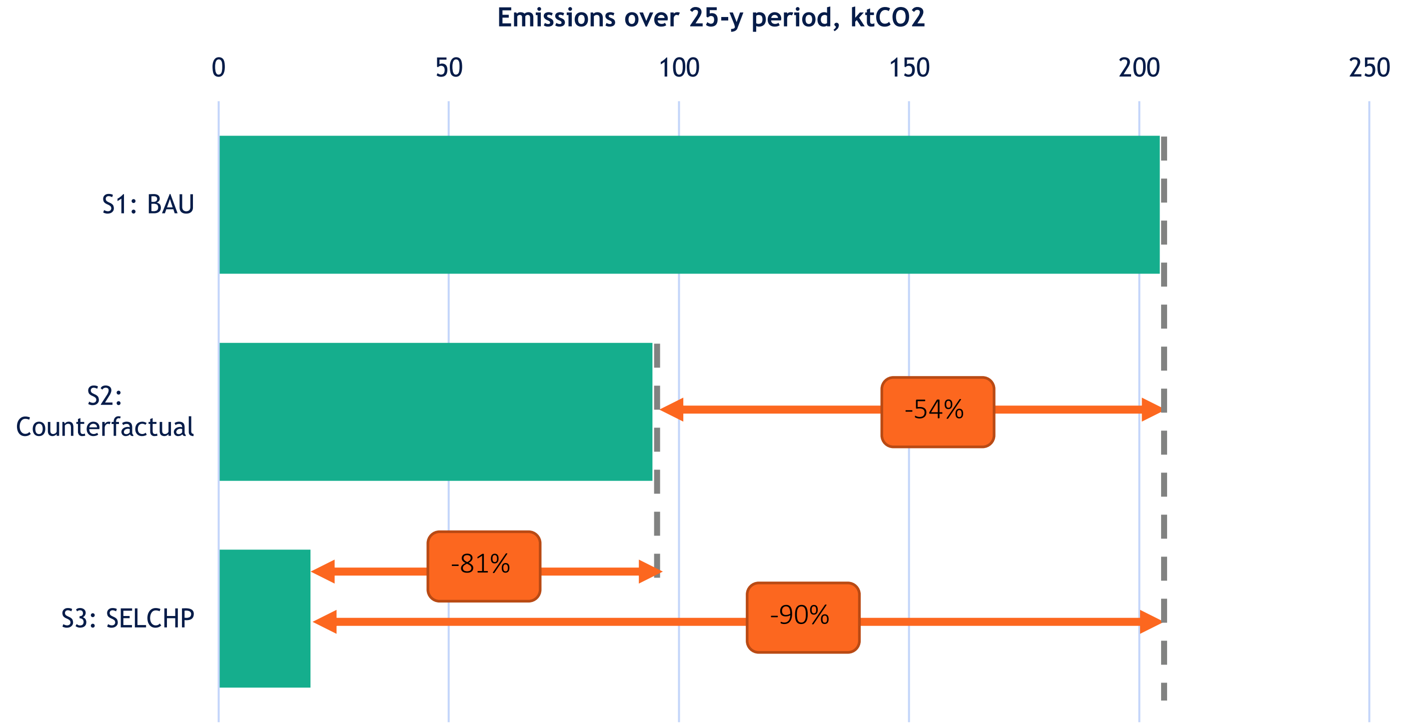


MAGNITUDE OF EMISSIONS FOR ANALYSED SCENARIOS OVER A 25-YEAR PERIOD.

Connecting to the heat network enables 90% carbon savings, corresponding to 194,000 tonnes over 25-year period.

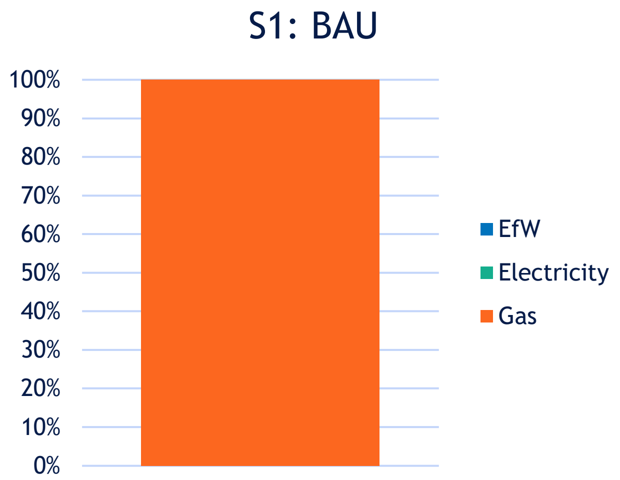
- Counterfactual scenario offers a significant emissions reduction of 54% (or 110,000 tonnes of CO_2).
- The target scenario offers a much deeper reduction thanks to lower emission factors of the SELCHP heat network.
- The SELCHP scenario introduces substantial relative emissions reduction also against the counterfactual scenario, at 81% (74,000 tonnes CO_2).

Cumulative emissions

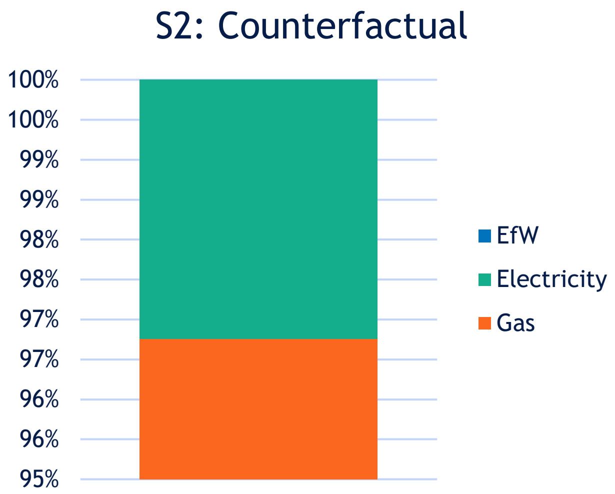


STRUCTURE OF EMISSIONS FOR ANALYSED SCENARIOS

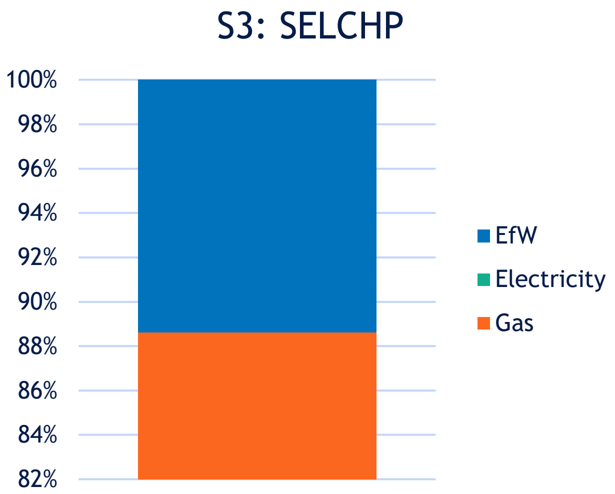
Baseline



Counterfactual



SELCHP



- Natural gas is a significant contributor to overall emissions in all scenarios, even in cases where it is phased out relatively quickly, and overall volume is limited
- This demonstrates the importance of acting early and introducing interventions to maximise emissions reductions

RESULTS SUMMARY

Conclusions from Task 1

- Modelling shows a significant reduction of carbon emissions in both counterfactual (54%) and SELCHP (90%) scenarios
- The counterfactual scenario results rely on several external elements such as electric grid decarbonisation rate, equipment availability and proper maintenance of a large number of newly installed systems
- In the SELCHP scenario, the heat delivered is low carbon from the start, which mitigates the uncertainty around future emissions factors trajectories and resource availability
- The SELCHP scenario offers the lowest emissions both in terms of annual values at the end of the project and in cumulative terms over the studies period
- Detailed techno-economic assessment around optimal scenario deployment is recommended to allow for further risks identification and mitigation

02 Static Heat Loss Assessment

BUILDING FABRIC ASSESSMENT

- LBS is exploring the potential to retrofit 35 residences in the following roads: Asterbury Road, Dayton Grove, Clifton Crescent, Colls Road and York Grove. The retrofit involves improving the residences to match LETI guidelines which includes measures such as wall, floor and roof insulation, window and door replacement, improving air tightness, draught proofing and mitigating thermal bridging.

- The residences are a mixture with construction from 1900 onwards, with EPC ratings A-F, mainly solid brick, with a mixture of insulation & glazing.

- Some are terraced houses, some are flats.

- Anthesis performed static heat loss calculations as per CIBSE guidance giving a range of peak heating loads circa 4kW to 22kW. Based on heating degree day data (HDD) heat consumptions of 7,315kWh to 38,426kWh per year were estimated.

BUILDING FABRIC ASSESSMENT

- Anthesis reviewed the current building fabric parameters against recent refurbishment proposals for the Tustin Estate and guidance from the Low Energy Transformation Initiative for refurbishment of constrained buildings.
- After discussion with LBS the LETI constrained building parameters were chosen as the targeted level of retrofit.
- The static heat loss models were run with these parameters.

	Current	Greengage for Tustin	LETI Constrained Retofit	Units
U Value Wall	2.1	0.55	0.32	$w/m^2.k$
U Value Floor	0.86	0.86	0.86	$w/m^2.k$
U Value Roof	0.68	0.15	0.12	$w/m^2.k$
U Value Window	3.1	1.4	1.3	$w/m^2.k$
U Value Door	3.1	1	1	$w/m^2.k$
ACH	1	0.12	0.15	Air Changes per Hour
Thermal Bridging	0.15	0.15	0.15	$w/m^2.k$

https://www.leti.uk/retrofit

BUILDING FABRIC ASSESSMENT

Gas Intensity	Electricity Intensity	SELCHP DHN**
0.184	0.193	0.013
Efficiency	SCOP*	
90%	3.26	

- The revised static heat loss calculations gave a range of heating loads c 1kW to 6kW. Based on HDD data revised heat consumption of 1,426kWh to 9,989kWh per year.
- The reduction in heat consumption ranged 55% to 88% with an average of 71% across the 35 residences.
- Swapping the heat source from a condensing boiler to typical Air Source Heat Pump increased carbon savings from 71% to 92% as a counterfactual.
- Swapping the heat source from a condensing boiler to SELCHP increased carbon savings from 71% to 98% as the preferred way forward.
- Looking at SAP 10 calculations, both ASHP & SELCHP saw similar Environmental improvement (E42=>B88). However Energy Efficiency went down to G12 for ASHP but up to D65 for SELCHP. This indicates the comparative costs of electricity and SELCHP heat being key factors.

Street Name	Flats as Are		Flats to LETI Refurbishment Standard		Carbon BaseCase As Is Gas	Counter factual ASHP	SELCHP
	Peak Heat Loss kW	Annual Heat Loss kWh	Peak Heat Loss kW	Annual Heat Loss kWh	kG CO2e	kG CO2e	kG CO2e
Astbury Road	17.11	29,560	5.42	9,363	6,042	555	117
Astbury Road	17.11	29,560	5.42	9,363	6,042	555	117
Astbury Road	12.01	20,761	3.61	6,244	4,244	370	78
Astbury Road	8.22	14,211	2.71	4,681	2,905	278	59
Dayton Grove	7.57	13,079	2.21	3,822	2,673	227	48
Dayton Grove	6.11	10,550	2.21	3,822	2,157	227	48
Clifton Cresent	19.96	34,494	5.52	9,540	7,051	566	119
Clifton Cresent	13.70	23,621	3.69	6,358	4,828	377	79
Clifton Cresent	10.39	17,952	4.70	8,122	3,670	482	102
Clifton Cresent	10.39	17,952	4.70	8,122	3,670	482	102
Clifton Cresent	6.52	11,258	1.82	3,144	2,301	186	39
Clifton Cresent	19.96	34,494	5.52	9,540	7,051	566	119
Clifton Cresent	13.70	23,621	3.69	6,358	4,828	377	79
Clifton Cresent	6.97	12,041	1.82	3,144	2,461	186	39
Clifton Cresent	19.96	34,494	5.52	9,540	7,051	566	119
Colls Rd	4.23	7,315	1.81	3,122	1,495	185	39
Colls Rd	4.32	7,461	1.83	3,165	1,525	188	40
Astbury Road	12.76	22,053	1.67	2,885	4,508	171	36
Astbury Road	7.14	12,342	1.66	2,874	2,523	170	36
Astbury Road	7.14	12,342	1.66	2,874	2,523	170	36
Colls Rd	4.51	7,794	0.83	1,426	1,593	85	18
Colls Rd	12.76	22,053	1.67	2,885	4,508	171	36
York Grove	7.86	13,579	0.98	1,685	2,776	100	21
Colls Rd	22.24	38,426	5.02	8,679	7,855	515	108
Colls Rd	22.24	38,426	5.02	8,679	7,855	515	108
Colls Rd	22.24	38,426	5.02	8,679	7,855	515	108
York Grove	22.24	38,426	5.02	8,679	7,855	515	108
York Grove	22.24	38,426	5.02	8,679	7,855	515	108
Astbury Road	12.18	22,774	5.34	9,989	4,655	593	125
Astbury Road	12.18	22,774	5.34	9,989	4,655	593	125
Astbury Road	9.35	16,154	3.82	6,603	3,302	392	83
Colls Rd	12.18	22,774	5.34	9,989	4,655	593	125
Colls Rd	9.35	16,154	3.82	6,603	3,302	392	83
	416.81	**725,348**	**119.44**	**208,647**	**148,269**	**12,377**	**2,608**
				71%		**92%**	**98%**

RESULTS SUMMARY

Conclusions from Task 2

- Refurbishing the buildings to LETI constrained building parameters will reduce heat consumption to an average of 71% across the 35 residences (range 55% to 88%)
- Swapping the heat source from a condensing boiler to typical Air Source Heat Pump increased carbon savings from 71% to 92% as a counterfactual (135 T CO_2e saving)
- Swapping the heat source from a condensing boiler to SELCHP increased carbon savings from 71% to 98% as the preferred way forward (146 T CO_2e saving)
- Modelling shows the energy costs for counterfactual (ASHP) go up under SAP10 calcs whereas SELCHP goes down. Comparative costs of electricity and SELCHP heat are key factors to consider.

03 Brimmington Park Sports Hub

OVERVIEW: BRIMMINGTON PARK

- Currently, Brimmington Park has two 5-a-side football pitches which are in poor condition and a sports centre which is currently not in use and in need of refurbishment.
- As part of the Phase 1 project, changes will be implemented at Brimmington Park which include a retrofit and extension of the existing sports hub building, removal of 1,350 m^2 hard standing and greening/biodiversity improvements in the park.
- Removal of hard standing will allow for new and improved park entrances, relocated outdoor gym equipment, a new Toro pitch, new asphalt pathways, refurbished 3g pitches.
- The impact of the Brimmington Park renovation has been modelled to determine the carbon impact associated with the planned improvements. The carbon impact has been modelled for the following distinct parts of the project: tree planting and retrofit of the sports hub building.

Brimmington Park: Current condition

Brimmington Park Renovation Plans: Brimmington Park Illustrative Masterplan (Figure 9)

CARBON IMPACT: TREE PLANTING

The amount of carbon dioxide (CO_2) woodland can absorb depends on several factors that impact how a tree grows:

- Species
- Location
- Growing conditions
- Climate
- Soil
- Tree density
- Site specific factors

Maturity of the tree also impacts its ability to absorb CO_2.

According to Bernal *et al.* (2018), planted forests and woodlots remove between 4.5 and 4.7 tCO_2 per year, per hectare, during the first 20 years of tree growth, depending on the factors above.

Using the above information combined with average planting densities, estimate an average tree absorbs on average 0.01 tCO_2 per year for the first 20 years and a mature tree can absorb around 0.02 tCO_2 per year.

With the provision of further information related to the number and species of trees being planted in Brimmington Park, it would be possible to estimate the possible carbon savings. In the absence of this information, it can be assumed that between 2022 and 2030, one new tree could save 0.08 tCO_2.

As part of the renovation, new asphalt pathways will be added to the park, which will require the removal of one tree. The existing trees in the park are mature, therefore we would assume that per year, this would result in 0.02tCO_2 to be added to the atmosphere and 0.18 tCO_2 between 2022 and 2030.

In summary:

Carbon impact (per annum)	0.01 tCO_2 saving per tree 0.02 tCO_2 added following removal of one tree
Cumulative carbon impact from 2022 to 2030	0.08 tCO_2 saving per tree 0.18 tCO_2 added following removal of one tree
Change in number of trees	Trees planted: Unknown Trees removed: 1

CARBON IMPACT: RETROFIT OF SPORTS HUB BUILDING

At Brimmington Park, there is an existing 120m^2 temporary building containing a changing room, administrative office and storage space, with an electric combi-boiler system in operation. Options are to refurbish the existing building to a good standard with energy efficiency measures or refurbish and extend the building by 40m^2.

Initial assessments have estimated that the operational carbon from electricity within the existing building is approximately 9.3 tCO_2e per year (48 – 120 tCO_2e when considering operational and embodied carbon). Refurbishing the building to a good standard could result in the operational carbon to be approximately 6.5 tCO_2e per year (243 – 315 tCO2e when considering both operational and embodied carbon). Refurbishing and extending the building could result in the operational carbon to be approximately 8.7 tCO_2e per year (349 - 421 tCO2e for operational and embodied carbon).

These calculations are estimates for guidance only and based on square metre data with industry recognised carbon factors. It is recommended that actual consumption data is provided and a detailed site survey carried out, to better understand the possible carbon savings.

In summary:

The below table highlights the possible **operational** carbon savings in both scenarios. Savings from embodied carbon have not been included in the table as they fall into the Scope 3 emissions.

	Retrofit of the existing building	Retrofit of and extension to the existing building
Carbon impact (per annum)	Saving of 2.8 tCO_2e	Saving of 0.6 tCO_2e
Cumulative carbon impact to 2030	Saving of 22.4 tCO_2e	Saving of 4.8 tCO_2e

RESULTS SUMMARY

Conclusions from Task 3

- Tree planting plans for Brimmington Park are currently unknown, but it can be assumed that between 2022 and 2030, one new tree could save 0.08 tCO_2. The addition of new asphalt pathways will require the removal of one tree. The existing trees in the park are mature, therefore we would assume that between 2022 and 2030, this would result in 0.18tCO_2 to be added to the atmosphere.
- There are two options to refurbish the existing changing room building at Brimmington Park, which are to refurbish the existing building to a good standard with energy efficiency measures, which could have a cumulative saving of 22.4tCO2e by 2030, or to refurbish and extend the building by 40m2, which could have a cumulative saving of 4.8tCO_2e by 2030.

04 Transport Infrastructure Savings

TRANSPORT: SUMMARY
CARBON IMPACTS

This section models carbon savings which result from the actions in the council's 2019 Movement Plan. The MP aims to help change travel patterns by encouraging people to make a high proportion of their trips using public transport, by walking and cycling. Within the neighbourhood area Southwark will be taking a number of steps to help achieve this including through progressing proposals for the Rotherhithe-Peckham cycle route, introducing segregated cycle lanes, wider pavements and better crossings on Old Kent Road, ensuring new development is car free for new residents, introducing a controlled parking zone and increasing the number of electric charging points.

We have calculated the carbon reduction associated with a reduction in car usage and increase in the usage of public transport, cycling and walking targeted in Southwark's Movement Plan.

- The impact of these measures is provided as a range given the limited information available on the projects – more explanation can be found on page 37.
- Current transport emissions based on the starting model shift figures are estimated to be approximately **12,900tCO_2e per annum.**
- Scenario 1 models no change in population between the starting point and 2030.
- Scenario 2 models a change in population of +5,900 in line with the borough's growth plans.
- Across both scenarios, improvements in vehicle efficiencies have been assumed for both ICE and electric vehicles, buses and trains.

Scenario summaries:

	Scenario 1	Scenario 2
The difference in emissions between the 2019 modal split and 2030 modal split	**-5,631** tCO_2e (up to a 44% decrease)	**-3,709** tCO_2e (up to a 29% decrease)
Cumulative carbon impact to 2030	**0 to 16,128** tCO_2e	**0 to 10,624** tCO_2e
Change in population	None	+5,900 (total 22,900)
Change in mode	4% increase in cycling, 5% decrease in private on-road vehicles	*For the additional population:* 7% increase in cycling, 22% decrease in private on-road vehicles

TRANSPORT: SUMMARY
KEY INFORMATION

Potential Impact

The impact of these measures is provided as a range given the limited information available. The impact of the cycle route alone could feasibly be zero if those using the new cycle route were already using this route or have now shifted from walking. However, a maximum impact has also been provided to show a scenario where the measures enable a greater shift away from cars, alongside an increased share of electric vehicles.

Where in this range the projects fall depends on several factors, such as the cycle route's connectedness to other routes and segregation from vehicles. See the Cycling Level of Service Tool for factors impacting uptake of cycle routes.

Modal split

The modal split used for the modelling is provided in the table opposite. The starting modal split is taken from Southwark's 2019 Movement Plan, alongside the 2030 modal split figures. The figures for the new development contributing to the increase in population have been provided by Southwark Council. A linear change between the two modal splits has been modelled meaning carbon savings increase each year to 2030.

Modal split for the scenarios:

	Starting modal split (Southwark's 2019 Movement Plan)	2030 modal split	2030 New Development modal split
Walking	8.5%	12.2%	13.4%
Cycling	2.2%	6.1%	9.0%
Private on-road transport	29.9%	24.3%	2.2%
Buses	31.4%	28.2%	35.4%
Railways	27.9%	29.2%	36.5%

TRANSPORT: MODELLING CAVEATS

Caveats

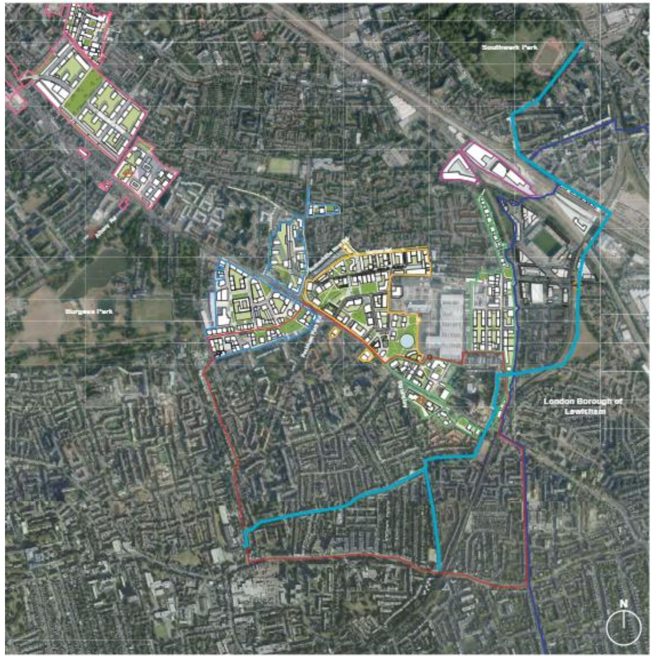
The estimates provided are high-level. A model has been built to model the change in vehicle km and the associated carbon impact from changing the percentage of journeys travelled by each mode.

This model follows the same method as in the SCATTER cities model. A number of assumptions have been made about the average distances travelled in the site area and the efficiency of vehicles.

The modelling starts from 2024, in line with the proposed delivery of projects.

- Changes in technology efficiency were modelled.
- Changes in distances travelled were not modelled.
- This does not consider the embodied carbon of installing a cycle route and the carbon impact of the construction and materials.
- The assessment of emissions uses a best practice example to show the maximum potential savings of emissions reductions, rather than a scenario based on local context.
- The ambitious growth plans of the area will have a major impact on the cycle route and will likely increase emissions drastically. This has not been considered in the modelling to isolate the specific savings from the cycle route.
- Modelling of an increase in population of 5,900 has been included in Scenario 2. For the additional 5,900, a different modal split has been used due to the development's car-free design.

Given the assumptions and limitations outlined above, this estimate serves only as an indication of the magnitude of change possible from shifting modes as a result of infrastructure changes. This does not represent a guaranteed saving.



Proposed cycle route route. (Figure 10)

TRANSPORT: LOCAL TRAFFIC VERSUS THROUGH TRAFFIC AND DELIVERIES

Method and Caveats

The estimates for the split of local traffic versus deliveries and through traffic were taken from DfT's traffic data on the average annual daily flow by direction for Southwark. This data takes counts from different points across Southwark, broken down by vehicle type. The data was isolated around Old Kent Road, with through traffic being defined as counts that end at the LA boundary, and deliveries being defined as counts that are LGVs/HGVs.

Only counts for vehicles were accounted for, (cycling was not included). It should be noted that deliveries by bicycle are prominent in urban areas, but we are not able to disaggregate that from the counts. The data is limited by the total count of around 72,348 and is taken from the most recent year of 2021.

	% Split of on-road transport
Local traffic	28%
Deliveries and through traffic	72%

06 Conclusion

PROJECT SUMMARY

Following the carbon reduction assessment that was possible with the information provided, the below carbon savings have been estimated. Project specific carbon savings have been listed as each project contains differences in terms of the timeframe in which the savings occur. The cumulative carbon savings to 2030 have also been calculated where possible. Totals savings have been calculated for each project where there are multiple workstreams (projects 1, 2 and 3).

Project	Project workstream	Project specific carbon saving (tCO_2e)	Timeframe and comment	Cumulative carbon savings to 2030 (tCO_2e).
1. Connection to SELCHP DHN network	Counterfactual scenario (Phased ASHP deployment)	117,000	Over 25 years when compared to business-as-usual (BAU)	N/A - deployment occurs after 2030
	Target scenario	185,000	Over 25 years when compared to BAU	39,000
Total for Project 1		**185,000**	**Total for Project 1**	**39,000**
2. Static heat loss assessment	Counterfactual ASHP	135	Per annum	1,080
	Connecting to SELCHP	146	Per annum	1,168
Total for Project 2		**281**	**Total for Project 2**	**2,248**
3. Brimmington Park	Tree planting	0.01 (planted) -0.02 (removal)	Saving per tree, per annum Cost per removal of one tree	N/A - current tree planting plans are unknown
	Sports hub retrofit	2.8 (retrofit only) 0.6 (retrofit and extension)	Per annum	22.4 (retrofit only) 4.8 (retrofit and extension)
Total for Project 3		**2.8 (sports hub retrofit)** **0.6 (sports hub retrofit and extension)**	**Total for Project 3**	**22.4** **4.8**
4. Transport infrastructure	Scenario 1	0 to 5,631	The difference in emissions between the 2019 modal split and 2030 modal split.	0 to 16,128
4. Transport infrastructure	Scenario 2	0 to 3,709	The difference in emissions between the 2019 modal split and 2030 modal split.	0 to 10,624

05 Disclaimer

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