Cambridge Waste Water Treatment Plant Relocation Project
Anglian Water Services Limited

Environmental Statement Chapter 10: Carbon

Application Document Reference: 5.2.10
PINS Project Reference: WW010003
APFP Regulation No. 5(2)a

Revision No. 04
January 2024

Document Control

Document title	Chapter 10: Carbon
Version No.	~~00~~~~03~~04
Date Approved	~~15.12.2023~~22.01.2024
Date 1st Issued	30.01.23

Version History

Version	Date	Author	Description of change
01	30.01.23	-	DCO Submission
02	19.04.23	-	Updated to reflect s.51 advice letter
03	15.12.23	-	Updated to reflect Examination Responses
04	19.01.24	-	ISH Action Points for Deadline 4

Contents

Figures

Tables

Summary

This chapter presents the findings of an Environmental Impact Assessment (EIA) completed in relation to the potential carbon emissions[1] generated by the Proposed Development. This assessment has considered the following aspects of the Proposed Development:

- Decommissioning: carbon emissions arising from activities in decommissioning the existing site.
  - The baseline is zero carbon emissions (no decommissioning activities).
- Construction: capital carbon emissions associated with construction materials, transport of materials to the Proposed Development, and construction activities.
  - Baseline: Zero carbon emissions (no construction activities) on the site.
  - Preferred Option: A preferred option design.
  - Alternative Design: An alternative of a ~~A baseline of a~~ pre-value-engineered view (based on 2010 construction practices and baseline models) has been assessed to highlight the mitigation efforts taken up to this stage in the preferred option design.
- Land use change: carbon sequestration impacts from proposed landscaping plans.
  - The baseline is for no change in land use of the Proposed Development site, assuming the site remains in it's current state.
- Operation: carbon emissions associated with operational energy use and other operational processes over the opening year of the Proposed Development. Two different scenarios are presented for operation:
  - Baseline: Emissions from the existing wastewater treatment plant.
  - Preferred Option: where biogas generated by the Proposed Development is exported to the UK gas grid (known as 'gas to grid'). The export of gas to grid has been estimated to result in avoided carbon emissions through displacement of other sources of gas supply to the UK grid.
  - Alternative Design: ~~CHP Option:~~ An alternative where biogas generated by the Proposed Development is used in efficient combined heat and power engines (CHP). This reduces the requirement for grid electricity to operate the Proposed Development. This has been modelled as an alternative scenario as a

[1] The term 'carbon emissions' is used throughout this report. Carbon is the commonly used term referring to greenhouse gases (GHGs).

worst case, should gas to grid be unviable at point of construction. ~~This option aligns to the operational emissions of the baseline.~~

- Whole assessment life: carbon emissions associated with all the above aspects presented for the whole assessment lifetime.

The estimated carbon emissions have been presented as gross and net emissions. Net emissions show the impacts when avoided emissions are accounted for.

Under the Preferred Option scenario, the assessment lifetime impact has been calculated as net negative carbon emissions (-35,380 tCO_2e) based on the anticipated export of gas to grid during operation.

The ~~alternative~~ Alternative ~~Proposed Development scenario~~Design of using biogas in CHP is estimated to have overall net carbon emissions over the assessment life of 68,430 tCO_2e. The net operational carbon emissions under this scenario would be offset through a ~~I~~ Carbon Management Plan, to ensure that Anglian Water's commitment to an operationally net zero project would be met.

Good practice construction measures to reduce GHG emissions have been recommended in the Code of Construction Practice Part A and B (CoCP) (Appendix 2.1 & 2.2, Application Document Reference 5.4.2.1 and 5.4.2.2). Reductions in construction emissions of just under 50% have been made between the assessment of the ~~baseline design~~Alternative Design when compared to the Proposed Development. Further design optimisation opportunities are being investigated by the Applicant to meet their corporate capital carbon reduction target of ~~at least a~~ 70% reduction from a 2010 baseline[2] that will continue during detailed design of the Proposed Development. The Applicant has also committed to a 55% reduction in capital carbon emissions from a 2010 baseline, and ongoing reporting of its progress to its 70% reduction target. These commitments are secured through the Design Code (App Doc Ref 7.17).

[2] Anglian Water (2021) Net Zero 2030 Strategy [online] https://www.anglianwater.co.uk/siteassets/household/environment/net-zero-2030-strategy-2021.pdf

1 Introduction

1.1 Purpose of this chapter

1.1.1 This chapter of the Environmental Statement (ES) presents the findings of an Environmental Impact Assessment (EIA) completed in relation to the potential carbon emissions arising from the Proposed Development.

1.1.2 The ES has been prepared as part of the application to the Planning Inspectorate (PINS) for development consent. This chapter considers the potential greenhouse gas emissions (GHGs) (commonly referred to as carbon emissions)[3] arising as a result of the Proposed Development during its construction (including commissioning), operation and maintenance and decommissioning phases.

1.1.3 Potential impacts of future climate conditions on the Proposed Development are assessed in Chapter 9: Climate Resilience.

1.1.4 This chapter summarises information from supporting studies, technical reports and publicly available data which are included within Appendix 10.1: GHG Calculations (App Doc Ref 5.4.10.1).

1.2 Competency statement

1.2.1 Summaries of the qualifications and experience of the chapter authors are set out in Table 1.1: ~~Table 1-1:~~

Table 1.1: Competent experts

Author	Qualification / Professional Membership	Years of experience	Project experience summary
[redacted]	MSc, CEnv, MIEMA	14	Contributor and reviewer roles for multiple EIA and ESIA projects. Multi-sector experience, including major transport projects and the power sector. Experience in data management and analysis for a range of environmental assessments. Specialist in carbon management and assessment.
[redacted]	MSc, CWEM	10	Contributor as part of the technical authoring team for PAS 2080:2016. Experience in developing carbon data sets for water sector assets and carbon assessments for major infrastructure projects.
[redacted]	MSc, CEnv, MIES	7	Contributor and reviewer roles for multiple EIA projects. Multi-sector experience, including the

[3] *GHGs refer to the seven gases covered by the Kyoto Protocol: carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), sulphur hexafluoride (SF_6) and nitrogen trifluoride (NF_3). These are measured in units of carbon dioxide equivalent (CO_2e) which expresses the impact of each gas in terms of the amount of CO_2 that would create the same impact.*

Author	Qualification / Professional Membership	Years of experience	Project experience summary
			water sector (EIA, regional planning, WRMPs). Experience in data management and assessment for a range of environmental assessments, specialist in EIA, as well as Natural Capital and Ecosystem Services Assessments.

1.3 Planning policy context

National Planning Statement (NPS) requirements

1.3.1 Planning policy on waste water Nationally Significant Infrastructure Projects (NSIPs), specifically in relation to water resources, is contained in the National Policy Statement (NPS) for Waste Water .

1.3.2 Table 1.2:~~Table 1-2:~~ sets out how the scope proposed in this chapter complies with the NPS for Waste Water.

Table 1.2: Scope and NPS Compliance

NPS requirement	Compliance of ES scope with NPS requirements
Paragraph 2.2.3 sets out the policy context including 'to help deliver the UK's obligation to reduce greenhouse gas emissions by 80% by 2050 and work to carbon budgets stemming from the Climate Change Act 2008'.	Note that the Climate Change Act was amended in 2019, and now commits the UK to 'net zero' by 2050. This ES scope includes assessment of GHG emissions from operation and construction, with mitigation measures to reduce emissions identified. Emissions estimates are compared against the UK's carbon budgets.

National planning policy

1.3.3 National planning policy of relevance to carbon and pertinent to the Proposed Development is listed below.

- National Planning Policy Framework (NPPF) with particular reference to:
  - paragraphs 8, 20 and p153-154 in relation to adaptation, mitigation and climate change resilience;
  - paragraphs 152, p154-158 in relation to reduction of GHG emissions through design and reduced energy consumption (Ministry of Housing, Communites & Local Government, 2021).

Local planning policy

1.3.4 Local planning policy of relevance to the Proposed Development includes:

- South Cambridgeshire District Council Local Plan 2018 (South Cambridgeshire District Council, 2018) with particular reference to:
  - Policy CC/1: Mitigation and Adaptation to Climate Change, which states that proposals should 'embed the principles of climate change mitigation and adaptation into the development'; and
  - Policy CC/3: Renewable and Low Carbon Energy in New Developments requires developments for new dwellings or other buildings to reduce carbon emissions.
- South Cambridgeshire District Council (SCDC) has committed to deliver Net Zero Carbon by 2050 and declared a Climate Emergency in December 2018:
  - The commitment is that the next local plan (to be a combined local plan with Cambridge City Council) will 'look at ways South Cambridgeshire District Council can press for a carbon-free area through the design of homes and other buildings, land use including open space, transport links, energy supplies and waste and recycling services'. The current local plan is focused on buildings and energy reduction, the new local plan will have to take a broader view on all new developments and how to reduce carbon (embedded and operational emissions).
- Cambridgeshire and Peterborough Minerals and Waste Local Plan 2036, adopted in July 2021 (Peterborough City Council and Cambridgeshire County Council, 2021) with particular reference to:
  - Policy 1: Sustainable development and climate change, where mineral and waste management proposals will be assessed against their active role in guiding development towards sustainable solutions.
- Cambridge City Council Local Plan 2018 (Cambridge City Council, 2018) with particular reference to:
  - Policy 28: Carbon reduction, community energy networks, sustainable design and construction, and water use which states that 'all developments should take the available opportunities to integrate the principles of sustainable design and construction into the design of proposals... including carbon reduction'.
- Cambridge City Council declared a Climate Emergency in January 2019. Relevant climate change strategy includes Cambridge City Council Climate Change Strategy (2021-2026) (Cambridge City Council, 2021) and supporting Carbon Management Plan (2021-2026) (Cambridge City Council, 2021). The climate change strategy identifies key objectives to tackle, including:
  - reducing energy consumption and carbon emissions from homes and buildings in Cambridge; and

- reducing consumption of resources, reducing waste and increasing recycling in Cambridge.

1.4 Legislation

National Legislation

1.4.1 The requirement to consider a project's impact on climate change (i.e. its GHG emissions) was introduced in the 2014 amendment to the Environmental Impact Assessment (EIA) Directive (2014/52) (The European Parliament and the Council of the European Union, 2014). The Directive has been fully transposed into UK law in the Infrastructure Planning (Environmental Impact Assessment) Regulations 2017. Schedule 4, paragraph 5 of the regulation states that 'A description of the likely significant effects of the development on the environment resulting from, inter alia—... (f) the impact of the project on climate (for example the nature and magnitude of greenhouse gas emissions)…' is required.

1.4.2 The Climate Change Act 2008 (UK Government, 2008) and its 2019 amendment (UK Government, 2019) supports the UK's transition towards a low carbon economy. It includes a legally binding commitment to reach net zero by 2050, which represents a 100% reduction in national carbon emissions compared to 1990 levels. The Act also sets a national 5-year carbon budgeting system, with legally-binding 'carbon budgets' to cap the amount of GHGs emitted in the UK over a five-year period. It also established the context for Government action and incorporated the requirement to undertake Climate Change Risk Assessments, and to develop a National Adaptation Programme (NAP) to address opportunities and risks from climate change (which is covered in Chapter 9: Climate Resilience).

1.5 Consultation

Scoping

1.5.1 Table 1.3: ~~Table 1-3:~~ provides a summary of key points raised during scoping.

Table 1.3: Key points raised during scoping

Consultee	Points raised	How and where addressed
Greater Cambridge Shared Planning	Assess both GHG (including carbon) and the vulnerability of the project to climate change.	GHGs are addressed in this assessment (Section 4 presents the assessment of effects). Chapter 9 covers Climate Resilience.
Greater Cambridge Shared Planning	Scope of assessment should include: decommissioning of the current WWTP and WRC and the intention (with carbon implications) for the proposed WWTP at the end of the plant's design life (post 2050).	Decommissioning of the existing Cambridge WWTP is quantified within this assessment (Section 4.5). Decommissioning involves limited activities to drain down and render safe the existing structure and has a limited impact. The Development Consent Order application does not include the demolition of the existing facility or its redevelopment for low carbon housing and employment uses, which will be approved through a separate planning permission. Carbon impacts associated with these activities are therefore not assessed in the environmental statement, but they are considered in a high-level strategic carbon assessment (Whole Life Carbon Assessment Application Doc Ref 7.5.2). Future forecasts of emissions are subject to broad assumptions and a high degree of uncertainty. There are no proposals to decommission the proposed WWTP, which would be retained indefinitely.
Greater Cambridge Shared Planning	Consider materials and technologies for reducing embodied carbon and offsetting carbon in both the construction and operational stages.	Opportunities for reducing capital carbon have been included within the design process, summarised within this assessment (Table 2.4~~Table 2-4~~). Carbon offsetting purchases are not considered within this assessment. The impacts presented here represent a reasonable worst-case scenario, without offsetting. The carbon benefits of land-use change and biomethane export are considered as part of the footprint.

Consultee	Points raised	How and where addressed
Fen Ditton Parish Council	Include an assessment of the embodied and operational carbon footprint if the current works were retained as a baseline.	The baseline for this assessment has been updated at Deadline 4 to present 0 construction emissions and an operational baseline of the existing Cambridge WWTP. ~~is a pre-value-engineered design which represents an early view of how the existing Cambridge WWTP would likely have been re-built through conventional processes and approaches~~ (see section 3.1 - Current baseline).
Fen Ditton Parish Council	Include an assessment of decommissioning of the Proposed Development.	Decommissioning and demolition of the Proposed Development has not been quantified – future forecast of emissions is subject to broad assumptions and a high degree of uncertainty. As discussed in the Project Description chapter~~-~~, there are no proposals to decommission the proposed WWTP, which would be retained indefinitely.
Fen Ditton Parish Council	Assessment of emissions significance based on net impact as per IEMA Guidance.	IEMA Guidance (Institute of Environmental Management and Assessment, 2022) has been used to inform this assessment.
Fen Ditton Parish Council	Provide a clear description of the energy generation proposals.	The assessed operation of the Proposed Development includes either export of biogas to grid, supported by solar generation, or use of biogas in CHP energy generation, supported by solar generation. These are described in Chapter 2.

Technical Working Groups

1.5.2 Table 1.4:~~Table 1-4:~~ provides a summary of key points raised during engagement with Technical Working Groups.

Table 1.4: Key points raised during engagement with Technical Working Groups

Date	Consultee	Points raised	How and where addressed
June 2022	Carbon SoCG Meeting (Anglian Water, Greater Cambridge Planning)	Clarify scope of assessment in the ES (especially re. decommissioning).	Section 2 on Assessment Approach covers the scope of assessment. The Development Consent Order application does not include the demolition of the existing facility or its redevelopment for low carbon housing and employment uses, which will be approved through a separate planning permission. Carbon impacts associated with these activities are therefore not assessed in the environmental statement, but they are considered in a high-level strategic carbon assessment which accompanies the DCO application.

Statutory s42 consultation

1.5.3 There are no statutory consultees for the regulation of carbon emissions.

Statutory s47 local community consultation

1.5.4 The Consultation Report (App Doc Ref 6.1) describes the consultation process that the Proposed Development has followed and details the responses to all comments made during this consultation. Matters raised in relevance to the carbon assessment include:

- the provision of details regarding the estimated carbon emissions involved in decommissioning of the existing Cambridge WWTP, construction (including transport) and operation of the Proposed Development, and land use change;
- the provision of information available to support the Applicant's 70% construction capital carbon reduction commitment; and
- requests that the details of carbon payback of the Proposed Development, including operational emissions and transport, be provided.

2 Assessment Approach

2.1 Guidance

2.1.1 The following guidance provides best practice for the assessment of carbon emissions and has been used to inform the EIA:

- Institute of Environmental Management and Assessment (IEMA) Environmental Impact Assessment Guide to Assessing Greenhouse Gas Emissions and Evaluating their Significance – Second Edition is widely accepted as comprehensive guidance on assessment of GHG emissions, and has been used to inform assessment of significance (Institute of Environmental Management and Assessment, 2022);
- Infrastructure Carbon Review (HM Treasury, 2013) sets out carbon reduction actions required by infrastructure organisations. In terms of the Proposed Development, this means that emissions reduction actions should be taken into account when developing scheme specific mitigation measures;
- National Planning Practice Guidance includes a dedicated section on climate change (Department for Levelling Up, Housing and Communities and Ministry of Housing, Communities & Local Government, 2019), which sets out key legislation and drivers for considering climate change in planning. The guidance sets out examples of climate change mitigation (reduction of emissions), and adaptation to climate change;
- PAS 2080: 2016 Carbon Management in Infrastructure (British Standards Institution, 2018) establishes a common understanding, approach, and language for whole life carbon management in the provision of economic infrastructure (defined as water, energy, transport, communications, and waste). This approach is key to informing the methodology for assessment, and the Applicant's carbon models are assessed against PAS 2080.
- The assessment of the impact on land use change has been undertaken in line with the following methodology guidance:
  - Enabling a Natural Capital Approach (ENCA): (DEFRA, 2021);
  - The Green Book Central Government Guidance on appraisal and evaluation: (HM Treasury, 2018); and
  - Natural Capital Atlas: Mapping Indicators for County and City Region (NECR318): Cambridgeshire: (Natural England, 2020).

2.2 Assessment methodology

2.2.1 The approach to assessment described in Chapter 5: Assessment Methodology has been followed.

2.2.2 Primary and tertiary mitigation for the Proposed Development has been identified as part of an iterative design process and is described in Chapter 2 (Project Description) and Chapter 3 (Alternatives). The preliminary assessment of the likely significant environmental effects has been undertaken with the assumption that primary and tertiary mitigation will be implemented.

2.2.3 Following the preliminary assessment, any further mitigation measures (secondary mitigation) are identified and described. These mitigation measures would further reduce an adverse effect or enhance a beneficial one.

2.2.4 This section provides specific details of the carbon emissions methodology applied to the assessment of the Proposed Development.

Impact assessment criteria

2.2.5 The significance of an effect is determined based on the magnitude of an impact and the sensitivity of the receptor affected by the impact of that magnitude. This section describes the criteria applied in this chapter to characterise the magnitude of potential impacts and sensitivity of receptors.

2.2.6 The assessment methodology is based on the IEMA Environmental Impact Assessment Guide to Assessing Greenhouse Gas Emissions and Evaluating their Significance (2022). Following this guidance, the significance of the effect is based on whether a project contributes to reducing carbon emissions (against the agreed baseline) in line with a relevant trajectory to net zero. The magnitude of carbon emissions is not necessarily an indicator of the significance of effect, instead the focus is on aligning with net zero.

Sensitivity of receptor

2.2.7 There is one receptor for carbon emissions assessment; the global climate. National planning policies and the UK Climate Change Act reiterate the serious nature of climate change and the need to rapidly decarbonise. This has been taken into account, in line with IEMA guidance, by defining the sensitivity of the global climate as high.

Significance of effect

2.2.8 Table 2.1~~Table 2-1~~ sets out the significance criteria adapted from the IEMA Guidance. Following this guidance, any effects with a significance level of minor or less are considered to be not significant. Where a range of significance is presented, the final assessment is based upon expert judgement.

Table 2.1: Significance criteria

Scale of effect	Description	Significance
Major adverse	Emissions are not mitigated, or only comply with do-minimum standards.	Significant
Moderate adverse	Emissions are partially mitigated, but do not align to relevant policy decarbonisation goals.	Significant

Scale of effect	Description	Significance
Minor adverse	Emissions fully align to applicable policy requirements and good practice.	Not significant
Negligible	Emissions reductions are well beyond applicable policy and design standards towards net zero, with minimal residual emissions.	Not significant
Beneficial	Net impacts are below zero, having a positive climate impact.	Significant

Residual effect

2.2.9 The residual effects are those remaining after accounting for the embedded mitigation (primary) and legal requirements (tertiary mitigation), and after the application of further mitigation measures (secondary mitigation). Effects after mitigation are referred to as 'residual effects'.

2.3 Study Area

2.3.1 The assessment of the effects on climate does not have a physical study area *per se* as the receptor (the global climate) for GHG emissions is not spatially defined. Climate change resulting from GHG emissions will lead to social, environmental and economic impacts felt globally, regardless of where they are emitted. Chapter 10: Climate Resilience considers the vulnerability of the Proposed Development to climate change.

2.3.2 Instead of a physical study area, the carbon impact assessment considers the potential carbon emissions arising from activities over the assessment lifetime. Therefore, the assessment includes:

- decommissioning of the existing Cambridge WWTP;
- construction of the Proposed Development (capital carbon in materials, transport of materials to site, construction plant use);
- land use change (the net impact on GHGs of the change in land use for the proposed WWTP and associated infrastructure, and of the proposed landscaping); and
- operation of the proposed WWTP.

2.4 Temporal scope of assessment

Construction

2.4.1 For the assessment, carbon emissions estimated are those for which the activity begins and ends during the construction and commissioning stages prior to the proposed WWTP becoming fully operational (as set out in Chapter 2 Project Description).

2.4.2 The assumed assessment years for construction are from ~~Year~~year 1 to year 4 (currently assumed to be) 2024 until 2028, should construction activities be extended this would likely lead to increased emissions.

2.4.3 Decommissioning of the existing Cambridge WWTP would take place after commissioning of the Proposed Development.

2.4.4 The Development Consent Order application does not include the demolition of the existing facility or its redevelopment for low carbon housing and employment uses, which will be approved through a separate planning permission. Carbon impacts associated with these activities are therefore not assessed in this chapter of the environmental statement, but they are considered in a high-level strategic carbon assessment which accompanies the DCO application.

Operation and maintenance

2.4.5 For the assessment, these are the carbon emissions that are emitted once the proposed WWTP is commissioned and fully operational and includes the effects of the physical presence of the infrastructure, its operation, use and maintenance, including the permanent change in land use.

2.4.6 Carbon emissions are presented for the whole assessment lifetime, including construction and operation up to the year 2090. This has been selected based on the designed operational lifespan of the Proposed Development.

Duration of effects

2.4.7 The assessment of the effects on climate assumes a permanent effect on the global atmosphere where effects cannot be reversed. Climate change resulting from GHG emissions will lead to social, environmental, and economic impacts felt globally.

2.5 Baseline study

Desktop data

2.5.1 Baseline information was collected through a detailed desktop review of existing studies and datasets. These are summarised in Table 2.2~~Table 2-2~~ below.

Table 2.2: Desktop information sources

Item or feature	Year	Source
~~Construction emissions include the following emissions sources:~~ ~~Emissions associated with the manufacture of raw materials and construction products~~ ~~Transport of those materials to construction site~~ ~~Construction effort emissions e.g. fuel use in construction~~	~~Data accessed 2021/22~~	~~Anglian Water carbon models (PAS 2080 compliant). The models rely on a number of emissions data sources, mainly using the Inventory of Carbon and Energy (Embodied Carbon - The ICE Database, 2019) for construction materials, and the (Civil Engineering Standard Measures of Measurement (CESMM4) Carbon and Price Book, 2013) for construction activities. Department for Business, Energy & Industrial Strategy (BEIS) annual conversion factors for company reporting (Department for Business Energy & Industrial Strategy, 2021) are used to account for transport emissions and waste.~~

Item or feature	Year	Source
~~Allowance for disposal of construction waste~~		
Operation emissions for the commissioning year and full capacity operations, using ~~predicted~~ current operational activities.	Data accessed 2021/22	Anglian Water's data on operation emissions for wastewater treatment using emissions factors published by the UK Government and other industry sources. This accounts for grid carbon emissions from BEIS; including both current year grid carbon intensity data (Department for Business Energy & Industrial Strategy, 2021), and grid decarbonisation forecasts from Green Book supplementary guidance: valuation of energy use and greenhouse gas emissions for appraisal, data tables 1-19, table 1 (Department for Business Energy & Industrial Strategy, 2021).
Land use change	Data accessed 2022	Other ES technical topics: The extent and condition of the natural capital stocks was informed by the Extended Phase 1 Habitat Survey (Appendix 8.12, Baseline Survey Technical Note, App Doc Ref 5.4.8.12) and proposed landscape plan (within the Landscape Ecology and Recreation Management Pan (LERMP), Appendix 8.14, App Doc Ref 5.4.8.14). Carbon values from the Committee on Climate Change (JBA Consulting, 2018).

Surveys

2.5.2 No physical surveys were undertaken for the carbon assessment.

2.6 Maximum design envelope (Rochdale) parameters for assessment

2.6.1 The design parameters and assumptions presented are in line with the 'maximum design envelope' approach. For each element of this carbon assessment, the maximum design parameters detailed within Table 2.3~~Table 2-3~~ have been selected as those having the potential to result in the greatest effect on carbon emissions.

2.6.2 The assessment uses the Applicant's carbon models to calculate the likely scale of carbon emissions associated with the Proposed Development. The models have been reviewed against Chapter 2: Project Description to ensure that the key metrics of the model are aligned. The assessment considers a realistic maximum design envelope based on the maximum scale of the elements; as a result, effects of equal or lesser significance than those assessed are likely.

Table 2.3: Maximum design envelope parameters for carbon assessment

Potential impact	Maximum design scenario	Justification
Emissions associated with decommissioning of the existing Cambridge WWTP, which includes draining and cleaning of the tanks and pipework and the removal of surplus chemicals.	An allowance for on-site vehicle movements and journeys to and from start location has been estimated based on discussion with contractors for the Proposed Development. Note that the baseline is for no decommissioning (zero emissions).	The main source of carbon emissions from decommissioning activities is vehicle movement. Any construction elements are included within the construction footprint. Decommissioning carbon emissions are a small proportion of the capital carbon impact in comparison to the construction of the proposed WWTP and this provides a pragmatic approach to estimate the likely scale of emissions from these activities.
Emissions associated with construction	~~Two~~ Three construction assessments have been presented: • Baseline: Zero carbon emissions (no construction activities) on the site. This baseline has assumed no additional capital works will be required beyond like for like capital replacements of existing assets and does not provide the same outcomes as the Proposed Development in terms of water quality and the strategic objective of the scheme of freeing up space for housing in North Cambridge. • ~~Baseline (referred to as Delivery Milestone Zero, 'DM0'): Covers the pre-value-engineered design which represents an early view of how the existing Cambridge WWTP would likely have been re-built through conventional processes and approaches.~~ • Preferred Option Proposed Development: Covers the current DCO planning stage design (the preferred option), including for a range of mitigation measures that have been committed to within the design of the Proposed Development. Includes Biomethane	The baseline for this assessment is zero emissions, assuming no construction occurs. ~~a pre-value-engineered design (based on 2010 construction practices and baseline models) which represents an early view of how the existing Cambridge WWTP would likely have been re-built through conventional processes and approaches.~~ The Proposed Development design provides a realistic viable design accounting for committed emissions mitigation activities. The Alternative Design presents a pre-value-engineered design (based on 2010 construction practices and the Applicant's DM0 models) which represents an early view of how the existing Cambridge WWTP would likely have been re-built through conventional processes and approaches. To estimate carbon emissions from the transport of materials, reasonable transport distances were agreed with the Applicant. These distances were based on typical procurement practices

Potential impact	Maximum design scenario	Justification
	production as this is worst case for carbon emissions associated with construction. • Alternative Design (referred to as Delivery Milestone Zero, 'DM0'): Covers the pre-value-engineered design which represents an early view of how the existing Cambridge WWTP would likely have been re-built through conventional processes and approaches. These assessments cover capital carbon in materials, expected transport distances of products and materials to site, and fuel use in construction.	and supplier locations (for example concrete us typically sourced from within 50km of a site).
Emissions from operation	~~Two~~ Three operation assessments are presented: • Baseline of the current WWTP operation (this baseline does not provide the same outcomes as the Proposed Development in terms of water quality and the strategic objective of the scheme of freeing up space for housing in North Cambridge). • Preferred Option for t~~T~~he Proposed Development includes the upgrade of biogas to biomethane for export (the preferred option). For biogas export to the grid, the emissions intensity of the grid gas has been assumed to be constant up to 2050 (at which point the UK gas grid is assumed to be net zero). • The Alternative Design CHP option where biogas is used in CHP engines on-site (as per the ~~baseline~~ 'DM0' design).	Preferred Option d~~D~~esign provides a realistic viable design of preferred option of biomethane production, but also represents an alternative design option of CHP use (should changes to Government policy change on UK energy strategy favour alternative use of biogas to meet net zero climate targets). All avoided emissions are presented within the net totals. For the Proposed Development, utilisation of biogas in CHP represents the worst case position in terms of net carbon emissions. As there is no readily available forecast for the likely decarbonisation of the gas grid per kWh, a constant emissions factor has been assumed year on year until 2050.
Emissions associated with construction and operation	Solar panels are excluded from the operation carbon footprint, although an estimation is provided for the capital carbon which occurs during construction.	As the exact configuration and capacity of solar panels is to be determined, exclusion of solar energy generation represents a worst-case assessment with higher operational emissions.

Potential impact	Maximum design scenario	Justification
Land use change	The landscape masterplan will be implemented and managed in line with the commitments in the LERMP (Appendix 8.14, App Doc Ref 5.4.8.14), additional sequestration potential beyond the management plan period is not accounted for.	Represents the land use change over the 30 year lifetime of the management plan.

2.7 Impacts scoped out of the assessment

2.7.1 The following emissions sources are not included in this assessment:

- Decommissioning and demolition of the proposed WWTP are not quantified. Future forecasts of emissions are subject to broad assumptions and a high degree of inaccuracy. There are no proposals to decommission the proposed WWTP before 2050 and it is anticipated that a future decommissioning exercise would likely take place in a world where low carbon plant and activities are commonplace;
- The wider effects as a result of redeveloping the existing Cambridge WWTP are not within the scope of this project:
  - demolition of the existing Cambridge WWTP;
  - redevelopment of/construction on the existing Cambridge WWTP; and
  - future use of the existing Cambridge WWTP (e.g. operational energy use and transport emissions generated during use following redevelopment).

2.7.2 Construction and operation of the Waterbeach pumping station, as the construction and operation of the pumping station will not fall under the remit of the Applicant.

2.7.3 From discussions between the Applicant and the developers who will demolish and redevelop the existing Cambridge WWTP, it is understood that these effects will be considered as part of their subsequent separate planning process as more detailed design information is developed.

~~2.7.2~~2.7.4 Emissions have also not been presented where there is expected to be no change from the baseline assessed. This particularly includes elements, such as, sludge deliveries within operational emissions which are expected to be unchanged between the existing site and the Proposed Development.

2.8 Mitigation measures adopted as part of the Proposed Development

2.8.1 This section refers to the mitigation types, as defined in Chapter 5: Assessment Methodology, and how they apply to the assessment of carbon.

2.8.2 In developing the Proposed Development through an iterative process including consultation and engagement with consultees and through the EIA, the Applicant has sought to identify and incorporate suitable measures and mitigation for potentially significant adverse effects, as well as maximising beneficial effects where possible.

2.8.3 Some measures are 'embedded' in the design of the Proposed Development for which consent is sought by virtue of the scope of the authorised development as set

out in Schedule 1 to the DCO and the accompanying Works Plans. These are considered primary mitigation. For example, the adjustment of Order Limits to avoid sensitive features, or amending the sizing and location of temporary access routes and compounds.

2.8.4 Other measures are either secondary, such as control plans, or measures integrated into legal requirements through environmental permits and consents (termed tertiary). Chapter 5: Assessment Methodology sets out the required permits and consents related to the Proposed Development.

2.8.5 The remainder of this section sets out the embedded measures (primary), legal requirements (tertiary) and additional measures (secondary) relevant to the assessment of carbon.

Primary (embedded) and tertiary measures

2.8.6 Mitigation options to reduce the impact have been identified and implemented throughout the development of the design, in line with the methodology set out in PAS 2080 and the Applicant's carbon reduction targets. This involved developing a ~~carbon baseline~~DM0 model for the Proposed Development (the Alternative Design) ~~(referred to as 'DM0')~~, then assessing the carbon impact of ~~alternative~~ design options (for example alternative processes and the physical arrangement or extent of built development within the proposed WWTP). Carbon is a primary metric of the options evaluation process during design development.

2.8.7 During the design process, challenges have been set to reduce the impact of the construction and operation. These have included assessing process sizing to ensure requirements are optimi~~z~~sed, flows optimi~~z~~sed to ensure network and above ground infrastructure is not oversized. These ~~challenges include~~have led to the following mitigation measures being embedded into the design (further detail in Table 2.4~~Table 2.4~~):

- Reduction in tunnel diameters and lengths
- Choice of sand filter provider to reduce the capital carbon intensity of this treatment process
- Material specification for outfall pipelines
- Optimisation of civil structure volumes
- Optimisation of site road layouts and design specification
- ~~process sizing to ensure requirements are optimised;~~
- ~~flows to optimise network sizing to ensure infrastructure is not oversized;~~

The above measures are secured through the Design Code (App Doc Ref 7.17). As the design continues to be refined at detailed design and through to construction, further mitigation measures will be considered to continue to further mitigate capital carbon emissions towards the Applicants 70% reduction target. Further mitigation measures~~, these~~ include, amongst others, the following measures:

- the selection of innovative low energy process technologies such as Membrane Aerated Biofilm Reactor (MaBR), vacuum de-gassing, and energy efficient steam raising plant;
- reviewing each component of the built development and process stream (e.g. primary and secondary treatment) to ensure process selection was optimum for carbon; and
-
- material selection and methodology of construction.

The Design Code (App Doc Ref 7.17) provides a secured commitment to continue to report on progress on the review and application of further mitigation measures by providing an updated carbon model at the following stages:

- 6 weeks prior to enabling works commencing;
- Before commencement of main construction works;
- Finalisation of the Detailed Design; and
- At any stage where decisions are made which impact Capital Carbon emissions of the Proposed Development by more than 5%.

Table 2.4

2.8.8 ~~Table 2-4~~ sets out the embedded mitigation measures that will be adopted during the construction, operation and decommissioning of the Proposed Development.

Table 2.4: Embedded mitigation (primary and tertiary) measures relating to carbon, adopted as part of the Proposed Development

Mitigation measures		Type	Applied to	Justification
Construction				
Tunnel design	Design optimised to r~~R~~educe.~~tion in~~ tunnel length and diameters	Tertiary	Proposed Development	Design changes made to optimise the design, reducing construction emissions.
Tertiary treatment	Choice of sand filter provider to reduce capital carbon intensity of this treatment process	Tertiary	Proposed WWTP	
Treated effluent pipelines and outfall	Design c~~C~~hoice of composite pipes over ductile iron and reduction in overall length of the pipelines	Tertiary	Treated final effluent and storm pipelines and outfall to the River Cam	
Optimisation of process-tank volume	Optimisation of major process-tank volumes from original ~~baseline~~ DM0 sizes (e.g. aeration lanes and storm tanks)	Tertiary	Proposed WWTP	
Optimisation of road area	Design optimisation to reduce ~~Reduction in~~the total area of roads required	Tertiary	Proposed Development	
Operation				
Landscape masterplan	Provision of landscaped areas in place of arable farmland	Primary	Area of land required for the landscape masterplan	Represents area of land subject to land use change offering improved carbon sequestration from baseline
Gas to grid or CHP	Generating and feeding renewable bio-methane into the national grid in the Preferred Option. Or as in the Alternative CHP option, generating power and heat through utilising biogas through a CHP engine. Both options have different operational mitigations impact and the Carbon Management	Tertiary	Proposed Development – biogas use	Design changes made to optimise the design, reducing operational and whole life emissions.

Mitigation measures		Type	Applied to	Justification
	Plan addresses this difference through committing to securing enough offsets to ensure the Proposed Development under either options meets the Applicants operational net zero commitment.			
Pumping power demand	Optimisation pumping power demand of Terminal Pumping Station (TPS).	Tertiary	Proposed Development – TPS and site wide hydraulic profile.	
Dewatering technology	Reduction in chemicals and power demand for sludge dewatering through choice of dewatering technology.	Tertiary	Proposed Development – Sludge thickening and dewatering.	
Vacuum degassing	Vacuum degassing post-digestion (see Chapter 2 Section 2.4, Sludge Treatment Centre (App Doc Ref 5.2.2) to recover more biogas to be upgraded to biomethane.	Tertiary	Proposed Development – Post-digestion biogas recovery.	

Secondary measures

2.8.9 Secondary measures will be applied to provide further controls to avoid or reduce impacts. Those applied during construction, decommissioning, operation and maintenance for ~~water resources~~carbon reduction are indicated below.

Construction

2.8.10 During the construction phase, the Code of Construction Practice (CoCP) Part A and B (Appendix 2.1 & 2.2, App Doc Ref 5.4.2.1 and 5.4.2.2) and associated management plans specify the range of measures to avoid and minimise impacts (including aspects such as materials, fuel, and water use, and waste production, which all link back to carbon impacts from construction) that may occur in construction.

2.8.11 Section 7.5 of the CoCP Part A (Waste Management and Resource Use) (Appendix 2.1, App Doc Ref 5.4.2.1) requires the Principal Contractor(s) to put in place measures to minimise energy consumption and carbon emissions during construction.

2.8.12 The Proposed Development will align to the Design Code (App Doc Ref 7.17) which secures a commitment ~~seek~~ to achieve BREEAM Excellent for the gateway building. BREEAM status is not a guarantee of specific measured carbon reductions, as there are different credits which can be used to achieve the target status. There are however several credits relating to carbon emissions, including reducing energy use, low carbon design and lifecycle impact assessment of the building (including embodied carbon in materials).

~~2.8.12~~2.8.13 The Design Code (App Doc Ref 7.17) also secures a commitment to achieve a 55% reduction in capital carbon emissions from a 2010 baseline (through measures including continued innovation review of design and material specifications throughout the design process), alongside a commitment to continue to report progress against the Applicants 70% capital carbon reduction target through reporting an updated carbon model as set out in section 2.8.7.

Operation

~~2.8.13~~2.8.14 The LERMP is included within the Application (Appendix 8.14, App Doc Ref 5.4.8.14). The purpose of the LERMP is to set out how landscape, recreational features and ecological habitat and enhancements (vegetation and habitats) would be protected and managed for a period of 30 years following construction. Post grant of the DCO and prior to commencement of landscaping works, an updated plan will be prepared and agreed with the local authority. Management is key to ensuring that the vegetation grows and continues to sequester carbon.

~~2.8.14~~2.8.15 The Development Consent Order (App Doc Ref 2.1) requires a Carbon Management Plan (CMP) to be agreed prior to the operation of the proposed WWTP. The approved CMP will align with the Carbon Management Plan (App Doc Ref 5.4.10.2). The CMP will ensure that, in the event of the worst-case option (CHP) being adopted, the proposed development will remain carbon neutral during its operation, in line with commitments made during the pre-application consultation.

The CMP would secure the necessary measures, most likely offsets, required to ensure that the project is not a net emitter of greenhouse gases during the operational phase. The CMP secures the commitment for the Applicant to secure sufficient long term offsets to cover the expected net annual emissions based on its detailed design assessment, and to report operational emissions from the Proposed Development annually, and if required to secure additional offsets if operational emissions increase expected annual net emissions.

~~2.8.15~~2.8.16 Operation and maintenance activities will be subject to operational management plans and procedures. The management plans and procedures will sit within the EMS required under the environmental permitting regime. These will be 'live' documents that identify the environmental risks and legal obligations associated with the operations of the Proposed Development once construction has been completed. These will specify the management measures the operator will implement in order to prevent or minimise the environmental effects associated with the Proposed Development.

Decommissioning

~~2.8.16~~2.8.17 Decommissioning of the existing Cambridge WWTP will be subject to a Decommissioning Management Plan which is to be agreed with the local planning authority. An Outline Decommissioning Plan (Appendix 2.3, App Doc Ref 5.4.2.3) describes measures applied to this activity. Post grant of the DCO and prior to commencement of decommissioning, a detailed plan will be prepared and agreed with the local planning authority.

2.9 Assumptions and limitations

2.9.1 Any carbon emissions assessment at design stage is an estimate based on best available data and using industry standard emissions factors. There is an inherent limitation in carbon assessments as the assessment is based on the scheme design at the time. The final constructed asset will not have the same carbon emissions as estimated due to differences in the final materials' procurement specification and construction practices on site. Final carbon emissions are expected to be less than the emissions estimated here, as the Applicant will continue to review the design and strive to meet their 70% capital carbon reduction target against the 2010 ~~baseline~~DM0 model.

2.9.2 In some cases, there is not an absolute equivalent emission factor available for the material specified in the design, for example where the unit of measurement is not directly equivalent, or the material specification varies. In these instances, assumptions based on professional judgement have been made to attempt to replicate the type and weight of the materials as closely as possible. Any assumptions made have been conservative, i.e. when there is a choice, the highest emissions factor or density is used.

2.9.3 The assessment of the carbon emissions from the construction and operation of the Proposed Development has been based on the Applicant's asset level carbon models. It is assumed that these are the most representative source of data. These

have been developed to align to the Applicant's design standards, provide good quality representative data to make comparative decisions between options, and provide an understanding of likely scale of emissions.

2.9.4 The carbon mitigation strategy for the Proposed Development has considered several novel treatment processes. Where this is the case, standard emissions data and processes have been used alongside supplier data to estimate the emissions from these new processes. Where a full set of supplier data was not available, conservative assumptions have been made to fill gaps to avoid underestimating emissions.

2.9.5 Maintenance activities are expected to be labor-intensive rather than requiring significant additional energy or materials, and therefore it is assumed that the operational energy use covers routine maintenance activities. Carbon emissions from capital replacements are calculated separately and included within the whole life carbon assessment.

2.9.6 The export of gas to grid has been estimated to result in avoided carbon emissions through displacement of other sources of gas supply to the UK grid. Avoided emissions are presented in the net emissions for the Proposed Development. For biogas export to the grid, the emissions intensity of the grid gas has been assumed to be constant up to 2050 (at which point the UK gas grid is assumed to be net zero) (Navigant, 2019). There is no readily available forecast for the likely decarbonisation of gas per unit.

2.9.7 The solar photovoltaic (PV) panels have been excluded from the operation carbon assessment because the design and scale of generation has not been finalised. An estimate has been made for the capital carbon emissions based on a build-up of technical datasheet and environmental product declaration for PV panels. Excluding the solar panels from the operation model is a worst-case approach, as the emissions savings (i.e. reducing the amount of grid electricity required) have not been accounted for in the modelling.

2.9.8 Decommissioning and demolition of the Proposed Development has not been quantified. Future forecasts of emissions are subject to broad assumptions and a high degree of uncertainty. There are no proposals to decommission the Proposed Development before 2050. It is anticipated that a future decommissioning exercise would likely take place in a world where low carbon plant and activities are commonplace.

2.9.9 The land use change assessment is based on the Proposed Development design and landscape plan. The assessment assumes a constant rate of carbon sequestration and that the assumed time period required to achieve carbon sequestration for newly planted deciduous woodland is 11 years. These assumptions are based on planned maintenance in accordance with the LERMP (Appendix 8.14, App Doc Ref 5.4.8.14).

3 Baseline Environment

3.1 Assessment approach

3.1.1 The section presents the assessment of the baseline for the Proposed Development. The baseline covers construction, land use change, operation, decommissioning of the existing WWTP. The baseline carbon emissions over the assessment lifetime are covered in Section 4.6.

3.2 Current baseline

3.2.1 The construction baseline assumes zero carbon emissions (no construction activities) on the site. This baseline has assumed no additional capital works will be required beyond like for like capital replacements of existing assets and does not provide the same outcomes as the Proposed Development in terms of water quality and the strategic objective of the scheme of freeing up space for housing in North Cambridge.

~~3.2.1~~3.2.2 ~~baseline used the 'DM0' model design for the likely scale of construction and operational emissions, taking a conventional approach to building the works at the new location.~~ No decommissioning activities are included ~~within the DM0 model~~ (the baseline for decommissioning is zero). ~~The baseline design is a pre-value-engineered design which represents an early view of how the existing Cambridge WWTP would likely have been re-built through conventional processes and approaches.~~

~~3.2.2 Baseline conditions associated with construction are presented below. These emissions are modelled based on a basic scheme design. All of the assets identified in Table 3-1: result in carbon emissions from construction materials and processes. These are presented as positive numbers (greater than zero) in the table below.~~

~~Table 3-1: Baseline construction estimate~~

~~Asset~~	~~Carbon estimate (tCO_2e)*~~
~~Tunnel & Final Effluent Discharge~~	~~39,960~~
~~Aeration Tank~~	~~5,060~~
~~Final Settlement Tank~~	~~7,850~~
~~Sand Filtration~~	~~3,890~~
~~Roads~~	~~1,070~~
~~Primary Settlement Tank~~	~~1,640~~
~~Storm Tank~~	~~1,480~~
~~Import Area (Screening and Thickening)~~	~~1,290~~
~~Buildings~~	~~5,970~~
~~Inlet Works~~	~~1,380~~

~~Asset~~	~~Carbon estimate (tCO_2e)*~~
~~Inter process Pumping~~	~~2,660~~
~~TPS~~	~~4,210~~
~~Electrical Distribution~~	~~440~~
~~Digestion~~	~~1,940~~
~~LTP~~	~~960~~
~~Boundary Fencing~~	~~400~~
~~Common Control (MCC)~~	~~490~~
~~Biogas Area - Storage + CHP/BUP~~	~~720~~
~~HPH~~	~~1,100~~
~~Pressure Water System~~	~~20~~
~~Dewatering~~	~~250~~
~~Odour Control~~	~~490~~
~~Landscaping~~	~~1,080~~
~~Ferric Dosing~~	~~700~~
~~Site Services~~	~~<10~~
~~Additional Items~~	~~2,050~~
~~**TOTAL**~~	~~**96,750**~~

~~*tCO_2e rounded to nearest 10 tonnes~~

3.2.3 The baseline for land use change is the sequestration potential from the current land use of the site. This is presented in Table 3.1~~Table 3-1~~~~Table 3-2~~. The carbon sequestration rates are from a report on land use change for The Committee on Climate Change (JBA Consulting, 2018). The negative numbers are emissions savings from carbon sequestration.

Table 3.1~~3-2~~: Baseline carbon sequestration from land use

Landscape type	Carbon sequestration rate for landscape type (tCO2e/ha)	Baseline	
		Area (Ha)	Total Seq/yr (tCO2e/yr)
Woodland deciduous	-5	1	-6
Woodland coniferous	-13	<1	-1
Grassland	<0	29	-12
Arable land	<0	145	-16
Shrub	-1	5	-3
Total			**-38**

Seq = carbon sequestration. All figures rounded to the nearest whole number – totals may not sum due to rounding

3.2.4 Baseline conditions associated with operation annually are presented below (Table 3.2:~~Table 3-2:~~~~Table 3-3:~~). The model used for the baseline is based on current operations data using 2028 emissions factors to enable comparison to the

potential impacts of the Proposed Development operation.~~includes on-site CHP using biogas generated by the sludge treatment centre. The on-site CHP plant would supply some of the energy required for operation (grid electricity emissions avoided are shown as negative emissions in Table 3-3), while the remainder of the energy requirement would be met by grid electricity. Carbon emissions during operation also arise from chemical use, and from transport of biosolids for recycling.~~

Table 3.2~~3-3~~: Baseline operational estimate

Process	Carbon estimate (tCO_2e)*
Grid Electricity	~~2,690~~620
Chemicals	~~20~~220
Fossil fuel consumption (~~propane~~diesel use)	~~n/a~~100
Transport - biosolids recycling to land	70
Total gross emissions	**~~2,770~~1010**
CHP energy use	~~-1,350~~-370
Biomethane export	n/a
Total net emissions	**~~1,420~~640**

**tCO_2e rounded to nearest 10 tonnes*

3.2.5 The following emissions sources provide context for the carbon emissions presented in this assessment to help demonstrate the scale of the Proposed Development's impact:

- annual UK emissions, including national wastewater and construction sector emissions; and
- the Applicant's published operational emissions per Ml of treated wastewater.

3.2.6 In 2019, UK net greenhouse gas emissions were estimated at 455 $MtCO_2e$ (million tonnes of carbon dioxide equivalent) (Department for Business, Energy & Industrial Strategy, 2021). The water supply and sewage services sector accounted for 0.8% of UK GHG emissions in 2019.

3.2.7 The World Green Building Council has found that building materials and construction were responsible for around 11% of global energy related GHG emissions in 2018 (World Green Building Council, 2019). This is similar to previous findings for the UK construction industry consumption of natural resources in the UK accounting for equivalent to 10% of the total UK carbon emissions (Institute of Civil Engineers, 2014). Therefore assuming a 10% proportion, it has been estimated that approximately 45 $MtCO_2e$ are attributed to the embodied carbon of construction materials in the UK as a whole.

3.2.8 The total annual net emissions in 2020 for the Applicant are reported as 290,266 tCO_2e (Anglian Water, 2020). GHG emissions related to wastewater (water

recycling and sludge treatment) comprise 53% of the Applicant's reported operational emissions. Emissions are also reported as 0.432 tCO_2e per Ml of recycled water.

3.3 Future baseline

3.3.1 The Climate Change Committee (CCC) has determined a balanced net-zero pathway for construction and manufacturing that includes a reduction of 70% by 2035, and 90% by 2040 on 2018 levels (Climate Change Committee, 2020). This pathway considers that a proportion of the reduction will come from improved resource efficiency in production and material substitution. Therefore, significant effort is required to ensure that all contributing emissions are reduced as far as possible through the design, construction, and operation of all projects. This project adopts a construction reduction target of 70% compared with the 2010 construction ~~baseline~~DM0 model. The Applicant, further to its aspirational 70% target, has secured through the Design Code (App Doc Ref 7.17) a commitment to achieve 55% reduction against its DM0 baseline and to report on progress against this target at several points from prior to the enabling works commencing to completion of construction.

3.3.2 In 2021, the CCC's ambitious 6th Carbon Budget was brought into law committing the UK to cut emissions by 78% by 2035 compared to 1990 levels. The UK carbon budgets should lead to decarbonisation across the UK, including in electricity generation and the transport sector. In 2019, the Applicant, along with other water companies in England, committed to achieve net zero operational carbon emissions by 2030. This includes emissions associated with operational power use, transportation, and process emissions of the Proposed Development.

3.3.3 The national policy, coupled with the Applicant's net zero commitment, indicates a future baseline of low carbon emission operation of wastewater assets.

4 Assessment of Effects

4.1 Assessment approach

4.1.1 The section presents the assessment of effects for the Proposed Development. The assessment is split into construction, land use change, operation, decommissioning of the existing WWTP and lifetime carbon. The assessment sets out a preliminary assessment that takes into account primary and tertiary mitigation in determining effects and then considers secondary mitigation and the assessment of residual effects.

4.2 Construction phase

4.2.1 The construction phase assessment includes the following emissions sources:

- emissions associated with the manufacture of raw materials and construction products;
- transport of those materials to construction site; and
- construction effort emissions e.g. fuel use in construction.

Magnitude of impact

4.2.2 The potential emissions from the construction of the Proposed Development are indicated in Table 4.1~~Table 4-1~~, listed by site or process area. This assessment has been completed on the basis that designed-in mitigation measures (see section 2.8,

~~4.2.2~~4.2.3 Table 2.4~~Table 2-4~~) and CoCP requirements (Appendix 2.1 & 2.2, App Doc Ref 5.4.2.1 and 5.4.2.2) are implemented.

Table 4.1: Estimated construction carbon comparing ~~baseline to DCO~~Preferred Option and Alternative D~~-d~~esigns

Site Area	DM0 ~~Baseline~~ Alternative Design (tCO_2e)	Preferred Option DCO Design (tCO_2e)	% Change Against Total Design Footprint
Tunnel & Final Effluent Discharge	39,960	13,660	-27%
Final Settlement Tank	5,060	5,820	1%
Aeration Tank	7,850	5,280	-3%
Primary Settlement Tank	3,890	3,550	0%
Storm Tank	10,720	2,100	-9%
Import Area (Screening and Thickening)	1,640	2,020	0%
Buildings	1,480	800	-1%
TPS	1,290	1,710	0%
Roads	5,970	3,140	-3%

Site Area	DM0 ~~Baseline~~ Alternative Design (tCO_2e)	Preferred Option DCO Design (tCO_2e)	% Change Against Total Design Footprint
Inter Process Pumping	1,380	1,320	0%
Inlet Works	2,660	1,220	-1%
Sand Filtration	4,210	1,130	-3%
Electrical Distribution	440	1,010	1%
Digestion	1,940	1,080	-1%
LTP	960	630	0%
Boundary Fencing	400	600	0%
Biogas Area - Storage + CHP/BUP	720	420	0%
Common Control (MCC)	490	380	0%
Dewatering	250	380	0%
HPH	1,100	310	-1%
FE Discharge Pipework	-	280	0%
Odour Control	490	220	0%
Landscaping	1,080	1,080	0%
Ferric Dosing	700	190	-1%
Pressure Water System	20	180	0%
Site Services	-	140	0%
Additional Items	2,050	-	-2%
Solar Panels		4,370	5%
TOTAL	**96,750**	**53,000**	**-45%**

*tCO_2e rounded to nearest 10 tonnes, totals may not sum due to rounding

~~4.2.3~~4.2.4 Table 4-1 shows the results of the construction assessment of the Preferred Option ~~Proposed Development~~ in comparison to the ~~baseline d~~DM0 Alternative Design. Overall, there is a reduction of 45% compared with the ~~DM0 baseline design~~Alternative Design.

~~4.2.4~~4.2.5 This leaves an additional ~~22~~25% of carbon reduction efficiencies to meet the Applicant's capital carbon reduction target, and a further 10% from its 55% reduction commitment secured through the Design Code (App Doc Ref 7.17). This will need to be achieved through the later design stages and on-site construction activities. The section on secondary mitigation highlights some of the areas of focus to achieve this further level of reduction.

~~4.2.5~~4.2.6 Table 4.1~~Table 4-1~~ shows how the different site areas contribute to the overall 45% reduction in the construction footprint. The key areas driving this reduction in the capital carbon footprint are summarised below and are illustrated in Figure 4.1 below. The biggest reductions from DM0 ~~Baseline~~ Alternative Design to ~~Proposed Development DCO~~Preferred Option design are:

- Reduction in tunnel diameters and lengths

- Choice of sand filter provider to reduce the capital carbon intensity of this treatment process
- Material specification for outfall pipelines
- Optimisation of civil structure volumes
- Optimisation of site road layouts and design specification
- ~~tunnel and final effluent discharge (reduction in length and diameter);~~
- ~~storm tank (optimisation of volume);~~
- ~~aeration tank (optimisation of volume);~~
- ~~roads (optimisation of total area required); and~~
- ~~sand filtration (change of process).~~

~~4.2.6~~4.2.7 The elements of the Proposed Development that have been optimised in the Preferred Option design and have achieved the greatest reductions, still form a large part of the capital carbon emissions associated with the Proposed Development. These are mainly large civil structures and there are further opportunities for emissions reduction through materials specification (e.g. lower carbon intensity materials) and efficient construction (e.g. off-site manufacture or 3D printing of smaller items) which are being explored to further drive down emissions (refer to discussion on further mitigation in paragraph 4.2.14~~4.2.13~~).

~~4.2.7~~4.2.8 The remaining largest sources of carbon emissions in the Proposed Development are:

- tunnel and final effluent discharge (28% of DCO construction footprint);
- final settlement tank (FST) (12%);
- aeration tank (11%);
- primary settlement tank (PST) (7%); and
- roads (6%).

~~4.2.8 Table 4-1The Proposed Development represents around 0.1% of the estimated UK construction emissions of 45 $MtCO_2e$.~~

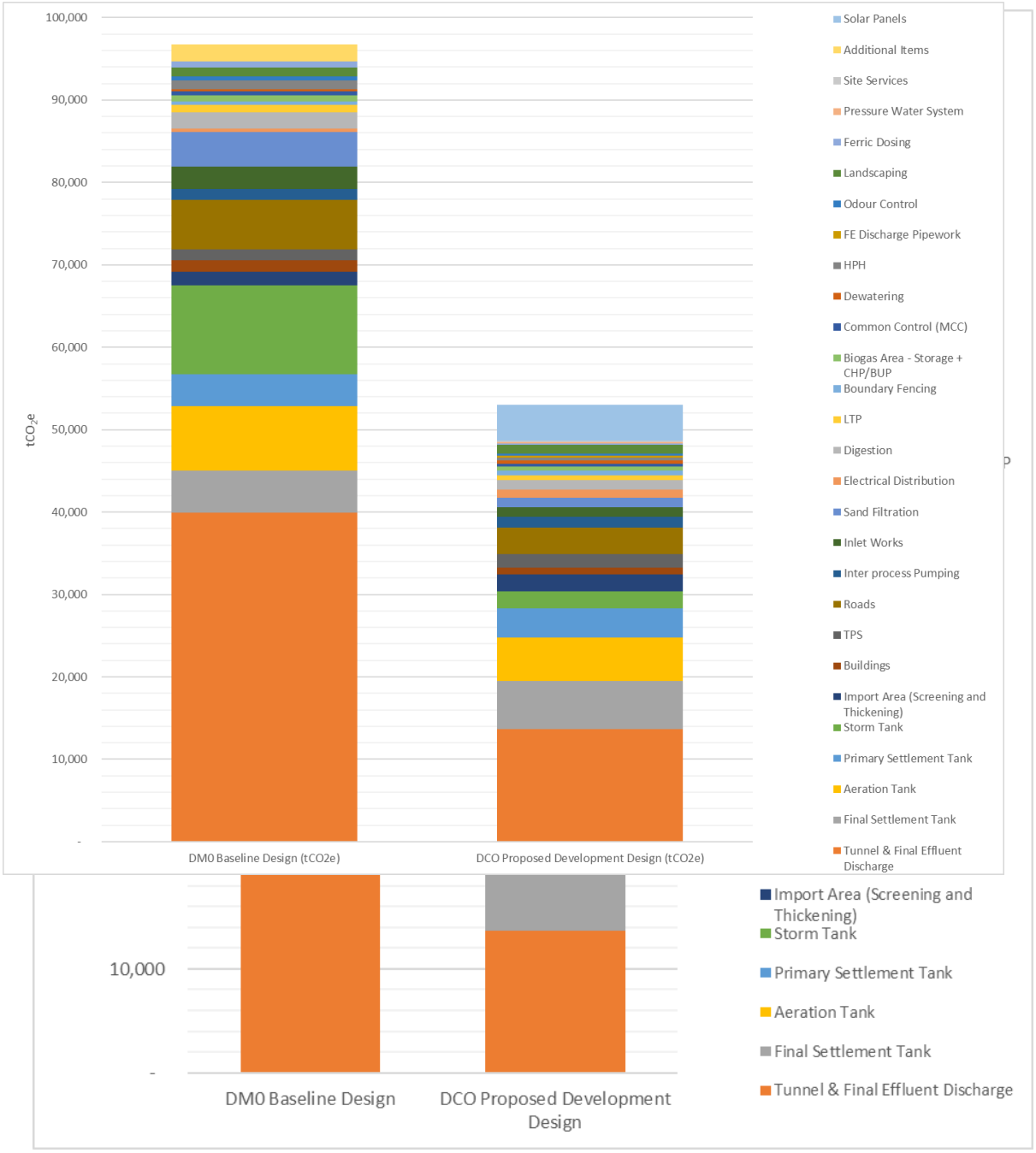


Figure 4.1: Construction emissions (tCO_2e)

4.2.9 The potential emissions from the construction of the Proposed Development are summarised in ~~Table 4-2~~.

Table 4.2: Summary of estimated construction carbon

Model	Total emissions (tCO_2e)*
Baseline (no construction)	0
DCO Preferred Option	53,000
DM0 Alternative Design	96,750

*tCO_2e rounded to nearest 10 tonnes, totals may not sum due to rounding

~~4.2.9~~4.2.10 The Preferred Option represents around 0.1% of the estimated UK construction emissions of 45 $MtCO_2e$.

Sensitivity of receptor

~~4.2.10~~4.2.11 There is one receptor for carbon emissions assessment: this is the global climate. National planning policies and the UK Climate Change Act reiterate the serious nature of climate change and the need to rapidly decarbonise. This has been taken into account, in line with IEMA guidance, by defining the sensitivity of the global climate as high.

4.2.12 Significance of effect

Table 2.1

~~4.2.11~~4.2.13 ~~Table 2-1~~ sets out the significance criteria adapted from the IEMA Guidance. The construction of the Proposed Development leads to carbon emissions which contribute to global climate change. The construction footprint shows a **moderate adverse** impact, which is rated as **significant**. This conclusion is applied because construction emissions are partially mitigated through the Client's design optimisation approach.

Secondary mitigation or enhancement

~~4.2.12~~4.2.14 Whilst the design process for the Proposed Development has taken substantial steps towards mitigating its carbon impact ~~against its baseline~~, the Applicant will continue the process of carbon reduction against the Alternative Design as detailed design progresses and construction is undertaken. Further opportunities to mitigate carbon have been identified by the design team, with an estimate of potential reductions provided based on previous experience and high-level estimates:

- **Continued innovation review (~1-10% estimated reduction potential):** there will be a continual review as technologies develop and market conditions change. This will include continued engagement and collaboration with the supply chain to implement innovations within the Proposed Development.
- **Material specification (~5-15% estimated reduction potential):** use of low-carbon construction materials (e.g. low carbon concrete, alternative materials) for tunnels and pipelines at procurement stage:
  - optimisation of concrete mix with up to 70% cement replacement in 5 major tank structures could achieve an additional 9% carbon saving (the Applicant has used this technology and is confident of its application in the detailed design). Further savings would be possible when expanded to other concrete structures and base pours within the Proposed Development;
  - alternative reinforcement options will also be reviewed, for example fibre options for large concrete pours and basalt rebar for structures; and

  - continuing to identify alternative materials or optimal concrete mixes for other smaller structures and chambers.

- **Efficient construction and temporary works (~0.5-3% estimated reduction potential):** The assessment method has largely assumed current methods of construction are used, such as the use of diesel-powered construction plant and typical site cabins and temporary works. The following opportunities are being reviewed, but are not accounted for within this quantified assessment:
  - use of electric crawler cranes;
  - solar powered temporary lighting towers;
  - solar porta-loos for on-site facilities;
  - solar hybrid generators to provide lower carbon site power during construction; and
  - solar powered Automatic Number Plate Recognition (ANPR) cameras and traffic lights.

~~4.2.13~~4.2.15 Through progression of the Proposed Development, there will be reviews of development within the supply chain of construction plant, where feasible use of low and zero carbon alternatives will be maximised.

~~4.2.14~~4.2.16 The Proposed Development will also seek to achieve BREEAM 'Excellent' standard for the Gateway building (this approach requires the assessment of capital carbon, and encourages the construction of assets with lower embodied carbon and lower whole life carbon).

~~4.2.15~~4.2.17 Overall, with the secondary mitigation measures identified above, the Proposed Development is considered likely to achieve alignment with the Applicant's capital carbon reduction target~~commitment of 70% reduction~~ against the ~~2010 baseline model~~DM0 Alternative Design.

Residual effect

~~4.2.16~~4.2.18 The construction stage would result in new carbon emissions which contribute to global climate change. On the basis that no secondary mitigation or enhancement measures are committed or calculated at this stage, the residual effect of construction remains **moderate adverse**, which is **significant**.

Monitoring

4.2.19 Emissions will continue to be quantified to detailed design stage, working towards the Applicant's commitment to achieve a 70% reduction against the DMO Alternative Design. The Design Code (App Doc Ref 7.17) provides a secured commitment to continue to report on progress on the review and application of further mitigation measures by providing an updated carbon model at the following stages:

- 6 weeks prior to enabling works commencing

- Before commencement of main construction works
- Finalisation of the Detailed Design
- At any stage where decisions are made which impact Capital Carbon emissions of the Proposed Development by more than 5%

~~4.2.17~~4.2.20 Section 7.5 of the CoCP Part A (Waste Management and Resource Use) requires the Principal Contractor(s) to put in place measures to minimise energy consumption and carbon emissions during construction.

4.3 Land use change carbon assessment

4.3.1 The impact of the Proposed Development on carbon sequestration within the study area was assessed using the proposed landscape plan within the Landscape Ecology and Recreation Management Plan (LERMP) (Appendix 8.14, App Doc Ref 5.4.8.14). Areas and types of landscaping were identified for the baseline and Proposed Development, with the change in sequestration potential being assessed. The baseline for the land use change assessment is the current land use of the site.

Magnitude of impact

4.3.2 Assessment results are presented in Table 4.3~~Table 4-2~~. The carbon sequestration rates are from a report on land use change for The Committee on Climate Change (JBA Consulting, 2018). The negative numbers are emissions savings from carbon sequestration.

Table 4.3~~4-2~~: Carbon sequestration from land use change

Landscape type	Carbon sequestration rate for landscape type (tCO_2e/ha)	Baseline		Proposed Development in year 1 of operation		Overall change in year 1 of operation (tCO_2e /yr)
		Area (Ha)	Total Seq/yr (tCO_2e/yr)	Area (Ha)	Total Seq/yr (tCO_2e/yr)	
Woodland deciduous	-5	1	-6	22	0	6
Woodland coniferous	-13	<1	-1	<1	-1	0
Grassland	<0	29	-12	39	-16	-4
Arable land	<0	145	-16	93	-10	6
Shrub	-1	5	-3	5	-3	0
Total			**-38**		**-30**	**8**

Seq = carbon sequestration. All figures rounded to the nearest whole number – totals may not sum due to rounding
** Note that deciduous woodland is established from year 11 after planting.*

4.3.3 The results show an overall decrease in carbon sequestration per year. Only the first year of operation is accounted for here, because the ongoing management of the landscape is dependent on the LERMP (Appendix 8.14, App Doc Ref 5.4.8.14).

This sums to -30 tCO_2e in the first year of operation, a reduction in carbon sequestration of approximately 8 tCO_2e compared to the baseline.

Sensitivity of receptor

4.3.4 There is one receptor for carbon emissions assessment: this is the global climate. National planning policies and the UK Climate Change Act reiterate the serious nature of climate change and the need to rapidly decarbonise. This has been taken into account, in line with IEMA guidance, by defining the sensitivity of the global climate as high.

Significance of effect

4.3.5 The results show that the Proposed Development would not sequester as much carbon as the baseline, with an overall decrease in carbon sequestration of 8 tCO_2e per year.

~~4.3.5~~ Table 2.1

4.3.6 ~~Table 2.1~~ sets out the significance criteria, adapted from the IEMA Guidance. The land use of the Proposed Development (with embedded mitigation) is still sequestering some carbon in the first year of operation. Compared to the baseline this is a **minor adverse** impact, rated as **not significant**.

Secondary mitigation or enhancement

4.3.7 Once the LERMP (Appendix 8.14, App Doc Ref 5.4.8.14) planting management is taken into account, the largest increase in carbon sequestration is due to the planting of deciduous woodland. Overall, there would be a proposed reduction in landscaped area (including the area of arable land lost). However, the increase of deciduous woodland as a result of the Proposed Development means that on balance, there is expected to be an increase in carbon sequestration.

4.3.8 Assessment results are presented in Table 4.4~~Table 4-3~~.

Table 4.4~~4-3~~: Carbon sequestration from land use change after secondary mitigation

Landscape type	Carbon sequestration rate for landscape type (tCO_2e/ha)	Baseline		Proposed Development from year 11 after planting		Overall change from year 11 after planting (tCO_2e /yr)
		Area (Ha)	Total Seq/yr (tCO_2e/yr)	Area (Ha)	Total Seq/yr (tCO_2e/yr)	
Woodland deciduous	-5	1	-6	22	-109	-103
Woodland coniferous	-13	<1	-1	<1	-1	0
Grassland	<0	29	-12	39	-16	-4
Arable land	<0	145	-16	93	-10	6
Shrub	-1	5	-3	5	-3	0
Total			**-38**		**-140**	**-101**

Seq = carbon sequestration. All figures rounded to the nearest whole number – totals may not sum due to rounding

4.3.9 The results show an overall increase in carbon sequestration per year compared to the current undeveloped site, once the deciduous woodland is established from year 11 after planting. This sums to 101 tCO_2e additional carbon sequestered per year.

Residual effect

4.3.10 The results show an overall increase in carbon sequestration of -101 tCO_2e per year, once the woodland area is established.

~~4.3.10~~ Table 2.1

4.3.11 ~~Table 2-1~~ sets out the significance criteria adapted from the IEMA Guidance. On the basis of the LERMP (App Doc Ref 5.4.8.14~~) secondary~~) secondary mitigation, the operational footprint shows a beneficial impact with less than zero carbon emissions, having a **beneficial** climate impact, rated as **significant**.

Monitoring

4.3.12 Monitoring in accordance with the landscape requirements to ensure that the landscape planting is successful. Landscape requirements are contained within the LERMP (Appendix 8.14, App Doc Ref 5.4.8.14).

4.4 Operation phase

4.4.1 The operation phase assessment includes annual emissions from year 1 of operation (assumed to be 2028). Section 4.64.6 (whole life carbon) includes emissions associated with the operation and replacement of assets over the assessment lifetime to 2090. Carbon emissions are presented for two options:

- assessment of the preferred option for the Proposed Development of biomethane production; and
- an alternative option with the utilisation of biogas in CHP engines~~. This approach aligns to the operational emissions of the baseline~~.

4.4.2 These options are presented against the baseline, operation of the existing WWTP.

~~4.4.2~~4.4.3 Maintenance activities are expected to be labour-intensive, rather than requiring significant additional energy or materials. Therefore, it is assumed that the operational energy use covers routine maintenance activities. Carbon emissions from capital replacements are calculated separately and included within Section 4.6 (whole life carbon).

Magnitude of impact

~~4.4.3~~4.4.4 This assessment has been completed on the basis that designed-in measures (see Section 2.8~~2.8~~) are implemented.

4.4.44.4.5 In line with UK environmental reporting guidelines (Department for Business Energy & Industrial Strategy, 2019), energy produced and exported to the grid may be reported as an emissions reduction in a net figure. For the two options presented, net emissions arise as follows:

- Alternative Option ~~DM0~~ CHP model~~, CHP option~~: Use of biogas in on-site CHP to reduce the power demand of the development. UK average grid electricity emissions factor (forecast to 2028) has been used to calculate the emissions avoided (Department for Business Energy & Industrial Strategy, 2021);
- Preferred Option DCO model ~~(preferred option)~~: Biomethane supply to the gas grid replaces other sources of gas, and so avoids emissions from gas generated (wholly or partially) from other more carbon intensive sources. The UK average natural gas emissions factor has been used to calculate the emissions avoided (Department for Business Energy & Industrial Strategy, 2021).

4.4.54.4.6 The potential emissions from the operation of the Proposed Development are indicated in Table 4.5~~Table 4-4~~, split out by key processes. The positive numbers (greater than zero) are carbon emissions, while the negative numbers are emissions avoided.

Table 4.5~~4-4~~: Potential annual emissions from operation in year 1

Process	Baseline (existing WWTP operation) Tonnes CO_2e/y	Alternative Option CHP model ~~Biogas utilised in CHP (based on DM0)~~ Tonnes CO_2e/y*	Biomethane production (DCO preferred option) Tonnes CO_2e/y*
Grid Electricity[4]	620*	2,040*	1,740
Chemicals	220	20	50
Fossil fuel consumption (propane)	100	-	860
Transport - biosolids recycling to land	70	70	70
Total gross emissions	**1,010**	**2,130**	**2,730**
CHP energy use	-370	-1,030	
Biomethane export[5]	-	-	-6,210
Total net emissions	**640**	**1,110**	**-3,490**

[4] Grid electricity emissions have been based on forecast 2028 (expected year of operation start) grid carbon intensity from BEIS green book supplementary guidance, data tables 1-19, Table 1 commercial/public sector.

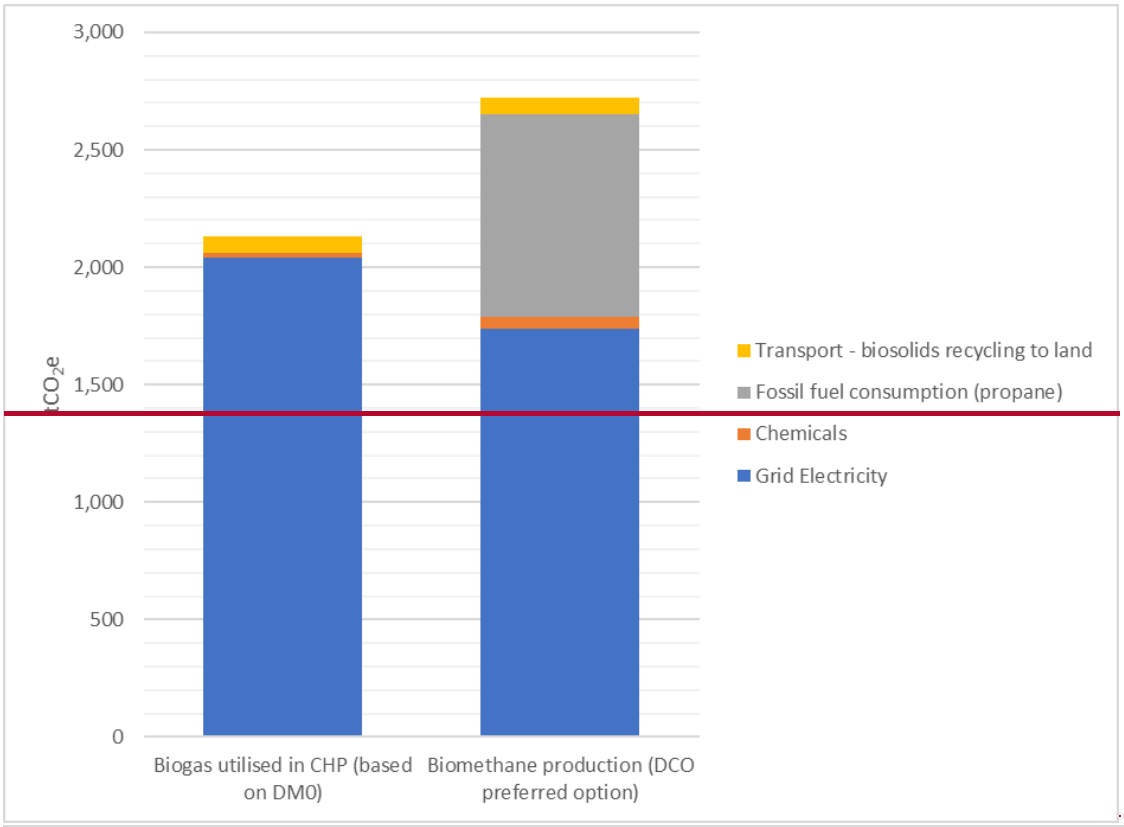
[5] A constant emissions factor has been used for calculating avoided emissions through biomethane export. There are no UK Government projections for gas grid decarbonisation by unit of gas. It has been assumed that from 2050 onwards, the gas grid will be net zero and therefore no avoided emissions have been included from this point.

tCO₂e rounded to nearest 10 tonnes, totals may not sum due to rounding

**Grid electricity emissions account for power generated from CHP engine*

Annual carbon emissions from operation in year 1 are illustrated in

4.4.64.4.7 **Figure 4.1**Figure 4.1Figure 4.1 (gross emissions) and Figure 4.2Figure 4.2 (net emissions).


3,000
2,500
2,000
1,500
1,000
500
0
tCO2e
Biogas utilised in CHP (based on DM0)
Biomethane production (DCO preferred option)
Transport - biosolids recycling to land
Fossil fuel consumption (propane)
Chemicals
Grid Electricity

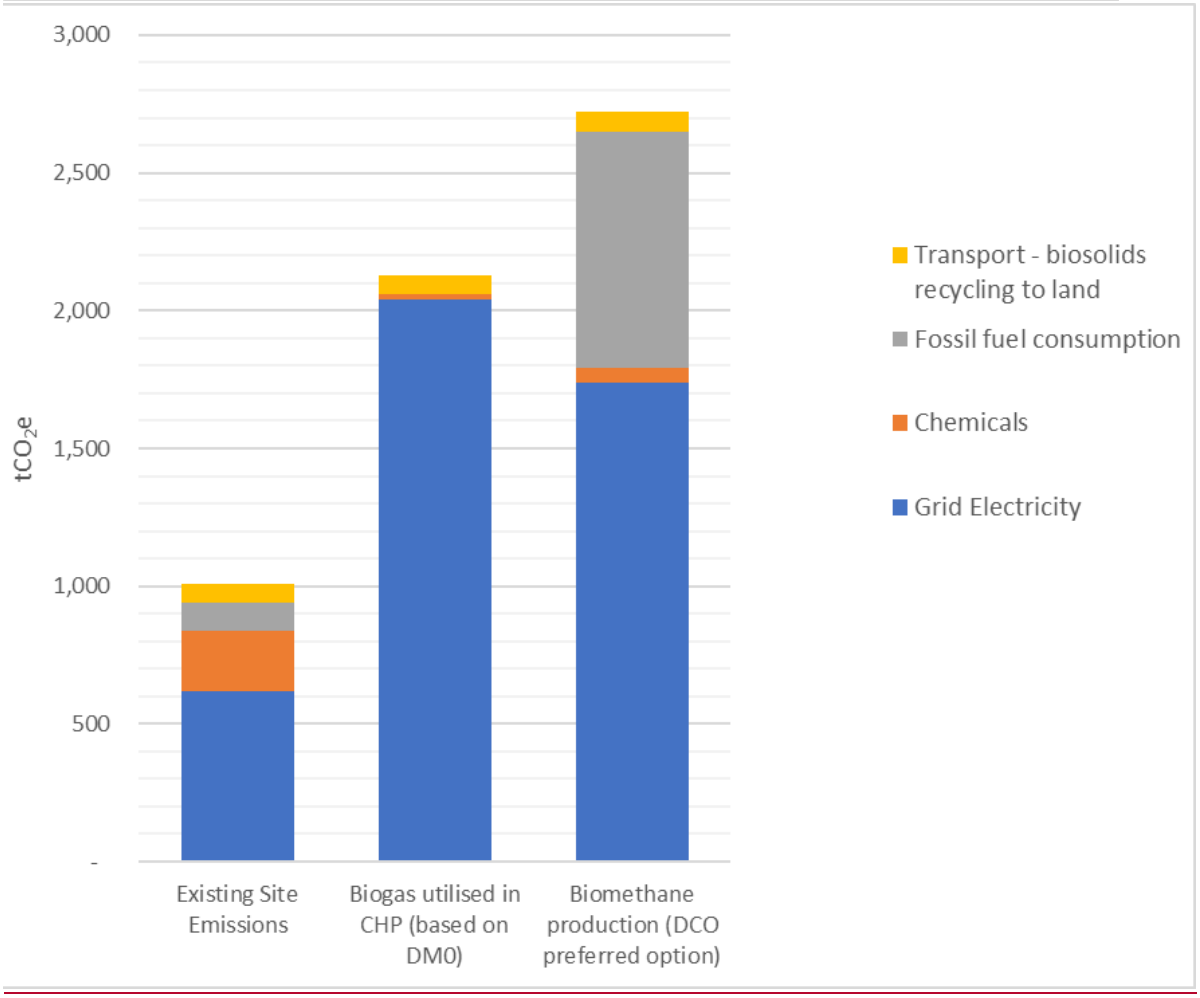
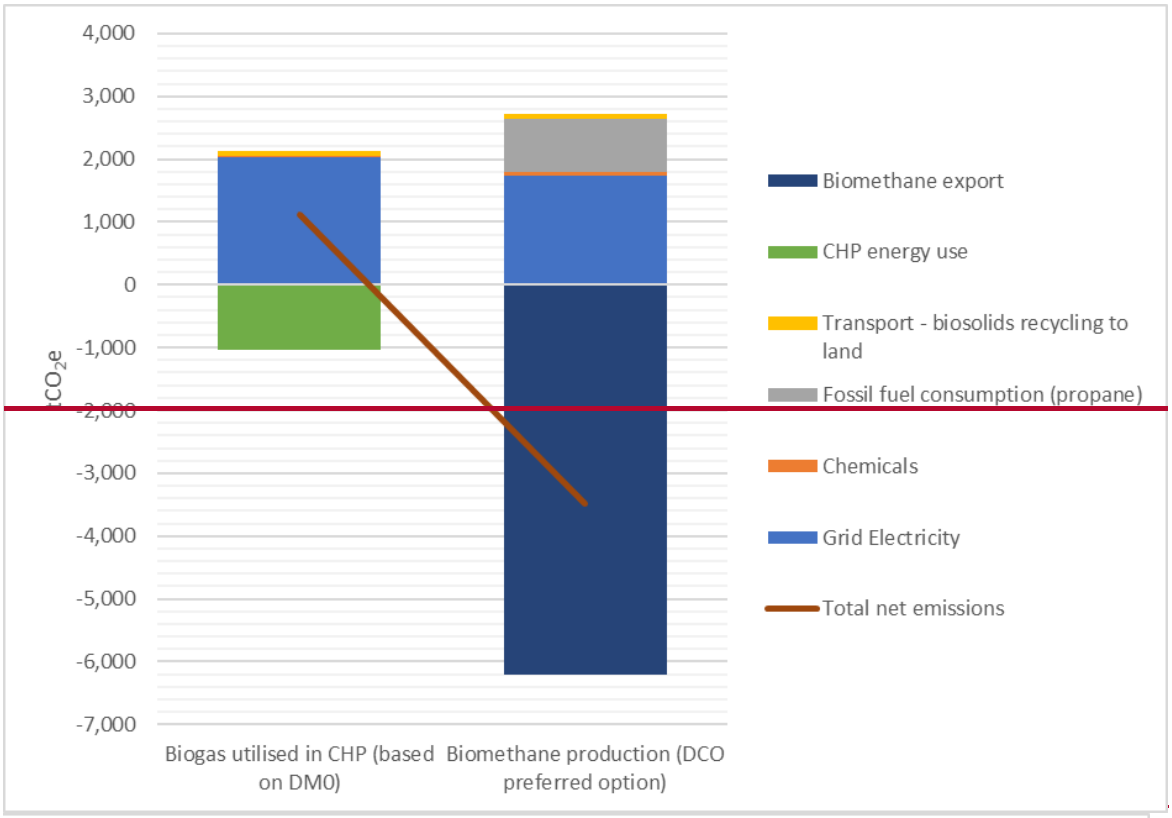

3,000
2,500
2,000
1,500
1,000
500
-
tCO2e
Existing Site Emissions
Biogas utilised in CHP (based on DM0)
Biomethane production (DCO preferred option)
Transport - biosolids recycling to land
Fossil fuel consumption
Chemicals
Grid Electricity

Figure 4.2: Gross annual operation carbon emissions in year 1 (tCO_2e)


4,000
3,000
2,000
1,000
0
-1,000
-2,000
-3,000
-4,000
-5,000
-6,000
-7,000
tCO2e
Biogas utilised in CHP (based on DM0)
Biomethane production (DCO preferred option)
Biomethane export
CHP energy use
Transport - biosolids recycling to land
Fossil fuel consumption (propane)
Chemicals
Grid Electricity
Total net emissions

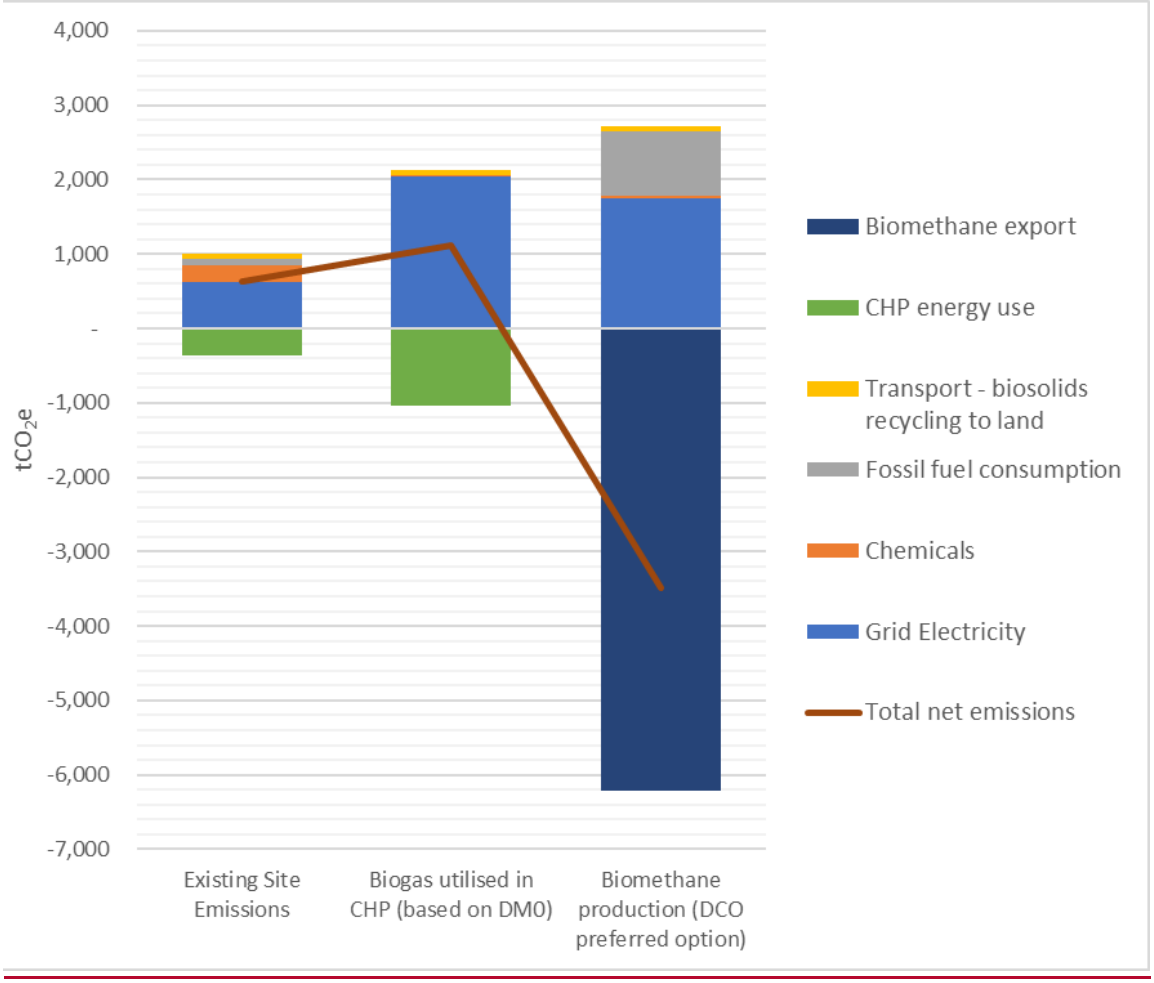

4,000
3,000
2,000
1,000
-
-1,000
-2,000
-3,000
-4,000
-5,000
-6,000
-7,000
tCO2e
Existing Site Emissions
Biogas utilised in CHP (based on DM0)
Biomethane production (DCO preferred option)
Biomethane export
CHP energy use
Transport - biosolids recycling to land
Fossil fuel consumption
Chemicals
Grid Electricity
Total net emissions

Figure 4.3: Net annual operation carbon emissions in year 1 (tCO_2e)

~~4.4.7~~ Overall net emissions of -3,490 tCO_2e in year 1 are identified during operation of the Proposed Development (preferred option). When compared to the ~~baseline~~ Alternative Option CHP model ~~CHP option~~ operation of net 1,110 tCO_2e, this is a reduction of 4,600 tCO_2e.

4.4.8 Gross emissions are higher for the Proposed Development (preferred option), an increase of 600 tCO_2e in year 1 against the ~~baseline CHP option~~ Alternative Option CHP model. This is mainly due to the additional use of propane to achieve the required calorific content within biomethane to enable export into the gas network.

~~4.4.8~~4.4.9 The baseline of the existing WWTP operation has lower gross emissions than either the Preferred Option or the Alternative Option. Net emissions are lower for the Preferred Option than for the baseline, given the avoided emissions through biomethane export. This does not take into account the higher standard of effluent treatment provided by the Proposed Development.

~~4.4.9~~4.4.10 The anticipated emissions per mega litre processed have been compared in Table 4.6~~Table 4-5~~ for the Proposed Development, Alternative Option CHP model, the baseline, and the Applicant's reported annual average across their network. Mitigation has been included through the design process and is outlined in Section 2.8. Both gross and net figures are provided for context.

Table 4.6~~4-5~~: Operation emissions (year 1) compared to annual average emissions reported by the Applicant

Operation emissions	Gross tCO_2e* per Ml	Net tCO_2e* per Ml
Proposed Development ~~total~~ – DCO preferred option of gas to grid	0.043	-0.055
~~Baseline basic scheme design (DM0 design) of CHP~~Alternative Option CHP model	0.034	0.018
Baseline (existing WWTP)	0.025	0.016
Applicant's average emissions per Ml recycled water	0.432	

**tCO₂e rounded to nearest 10 tonnes.*

4.4.11 The gross emissions of the Proposed Development (preferred option, year 1) are around 0.08% of estimated UK water sector emissions of 3.6 $MtCO_2e$. Gross emissions for the ~~Baseline and~~Alternative Option CHP option are 0.06% of UK water sector emissions. Gross emissions for the baseline are 0.03% of UK water sector.

4.4.12 Net emissions for the preferred option are 0.1% of UK water sector emissions, whilst net emissions for the ~~Baseline and~~ Alternative Option CHP option are 0.03%, and for the baseline 0.02%.

Sensitivity of receptor

~~4.4.10~~4.4.13 There is one receptor for carbon emissions assessment: this is the global climate. National planning policies and the UK Climate Change Act reiterate the serious nature of climate change and the need to rapidly decarbonise. This has been taken into account in line with IEMA guidance by defining the sensitivity of the global climate as high.

Significance of effect

4.4.14 The significance of effect depends on the option selected and assessment of gross or net emissions. This is presented in Table 4.7~~Table 4-6~~ for clarity (reference

~~4.4.11~~4.4.15 Table 2.1~~Table 2-1~~ sets out the significance criteria, adapted from the IEMA Guidance).

Table 4.7: Significance of effect

Option	Significance
Proposed Development DCO preferred option of gas to grid Gross emissions	**Moderate adverse** impact, rated as **significant**
Proposed Development DCO preferred option of gas to grid Net emissions	**Beneficial** impact, rated as **significant**
Alternative Option CHP model ~~Alternative design (DM0 design) of CHP~~ Gross emissions	**Moderate adverse** impact, rated as **significant**
Alternative Option CHP model ~~Alternative design (DM0 design) of CHP~~ Net emissions	**Moderate adverse** impact, rated as **significant**

~~4.4.12~~4.4.16 Both design options show an increase in gross emissions from the baseline (an adverse effect). The Proposed Development preferred approach shows net emissions avoided (a beneficial effect) in annual operation and aligns with Anglian Water's commitment to reduce emissions to net zero in operation by 2030.

Secondary mitigation or enhancement

~~4.4.13~~4.4.17 As part of the design process, there is a continuing review of opportunities to:

- improve energy efficiency;
- generate renewable power (through solar panels with capacity of 7 MW); and
- maximise green gas production.

~~4.4.14~~4.4.18 The ~~mitigation measures committed to are outlined in Section 5, and include a~~ Carbon Management Plan (CMP) sets out mitigation measures, primarily

a requirement to secure offsets, which will ensure that operational carbon neutrality is maintained under all operational scenarios. The CMP requires the Applicant to secure sufficient long term offsets to cover the expected residual net annual emissions based on its detailed design stage carbon model to ensure the Proposed Development continues to meet the Applicants operational net zero commitment. It also requires the Applicant to report operational emissions from the Proposed Development annually, and if required to secure additional offsets if residual operational emissions increase to ensure the Proposed Development continues to operate within the Applicants operational net zero commitment.

Residual effect

~~4.4.15~~4.4.19 On the basis that ~~no~~ further mitigation or enhancement measures are committed or calculated at this stage, the residual effect of the preferred option ~~remains as per Table 4-6~~is set out in Table 4.8~~Table 5.2~~.

4.4.20 Accounting for net emissions from the Proposed Development preferred approach leads to **beneficial** impacts, rated as **significant**. The net emissions of the Alternative Option CHP model~~Alternative Design~~, and the gross emissions of both options, when addressed as part of the CMP lead to ~~operational emissions and the residual~~carbon neutrality which is a **negligible** impact, rated as **not significant.** ~~effect would be classed as a **moderate adverse** impact, rated as **significant.**~~

Table 4.~~8~~2: Residual significance of effect

Option	Significance
Proposed Development DCO preferred option of gas to grid Gross emissions	**Negligible** impact, rated as **not significant**
Proposed Development DCO preferred option of gas to grid Net emissions	**Beneficial** impact, rated as **significant**
Alternative Option CHP model Gross emissions	**Negligible** impact, rated as **not significant**
Alternative Option CHP model Net emissions	**Negligible** impact, rated as **not significant**

Monitoring

~~4.4.16~~ The Applicant will continue to report operational emissions from the Proposed Development annually, as required through the CMP. ~~The Applicant will continue to monitor and report their annual operational footprint and the Proposed Development will form part of this monitoring and reporting.~~

~~4.4.17~~4.4.21 Monitoring will be required in relation to annual carbon accounting in accordance with mandatory reporting of operational emissions for 2021-22 onwards to Ofwat (Ofwat, 2022).

4.5 Decommissioning existing WWTP

4.5.1 Chapter 2: Project Description sets out the main activities for decommissioning the existing WWTP as draining, desludging and cleaning. The main source of GHG emissions from these activities would be associated with vehicle movements.

Magnitude of impact

4.5.2 The potential emissions from the decommissioning of the existing Cambridge WWTP are indicated in Table 4.9~~Table 4-7~~, with vehicle movements identified as the main activity.

Table 4.9~~3~~4-7: Potential emissions from decommissioning

Process	Tonnes CO_2e
Medium Van Movements	1
Transit Truck Movements	1
Tanker Movements	11
TOTAL	**13**

4.5.3 Vehicle movements have been agreed in discussion with contractors for the Proposed Development, considering project-specific requirements and experience from previous projects. Appendix 10.1 (App Doc Ref 5.4.10.1) includes the decommissioning carbon emissions calculations in more detail. The key areas driving this footprint are identified as:

- distance of vehicle travel off site (assumed 60 miles per vehicle per day to and from the site);
- distance of vehicle travel on site (assumed 1 mile for medium van and transit truck, and 5 miles for tankers per day);
- estimated duration of works; and
- estimated number of medium vans, transit trucks and tankers.

4.5.4 Overall, 13 tCO_2e emissions are estimated as a result of decommissioning.

Sensitivity of receptor

4.5.5 There is one receptor for carbon emissions assessment: this is the global climate. National planning policies and the UK Climate Change Act reiterate the serious nature of climate change and the need to rapidly decarbonise. This has been taken into account in line with IEMA guidance by defining the sensitivity of the global climate as high.

Significance of effect

4.5.6 Although the decommissioning footprint results in emissions, these are considered to be of minor impact compared to the proposed construction

emissions (decommissioning is ~0.03% of construction emissions). Therefore, overall a **minor adverse** impact, rated as **not significant**.

Secondary mitigation or enhancement

4.5.7 Best practice construction site processes and further reduction initiatives will be pursued on site for construction and decommissioning. No specific mitigation measures have been identified for decommissioning at this stage.

Residual effect

4.5.8 On the basis that no further mitigation or enhancement measures are committed or calculated at this stage, the residual effect remains **minor adverse**, and is **not significant**.

Monitoring

4.5.9 There are no requirements for ongoing monitoring in relation to decommissioning the existing WWTP.

4.6 Whole life carbon

4.6.1 This section provides an estimate of the likely carbon emissions over the assessment lifetime from construction through to operation in 2090, including the replacement of assets over the assessment lifetime and decommissioning of the existing Cambridge WWTP. Carbon emissions are presented for the following scenarios:

- Baseline assessment of zero construction, operation of existing WWTP;
- Preferred option of DCO construction model, with biomethane production in operation;
- Alternative Option of DCO construction model, using biogas in CHP during operation;
- Alternative Design of DM0 construction model, using biogas in CHP during operation.

As per Section 4.4, carbon emissions are presented as gross and net emissions. The net emissions demonstrate emissions avoided through energy generation and sequestration (in line with UK environmental reporting guidelines (Department for Business Energy & Industrial Strategy, 2019)).

Magnitude of impact

4.6.2 The estimated whole life carbon impact of the Proposed Development up to 2090 is outlined in Table 4.10~~Table 4-8~~, summarised by emission category and the different scenarios modelled.

4.6.3 The year 2090 has been selected based on the designed operational life of the Proposed Development lifespan. The management of the landscaping is

secondary mitigation (tied to the LERMP (Appendix 8.14, App Doc Ref 5.4.8.14)), and so sequestration potential after the first year of operation is only calculated within the residual effects.

4.6.4 The whole life assessment has considered an estimate of the likely replacement lifecycles of assets within the Proposed Development.

4.6.5 The operational phase of emissions highlights the impact of biomethane exports on whole life emissions, as well as emission sources such as chemicals, transport, fuel, and electricity emissions.

4.6.6 Electricity emissions have accounted for potential future grid decarbonisation based on BEIS Green Book supplementary guidance (Department for Business Energy & Industrial Strategy, 2021), data table 1-19, Table 1, commercial/public sector. Other emissions sources have not had a decarbonisation allowance applied to them. This is due to no readily available forecast for the likely decarbonisation of the gas grid or chemicals sectors, and therefore a steady emissions intensity has been assumed. In calculating the avoided emissions from export of biomethane, a constant emissions factor has been assumed for grid gas. At 2050 and beyond, it is assumed that the UK's commitments to net zero are in-place and therefore biomethane export is not counted as avoiding emissions from 2050.

4.6.7 The Proposed Development preferred option of biomethane production is estimated to have a gross emissions impact of 119,~~860~~ 870 tCO_2e across construction and the designed operation period~~-~~. The biomethane export benefits and sequestration impacts account for a net benefit of -136,710 tCO_2e avoided due to the export of biomethane. This results in total whole life net emissions of the Proposed Development of -16,~~880~~ 870 tCO_2e.

4.6.8 The Alternative Option CHP model is estimated to have a gross carbon impact over the same period of 101,~~470tCO_2e~~480tCO_2e. This takes into account the mitigation measures adopted in construction. The benefits of CHP power generation and sequestration account for a net emissions benefit of -11,910 tCO_2e, which gives a total whole life net emissions impact of the Proposed Development of 89,~~530tCO_2e~~540tCO_2e.

4.6.9 Table 4.10~~Table 4-8~~ presents the whole assessment life carbon emissions. Only the preferred biomethane option achieves a net negative emissions impact.

Table 4.1044 8: Potential whole life carbon emissions to 2090

Category	Baseline assessment	Alternative Design of DM0 construction model, using biogas in CHPAlternative Design CHP model	Alternative Option of DCO construction model, using biogas in CHPBiogas utilised in CHP (Proposed Development - worst case) Tonnes CO_2e*	Preferred option: DCO construction model, with biomethane productionBiomethane production (DCO preferred option) Tonnes CO_2e*
	Tonnes CO_2e*			
Construction Capital emissionsCarbon (construction and decommissioning)	0	96,760	53,000010**	53,000 010
Capital Replacements	0***	32,550	19,210	19,210
Operational Carbon – Electricity	9,730	23,680	23,680	20,180
Operational Carbon - Non-electricity	25,300	5,590	5,590	27,480
Gross total	**35,030**	**158,560570**	**101,470480**	**119,860870**
CHP Energy Use	-5,850	-11,910	-11,910	-
Biomethane Export	-	-	-	-136,710
Sequestration	-2,480	-30	-30	-30
Net total	**26,690**	**144,180 146,62640**	**89,530540**	**-16,880870**

*tCO_2e rounded to nearest 10 tonnes, totals may not sum due to rounding
**Capital carbon emissions for the CHP option has used the same construction carbon assessment as the biomethane production to represent a worst-case position for this option. In reality, less carbon intensive infrastructure would be required for a CHP installation.
***The baseline is assumed not to have replacement of assets over the assessed lifetime, this is a worst-case position as in reality the baseline would be larger.

Sensitivity of receptor

4.6.94.6.10 There is one receptor for carbon emissions assessment: this is the global climate. National planning policies and the UK Climate Change Act reiterate the serious nature of climate change and the need to rapidly decarbonise. This has been taken into account in line with IEMA guidance by defining the sensitivity of the global climate as high.

Significance of effect

4.6.104.6.11 The significance of effect depends on the option selected and assessment of gross or net emissions. This is presented in Table 4.11Table 4-9 for clarity

(reference Table 2.1~~Table 2-1~~ sets out the significance criteria, adapted from the IEMA Guidance).

Table 4.11~~54-9~~: Significance of effect

Option		Significance
Preferred option: DCO construction model, with biomethane production~~Proposed Development DCO preferred option of gas to grid~~ ~~Gross emissions~~ ~~Proposed Development DCO preferred option of gas to grid~~ ~~Net emissions~~	Gross emissions	**Moderate adverse** impact, rated as **significant**
	Net emissions	**Beneficial** impact, rated as **significant**
Alternative Design of DM0 construction model, using biogas in CHP	Gross emissions	**Moderate adverse** impact, rated as **significant**
	Net emissions	**Moderate adverse** impact, rated as **significant**
Alternative Option of DCO construction model, using biogas in CHP~~Baseline basic scheme design (DM0 design) of CHP~~ ~~Gross emissions~~ ~~Baseline basic scheme design (DM0 design) of CHP~~ ~~Net emissions~~	Gross emissions	**Moderate adverse** impact, rated as **significant**
	Net emissions	**Moderate adverse** impact, rated as **significant**

~~4.6.11~~4.6.12 The whole life carbon impact of the Proposed Development (preferred option) shows an overall reduction in emissions primarily driven by the emissions value of biomethane exports. After 15 years of operation, the impact of the construction emissions is estimated to have been negated by the benefit of the biomethane exports. An estimated net of -16,~~880~~ 870 tCO_2e avoided will likely be achieved from the Proposed Development operating to 2090. The preferred approach whole life footprint shows a beneficial impact, rated as significant.

~~4.6.12~~4.6.13 Note that the Alternative Option of DCO construction model, using biogas in CHP, and the Alternative Design of DM0 construction model, using biogas in CHP ~~Proposed Development with CHP~~ would ~~lead to~~ lifetime gross and net emissions ~~of 76,190 tCO_2e~~ higher than the baseline~~71,480 tCO_2e~~. ~~Although this is a reduction on the baseline, it is~~These are classed as a moderate adverse impact, rated as significant.

Secondary mitigation or enhancement

~~4.6.13~~4.6.14 Ongoing management of the landscape is dependent on the LERMP, which is classed as secondary mitigation. Sequestration has been applied annually for up to the lifetime of the monitoring plan to 30 years (anticipated year 2057). The impact of the LERMP (Appendix 8.14, App Doc Ref 5.4.8.14) ~~-~~on carbon sequestration over the 30 year plan is ~~-2,010~~600 tCO_2e additional carbon sequestered compared to the baseline (a total of -3,080 tCO_2e sequestered).

~~4.6.14~~4.6.15 As covered in the construction and operation phase sections above, several additional mitigation measures are being explored to further mitigate the emissions impact of the construction phase and ~~optimise~~optimise the operational carbon balance (mitigation summarised in Table 5.2).

~~4.6.15~~4.6.16 The optimal mix of technologies (gas-to-grid, solar, battery storage, CHP) will be determined at the detailed design phase in accordance with the DCO Requirements. As discussed above, the worst-case assessment for carbon assumes that a CHP option with no solar would be built, potentially resulting in net positive operational carbon emissions from the operation of the ~~propseed~~proposed WWTP~~plant~~. To ensure that operational carbon neutrality is maintained under all build scenarios the DCO includes a requirement for a Carbon Management Plan (CMP) to be agreed prior to the operation of the plant. The CMP requires the Applicant to track emissions annually and secure sufficient long term offsets to cover the expected residual net annual emissions and ensure carbon neutrality regardless of the option taken forward.

Residual effect

~~4.6.16~~4.6.17 On the basis that the carbon sequestration benefits are minor in comparison to the overall whole life carbon footprint, the residual effect remains as set out in Table 4.11~~Table 4-9~~ which is significant beneficial for net emissions of the preferred option (DCO construction model, with biomethane production),~~preferred option~~ and significant moderate adverse for the alternatives (and for gross emissions of the preferred option)~~CHP option~~.

~~4.6.17~~4.6.18 Operating for 65 years and including sequestration for 30 years, an estimated net lifetime of -20,~~270~~260 tCO_2e avoided could be achieved for the Proposed Development.

~~4.6.18~~4.6.19 Note that the Alternative Option of DCO construction model, using biogas in CHP~~Proposed Development with CHP~~, including sequestration, would lead to net lifetime emissions of 86,~~480~~490 tCO_2e.

~~4.6.19~~4.6.20 The assessment results with secondary mitigation (excluding the operation of the Carbon Management Plan) are presented in Figure 4.4 ~~Figure 4.4~~ **Error! Reference source not found.**to Figure 4.8~~Figure 4.8~~**Error! Reference source not found.**.

~~4.6.20~~4.6.21 Figure 4.4 shows the gross cumulative emissions over the assessment lifetime. The step increase in emissions at 22 years into the lifetime of the

proposed WWTP is where there is additional capital carbon required for equipment replacement.

~~4.6.21~~4.6.22 Figure 4.5**Error! Reference source not found.** shows the net cumulative emissions by design option and avoided emissions from use of CHP and export of biomethane. The whole life carbon impact of the ~~Proposed Development (p~~Preferred ~~option~~Option~~)~~ shows an overall reduction in emissions, primarily driven by the emissions value of biomethane exports. After ~~15~~ 14 years of development lifetime, the impact of the construction emissions is estimated to have been negated by the net benefit of the natural gas exports. The figure shows the impact of capital replacements during operation as an increase in emissions after a period of operation.

~~4.6.22~~4.6.23 Figure 4.6**Error! Reference source not found.** shows emissions for the Preferred Option year on year. This shows positive emissions for construction, replacements, operational power and non-power emissions. Gas to grid and sequestration are presented as negative emissions.

~~4.6.23~~4.6.24 Figure 4.7 shows emissions for the Alternative Option of DCO construction model, using biogas in CHP ~~CHP Option~~ operation year on year. This shows positive emissions for construction, replacements, operational power and non-power emissions. CHP power generation and sequestration are presented as negative emissions.

~~4.6.24~~4.6.25 **Error! Reference source not found.**Figure 4.8 shows the emissions year on year for the ~~baseline~~ Alternative Design of DM0 construction model, using biogas in CHP~~emissions year on year~~. This shows positive emissions for construction, capital replacements (note that construction and replacement are larger than in the DCO design options), operational power and non-power emissions. CHP power generation and sequestration are presented as negative emissions.

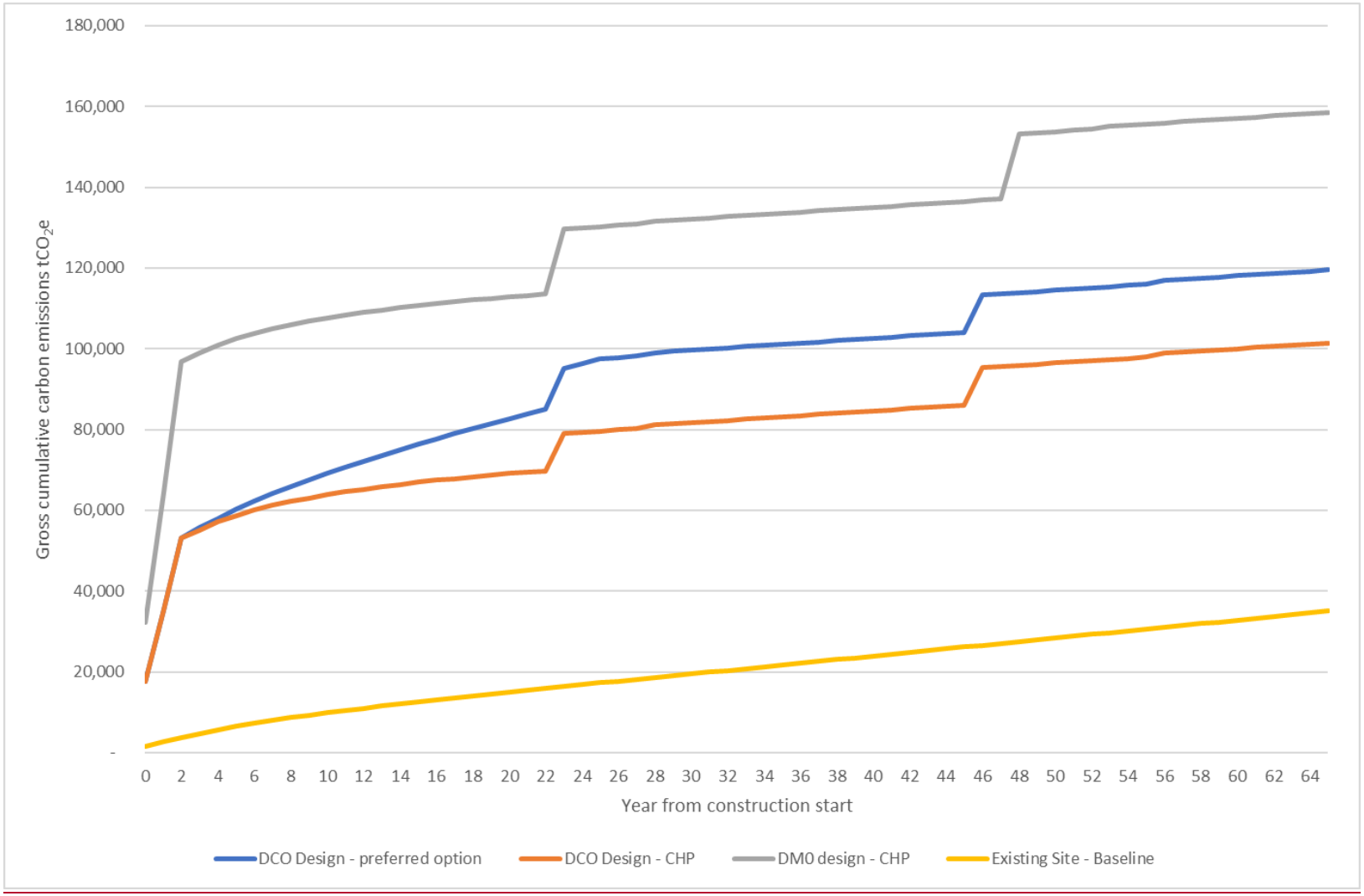
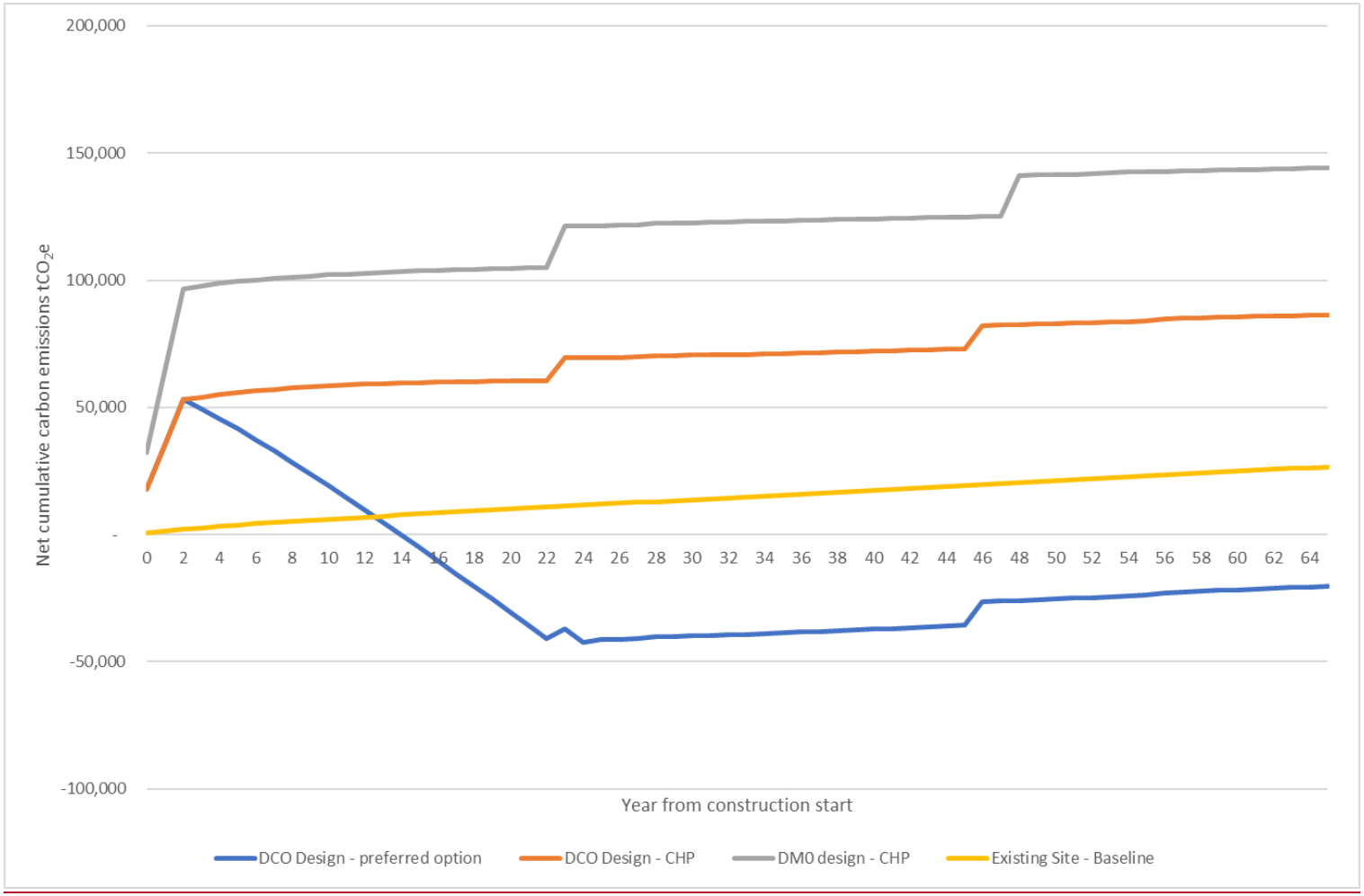


Figure 4.4: Gross cumulative lifetime emissions


200,000
150,000
100,000
50,000
-
-50,000
-100,000
Net cumulative carbon emissions tCO2e
0 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50 52 54 56 58 60 62 64
Year from construction start
DCO Design - preferred option
DCO Design - CHP
DM0 design - CHP
Existing Site - Baseline

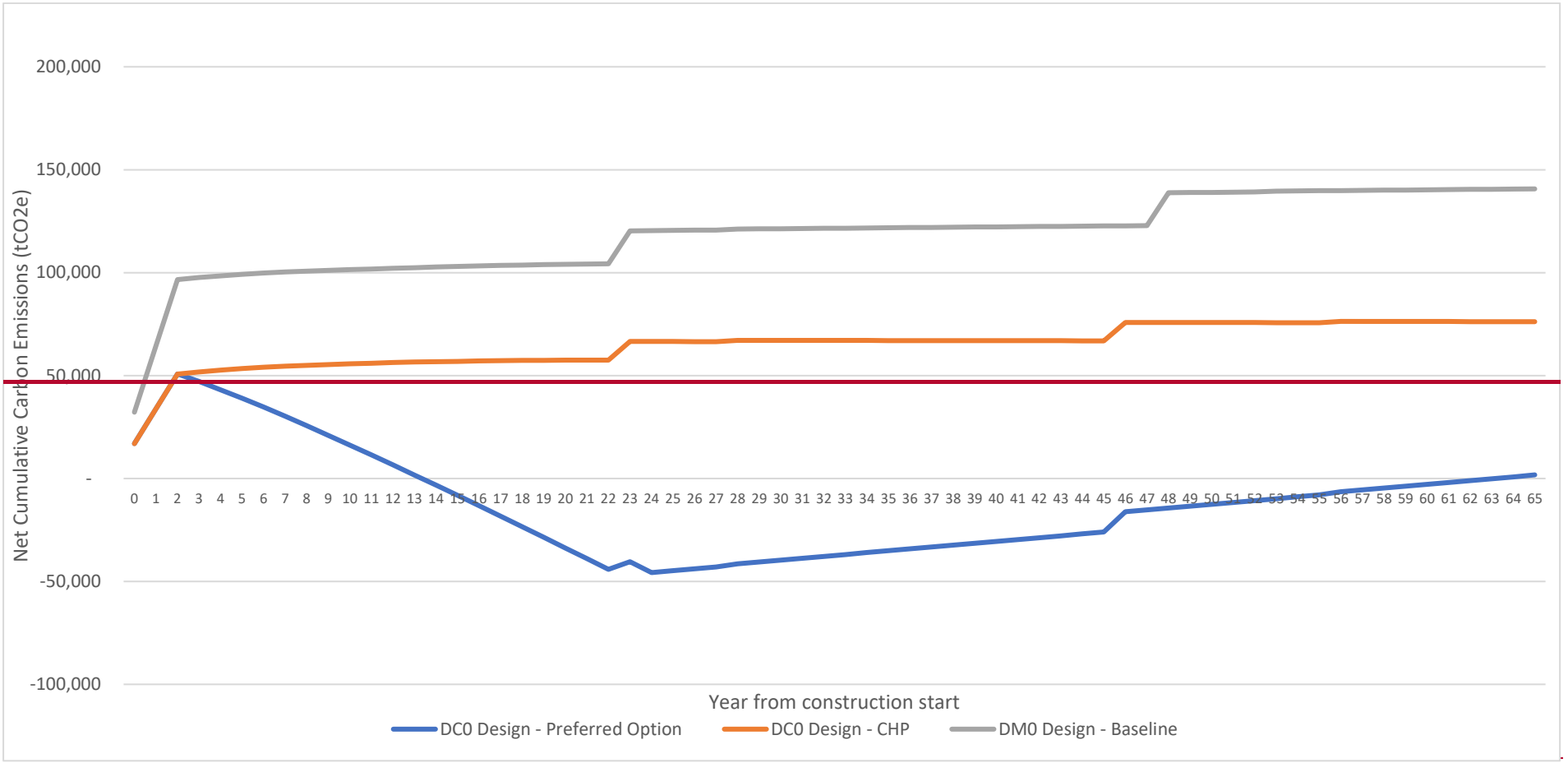
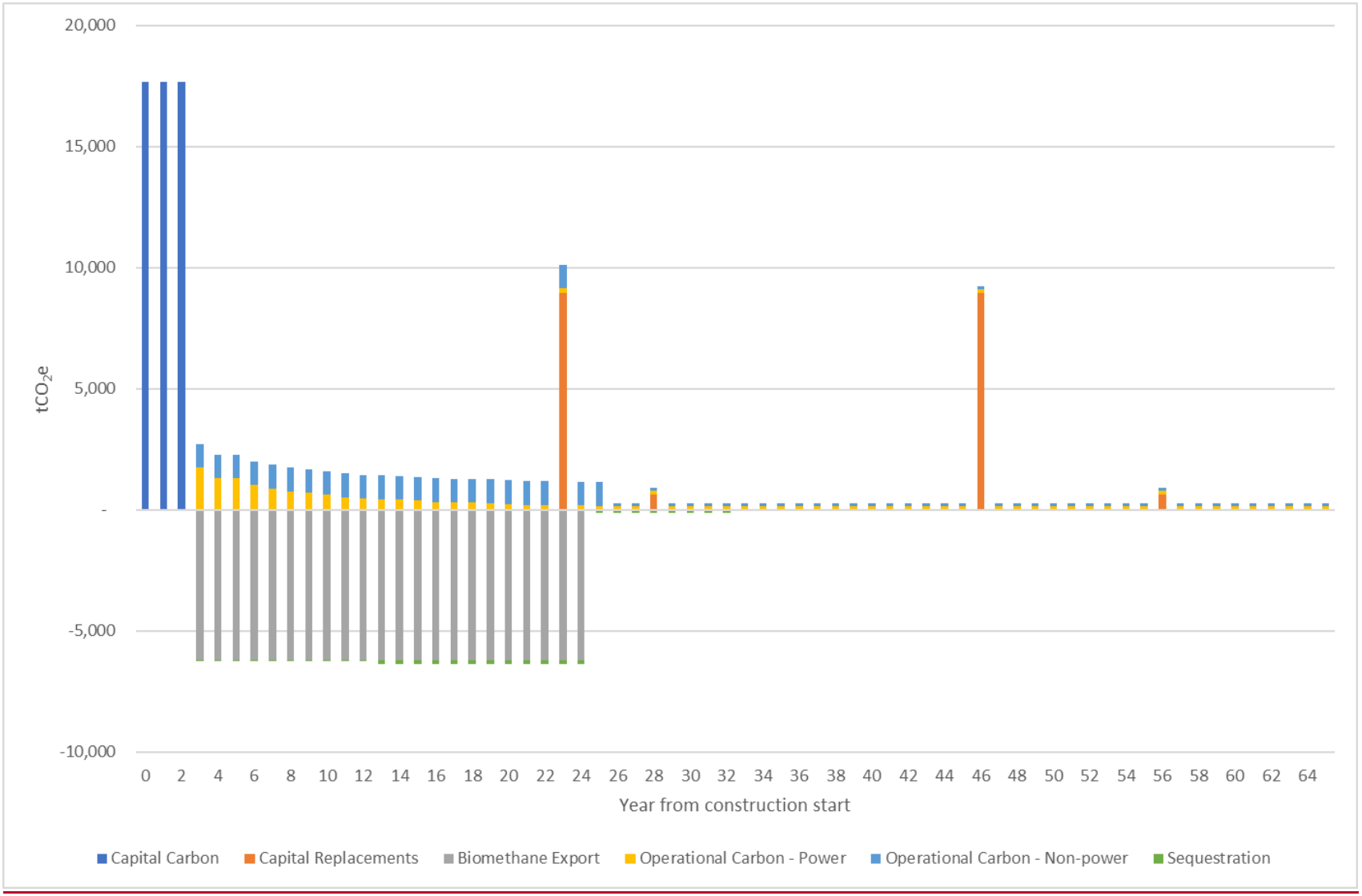


Figure 4.5 Net cumulative lifetime emissions


20,000
15,000
10,000
5,000
-
-5,000
-10,000
tCO2e
0 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50 52 54 56 58 60 62 64
Year from construction start
Capital Carbon
Capital Replacements
Biomethane Export
Operational Carbon - Power
Operational Carbon - Non-power
Sequestration

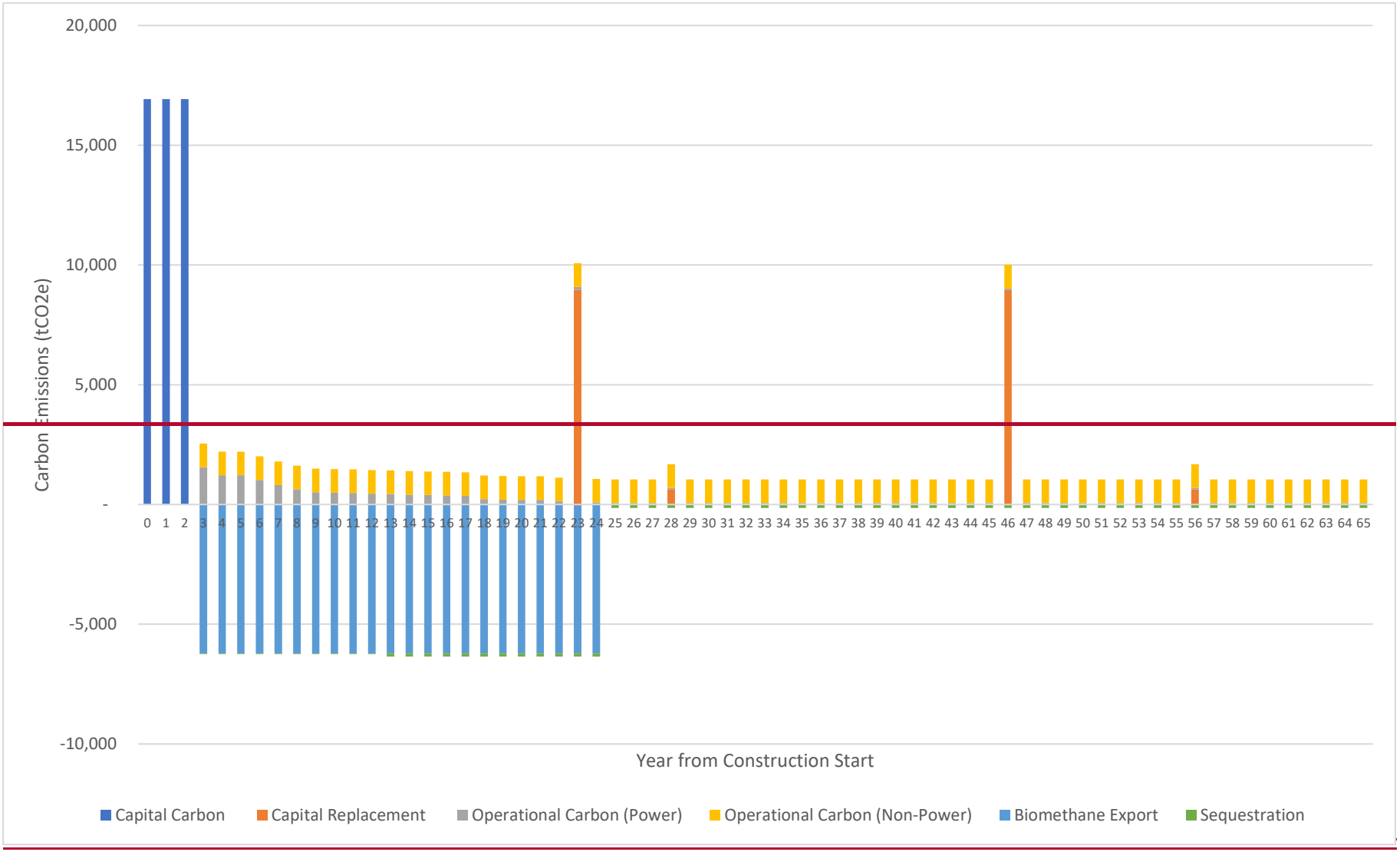
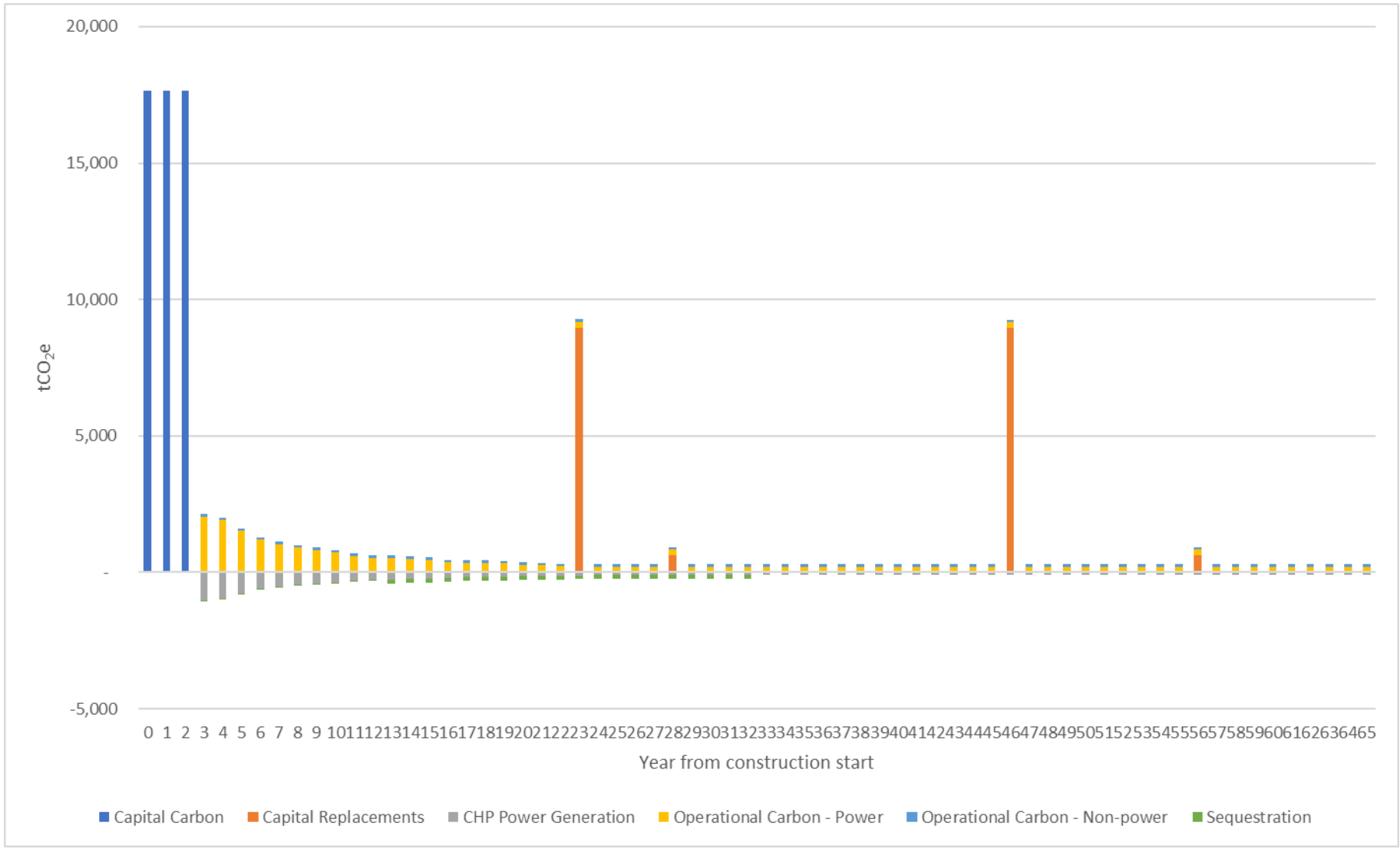


Figure 4.6 Preferred Option lifetime emissions by source


20,000
15,000
10,000
5,000
-
-5,000
tCO2e
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65
Year from construction start
Capital Carbon
Capital Replacements
CHP Power Generation
Operational Carbon - Power
Operational Carbon - Non-power
Sequestration

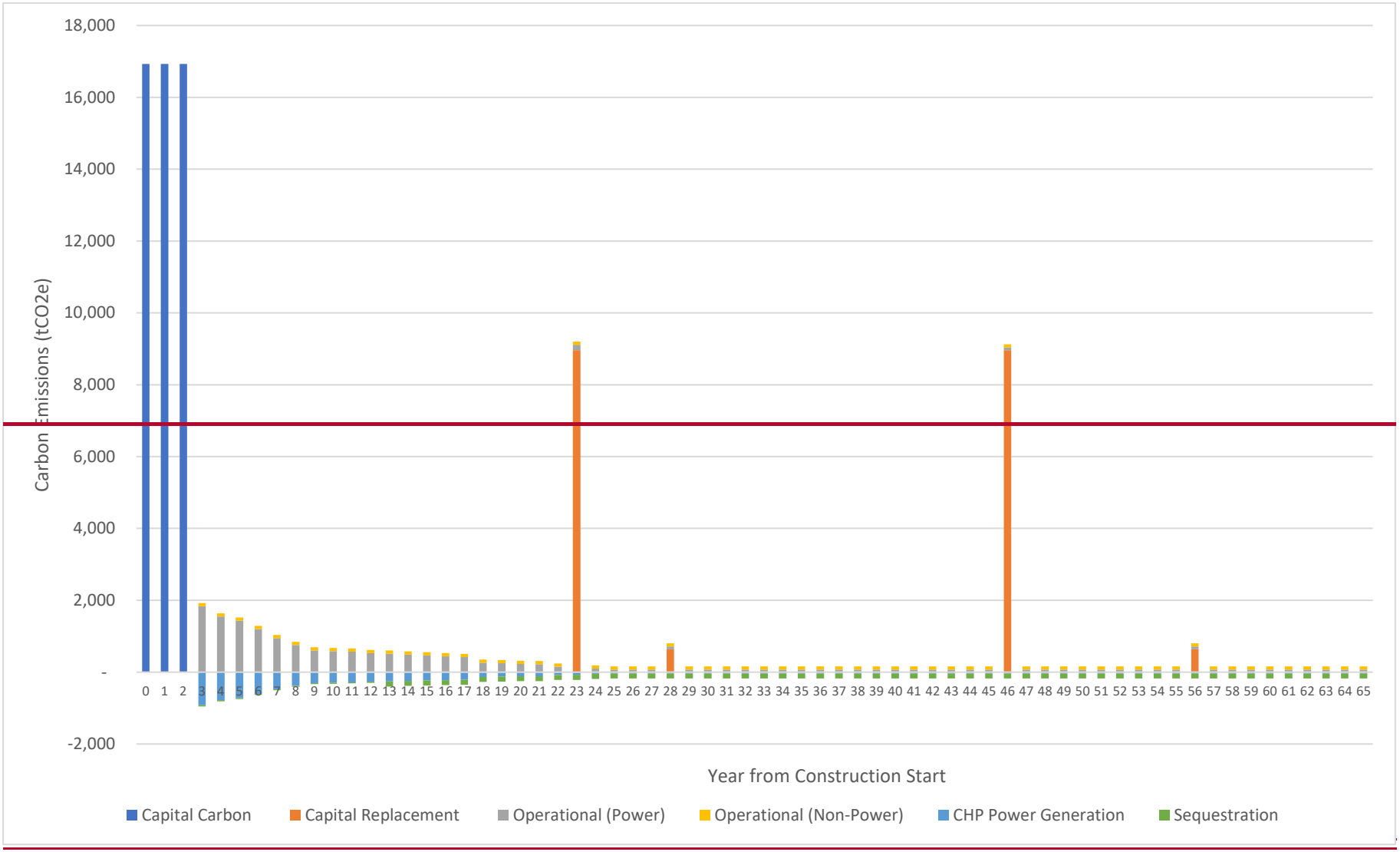


Figure 4.7: ~~CHP Option lifetime emissions by source~~ DCO design, alternative CHP ~~O~~option lifetime emissions by source

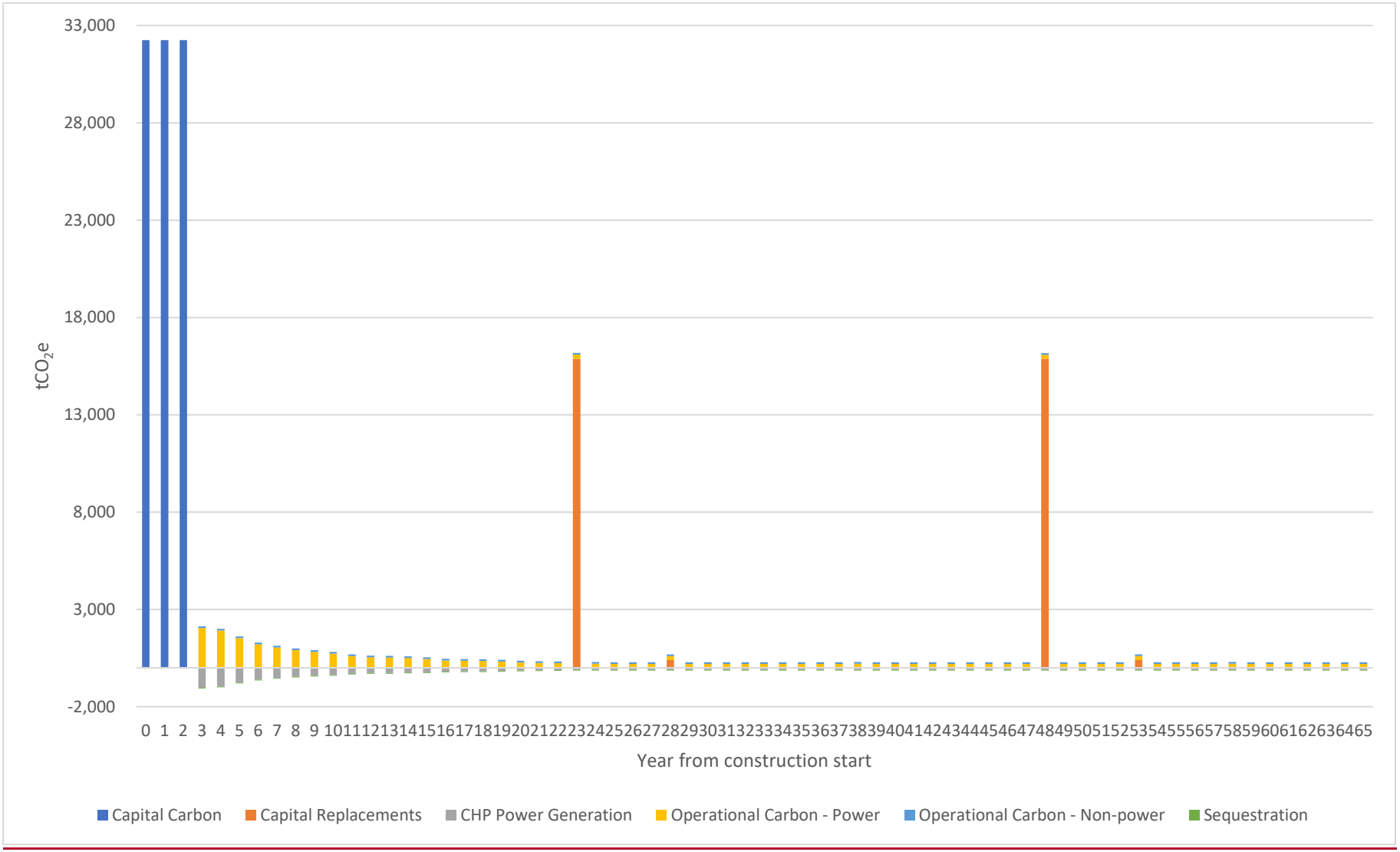


Figure 4.8: Alternative ~~Baseline~~DM0 design lifetime emissions by source

~~4.6.25~~ To test whether the Preferred Design Option could be considered in line with Government targets to achieve net zero at an economy level by 2050, the whole life emissions ~~of the Baseline and the Preferred Design Option~~ were compared against the balanced net zero pathway from the CCC's 6th Carbon Budget to 2050.

4.6.26 Comparisons were made for the following three options:

- Preferred option of DCO construction model, with biomethane production in operation (Figure 4.9~~Figure 4.9~~);
  - This shows the scale of emissions are lower than those tested against the 6th Carbon Budget sector decarbonisation trajectories.
- Alternative Option of DCO construction model, using biogas in CHP during operation (Figure 4.10);
  - This shows the scale of emissions are greater than those tested against the 6th Carbon Budget sector decarbonisation trajectories.
- Alternative Design of DM0 construction model, using biogas in CHP during operation (Figure 4.11).
  - This shows the scale of emissions are lower than those tested against the 6th Carbon Budget sector decarbonisation trajectories.

4.6.27 This was done by mapping the ~~baseline's~~ carbon categories to the respective sector in 6th Carbon Budget's decarbonisation pathway. Capital and Replacement Carbon was mapped to Manufacturing and Construction, Operational (non-power) to the Fuel supply pathway, and sequestration to the Land Use, Land-use change and forestry sink pathway.

4.6.28 The emissions associated with each category were then assumed to ~~decarbonize~~ decarbonise in line with how each of the sector was forecast to decarbonize under the balanced net zero pathway, to provide an indicative trajectory of the pace of decarbonization assumed within the 6th Carbon budget. This is presented as a dashed line in in the figures below Figure 4.9~~Figure 4.9~~, Figure 4.10, and Figure 4.11.

~~4.6.26~~4.6.29 ~~.~~ It should be noted this has been done to provide an indicative view of how the Proposed Development compares to UKs net zero targets, in the absence of any formal guidance on how individual projects should test their alignment against the Governments targets set in the updated Climate Change Act 2019

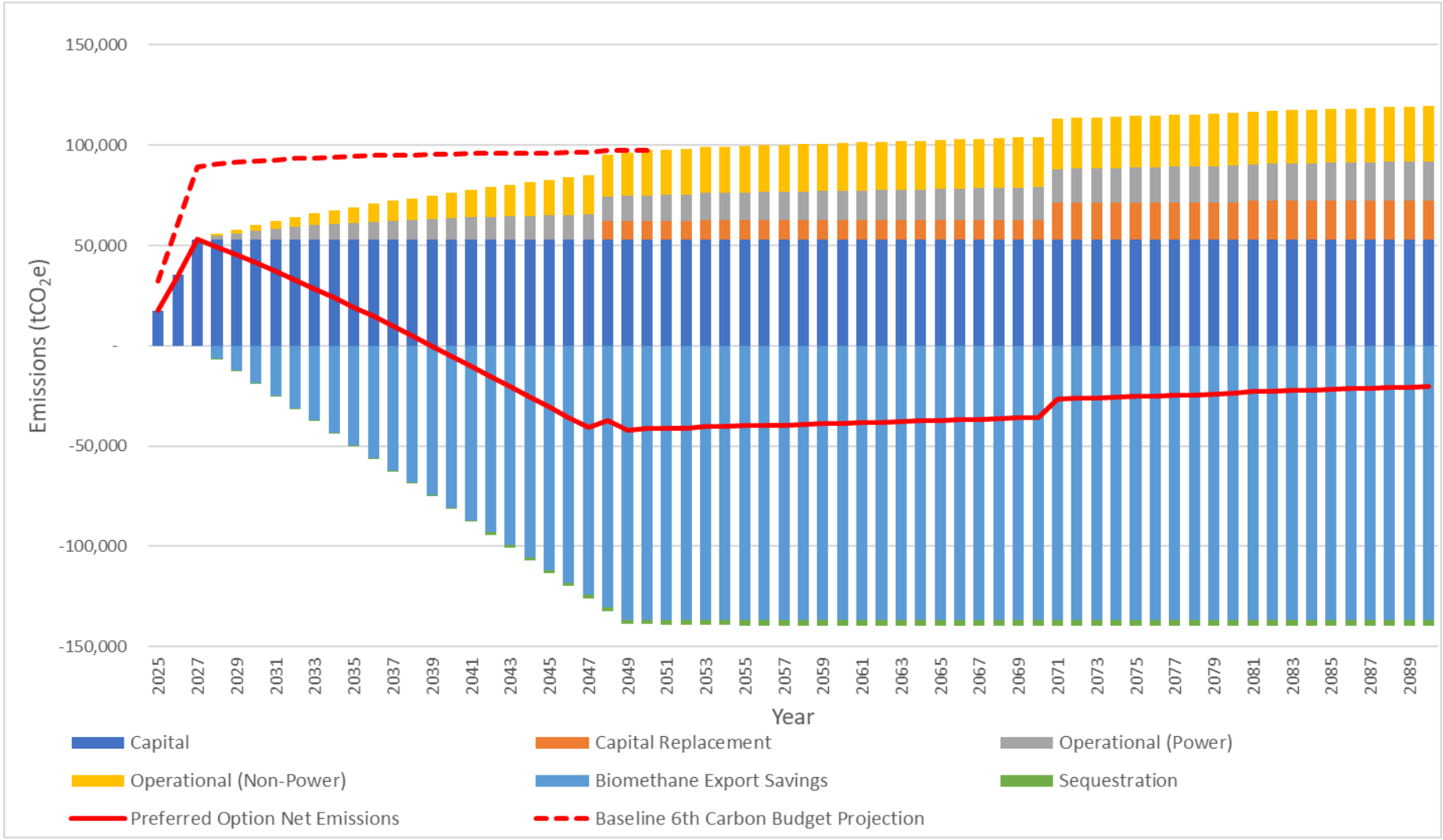


Figure 4.9: Cumulative Carbon emissions ~~DM0 option~~ of Preferred Option (DC0) against CCC's 6th Carbon Budget Trajectory

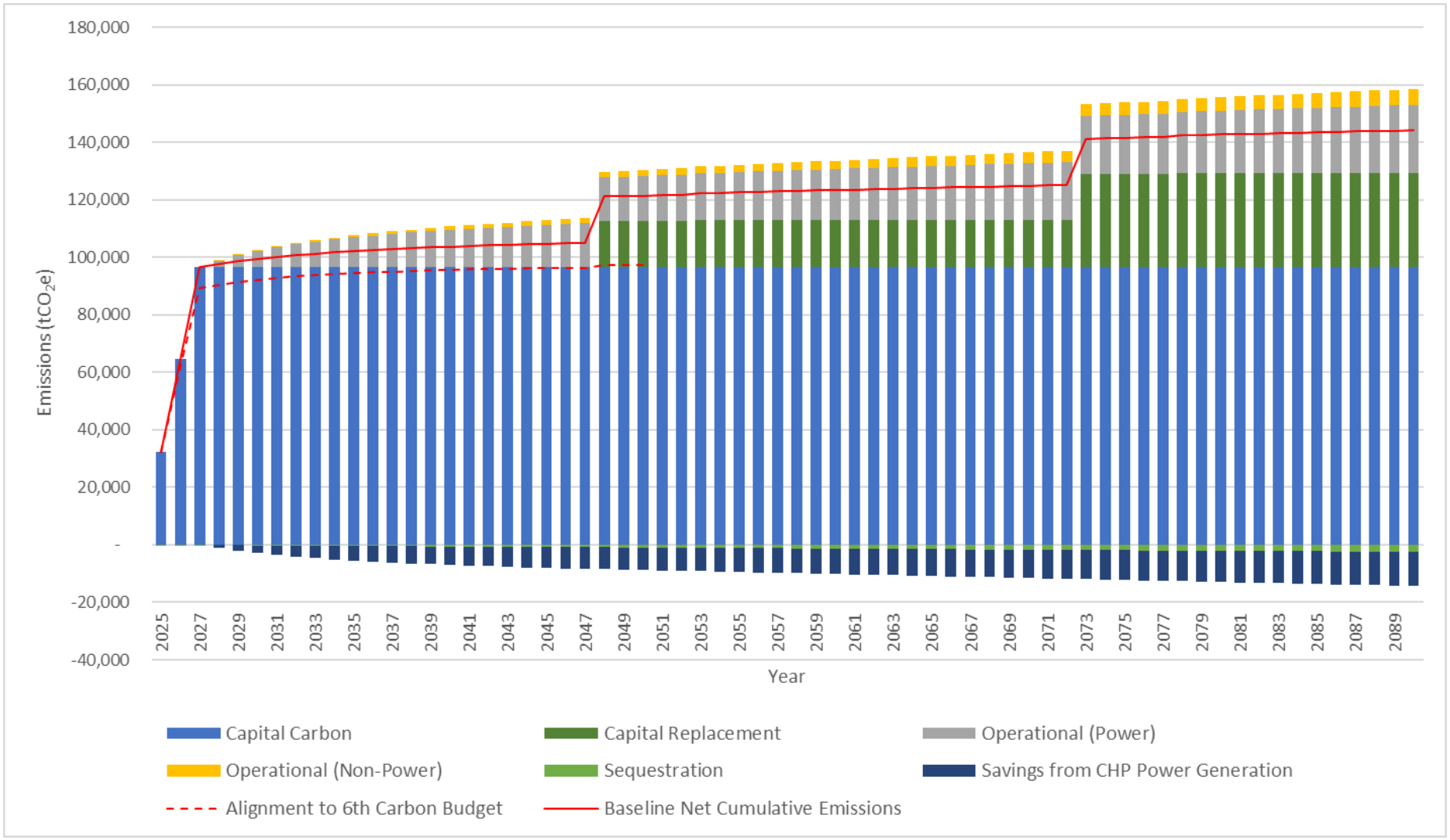
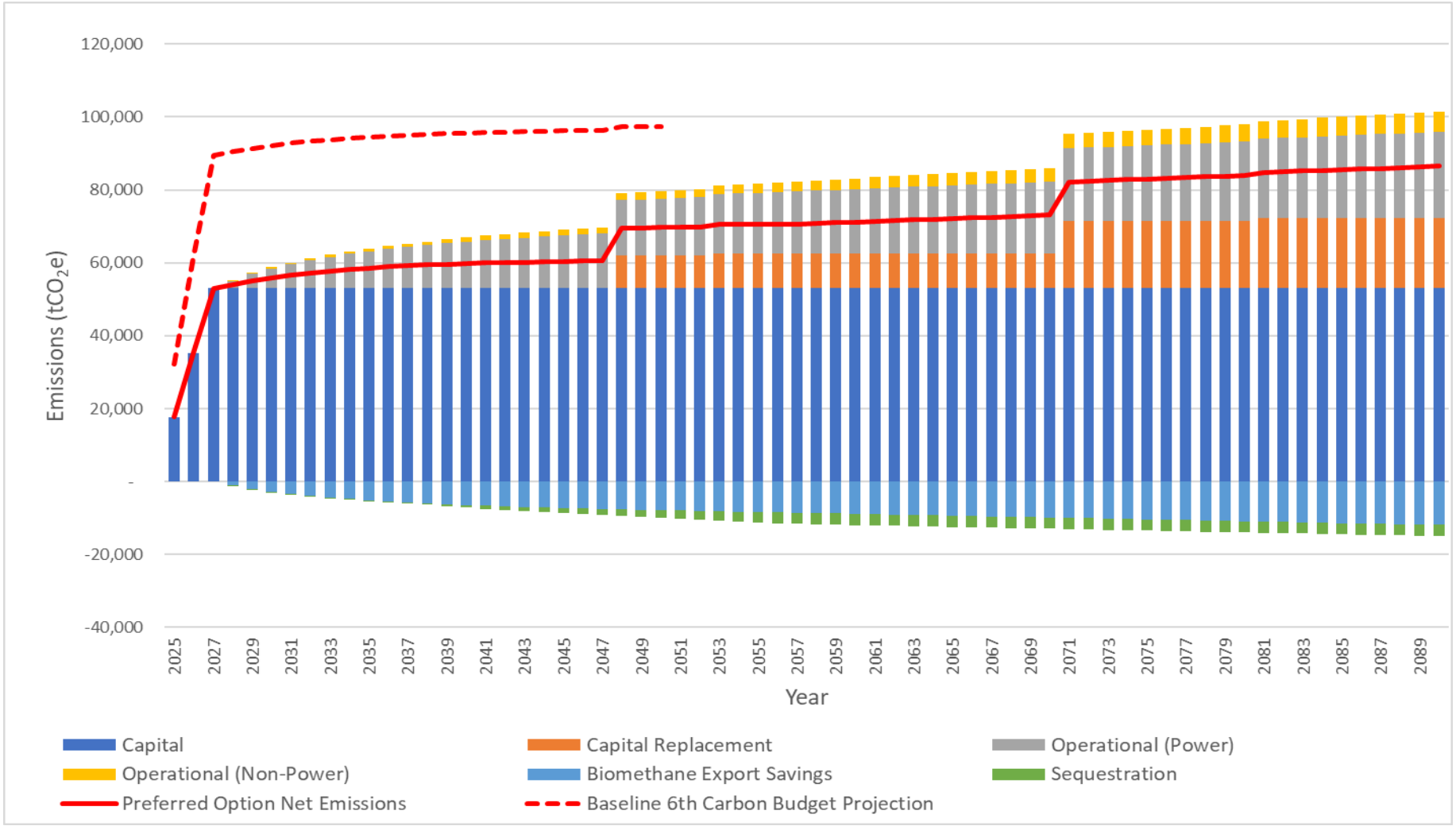


Figure 4.10: Cumulative Carbon Emissions of the DM0 option against the CCC's 6th Carbon Budget Trajectory



~~Figure 4.910: Cumulative Carbon Emissions of the DM0 option against the CCC's 6th Carbon Budget Trajectory~~

Figure 4.11: Cumulative Carbon Emissions of the DMC design with CHP option against the CCC's 6th Carbon Budget Trajectory

~~Figure 4.9 shows that for the Baseline option the scale of emissions are greater than those tested against the 6th Carbon Budget sector decarbonization trajectories. Whereas Figure 4.10 shows that the Preferred Design Option demonstrates reductions beyond the expected pace of decarbonization in the 6th Carbon Budget.~~

Monitoring

~~4.6.27~~4.6.30 Monitoring aspects are covered in the construction, land use change, and operation phase sections above.

Cumulative effects

~~4.6.28~~4.6.31 Emissions of GHGs are cumulative in nature, impacting the global atmospheric concentration of emissions. Additional development in the local area does not result in a greater local climate change effect from the Proposed Development (or vice versa).

~~4.6.29~~4.6.32 IEMA Guidance states that "effects of GHG emissions from specific cumulative projects therefore in general should not be individually assessed, as there is no basis for selecting any particular (or more than one) cumulative project that has GHG emissions for assessment over any other".

~~4.6.30~~4.6.33 For the Proposed Development, the relocation of the WWTP is intended to allow the development of the existing Cambridge WWTP. The processes employed for demolition of the existing Cambridge WWTP, and construction and operation for the Proposed Development would lead to further carbon emissions, but are currently unknown. These would be assessed by the developers of the existing Cambridge WWTP as part of separate planning application.

Inter-related effects

~~4.6.31~~4.6.34 Emissions of GHGs have been assessed for the construction and operation of the Proposed Development as a whole, including land use change and whole life impacts. Impacts assessed in Section 4.1 consider the impact of individual elements on the construction and operation of the whole site.

~~4.6.32~~4.6.35 No further inter-related effects are considered.

5 Conclusion and Summary

5.1 Summary of carbon emission effects

5.1.1 The likely significant effects of carbon emissions from the Proposed Development on carbon have been assessed in this ES chapter.

5.1.2 Land use change is estimated to provide additional carbon sequestration once the deciduous woodland is established from year 11 after planting as stated in the vegetation management under the LERMP (Appendix 8.14, App Doc Ref 5.4.8.14).

5.1.3 Although construction emissions are large in comparison to a baseline of zero construction, good progress has been made in reducing emissions between the alternative and preferred option designs. Furthermore, good practice construction stage measures to reduce GHG emissions have been recommended in the CoCP (Appendix 2.1 & 2.2, App Doc Ref 5.4.2.1 and 5.4.2.2). This is consistent with IEMA guidance that any GHG emissions (and hence opportunities for reductions) may be significant. Construction emissions are outweighed over the lifetime of the Proposed Development with the preferred option of gas to grid. ~~, good practice construction stage measures to reduce GHG emissions have been recommended in the CoCP (Appendix 2.1 & 2.2, App Doc Ref 5.4.2.1 and 5.4.2.2). This is consistent with IEMA guidance that any GHG emissions (and hence opportunities for reductions) may be significant.~~

5.1.4 Although construction, operation, and decommissioning activities would generate carbon emissions (119,~~520~~ 530 tCO_2e lifetime gross emissions), the net whole life emissions of the Proposed Development preferred option would lead to an estimated -20,~~270~~ 260 tCO_2e (avoided emissions due to export of gas to the grid which displaces other sources of natural gas). ~~The alternative Proposed Development worst case scenario of using biogas in CHP engines is estimated to have a net carbon impact over the same period of 86,480 tCO_2e. This impact could be effectively mitigated using an operational Carbon Management Plan with carbon offsetting.~~

5.1.5 Key uncertainties in the assessment relate to future energy policy and market responses, which affect the likely future baseline carbon intensity of national grid electricity and gas supplies. This impacts the projected operational electricity usage, the avoided emissions through use of CHP and the avoided emissions through export of biomethane to the grid.

5.1.6 Government projections of future grid electricity carbon intensities have been used. Whilst still uncertain and subject to review, these are the most up-to-date projections available. Another key uncertainty is the ongoing carbon emissions value of exporting biogas. The assessment assumes that the carbon benefit to displacing fossil-fuel derived natural gas from the national gas network over the assessment period remains the same each year up to 2050 (at which point the UK is expected to reach net-zero). Over time, to support decarbonisation to net zero, the gas network is likely to be blended with a greater proportion of biogas or other low-carbon gas

sources, and reduce the carbon benefit of the exports from the Proposed Development.

5.1.7 Whilst there is uncertainty around the assumption to use a constant emissions factor for grid gas displaced, the current pace of decarbonisation of the gas grid is slow, and latest years figures show an increase in carbon intensity of the grid. The production of green gas is being incentivised by current policy e.g. Green Gas Support Scheme (Department of Business, Energy & Industrial Strategy, 2021), highlighting the role of green gas production to support delivery of net zero targets (both for the energy sector and for transport fuels). Therefore, this assumption is seen as a reasonable view based on current knowledge and taking into account that green gas will have a significant role to play in achieving the UK's net zero targets. This is further supported by the UK Energy Security Plan, updated in April 2023, which states "*Gas will continue to play a declining but still significant role in our energy system for decades to come and it is essential we take action to strengthen the security of our gas supplies. Drawing from the lessons we have learnt since Putin's invasion of Ukraine, the government will put in place measures to ensure we have the supplies we need for the long term and increased resilience in the gas system to withstand supply shocks, if they do occur. We will do this by:*

- *maximising supply of UK gas*
- *maintaining and securing our gas import and export capacity*
- *increasing system resilience*
- *ensuring long term investment in gas networks"*

This highlights the long-term role green gas has to play in the UK energy mix and the ongoing investment to increase security of supply through increasing Green Gas production in the UK. In total the gas network would have to decarbonise by more than 55% before the operational carbon of the Proposed Development would be consider not net zero, as per the Applicants commitment.

~~5.1.7~~5.1.8 The assessment also presents the potential for utilising biogas in CHP engines which was considered as a worst case option. This impact ~~could~~will be effectively mitigated using an operational Carbon Management Plan with carbon offsetting, to ensure that operational emissions impact remain net neutral. While both options have been assessed, the preference as discussed in Chapter 2: Project Description, Section 2.4 Sludge Treatment Centre (App Doc Ref 5.2.2) is to proceed with the export of biogas to grid.

Table 5-1: Summary of GHG emission effects

Description of impact	Effect	Design/mitigation measures adopted as part of the project	Magnitude of impact	Sensitivity of receptor	Significance of effect	Additional mitigation measures	Residual effect	Proposed monitoring	Responsible party
Capital carbon as a result of materials and activities to construct the Proposed Development and decommission the existing	Moderate adverse	Design optimised to reduce ~~Reduction in~~ tunnel length and diameters~~;~~ Inclusion of t~~T~~ertiary treatment within the design ~~;~~ Optimized design to reduce size of t~~T~~reated effluent pipelines and outfall~~;~~ Optimisation of major process-tank volumes from original ~~baseline~~ DM0 sizes~~;~~ Design optimised to reduce the ~~Optimisation of~~ road area.	53,~~000~~ 010 tCO_2e	High	Significant	The Design Code (App Doc Ref 7.17) identified further measures that will continue to be optimised throughout detailed design and construction to further mitigation construction ~~emisssions~~emissions, these include: • Continued innovation review taking a balanced view of whole life carbon impact, balancing capital and operational carbon impact; • ~~-~~Material specification; • Efficient construction and temporary works. • Use of low carbon fuels, where possible • Utilising procurement to ~~recuce~~reduce transport distance of key materials.	Significant, moderate adverse	The Design Code (App Doc Ref 7.17) secures monitoring of construction emissions through reporting of an updated carbon at the following stages: • ~~•~~6 weeks prior to enabling works commencing • ~~•~~Before commencement of main construction works • ~~•~~Finalisation of the Detailed Design • ~~•~~At any stage where decisions are made which impact Capital Carbon emissions of the Proposed Development by more than 5% ~~Emissions only monitored to detailed design stage.~~ In accordance with Section 7.5 of the CoCP Part A (Waste Management and Resource Use) (App Doc Ref 5.4.2.1).	Appointed contractor(s)
Land use change	Minor adverse	Landscaping plan initial planting results in a lower carbon sequestration potential.	<10 tCO_2e per year	High	Not Significant	~~LERMP:~~M ~~m~~anagement of vegetation and planting within the landscape masterplan going forwards enables increased sequestration of -100 tCO_2e / year.	Significant, beneficial	In accordance with landscaping monitoring Table 5-1 LERMP (App Doc Ref 5.4.8.14) ~~Table 5-1~~	Main contractor and operator
Operation of the proposed WWTP	Depending on option: Preferred gas to grid option: Beneficial net effect CHP option: Moderate adverse net effect	~~This depends on the preferred option being taken forward~~The gas to grid option adopts the following measures: • Using renewable biomethane (gas to grid)~~;~~ Both options adopt the following design/mitigation measures:	Gross emissions: 2,730 tCO_2e per year (preferred gas to grid option)2,130 tCO_2e per year (CHP option) Net emissions: -3,490 tCO_2e per year	High	Significant	~~• Improve energy efficiency;~~ ~~• Generate renewable power;~~ ~~• Maximise green gas production.~~ The CMP requires the Applicant to secure sufficient long term offsets to cover the expected residual net annual	~~Significant.~~ Depending on option: • Preferred gas to grid option: **Significant**, Beneficial net effect • CHP option: Moderate adverse net	The Applicant will continue to report operational emissions from the Proposed Development annually, as required through the CMP (App Doc Ref 5.4.10.2).~~The Applicant will continue to monitor and report their annual operational footprint.~~	The Applicant

Description of impact	Effect	Design/mitigation measures adopted as part of the project	Magnitude of impact	Sensitivity of receptor	Significance of effect	Additional mitigation measures	Residual effect	Proposed monitoring	Responsible party
		• Optimisation pumping power demand of Terminal Pumping Station (TPS); • Reduction in chemicals and power demand for sludge dewatering; and • Design includes vacuum degassing post-digestion.	(preferred gas to grid option)1,110 tCO_2e per year (CHP option)			emissions based on its detailed design stage carbon model to ensure the Proposed Development continues to meet the Applicants operational net zero commitment. It also requires the Applicant to report operational emissions from the Proposed Development annually, and if required to secure additional offsets if residual operational emissions increase to ensure the Proposed Development continues to operate within the Applicants operational net zero commitment. This requirement applies regardless of whether the gas to grid or CHP option are chosen. ~~Operational Carbon Management Plan (CMP) to ensure that in the event of the CHP option being adopted the project would remain operationally net zero carbon.~~	effect (reduced to neutral, **negligible effect, non-significant, through use of CMP**)		
~~Decommissioning the existing Cambridge WWTP~~	~~Minor adverse~~	~~NA~~	~~>10 tCO_2e~~	~~High~~	~~Not Significant~~	~~Efficient construction and temporary works.~~	~~Not significant, minor adverse~~	~~None~~	
Whole life carbon	Depending on option: Preferred gas to grid option: Beneficial net effect CHP option: Moderate	~~This depends on the preferred option being taken forward:~~Construction mitigation through: • ~~emissions~~ Design optimised to reduce tunnel length and diameters	Gross emissions: 119,8~~76~~0 tCO_2e over design lifetime (preferred gas to grid option) 101,~~470~~ 480 tCO_2e over design lifetime (CHP option)	High	Significant	The Design Code (App Doc Ref 7.17) identified further measures that will continue to be optimised throughout detailed design and construction to further mitigation construction emissions, these include: • Continued innovation review taking a balanced view of whole life carbon impact, balancing capital	~~Significant.~~ Depending on option: • Significant. Preferred gas to grid option: Beneficial net effect • CHP option: Moderate adverse net effect (reduced	Construction: The Design Code (App Doc Ref 7.17) secures monitoring of construction emissions through reporting of an updated carbon at the following stages: • 6 weeks prior to enabling works commencing • Before commencement of main construction works	The Applicant

Description of impact	Effect	Design/mitigation measures adopted as part of the project	Magnitude of impact	Sensitivity of receptor	Significance of effect	Additional mitigation measures	Residual effect	Proposed monitoring	Responsible party
	adverse net effect	• Inclusion of tertiary treatment within the design • Optimized design to reduce size of treated effluent pipelines and outfall • Optimisation of major process-tank volumes from original DM0 sizes • Design optimised to reduce the road area.~~are mitigated as per the first row of this table.~~ For operational emissions, ~~Operational emissions~~ the gas to grid option adopts the following measures: • ~~•~~ Using renewable biomethane (gas to grid); • Both options adopt the following design/mitigation measures: • ~~•~~ Optimisation pumping power demand of Terminal Pumping Station (TPS); • ~~•~~ Reduction in chemicals and power demand for sludge dewatering; and • ~~•~~ Design includes vacuum degassing post-digestion. Measures adopted in operation and land use change act to reduce	Net emissions: -16,~~880~~ 870 tCO_2e over design lifetime (preferred gas to grid option) 89,~~530~~ 540 tCO_2e over design lifetime (CHP option)			and operational carbon impact; • Material specification; • Efficient construction and temporary works. • Use of low carbon fuels, where possible • Utilising procurement to reduce transport distance of key materials. ~~LERMP:~~M ~~m~~anagement of vegetation going forwards enables increased sequestration. Net emissions: -20,~~270~~ 260 tCO_2e over design life (preferred gas to grid option) 86,~~480~~ 490 tCO_2e over design life (CHP option) The CMP requires the Applicant to secure sufficient long term offsets to cover the expected residual net annual emissions based on its detailed design stage carbon model to ensure the Proposed Development continues to meet the Applicants operational net zero commitment. ~~Operational Carbon Management Plan (CMP) to ensure that in the event of the CHP option being adopted the project would remain operationally net zero carbon.~~ ~~Additional mitigation measures listed above for construction and operation would further contribute to carbon reduction over the~~	to neutral, negligible effect, non-significant, through use of CMP)	• Finalisation of the Detailed Design • At any stage where decisions are made which impact Capital Carbon emissions of the Proposed Development by more than 5%~~See proposed monitoring above for construction, land use change, and operation~~. Operation: The Applicant will continue to report operational emissions from the Proposed Development annually, as required through the CMP (App Doc Ref 5.4.10.2).	

Description of impact	Effect	Design/mitigation measures adopted as part of the project	Magnitude of impact	Sensitivity of receptor	Significance of effect	Additional mitigation measures	Residual effect	Proposed monitoring	Responsible party
		emissions over the whole life of the assessment.				~~whole life of the Proposed Development.~~			

5.2 Securing mitigation

5.2.0 The delivery of mitigation will be controlled through the 'Development Consent Order (DCO) which:

- identifies parameters within which certain works activities will be located and constructed (e.g. maximum and minimum building dimensions (including below ground), or locational zones);
- sets requirements for construction, operation and maintenance of the Proposed Development to be undertaken in accordance with 'control plans / documents' (including those that are related to compliance with environmental permits); and
- sets requirements for the control of specific issues or works (e.g. time limits around the completion of the outfall construction).

5.2.1 Table 5-2 summarises all mitigation in relation to Carbon, how these measures are secured, the party responsible for the implementation of the measure, when the measure would be delivered and any mechanisms to deliver the measure.

Table 5.2: Securing mitigation summary

Description of impact	Residual effect	Mitigation measure	Mitigation type	Secured by	Responsible party	Timing on the provision of the measure	Trigger for the discharge of any related requirement
Capital carbon as a result of materials and activity to construct the Proposed Development	Significant, moderate adverse	Reduction in tunnel length and diameters	Primary	Primary measures are secured through the Design Code (App Doc Ref 7.17). ~~Requirement to update Carbon model to account for detailed design of the Proposed Development to monitor further carbon savings through detailed design when compared to the baseline DM0 design secured through a requirement of the draft DCO (App Doc Ref 2.1)~~ The Design Code (App Doc Ref 7.17) also secures a commitment to provide secondary mitigation to achieve a 55% reduction in capital carbon emissions from a 2010 baseline, alongside a commitment to continue to report progress against the Applicants 70% capital carbon reduction target through reporting an updated carbon model	Appointed contractor(s)	Report on progress by providing an updated carbon model at the following stages: • ~~•~~ 6 weeks prior to enabling works commencing; • ~~•~~ Before commencement of main construction works; • ~~•~~ Finalisation of the Detailed Design; and • ~~•~~ At any stage where decisions are made which impact Capital Carbon emissions of the Proposed Development by more than 5%.~~Prior to construction~~	Detailed design to align with Design Code (App Doc Ref 7.17). Updated carbon model to be completed and carbon reduction achieved at finalisation of Detailed Design, to be indicated within the detailed design documentation provided for approval to the LPA. ~~Update to model be completed alongside detailed design and final model issued with detailed design~~
		Tertiary treatment: Choice of sand filter provider to reduce the capital carbon intensity of this treatment process					
		Treated effluent pipelines and outfall (material specification for outfall pipelines)					
		Optimisation of major process-tank volumes from original ~~baseline~~ DM0 sizes					
		Optimisation of site road layouts and ~~road area in~~ design specification					
		• Continued innovation review • Material specification • Efficient construction and temporary works	Secondary				
Land use change	Significant, beneficial	Landscape masterplan with the LERMP	Refinement and preparation of detailed plans	LERMP secured through ~~a~~ requirement 11 of the draft DCO (App Doc Ref 2.1)	The Applicant	Prior to construction	Approved detailed management and monitoring plan~~s~~
Operation of the proposed WWTP	Significant, beneficial to negligible (non-significant)	Inclusion of energy recovery within proposed WWTP (either CHP or G2G)	Primary	Requirement to update Carbon model to account for detailed design of the Proposed Development to monitor further carbon savings through detailed design when compared to the ~~baseline~~ DM0 design secured through the Design Code (App Doc Ref 7.17)~~a requirement of the draft DCO (App Doc Ref 2.1)~~	The Applicant	Detailed design approved prior to start of construction	Decision made prior to start of construction supported by updated Carbon model to account for type of energy recovery facility taken forward
		Solar panels to be included in the inner slope of the earth bank (for the preferred option of G2G).	Primary		The Applicant	Detailed design approved prior to start of construction	Decision made regarding inclusion of solar and extent prior to start of construction supported by updated Carbon model to account for solar design
		Gateway building to be designed to achieve BREEAM "Excellent" standard	Primary	Requirement to develop detailed design to meet BREEAM target secured through the Design Code (App Doc Ref 7.17). ~~a requirement of the draft DCO (App Doc Ref 2.1)~~	The Applicant	Prior to construction	BREEAM assessment completed alongside detailed design and final report issued with detailed design.

Description of impact	Residual effect	Mitigation measure	Mitigation type	Secured by	Responsible party	Timing on the provision of the measure	Trigger for the discharge of any related requirement
		Optimisation pumping power demand of Terminal Pumping Station (TPS) within design	Primary	Primary measures are secured through the Design Code (App Doc Ref 7.17).~~Intrinsic to design~~	Appointed contractor(s)	Prior to construction	Detailed design supported by update to carbon model with final model issued ~~-~~with detailed design
		Reduction in chemicals and power demand for sludge dewatering through design	Primary ~~Primary~~	~~Intrinsic to design~~ ~~Intrinsic to design~~ Primary measures are secured through the Design Code (App Doc Ref 7.17).	The Applicant ~~The Applicant~~		
		Vacuum degassing post-digestion included in design					
		Operational Carbon Management Plan (CMP) requires the Applicant to secure sufficient long term offsets to cover the expected residual net annual emissions based on its detailed design stage carbon model to ensure the Proposed Development continues to meet the Applicants operational net zero commitment. It also requires the Applicant to report operational emissions from the Proposed Development annually, and if required to secure additional offsets if residual operational emissions increase to ensure the Proposed Development continues to operate within the Applicants operational net zero commitment. This requirement applies regardless of whether the gas to grid or CHP option are chosen.	Secondary	Requirement to secure an operational Carbon Management Plan (CMP) through a requirement of the draft DCO (App Doc Ref 2.1) Approval and implementation of a detailed management and monitoring plan secured to comply with LERMP secured through a requirement of the draft DCO (App Doc Ref 2.1)	The Applicant	Commencement of operation	Plan to be submitted with approval of gas management phase
Whole life carbon	Significant, beneficial to negligible (non-significant)	Land use change acting to reduce emissions over the whole life of the assessment	Primary	LERMP secured through a requirement of the draft DCO (App Doc Ref 2.1)	The Applicant	Landscape planting completion prior to operation	Detailed management and monitoring plan prior to start of construction
			Secondary			Annual monitoring of habitat types and extents	Once first year of operation completed
		Measures adopted in operation act to reduce emissions over the whole life of the assessment: • Follow the Net Zero to 2030 Strategy (Applicant's commitment to operational net zero emissions)	Secondary	Requirement to secure an operational Carbon Management Plan (CMP) through a requirement of the draft DCO (App Doc Ref 2.1) ~~Schedule 2 requirement to apply 2030 strategy and include CWWTPR in annual reporting secured through a requirement~~	The Applicant	Year 1 of operation and then annually	Once first year of operation completed

Description of impact	Residual effect	Mitigation measure	Mitigation type	Secured by	Responsible party	Timing on the provision of the measure	Trigger for the discharge of any related requirement
		• Implement the Operational worker travel plan to encourage mode shift in transport		~~of the draft DCO (App Doc Ref 2.1)~~ Requirement to implement OWTP (Appendix 19.8, App Doc Ref 5.4.19.8) secured through a requirement of the draft DCO (App Doc Ref 2.1)		Commencement of operation	Approved OWTP ~~plan~~ prior to the commencement of operation
		Operational Carbon Management Plan (CMP) requires the Applicant to secure sufficient long term offsets to cover the expected residual net annual emissions based on its detailed design stage carbon model to ensure the Proposed Development continues to meet the Applicants operational net zero commitment. It also requires the Applicant to report operational emissions from the Proposed Development annually, and if required to secure additional offsets if residual operational emissions increase to ensure the Proposed Development continues to operate within the Applicants operational net zero commitment. This requirement applies regardless of whether the gas to grid or CHP option are chosen.	Secondary	Requirement to secure an operational Carbon Management Plan (CMP) through a requirement of the draft DCO (App Doc Ref 2.1)	The Applicant	Commencement of operation	~~carbon management p~~Plan CMP to be submitted with approval of gas management phase

References

Alonso, I., Weston, K., Gregg, R. and Morecroft, M. (2012). Carbon storage by habitat - Review of the evidence of the impacts of management decisions and condition on carbon stores and sources. Natural England Research Reports, Number NERR043

Anglian Water. (2020, August 20). *Greenhouse gas emissions report 2020.* Retrieved from Anglian Water: https://www.anglianwater.co.uk/siteassets/household/in-the-community/ghg-report-2020.pdf

British Standards Institution. (2018, June 18). *PAS 2080 Carbon Management in Infrastructure Verification.* Retrieved from British Standards Institution: https://www.bsigroup.com/en-GB/our-services/product-certification/product-certification-schemes/pas-2080-carbon-management-in-infrastructure-verification/

Cambridge City Council. (2018, October). *Cambridge City Council.* Retrieved from Local Plan 2018.

Cambridge City Council. (2021, March 25). *Carbon Management Plan 2021-2026.* Retrieved from Cambridge City Council: https://www.cambridge.gov.uk/media/9580/carbon-management-plan-2021-26.pdf

Cambridge City Council. (2021, March 16). *Climate Change Strategy 2021-2026.* Retrieved from Cambridge City Council: https://www.cambridge.gov.uk/media/9581/climate-change-strategy-2021-2026.pdf

Civil Engineering Standard Measures of Measurement (CESMM4) Carbon and Price Book. (2013). ICE.

Climate Change Committee. (2020, December). *The Sixth Carbon Budget: Manufacturing and construction.* Retrieved from https://www.theccc.org.uk/wp-content/uploads/2020/12/Sector-summary-Manufacturing-and-construction.pdf

Department for Business Energy & Industrial Strategy. (2019, March). *Environmental reporting guidelines: including Streamlined Energy and Carbon Reporting requirements.* Retrieved from https://www.gov.uk/government/publications/environmental-reporting-guidelines-including-mandatory-greenhouse-gas-emissions-reporting-guidance

Department for Business Energy & Industrial Strategy. (2021). *Green Book supplementary guidance: valuation of energy use and greenhouse gas emissions for appraisal*. Retrieved from https://www.gov.uk/government/publications/valuation-of-energy-use-and-greenhouse-gas-emissions-for-appraisal

Department for Business Energy & Industrial Strategy. (2021, October). *Green Book supplementary guidance: valuation of energy use and greenhouse gas emissions for appraisal.* Retrieved from https://www.gov.uk/government/publications/valuation-of-energy-use-and-greenhouse-gas-emissions-for-appraisal

Department for Business Energy & Industrial Strategy. (2021). *Greenhouse gas reporting: conversion factors*.

Department for Business, Energy & Industrial Strategy. (2021). *2019 UK Greenhouse Gas Emissions*. Retrieved from

https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/957687/2019_Final_emissions_statistics_one_page_summary.pdf

Department for Business, Energy & Industrial Strategy. (2021). *Annex 2: 2019 UK Greenhouse Gas Emissions, final figures by Standard Industrial Classification*. Retrieved from https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/995865/annex-2-1990-2019-uk-ghg-emissions-final-figures-by-sic.pdf

Department for Environment, Food & Rural Affairs. (2012, February 9). *Policy paper. National policy statement for waste water.* Retrieved from Gov.uk: https://www.gov.uk/government/publications/national-policy-statement-for-waste-water

Department for Levelling Up, Housing and Communities and Ministry of Housing, Communities & Local Government. (2019, March 15). *Climate Change*. Retrieved from UK Government: https://www.gov.uk/guidance/climate-change#full-publication-update-history

Department of Business, Energy & Industrial Strategy. (2021, November 29). *Green Gas Support Scheme (GGSS): open to applications*. Retrieved from https://www.gov.uk/government/publications/green-gas-support-scheme-ggss

Department of Environment, Food and Rural Affairs. (2012, March). *National Policy Statement for Waste Water: A framework document for planning decisions on nationally significant waste water infrastructure.* Retrieved from www.defra.gov.uk: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/69505/pb13709-waste-water-nps.pdf

Embodied Carbon - The ICE Database. (2019). Retrieved from Circular Ecology: https://circularecology.com/embodied-carbon-footprint-database.html

HM Treasury. (2013, November 25). *Infrastructure Carbon Review.* Retrieved from UK Government: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/260710/infrastructure_carbon_review_251113.pdf

Institute of Civil Engineers. (2014). *Energy Briefing Sheet: Embodied Energy and Carbon.* Retrieved from https://myice.ice.org.uk/ICEDevelopmentWebPortal/media/Documents/Disciplines%20and%20Resources/Briefing%20Sheet/Embodied_Energy_and_Carbon.pdf

Institute of Environmental Management and Assessment. (2022, February 28). *Institute of Environmental Management and Assessment: Assessing Greenhouse Gas Emissions and Evaluating their Significance - Second Edition.* Retrieved from Institute of Environmental Management and Assessment: https://www.iema.net/resources/blog/2022/02/28/launch-of-the-updated-eia-guidance-on-assessing-ghg-emissions

JBA Consulting. (2018, December). *Exploring the economics of land use change for increasing resilience to climate change in England.* Retrieved from The Committee on Climate Change: https://www.theccc.org.uk/wp-content/uploads/2018/12/JBA-Consulting-Exploring-the-economics-of-land-use-change-for-increasing-resilience-to-climate-change-in-England.pdf

Ministry of Housing, Communites & Local Government. (2021, July 20). *Policy paper. National Planning Policy Framework.* Retrieved from Gov.uk:

https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1005759/NPPF_July_2021.pdf

Navigant, E. N. (2019, October). *Pathways to Net-Zero: Decarbonising the gas networks in Great Britain.* Retrieved from https://www.energynetworks.org/assets/images/Resource%20library/ENA%20Gas%20decarbonisation%20Pathways%202050%20FINAL.pdf

Ofwat. (2022, January). *Net Zero Principles Position Paper*. Retrieved from https://www.ofwat.gov.uk/wp-content/uploads/2022/01/Net_Zero_Principles_Position_Paper_Jan_2022.pdf

Peterborough City Council and Cambridgeshire County Council. (2021, July). *Cambridgeshire and Peterborough Minerals and Waste Local Plan 2036.* Retrieved from Peterborough City Council Planning Policy Public Data: https://cccandpcc.sharepoint.com/sites/PCCPlanningPolicyPublicData/Shared%20Documents/Forms/AllItems.aspx?id=%2Fsites%2FPCCPlanningPolicyPublicData%2FShared%20Documents%2FPlanning%20Policy%2FAdopted%20Local%20Plan%2FMinerals%20and%20Waste%20Local%20Plan&p

South Cambridgeshire District Council. (2018, September). *South Cambridgeshire District Council Local Plan 2018.* Retrieved from South Cambridgeshire District Council: https://www.scambs.gov.uk/planning/local-plan-and-neighbourhood-planning/the-adopted-development-plan/south-cambridgeshire-local-plan-2018/

Strategy, D. f. (2021). *Greenhouse gas reporting: conversion factors.* Department for Business, Energy & Industrial Strategy (BEIS). Retrieved from (BEIS) Department for Business Energy & Industrial Strategy.

The European Parliament and the Council of the European Union. (2014). *Directive 2014/52/EU of the European Parliament and of the Council of 16 April 2014 amending Directive 2011/92/EU on the assessment of the effects of certain public and private projects on the environment*. Retrieved from https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32014L0052

UK Government. (2008, November 26). *UK Government.* Retrieved from Climate Change Act 2008: https://www.legislation.gov.uk/ukpga/2008/27/introduction

UK Government. (2019, June 17). *The Climate Change Act 2008 (2050 Target Amendment) Order 2019.* Retrieved from UK Government: https://www.legislation.gov.uk/ukdsi/2019/9780111187654

World Green Building Council. (2019, September). *Bringing Embodied Carbon Upfront.* Retrieved from https://www.worldgbc.org/embodied-carbon

Get in touch

You can contact us by:

Emailing at **info@cwwtpr.com**

Calling our Freephone information line on **0808 196 1661**

Writing to us at **Freepost: CWWTPR**

You can view all our DCO application documents and updates on the application on The Planning Inspectorate website:

https://infrastructure.planninginspectorate.gov.uk/projects/eastern/cambridge-waste-water-treatment-plant-relocation/