Heidelberg Materials

# TYTHERINGTON QUARRY: 6 MILLION TONNES ADDITIONAL RESERVES

## Environmental Statement: Chapter 14 Climate Change - Greenhouse Gas Emissions

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## Environmental Statement: Chapter 14 Climate Change - Greenhouse Gas Emissions

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# 14 CLIMATE CHANGE - GREENHOUSE GAS EMISSIONS

## 14.1 INTRODUCTION

14.1.1 This chapter reports the outcome of the assessment of likely significant effects arising from the Proposed Scheme upon Greenhouse gas (GHG) emissions.

14.1.2 To help minimise on-site emissions as a result of the Proposed Scheme, the assessment of GHG emissions recommends that the following secondary mitigation measures are carried out:

- Development and implementation of a Carbon Management Plan, following the PAS 2080: 2023 (Carbon Management in Buildings and Infrastructure) approach to whole life carbon management to minimise the whole life carbon emissions of the Proposed Scheme.

14.1.3 The following residual effects have been identified:

- There is likely to be a long term moderate adverse residual effect on the global climate due to greenhouse gas emissions resulting from the Proposed Scheme (significant).

14.1.4 The remainder of the chapter describes the assessment methodology and the baseline conditions relevant to the assessment, which have been used to reach these conclusions, as well as a summary of the likely significant effects leading to the secondary mitigation measures required to avoid, prevent, reduce or, if possible, offset any likely significant adverse effects, and the likely residual effects and any required monitoring after these measures have been employed.

14.1.5 This chapter is intended to be read as part of the wider ES with particular reference to **Chapter 3: Description of Proposed Scheme.**

## 14.2 LIMITATIONS AND ASSUMPTIONS

14.2.1 The following assumptions were made in completion of the transport assessment:

- A list of vehicles, machinery, and equipment was provided by Heidelberg Materials. The same number of machinery and equipment has been assumed for each phase of works.
- The emission factor taken for all mobile and non-mobile machinery/vehicles at the quarry reflects 100% diesel and does not represent fuel that could be blended with biofuel.
- Further to the above assumption, since the list of vehicles, machinery and equipment did not cross reference to the activities reported in the operating schedule reported in **Chapter 3 (Section 3.3)**, all vehicles have been assumed to operate for the longest weekly operating schedule.
- All machinery and equipment have been assumed to operate for the entire operating schedule used in the assessment. This includes the restoration period.
- The average distance travelled of each HGV load that is expected to delivery limestone from the quarry via the road network has been assumed to be 50 miles:
  - This is the distance from the quarry to a customer where the most frequent trips are made to deliver limestone.
- The weight of limestone to be transported via rail freight was estimated based on 89% of the total amount extracted being used as aggregate and 61% of sales being transported via rail during 2023:
  - These figures were assumed for each year of the operational lifetime of each assessment case.

14.2.2 The following assumptions were made in completion of the embodied carbon assessment:

- It has been assumed the existing extraction rate of 2 million tonnes per annum (mtpa) will be maintained. Extraction calculations are reported in **Table 14-7**.

## 14.3 LEGISLATIVE FRAMEWORK, POLICY AND GUIDANCE

14.3.1 This section identifies the legislation, planning policy and technical guidance that has informed the assessment of effects with respect to GHG emissions. Further information on policies relevant to the Proposed Scheme is provided in the accompanying Planning Statement.

### LEGISLATIVE FRAMEWORK

14.3.2 A summary of the relevant legislation is given in **Table 14-1**.

**Table 14-1 - Legislation relevant to the GHG assessment.**

| Legislation | Context |
|---|---|
| Climate Change Act 2008[1] (including The Climate Change Act 2008 (2050 Target Amendment) Order 2019)[2] | This Act, as amended in 2019, commits the UK to reduce its net GHG emissions by at least 100% below 1990 levels by 2050 (the 'UK carbon target', often referred to as 'net zero') and requires the Government to establish 5-year carbon budgets. The Act also established an independent expert body, the Committee on Climate Change, to advise the Government on the level of those emissions targets and report on progress made to reduce emissions. |
| The Carbon Budgets Order 2009[3] | This legislation implements the carbon budgets set out in the Climate Change Act 2008. The budgets require the UK to continually reduce emissions in line with the carbon reduction commitments established under that Act. |
| Energy Act 2016[4] | The Energy Act 2016 is a UK Act of Parliament relating to UK enterprise law and energy in the UK. It covers three main areas, establishes the new Oil and Gas Authority, sets out the formal powers of the OGA and sets out the closure of Renewables Obligation for onshore wind in England, Wales and Scotland. |
| Environment Act 2021[5] | The Environment Act received Royal Assent in 2021. This Act replaces EU environmental frameworks and has been produced as a result of the UK leaving the EU. |
| The Carbon Budget Order 2021[6] | Establishes the carbon budget for the 2033-2037 budgetary period in the UK. The carbon budget for the specified period is 965 million |

[1] Climate Change Act 2008 [online]. Available at: https://www.legislation.gov.uk/ukpga/2008/27/contents
[2] The Climate Change Act 2008 (2050 Target Amendment) Order 2019 [online]. Available at: https://www.legislation.gov.uk/uksi/2019/1056/contents/made
[3] The Carbon Budgets Order 2009 [online]. Available at: https://www.legislation.gov.uk/uksi/2009/1259/contents/made
[4] UK Government (2016). Energy Act 2016. (online). Available at: https://www.legislation.gov.uk/ukpga/2016/20/contents (Accessed August 2023)
[5] UK Government (2021). Environment Act 2021. (online). Available at: https://www.legislation.gov.uk/ukpga/2021/30/contents (Accessed August 2023).
[6] UK Government. (2021). The Carbon Budget Order 2021. Available at: The Carbon Budget Order 2021 (legislation.gov.uk)

| Legislation | Context |
|---|---|
| | tonnes of carbon dioxide equivalent, setting a cap on the maximum level of the net UK carbon account during this five-year period. |

14.3.3 All carbon budgets that have been legislated will be considered in the GHG assessment. The timescale of these budgets covers the construction period and the operational period of the Proposed Scheme. The total UK budgets, expressed in the form of million tonnes of carbon dioxide ($CO_2$) equivalent (million $tCO_2e$), are detailed in **Table 14-2**.

**Table 14-2 – UK Carbon Budgets**

| Budget | Carbon budget level (million $tCO_2e$) | Reduction below 1990 levels | Legal status |
|---|---|---|---|
| **3rd Carbon Budget (2018 – 2022)** | 2,544 | 37% by 2020 | Statute |
| **4th Carbon Budget (2023 to 2027)** | 1,950 | 51% by 2025 | Statute |
| **5th Carbon Budget (2028 to 2032)** | 1,725 | 57% by 2030 | Statute |
| **6th Carbon Budget (2033 -2037)** | 965 | 78% by 2035 | Statute |
| **Net Zero Target** | 0 | 100% by 2050 | Statute |

## POLICY

14.3.4 A summary of the relevant national and local planning policy is given in **Table 14-3**. The Planning Statement will cover the detail of actual policies.

**Table 14-3 - Planning policy relevant to the GHG assessment.**

| Technical guidance document | Context |
|---|---|
| **International planning policy** | |
| The United Nations Framework Convention on Climate Change (UNFCCC) Paris Agreement[7] | The UNFCCC is the major international body responsible for managing climate change and carbon emissions. In 2015, it adopted the Paris Agreement, the aims of which are stated as: "This Agreement, in enhancing the implementation of the Convention, including its objective, aims to strengthen the global response to the threat of climate change, in the context of sustainable development and efforts to eradicate poverty, including by: (a) Holding the increase in the global average temperature to well below 2 °C above pre-industrial levels and to pursue efforts to limit the temperature increase to 1.5 °C above pre-industrial levels, recognizing that this would significantly reduce the risks and impacts of climate change". The |

[7] UNFCCC (2015). Paris Agreement. (online). Available at: https://unfccc.int/sites/default/files/english_paris_agreement.pdf (Accessed August 2023).

| Technical guidance document | Context |
|---|---|
| | agreement sets targets for countries' GHG emissions, but these are not legally binding or enforceable. In December 2020, the UK submitted its first Nationally Determined Contribution (NDC) to the UNFCCC, committing to "at least a 68%" reduction in GHG emissions below 1990 levels (1995 levels for F-gases) by 2030, aligned with the UK's 2050 net-zero GHG emissions target. |
| UNFCCC Kyoto Protocol (UNFCCC, 1997)[8] | The Kyoto Protocol was adopted in December 1997 and there are currently 192 Parties to the Kyoto Protocol. It commits industrialised countries and economies to transition to limit and reduce GHG emissions in accordance with agreed individual targets. These have been strengthened in more recent international agreements culminating in the Paris Agreement (UNFCCC, 2015), as described above. |
| **National planning policy** | |
| Clean Growth Strategy (BEIS)[9] | This report, prepared by BEIS, provides the strategy for the UK's future clean growth to allow carbon budgets to be met and support economic growth. It sets out policies and targets out to 2050 for reducing GHG emissions across a number of sectors. Whilst not in itself planning policy it is a material consideration. |
| The UK's Nationally Determined Contribution (NDC) under the Paris Agreement[10] | In December 2020, the UK submitted its first NDC under the Paris Agreement9 to the UNFCCC, committing to "at least a 68%" reduction in economy-wide GHG emissions below 1990 levels (1995 levels for F-gases) by 2030, aligned with the UK's 2050 net zero GHG emissions target. |
| Net Zero Strategy: Build Back Greener[11] | The Strategy for Net Zero sets out the Government's plan to become net zero carbon by 2050 and to meet the Nationally Determined Contribution (NDC). This includes achieving a fully decarbonised power system by 2035 and delivering 5 GW of hydrogen production capacity by 2030. |

[8] UNFCCC (1998). Kyoto Protocol. (online). Available at: https://unfccc.int/resource/docs/convkp/kpeng.pdf (Accessed August 2023).
[9] Department for Business, Energy and Industrial Strategy (2017) Clean Growth Strategy. (online). Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/700496/clean-growth-strategy-correction-april-2018.pdf (Accessed August 2023).
[10] Department for Business, Energy & Industrial Strategy (2020). The UK's Nationally Determined Contribution under the Paris Agreement. (online). Available at: https://www.gov.uk/government/publications/the-uks-nationally-determined-contribution-communication-to-the-unfccc (Accessed August 2023).
[11] Department for Business, Energy & Industrial Strategy (2021). Net Zero Strategy: Build Back Greener. (online). Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1033990/net-zero-strategy-beis.pdf (Accessed August 2023).

| Technical guidance document | Context |
|---|---|
| National Planning Policy Framework (NPPF)[12] | The 2021 revision of the NPPF, paragraph 148 states: *"The planning system should support the transition to a low carbon future in a changing climate… shape places in ways that contribute to radical reductions in greenhouse gas emissions… and support renewable and low carbon energy and associated infrastructure".*<br>It also requires in paragraph 154 that new development should be planned for in ways that *"can help to reduce greenhouse gas emissions, such as through its location, orientation and design. Any local requirements for the sustainability of buildings should reflect the Government's policy for national technical standards".*<br>Furthermore, it is stated in paragraph 155, that local planning authorities should expect new development to:<br>a) *"comply with any development plan policies on local requirements for decentralised energy supply unless it can be demonstrated by the applicant, having regard to the type of development involved and its design, that this is not feasible or viable; and take account of landform, layout, building orientation, massing and landscaping to minimise energy consumption."* |
| **Local planning policy** | |
| Gloucestershire County Council Minerals Local Plan[13] | One of the strategic objectives of the Gloucester County Council Local Plan is 'mitigating and adapting to the impacts of climate change'. |

14.3.5 In addition, this Chapter has been prepared in accordance with the Government's National Planning Practice Guidance (2020).

## GUIDANCE

14.3.6 A summary of the technical guidance for the GHG assessment is given in **Table 14-4**.

**Table 14-4 - Technical guidance relevant to the GHG assessment.**

| Technical guidance document | Context |
|---|---|
| Environmental Impact Assessment Guide to: Assessing | The Institute of Environmental Management and Assessment (IEMA) provides guidance on GHG emissions assessment, mitigation and reporting within an EIA context and this is the primary source of guidance for assessing GHG emissions. The 2022 guidance further builds upon the 2017 guidance, with key changes including an |

[12] Ministry of Housing, Communities and Local Government (2021). National Planning Policy Framework. (online). Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1005759/NPPF_July_2021.pdf (Accessed August 2023).

[13] Gloucestershire County Council, 2018. *Minerals Local Plan for Gloucestershire.* [Online]. Available from: https://www.gloucestershire.gov.uk/media/zhuf1sp0/minerals-local-plan-for-gloucestershire-adopted-march-2020-reduced-version.pdf

| Technical guidance document | Context |
|---|---|
| Greenhouse Gas Emissions and Evaluating their Significance[14] | emphasis on mitigation at the Proposed Scheme outset and throughout its lifetime, and more nuanced levels of GHG emissions significance. It provides detail on the application of the five IEMA Principles on Climate Change Mitigation and EIA[15] :<br>1. "The GHG emissions from all projects will contribute to climate change, the largest inter-related cumulative environmental effect.<br>2. The consequences of a changing climate have the potential to lead to significant environmental effects on all topics in the EIA Directive (e.g. human health, biodiversity, water, land use, air quality).<br>3. The UK has legally binding GHG reduction targets – EIA must therefore give due consideration to how a project will contribute to the achievement of these targets.<br>4. GHG emissions have a combined environmental effect that is approaching a scientifically defined environmental limit, as such any GHG emissions or reductions from a project might be considered to be significant.<br>The EIA process should, at an early stage, influence the location and design of projects to optimise GHG performance and limit likely contribution to GHG emissions." |
| Publicly Available Standard (PAS) 2080: 2023 – Carbon management in infrastructure[16] | PAS 2080:2023 provides an approach to reducing GHG emissions from infrastructure projects including working with stakeholders throughout the project lifecycle. |
| The Greenhouse Gas Protocol: A Corporate Accounting and Reporting Standard (GHG Protocol)[17] | GHG Protocol provides standards and guidance for preparing a GHG emissions inventory. |
| BS EN ISO 14064-1[18] and 14064-2[19] | ISO 14064 sets out guidance for quantification and reporting of GHG emissions and removals. The methodology for quantification of GHGs follows this guidance and the stated guidance on reporting will be taken into account as part of this assessment. |

[14] IEMA (2022). Environmental Impact Assessment Guide to: Assessing Greenhouse Gas Emissions and Evaluating their Significance – 2nd Edition. (online). Available at: https://www.iema.net/resources/blog/2022/02/28/launch-of-the-updated-eia-guidance-on-assessing-ghg-emissions (Accessed August 2023).
[15] IEMA (2010). IEMA Principles Series: Climate Change Mitigation & EIA.
[16] The Green Construction Board, Construction Leadership Council (2023). PAS 2080:2016 Carbon Management in Infrastructure [online]. Available at: https://www.bsigroup.com/en-GB/standards/pas-2080/
[17] World Resources Institute and World Business Council for Sustainable Development (2004). The Greenhouse Gas Protocol: A Corporate Accounting and Reporting Standard [online]. Available at: https://ghgprotocol.org/sites/default/files/standards/ghg-protocol-revised.pdf
[18] BSI (2019). BS EN ISO 14064-1: 2019 Greenhouse gases. Specification with guidance at the organization level for quantification and reporting of greenhouse gas emissions and removals.
[19] BSI (2019). BS EN ISO 14064-1: 2019 Greenhouse gases. Specification with guidance at the project level for quantification, monitoring and reporting of greenhouse gas emission reductions or removal enhancements.

| Technical guidance document | Context |
|---|---|
| Methodology to calculate embodied carbon 1st edition and 2nd edition consultation document[20][21] | The Royal Institution of Chartered Surveyors (RICS) guidance note represents best practice on how to estimate carbon emissions associated with product and construction process stages. The aim of the guidance is to provide a framework of practical guidance on how to calculate embodied carbon emissions associated with projects. |
| Net Zero – The UK's contribution to stopping global warming[22] | This report prepared by the CCC to the UK Government reassesses the UK's long-term emission target. In the UK, the report recommends a net zero date of 2050 achieved through known technologies, improvements in people's lives and policy updates. As a result of this report, emission targets in the UK were updated in the Climate Change Act 2008[1] |
| 2022 Progress Report to Parliament[23] | This CCC annual report sets out the UK's progress for 2022 against emissions reduction targets to 2050. One of the CCC's key recommendations is funding and support for extra hydrogen production capacity. The UK Government is yet to respond to the CCC's recommendations. |
| Intergovernmental Panel on Climate Change (IPCC) Sixth Assessment Report (AR6): Climate Change 2021 - The Physical Science Basis[24] | In August 2021 the contribution of Working Group I to AR6 was published by the IPCC. The publication reinforces the evidence presented in the previous IPCC report (AR5) and, through the utilisation of updated climate model simulations and analyses, states that "it is unequivocal that human influence has warmed the atmosphere, ocean and land". It is highlighted that "global warming of 1.5°C and 2°C will be exceeded during the 21st century unless deep reductions in CO2 and other greenhouse gas emissions occur in the coming decades". The publication states that "limiting human-induced global warming to a specific level requires limiting cumulative CO2 emissions, reaching at least net zero CO2 emissions, along with strong reductions in other greenhouse gas emissions" and it is this assertion which will underpin the international response to global warming. |

[20] RICS. (2012). Methodology to calculate embodied carbon 1st edition.
[21] RICS (2023). Whole-life carbon assessment consultation. (online). Available at: file:///C:/Users/UKAXD779/Downloads/Whole%20Life%20Carbon%20Assessments%20PS%20Consultation%20Draft%20March%202023.pdf
[22] CCC (2019). Net Zero – The UK's contribution to stopping global warming. (online). Available at: https://www.theccc.org.uk/wp-content/uploads/2019/05/Net-Zero-The-UKs-contribution-to-stopping-global-warming.pdf (Accessed 01 August 2022).
[23] CCC (2022). 2022 Progress Report to Parliament. (online). Available at: https://www.theccc.org.uk/publication/2022-progress-report-to-parliament/ (Accessed 01 August 2022).
[24] IPCC (2021). The Physical Science Basis. Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change (Masson-Delmotte, V., P. Zhai, A. Pirani, S. L. Connors, C. Péan, S. Berger, N. Caud, Y. Chen, L. Goldfarb, M. I. Gomis, M. Huang, K. Leitzell, E. Lonnoy, J.B.R. Matthews, T. K. Maycock, T. Waterfield, O. Yelekçi, R. Yu and B. Zhou (eds.)). Cambridge University Press.

| Technical guidance document | Context |
|---|---|
| IPCC AR6: Climate Change 2022 – Mitigation of Climate Change[25] | The IPCC finalised the third part of AR6, the Working Group III contribution, in April 2022. It provides an updated global assessment of climate change mitigation progress and pledges, and examines the sources of global emissions. It explains developments in emission reduction and mitigation efforts, assessing the impact of national climate pledges in relation to long-term emissions goals. |
| CCC Sixth Carbon Budget Report Sector Summaries – Fuel Supply[26] | This document contains a summary of content for the fuel supply sector from the CCC's Sixth Carbon Budget Advice. The key messages include the important role that low carbon hydrogen plays in displacing emissions from fossil fuels. The CCC's recommended carbon budget sector allocations for fuel supply are:<br>• fourth carbon budget, 2023 to 2027, 148Mt$CO_2$e;<br>• fifth carbon budget, 2028 to 2032, 85Mt$CO_2$e; and<br>• sixth carbon budget, 2033 to 2037, 42Mt$CO_2$e. |

## 14.4 CONSULTATION, SCOPE, METHODOLOGY AND SIGNIFICANCE CRITERIA

### CONSULTATION UNDERTAKEN TO DATE

14.4.1 **Table 14-5** provides a summary of the consultation activities undertaken in support of the preparation of this chapter.

**Table 14-5 - Summary of consultation undertaken in support of this chapter**

| Body / organisation | Individual / statutory body / organisation | Meeting dates and other forms of consultation | Summary of outcome of discussions |
|---|---|---|---|
| Heidelberg Materials | Jenna Roberts | Email dated 9 February 2024 | A request for data was made. The data request sheet that was prepared was returned on 14 February 2024 which included activity data required for completion of the GHG assessment. |

[25] IPCC (2022). Climate Change 2022: Mitigation of Climate Change. Contribution of Working Group III to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change (P.R. Shukla, J. Skea, R. Slade, A. Al Khourdajie, R. van Diemen, D. McCollum, M. Pathak, S. Some, P. Vyas, R. Fradera, M. Belkacemi, A. Hasija, G. Lisboa, S. Luz, J. Malley, (eds.)). Cambridge University Press.
[26] CCC (2020). *The Sixth Carbon Budget - Fuel supply*. (online). Available at: https://www.theccc.org.uk/publication/sixth-carbon-budget/ (Accessed 01 August 2022).

## SCOPE OF THE ASSESSMENT

### The Proposed Scheme

14.4.2 The overall scope of the GHG assessment is considered to include:

- The GHG emissions associated with the mineral extraction activities. An embodied carbon amount will be associated with the materials extracted, and the associated GHG emissions will be calculated as part of the GHG assessment. Expected tonnages of materials to be extracted are reported in **Table 14-7**.
- The GHG emissions associated with the operation phases of the Proposed Scheme as described in **Table 14-6**. These comprise of transport emissions arising from the operational vehicles, machinery and equipment and the dispatching of material via rail.

### Spatial Scope

14.4.3 The spatial scope of the GHG assessment will be informed by the spatial extent of the mineral extraction activities of the Proposed Scheme. This will therefore equate to the extant planning application boundary as shown in **Figure 2.1**

### Temporal Scope

14.4.4 The temporal scope of the assessment of GHG emissions is consistent with the period over which the Proposed Scheme would be carried out and therefore covers the period during which the additional 6mt of mineral reserve would be extracted at the permitted rate of 2mpta if permission is granted, being mindful that during this time both existing consented mineral as well as the additional unconsented mineral would be extracted. This is based on a timescale of ~8.5 years, from 2025 – 2033, since the updated operational activity will allow for an additional 3 years of operation but within the consented timescales to 2042. Current operations are estimated to continue for 5.5 years. A start date of 2025 will be used since the Proposed Scheme seeks to allow for a change to currently approved working method within Tytherington Quarry (it is therefore assumed that if granted, activities will commence immediately).

## ELEMENTS SCOPED IN AND OUT OF THE ASSESSMENT

14.4.5 The likely significant GHG effects that have been taken forward for assessment in this ES are summarised below in **Table 14-6.** This is based on phases as defined within PAS 2080: Carbon Management in Infrastructure[16]. Pre-construction phases (as considered with PAS 208032) have not been considered since they are not applicable to the Proposed Scheme. Avoided GHG emissions were not identified as part of the Proposed Scheme, therefore the benefits and loads beyond infrastructure life cycle phase has not been considered for this GHG assessment.

**Table 14-6 - Stages of the Proposed Scheme considered as sources of GHG emissions and likely significant effects**

| Proposed Scheme phase | Main stages of Proposed Scheme life cycle | Sources of GHG emissions and effects |
|---|---|---|
| A0 – Pre-construction | Represents preliminary studies and works, for example strategy and brief development, design efforts, EIA and cost planning. Most, if not all, of these functions will be largely office-based functions contributions from across the value chain. | Out - There are no preliminary studies required for the Development. |
| A1-A2-A3 – Raw materials supply, transport and manufacture | GHG emissions associated with the material extracted at the quarry. These comprise embodied GHG emissions associated with the raw material assets. | In - Extraction amounts and programme of extraction for the material with and without development scenarios obtained from the Proposed Scheme Team. ICE emission factors utilised. |
| A4 – Construction transport | Transport of construction materials resources and equipment from point of purchase to the works site. Commuting of workforce during construction. | Out - There are no construction works associated with the Development. The Development seeks consent for continuation of and for the extension of the extraction activities currently undertaken at the quarry |
| A5 - Construction process stage | Emissions associated with construction and installation processes (including fuel and electricity consumption) of the temporary works, ground works, landscaping and permanent works. Emissions associated with site water demand.<br>Waste management activities (transport, processing, final disposal) associated with waste arising from the Proposed Scheme. | Out - There are no temporary construction works associated with the Development. |
| A5 - Construction process stage | GHG emissions associated with land use change. | Out - It is not anticipated that there is a potential for the release of GHG emissions from land use change such as disturbance of peat and therefore GHG emissions associated with this phase are scoped out. Any soil that is disturbed will be used as part of the progressive restoration process. The quarry will be restored to a deep-water body. Restoration will include the placement of upper benches above final water levels with shrubs and trees planted. Such restoration is considered as a benefit with regards to GHG emissions, and exclusion of such GHG emissions from the |

| Proposed Scheme phase | Main stages of Proposed Scheme life cycle | Sources of GHG emissions and effects |
|---|---|---|
| | | assessment will ensure a worse-case assessment. |
| B1 - Boundary of use stage – installed products and materials | Called 'Use', this represents the carbon emitted directly from the fabric of products and materials once they have been installed as part of infrastructure and it is in normal use. | Out - It is not anticipated that there are any materials installed at the quarry that will be capable of emitting carbon directly. |
| B2 – B5 – Maintenance, repair, replacement and refurbishment | Represents the works activities and new materials for the maintenance, repair, replacement and refurbishment of the infrastructure during the use stage / operation of infrastructure. | Out - The use of mobile machinery and vehicles which would include those used for maintenance purposes has been considered as part of the 'B8 - Other operational processes' phase. |
| B6 – Operational energy | Emissions resulting from the energy used by the Proposed Scheme to enable it to deliver its service during operation. | Out - There are GHG emissions associated with the operational energy usage of the main quarry offices. Due to the large contribution of GHG emissions estimated from the extraction of limestone (A1-A2-A3) and from other operational processes (B8), it is thought that GHG emissions associated with this energy usage will be less than 1% of the total GHG emissions. Therefore, GHG emissions associated with the operational energy usage of the main quarry offices are not considered to significantly alter the results of the assessment and have not been estimated. |
| B7 – Operational water | Emissions resulting from the consumption of water required by the Proposed Scheme to operate and deliver its service. | In – These are emissions from the diesel consumption of pumps used in the extraction of operational water during the plant operations. |
| B8 – Other operational processes | Represents other process GHG emissions arising from the Proposed Scheme to enable it to operate and deliver its service including management of operational waste. | In - GHG emissions associated with the use of both mobile and non-mobile machinery and vehicles on site. Fuel usage also associated with the use of rail transportation of product from site. |
| B9 – User's utilisation | Represents the activities associated with user's utilisation of the Proposed Scheme during the use stage. This is defined by the principle of control and influence whereby the GHG emissions are B9 (user's | Out - No GHG emissions associated with this aspect of the Proposed Scheme. |

| Proposed Scheme phase | Main stages of Proposed Scheme life cycle | Sources of GHG emissions and effects |
|---|---|---|
| | utilisation) when they arise from an activity that the user has control over. | |
| C1-C4 – End of life stage: deconstruction, transport, waste processing for recovery and disposal | Represents the on-site activities of deconstructing, dismantling and demolishing the infrastructure. All GHG emissions due to transport to disposal and / or until the end-of-waste state of waste materials arising. Activities associated with treatment and processing for recovery, reuse and recycling of waste materials arising from infrastructure. GHG emissions resulting from final disposal of demolition materials. | Out - The Proposed Scheme includes progressive restoration of the site whereby the quarry would be restored to a deep-water body. It has been assumed that the equipment and vehicles proposed for the operation of the Proposed Scheme would be utilised for these restoration activities. Therefore, GHG emissions associated with restoration activities have been considered within the 'B8 - other operational processes' phase. |
| D – Benefits and loads beyond the infrastructure life cycle | Includes avoided carbon emissions associated with the Proposed Scheme including potential for re-use, recovery and recycling of materials and / or energy and associated GHG emissions beyond the system boundary. | Out - There is the potential benefit of the Proposed Scheme through consideration of the restoration proposed. However, in the context of GHG emissions this would not influence the outcome of this assessment. |

## METHOD OF BASELINE DATA COLLATION

### Desk Study

14.4.6 Data sources which have been gathered to inform the baseline for the GHG assessment scoping material includes data relating to the UK carbon budgets, as reported in **Table 14-2**. Data sources that will be used for the GHG assessment are discussed within the Assessment Methodology section below.

## ASSESSMENT METHODOLOGY

14.4.7 Consideration of a 'With Development' and 'Without Development' case ensures that the methodology is in line with the IEMA guidance 2022[14]. The 'With Development' case will consider the current consented mining operations plus the proposed mining operations. The 'Without Development' case will only consider the current consented mining operations and can also be noted as the BaU case.

14.4.8 The approach to the GHG assessment is to quantify and contextualise the GHG emissions of a Project. As discussed in Scope of the Assessment, the GHG assessment of the Proposed Scheme will consider the GHG emissions associated with the operational vehicles, machinery and equipment, the embodied carbon of the raw materials mined, and the dispatching movements.

### Quantification of GHG emissions

14.4.9 The approach to quantifying the GHG emissions associated with the Proposed Scheme will consider the whole infrastructure life cycle of the Proposed Scheme. The infrastructure life cycle phases as described within the PAS 2080: Carbon Management in Infrastructure[16] will be used. These phases will allow for the identification of the GHG emission sources associated with the Proposed Scheme. This methodology is in line with the IEMA guidance[14].

14.4.10 GHG emissions associated with the Proposed Scheme emission sources will be calculated by gathering associated activity data and combining this data with associated emission factors.

14.4.11 For GHG emissions from machinery and equipment on site, emission factors will be gathered from the Department for Energy Security and Net Zero (DESNZ): greenhouse gas reporting: conversion factors 2023[27]. Activity data will consist of fuel usage for GHG emissions arising from mobile vehicles/machinery on site and from Non-Road Mobile Machinery (NRMM) on site. For GHG emissions from rail transport, emission factors will also be gathered from the DESNZ[27]. Activity data will consist of the total distance covered by rail freight which transports the limestone extracted at the quarry. This total distance will be multiplied by the total weight of limestone transported via rail.

14.4.12 For GHG emissions associated with the mined materials, embodied carbon figures reported by the Inventory of Carbon & Energy (ICE) database[28] will be used. These will be combined with extraction amounts of the limestone. **Table 14-7** presents the extraction calculations used to deduce the amount of limestone per annum for both the 'With Development' and 'Without Development' case. The calculations below are based on the 8mt remaining unconstrained permitted mineral reserve and the additional 6mt (i.e. total 14mt). The start year for the operation of the active quarry has been taken as 2024, as extraction from the permitted reserves is ongoing.

**Table 14-7 – Extraction calculations**

| Year | Extraction amount (tonnes per annum) | | | | |
|---|---|---|---|---|---|
| | Without development case | With development case | | | |
| | | Phase 1 | Phase 2 | Phase 3 | Total |
| 2024 | 2,000,000 | 2,000,000 | | | |
| 2025 | 2,000,000 | 2,000,000 | | | 2,000,000 |
| 2026 | 2,000,000 | 2,000,000 | | | 2,000,000 |

[27] DESNZ, 2022. *Greenhouse Gas reporting: conversion factors 2022.* [Online]. Available from: https://www.gov.uk/government/publications/greenhouse-gas-reporting-conversion-factors-2022

[28] Circular Ecology. The Inventory of Carbon and Energy (ICE) database. [Online]. Available from: https://circularecology.com/embodied-carbon-footprint-database.html

| Year | Extraction amount (tonnes per annum) | | | | |
|---|---|---|---|---|---|
| | Without development case | With development case | | | |
| | | Phase 1 | Phase 2 | Phase 3 | Total |
| 2027 | 2,000,000 | 2,000,000 | | | 2,000,000 |
| 2028 | 2,000,000 | 1,800,000 | 200,000 | | 2,000,000 |
| 2029 | 2,000,000 | | 2,000,000 | | 2,000,000 |
| 2030 | | | 2,000,000 | | 2,000,000 |
| 2031 | | | 2,000,000 | | 2,000,000 |
| 2032 | | | | 2,000,000 | 2,000,000 |
| 2033 | | | | 2,000,000 | 2,000,000 |
| **TOTAL** | **12,000,000** | **9,800,000** | **6,200,000** | **4,000,000** | **20,000,000** |

**Contextualisation and significance Criteria**

14.4.13 The GHG emissions quantified for the GHG assessment will be reported in the form of a kiloton of carbon dioxide equivalent ($ktCO_2e$), which will allow the emissions of the seven key GHGs from the Kyoto Protocol Reference Manual to be accounted for: carbon dioxide ($CO_2$), methane ($CH_4$), nitrous oxide ($N_2O$), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), sulphur hexafluoride ($SF_6$) and nitrogen trifluoride ($NF_3$).

14.4.14 IEMA guidance[14] outlines that the context of the magnitude of GHG emissions should be established by drawing from guidance, policy and scientific evidence. Part of contextualising the magnitude of the GHG emissions and their impacts is to determine their significance.

14.4.15 For determining the significance of GHG emissions, the GHG assessment will follow the methodology outlined within the IEMA guidance[14]. This guidance refers to the need for consideration towards a development's contribution to reducing GHG emissions relative to a comparable baseline when considering the significance of its GHG emissions. This comparable baseline must be consistent with a trajectory towards net zero by 2050.

14.4.16 The goal of the Paris agreement is to limit global warming below 2˚C, and to aim for 1.5˚C temperature rise compared with pre-industrial levels. According to the CCC, the UK's 2050 target and each interim target are compatible to meet the requirements of the Paris agreement. The GHG emissions calculated will be evaluated to determine whether and how the 'With Development' case contributes or jeopardises the achievement of these targets.

14.4.17 The current IEMA guidance[14] state that due to the combined environmental effect that GHG emissions have, any GHG emissions (either positive or negative) from a Development might be

considered to be significant. Therefore, the assessment methodology will aim to determine the relative scale of the impact of the Development on global climate change by considering the sensitivity (or value) of the receptor, its impacts and the magnitude of that impact. The only receptor for the climate assessment is the global climate and this receptor is considered highly sensitive.

14.4.18 Determining the magnitude of the impacts of the GHG emissions will involve concluding the significance of the GHG emissions. This will follow the IEMA guidance[14], where consideration will be made towards the Development's impact on:

- Relevant UK carbon budgets and targets at a national and local level;
- Science-based targets (1.5˚C trajectory); and
- Compliance with up-to-date policy and good practice measures.

**Effect Significance**

14.4.19 Significance criteria reported in the IEMA guidance will be used to determine the significance of the GHG emissions estimated for the Proposed Scheme. These are reported below in **Table 14-8**.

**Table 14-8 – Significance Criteria**

| Proposed Scheme phase | Main stages of Proposed Scheme life cycle |
|---|---|
| **Major Adverse** | The Proposed Scheme's GHG impacts are not mitigated or are only compliant with do-minimum standards set through regulation, and do not provide further reductions required by existing local and national policy for projects of this type. A Proposed Scheme with major adverse effects is locking in emissions and does not make meaningful contribution to the UK's trajectory towards net zero. |
| **Moderate adverse** | The Proposed Scheme' GHG impacts are partially mitigated and may partially meet the applicable existing and emerging policy requirements but would not fully contribute to decarbonisation in line with local and national policy goals for Proposed Schemes of this type. A Proposed Scheme with moderate adverse effects falls short of fully contributing to the UK's trajectory towards net zero. |
| **Minor Adverse** | The Proposed Scheme's GHG impacts would be fully consistent with applicable existing and emerging policy requirements and good practice design standards for Proposed Schemes of this type. A Proposed Scheme with minor adverse effects is fully in line with measures necessary to achieve the UK's trajectory towards net zero. |
| **Negligible** | The Proposed Scheme's GHG impacts would be reduced through measures that go well beyond existing and emerging policy and design standards for Proposed Schemes of this type, such that radical decarbonisation or net zero is achieved well before 2050. A Proposed Scheme with negligible effects provides GHG performance that is well 'ahead of the curve' for the trajectory towards net zero and has minimal residual emissions. |
| **Beneficial** | The Proposed Scheme's net GHG impacts are below zero and it causes a reduction in atmospheric GHG concentration, whether directly or indirectly, compared to the without-Development baseline. A |

| Proposed Scheme phase | Main stages of Proposed Scheme life cycle |
|---|---|
| | Proposed Scheme with beneficial effects substantially exceeds net zero requirements with a positive climate impact. |

## 14.5 BASELINE CONDITIONS

14.5.1 The 4th Carbon Budget reported in **Table 14-2** can be considered as the current baseline for the GHG assessment. The current baseline can be referred to as a 'Business as usual' (BaU) since, as per the IEMA guidance[14], the baseline can be either the GHG emissions but without the Proposed Scheme, or the GHG emissions arising from an alternative project design or BaU for a Proposed Scheme of this type. For this GHG assessment, the BaU case will consider the current consented mining operations where the quarry is operating at 2 mtpa and will involve extraction of the remaining amount of consented limestone only.

### FUTURE BASELINE

14.5.2 As indicated by the carbon budgets in **Table 14-2**, GHG emissions are required to reduce in the future. By 2025, GHG emissions are required to reduce by 51%, and the government has set a net zero target which requires the UK to reduce GHG emissions by 100% by 2050. The future baseline considers a number of the carbon budgets in **Table 14-2** as future Proposed Scheme activities coincide with a number of carbon budgets.

## 14.6 SENSITIVE RECEPTORS

14.6.1 GHG emissions have a global effect rather than directly affecting any specific local receptor to which a level of sensitivity can be assigned. The global climate is therefore the only receptor for the GHG assessment.

## 14.7 ASSESSMENT OF EFFECTS, MITIGATION AND RESIDUAL EFFECTS

14.7.1 The assessment of GHG emissions in the 'with Development' and 'without Development' case are presented here. The net change in GHG emissions is contextualised against relevant national targets.

### OPERATION – A1-A2-A3- EMBODIED CARBON

14.7.2 The GHG emissions associated with the embodied carbon of limestone extracted as part of the Proposed Scheme have been calculated based upon the information detailed in **Chapter 3: Section 3.3.**

14.7.3 The 'Without development' case only considers the current consented amount of limestone. As reported in **Table 14-7**, based upon information detailed in **Chapter 3: Section 3.3**, a total extracted amount of 12 million tonnes was used for the 'Without development' case, and a total extracted amount of 20 million tonnes was used for the 'With development' case. Embodied carbon emission factors from the ICE database[28] was used to calculate the emissions associated with this extraction amount.

14.7.4 The corresponding emissions in $ktCO_2e$ for both assessment cases are reported in **Table 14-9** overleaf.

**Table 14-9 – Embodied carbon assessment**

| Assessment case | Material extracted | Total amount extracted (Tonnes) | Emission (ktCO2e) |
|---|---|---|---|
| Without Development | Limestone | 12,000,000 | 20,951 |
| With Development | Limestone | 20,000,000 | 37,623 |

## OPERATION – B3 – TRANSPORT

14.7.5 The B3 phase GHG emissions considered for the assessment includes GHG emissions from the following sources:

- Operational mobile vehicles/equipment;
- Operational Non-Road Mobile Machinery (NRMM); and
- Rail freight movements.

**Mobile vehicles/equipment**

14.7.6 The fuel consumption per hour of each operational mobile vehicle was used to calculate the fuel consumption per annum of each mobile vehicle. Operating hours each week are not proposed to change when considering the 'Without development' and 'With development' case. However, the 'Without development' case considers an operational lifetime of 7 years, whereas the 'With development' case considers an operational lifetime of 10 years. A fuel consumption of each operational mobile vehicle for the lifetime of both assessment cases was therefore calculated.

14.7.7 The fuel consumption of mobile vehicle/machinery for the 'Without development' and 'With development' case and the associated GHG emissions from mobile vehicles/equipment are reported within **Table 14-10** below.

**Table 14-10 – Mobile vehicle/machinery GHG emissions**

| Vehicle/Machine | Without development case | | With development case | |
|---|---|---|---|---|
| | Fuel consumption (Litres/lifetime) | Emissions ($ktCO_2e$) | Fuel consumption (Litres/lifetime) | Emissions ($ktCO_2e$) |
| ADT | 712,008 | 1.9 | 1,068,012 | 3.2 |
| ADT | 589,248 | 1.6 | 883,872 | 2.6 |
| Water Bowser | 736,560 | 2.0 | 1,104,840 | 3.3 |
| FEL | 491,040 | 1.3 | 736,560 | 2.2 |
| FEL | 491,040 | 1.3 | 736,560 | 2.2 |
| EXC | 1,374,912 | 3.7 | 2,062,368 | 6.1 |
| EXC | 1,325,808 | 3.5 | 1,988,712 | 5.9 |

| Vehicle/Machine | Without development case | | With development case | |
|---|---|---|---|---|
| | Fuel consumption (Litres/lifetime) | Emissions ($ktCO_2e$) | Fuel consumption (Litres/lifetime) | Emissions ($ktCO_2e$) |
| EXC | 564,696 | 1.5 | 847,044 | 2.5 |
| Crusher | 8,30,676 | 5.0 | 11,86,680 | 8.3 |
| Crusher | 6,87,456 | 2.2 | 9,82,080 | 3.9 |
| Crusher | 8,59,320 | 1.8 | 12,27,600 | 2.6 |
| Crusher | 5,72,880 | 2.3 | 8,18,400 | 3.2 |
| Screen | 5,72,880 | 1.5 | 8,18,400 | 1.8 |
| Screen | 16,04,064 | 1.5 | 22,91,520 | 2.4 |
| Stacker Belt | 15,46,776 | 4.3 | 22,09,680 | 0.5 |
| Tractor | 6,58,812 | 4.1 | 9,41,160 | 1.1 |
| Telehandler | 21,76,944 | 1.8 | 31,09,920 | 1.1 |
| MiniDigger | 10,31,184 | 5.8 | 14,73,120 | 0.5 |
| **TOTAL** | **14,035,560** | **37** | **20,050,800** | **53** |

**Non-road Mobile Machinery (NRMM)**

14.7.8 As above in relation to mobile vehicles/machinery, GHG emissions from NRMM used in the operational phase of the Development were calculated by first considering the fuel consumption of each NRMM expected to be in use during the operation of the quarry. Emissions for water consumption are covered under NRMM which comprises of pumps.

14.7.9 The fuel consumption of NRMM for the 'Without development' and 'With development' case and the associated GHG emissions are reported within **Table 14-11**.

**Table 14-11 – NRMM GHG emissions**

| NRMM | Without development case | | With development case | |
|---|---|---|---|---|
| | Fuel consumption (Litres/lifetime) | Emissions ($ktCO_2e$) | Fuel consumption (Litres/lifetime) | Emissions ($ktCO_2e$) |
| **Pump** | 1,718,640 | 4.6 | 2,455,200 | 6.5 |
| **Pump** | 572,880 | 1.5 | 818,400 | 2.2 |
| **TOTAL** | **2,291,520** | **5** | **3,273,600** | **8** |

**Rail freight**

14.7.10 The total distance of which limestone has been transported via rail has been provided and was used in this assessment. The total amount of limestone extracted and transported via rail was then multiplied by the total distance of which it was transported and finally multiplied by the appropriate UK government emission factor.

14.7.11 One key assumption impacting transport emissions is that 80% of the total limestone exported will be via road transport. The remaining 20% is assumed to be transported via rail freight.

14.7.12 These calculations and associated GHG emissions are reported in **Table 14-12** overleaf.

**Table 14-12 – Rail freight GHG emissions**

| Year | Total distance travelled (km per annum) | 'Without Development' case | | | 'With Development' case | | |
|---|---|---|---|---|---|---|---|
| | | Total limestone transported (tonnes) | Tonne.km | Emissions ($ktCO_2e$) | Total limestone transported (tonnes) | Tonne.km | Emissions ($ktCO_2e$) |
| 2024 | | 10,85,800 | 143,357,088,200 | 3,988 | 10,85,800 | 143,357,088,200 | |
| 2025 | 132,029 | 10,85,800 | 143,357,088,200 | 3,988 | 10,85,800 | 143,357,088,200 | 3,988 |
| 2026 | 132,029 | 10,85,800 | 143,357,088,200 | 3,988 | 10,85,800 | 143,357,088,200 | 3,988 |
| 2027 | 132,029 | 10,85,800 | 143,357,088,200 | 3,988 | 10,85,800 | 143,357,088,200 | 3,988 |
| 2028 | 132,029 | 10,85,800 | 143,357,088,200 | 3,988 | 10,85,800 | 143,357,088,200 | 3,988 |
| 2029 | 132,029 | 10,85,800 | 143,357,088,200 | 3,988 | 10,85,800 | 143,357,088,200 | 3,988 |
| 2030 | 132,029 | 10,85,800 | 143,357,088,200 | 3,988 | 10,85,800 | 143,357,088,200 | 3,988 |
| 2031 | 132,029 | 0 | **0** | 0 | 10,85,800 | 143,357,088,200 | 3,988 |
| 2032 | 132,029 | 0 | 0 | 0 | 10,85,800 | 143,357,088,200 | 3,988 |
| 2033 | 132,029 | 0 | 0 | 0 | 10,85,800 | 143,357,088,200 | 3,988 |
| **TOTAL** | **1,188,261** | **6,514,800** | | **23,929** | **9,772,200** | | **35,894** |

### Road transport

14.7.13 The total distance for which limestone has been transported via road has been provided and was used in this assessment. An annual export rate of 2mt of limestone was used to calculate the total number of trips required for the road. The assessment has considered operational period of 7 years without development and 10 years with development.

14.7.14 The assessment considered some key assumptions to ensure the inclusion of all associated factors in the emission calculations. These assumptions are based on client interactions and are listed below:

- The same number of vehicles has been assumed per each phase of works. The data provided for operational activities was limited to a list of vehicles.
- All vehicles have been assumed to operate for the full amount reported for the weekly operating schedule. This provides a worse case, conservative assessment of the transport emissions.
- An assumption has been made that 80% of the aggregate produced at the quarry will be transported via road.
- The emission factor taken for all non-mobile and mobile machinery/vehicles at the quarry reflects 100% diesel fuel.
- The average distance travelled of each HGV load that is expected to deliver aggregate from the quarry has been assumed to be 50 miles.

14.7.15 These calculations and associated GHG emissions are reported in **Table 14-13** below.

**Table 14-13: Road transport GHG emissions**

| Assessment case | Total no. of trips made per year | No. of operational years | Emission ($ktCO_2e$) |
|---|---|---|---|
| Without Development | 6 | 7 | 42 |
| With Development | 9 | 10 | 60 |

## SUMMARY

14.7.16 A summary of the results for the complete GHG assessment of the Proposed Scheme is reported below in **Table 14-14**. The overall impact of the Proposed Scheme is concluded by calculating the net change in GHG emissions, whereby the GHG emissions calculated for the 'With development' case are reviewed relative to the GHG emissions calculated for the 'Without development' case.

**Table 14-14 – GHG emissions during the Proposed Scheme lifecycle of the 'With Development' and 'Without Development' case.**

| Stage of the Proposed Scheme | Main Stage of Proposed Scheme life cycle | 'Without Development' case emissions ($ktCO_2e$) | 'With Development' case emissions ($ktCO_2e$) |
|---|---|---|---|
| **Operation** | A1-A2-A3 – Raw materials supply, transport and manufacture | 900 | 1,620 |

| Stage of the Proposed Scheme | Main Stage of Proposed Scheme life cycle | 'Without Development' case emissions ($ktCO_2e$) | 'With Development' case emissions ($ktCO_2e$) |
|---|---|---|---|
| **Operation** | B8 – Other operational processes | 20,051 | 36,003 |
| **TOTAL** | | **20,951** | **37,623** |
| **Net change in GHG emissions resulting from the Proposed Scheme** | | **16,673 kt $CO_2e$** | |

14.7.17 As outlined in **Table 14-14** the total GHG emissions over the life cycle of the Proposed Scheme is estimated at 37,623 $ktCO_2e$.

14.7.18 Relative to the 'Without Development' case, the Proposed Scheme is estimated to result in a net increase in GHG emissions equivalent to **16,673 $ktCO_2e$**.

**Contextualisation against relevant UK carbon budgets**

14.7.19 To determine the significance of the Proposed Scheme's contribution to the UK GHG emissions, the net GHG emissions calculated are contextualised against the carbon budgets set out in **Table 14-2**. **Table 14-15** below reports the net $ktCO_2e$ GHG emissions associated with the embodied carbon assessment (Stage A1-A2-A3) and the transport assessment (Stage B8) during each of the legislated carbon budget period.

14.7.20 Net $ktCO_2e$ GHG emissions were calculated by first deducing the contributions from each stage for the 'With Development' case and the 'Without Development' case separately. The contributions from the 'Without Development' case were then subtracted from the 'With Development' case contributions.

**Table 14-15 – GHG emissions contextualised against relevant UK carbon budgets**

| Stage of the Proposed Scheme | | |
|---|---|---|
| | 5th Budget 2028 - 2032 | 6th Budget 2033 - 2037 |
| Total UK carbon budget ($ktCO_2e$) | 1,725,000 | 965,000 |
| CCC sector allocation ($ktCO_2e$) | 415,993 | 506,263 |
| **Operation – A1-A2-A3 ($ktCO_2e$)** | 540 | 180 |
| **Operation – B8 ($ktCO_2e$)** | 11,965 | 3,988 |
| **Total ($ktCO_2e$)** | **12,505** | **4,168** |
| **Total % of UK carbon budget** | **0.72%** | **0.43%** |
| **Total % of CCC sector allocation** | **3.01%** | **0.82%** |

CCC = Convention on Climate Change

14.7.21 Net Proposed Scheme GHG emissions were found to contribute 0.72% towards the 5th Carbon Budget, and 0.43% towards the 6th Carbon Budget.

14.7.22 Results are not reported for the 4th Carbon Budget. This is since there is no net change in GHG emissions when comparing the 'With Development' case with the 'Without Development' case. This is explained through understanding that during the time period of the 4th Carbon Budget, the 'With development' case consists of the same operational activities as the 'Without Development' case.

## 14.8 CUMULATIVE EFFECTS

14.8.1 According to the West of England Local Aggregates Assessment 2012-2021, South Gloucestershire has three operational quarries, including Tytherington Quarry. Since all three quarries are already active, the Proposed Scheme is not expected to significantly increase emissions from vehicle movements. Additionally, as the anticipated additional vehicle activity over the three years of extended activity (if the Proposed Scheme is approved) is unlikely to substantially increase current emissions, the cumulative effects on the environment are unlikely.

## 14.9 SUMMARY

14.9.1 The contributions of GHG emissions from the Proposed Scheme has been established and equates to up to 1% of each of the UK's carbon budget sector allocation. Although the percentage is low in a national context, the magnitude of GHG emissions increase due to the Proposed Scheme is high.

14.9.2 The GHG emissions will have an adverse impact on the climate and slow progress towards net zero as required by the Climate Act. Therefore, in accordance with IEMA guidance14, this effect is considered to be **moderate (adverse), i.e. significant**. However, it is concluded that these contributions will not materially impact on achieving carbon reduction targets as set out by the UK Government.

14.9.3 Although the Proposed Scheme is considered to have a moderate adverse effect on the climate, the majority of GHG emissions will result indirectly from the transportation of quarried material across Gloucestershire and Cheltenham by HGVs and predominantly by rail, these emissions being beyond the control of the Proposed Scheme.

**Table 14-16 - Summary of significance of effects**

| Description of Effects | Receptor | Significance and Nature of Effects Prior to Secondary Mitigation | Summary of Secondary Mitigation | Significance and Nature of Residual Effects |
|---|---|---|---|---|
| **Operational Phase** | | | | |
| A1-A2-A3: GHG emissions associated with the material extracted at the quarry | Global climate | Moderate Adverse (Significant) LT | N/A | Moderate Adverse (Significant) LT |
| | Global climate | Moderate Adverse | N/A | Moderate Adverse (Significant) LT |

| Description of Effects | Receptor | Significance and Nature of Effects Prior to Secondary Mitigation | Summary of Secondary Mitigation | Significance and Nature of Residual Effects |
|---|---|---|---|---|
| | | (Significant) LT | | |

Key to table:
+ / - = Beneficial or Adverse P / T = Permanent or Temporary, D / I = Direct or Indirect, ST / MT / LT = Short Term, Medium Term or Long Term, N/A = Not Applicable

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