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HJ BANKS AND COMPANY LIMITED

Highthorn Surface Mine Proposal

Greenhouse Gas Emissions

March 2017

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Wardell Armstrong LLP
City Quadrant, 11 Waterloo Square, Newcastle upon Tyne, NE1 4DP, United Kingdom
Telephone: +44 (0)191 232 0943 Facsimile: +44 (0)191 261 1572 www.wardell-armstrong.com

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March 2017

PREPARED BY:

Ishita Shah	Senior Environmental Scientist	
Sam Thistlethwaite	Associate Director	

APPROVED BY:

Dave Brignall	Regional Director	

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1 INTRODUCTION

1.1.1 Wardell Armstrong LLP (WA) have been commissioned by HJ Banks and Company Limited (Part of the Banks Group) to provide an estimation of the total Green House Gas (GHG) emissions associated with the proposed Highthorn surface mine proposal, Widdrington, Northumberland.

1.1.2 GHG calculations are not a mandatory requirement for this project under English planning law, nor has a request to produce this assessment been made by Northumberland County Council, Department for Communities and Local Government or the Planning Inspectorate. This assessment has been voluntarily produced to provide a detailed calculation of the anticipated GHG emissions that will be attributable to the development of the Highthorn surface mine proposal (referred to as 'Highthorn' throughout the remainder of this report).

1.1.3 This assessment defines an estimate of the level of GHGs emitted by both the site operations and by the subsequent use of the extracted coal (including its transportation to end users). The assessment provides an overview of the estimated GHG emissions associated with the proposed development within the context of total UK and European GHG emissions.

1.2 Project Background

1.2.1 The Highthorn planning application seeks planning permission for the extraction of approximately 3 million tonnes of coal and other minerals over a five-year period. The overall life of the mine is seven years including site preparation and restoration workings which will occur in years 1 and 7 respectively.

1.2.2 A planning application for Highthorn was submitted to Northumberland County Council (NCC) in October 2016 and was subsequently recommended for approval at Planning Committee in July 2016. Following the resolution to grant by the planning committee the application was referred to the Department for Communities and Local Government (DCLG) and was subsequently "called in" by the Secretary of State (SofS) in September 2016.

1.2.3 In the letter that informed both NCC and HJ Banks and Co Ltd of the decision to "call in" the application seven matters were outlined which the SofS particularly wished to be informed about. Of the seven outlined matters, the following are deemed to be the most relevant to this GHG assessment:

i) the extent to which the proposed development is consistent with Government policies for meeting the challenge of climate change (NPPF Chapter 10); and

iii) the extent to which the proposed development is consistent with Governments policies relating to the sustainable extraction of minerals (NPPF Chapter 13).

2 METHODOLOGY

2.1.1 The predicted GHG emissions for the proposal at Highthorn have been calculated in accordance with the following established guidelines and methodologies:

- World Business Council for Sustainable Development (WBCSD) and the World Resource Institute (WRI) 'Greenhouse Gas Protocol' (2013). A Corporate Accounting and Reporting Standard[1]';
- Department for Environment Food and Rural Affairs' (DEFRA) 'Guidance on how to measure and report your greenhouse gas emissions' September 2009;
- DEFRA's 'Environmental Reporting Guidelines: Including mandatory greenhouse gas emissions reporting guidance' June 2013; and
- Intergovernmental Panel on Climate Change (IPCC) Guidelines for National GHG Inventories from 1996 and 2006, as well as Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories from 2000.

2.1.2 The GHG emissions controlled or influenced by the proposed development (Highthorn surface mine proposal) along with its associated infrastructure have been considered. The direct and indirect greenhouse gas emissions associated with the mine site have been identified and classified into the following two scopes (known as Scopes):

- **Direct GHG emissions (also termed as "Scope 1 emissions"):** Direct GHG emissions include emissions that occur from sources that are owned or controlled by the company, for example, emissions from company owned or controlled boilers, furnaces, vehicles and emissions from production in owned or controlled process equipment. For Highthorn, the following direct emissions have been considered:
  - Emissions from onsite power generation (e.g. diesel generators);
  - Emissions from plant equipment and machinery;

[1] WBCSD and WRI (2004) *GHG Protocol: Corporate Accounting and Reporting Standard 2004.* Available from the URL: http://www.wri.org/sites/default/files/pdf/measuring-to-manage.pdf *(accessed April 2016)*

- Emissions from use of explosives; and
- Fugitive emissions from coal mining and handling.

- **Indirect GHG emissions (also termed as "Scope 2 emissions"):** Indirect GHG emissions accounts for GHG emissions from the generation of purchased electricity consumed by the company. Purchased electricity is defined as electricity that is purchased or otherwise brought into the organisational boundary of the company. For Highthorn, it is anticipated that there will be a connection to the local electricity grid which will supply power to the offices and other administrative buildings on site.

2.1.3 In addition, the GHG emissions that are not directly controlled by the project, but that occur in the value chain, including both upstream and downstream emissions have also been considered. These emissions are termed as Scope 3 emissions.

2.1.4 The DEFRA's 'Guidance on how to measure and report your greenhouse gas emissions' (Sep 2009) intends to support UK organisations by explaining how to measure GHG emissions and set targets to reduce them. This guidance states that reporting of Scope 3 emissions is discretionary as these emissions are a consequence of the activities of the company, but occur from sources not owned or controlled by the company. Further, these emissions are not included in the calculation of intensity ratios. i.e. the total GHG emission per unit of coal produced.

- **Emissions not controlled by the Company (also termed as "Scope 3 emissions"):** For the proposed development, the following Scope 3 emissions have been considered:

  Upstream Emissions

  - Emissions from transportation of raw materials to the site;
  - Emissions from employee commuting to and from the site;

  Downstream Emissions

  - Emissions due to the disposal of wastes arising from the site;
  - Emissions from transportation of the coal and by-products (fireclay and sandstone); and
  - Emissions that occur from the use of the coal extracted from the site.

2.1.5 A detailed description of the direct and indirect (Scope 1 and Scope 2) emission sources is provided in Appendix 1.

Reporting period

2.1.6 In accordance with DEFRA's Guidance, the reporting period has been identified as the company's financial year, which is a 12-month period from October to September.

2.2 Calculation Approach

2.2.1 The GHG inventory for the project is based on the methodology detailed in the WBCSD and WRI GHG protocol and DEFRA's guidance. A bespoke spreadsheet model was developed for Highthorn considering the activities associated with the proposed development which will lead to GHG emissions. The GHG emissions have been estimated using the activity data, i.e. information relating to combustion and other processes such as units of electricity consumed or fuel used for plant machinery and the emission factors provided by DEFRA/Department of Energy and Climate Change (DECC)[2] for each activity.

GHG emissions = Activity Data X Emission Factor

2.2.2 There are several greenhouse gases including carbon dioxide (CO_2), methane (CH_4) and nitrous oxide (N_2O), however, it is standard practice to report GHG emissions in tonnes of CO_2 equivalents (CO_2e)[3]. This approach accounts for the varying global warming potential of different greenhouse gases, which is a measure of the amount of infrared radiation captured by a gas in comparison to an equivalent mass of CO_2 over a fixed lifetime.

2.3 Activity Data

2.3.1 HJ Banks and Co Ltd has been collecting data regarding its GHG emissions since 2014. The current reporting covers emissions across all sectors of the group, including its mining and renewable energy businesses. As part of this reporting, the company has been collating information on its emission related activities such as total fuel usage and electricity used. The company currently records its emissions for the following three surface coal mining operations:

- Brenkley Lane – 3 million tonne coal surface mine located in south east Northumberland
- Shotton – 6 million tonnes coal surface mine located in south east Northumberland

[2] Available at 'https://www.gov.uk/government/collections/government-conversion-factors-for-company-reporting'
[3] A universal unit of measurement used to indicate the global warming potential of a greenhouse gas, expressed in terms of the global warming potential of one unit of carbon dioxide

- Rusha – 1.3 million tonne coal surface mine located in West Lothian, Scotland

2.3.2 Out of these three sites, the operations at Brenkley Lane are of a similar scale to the activity proposed for Highthorn due to the comparable volumes of coal and overburden to be extracted.

2.3.3 Since the proposed development is at planning stage and is not operational, some assumptions have been made based on the data available for the similar operations at Brenkley Lane where it has been appropriate to do so. Where corresponding information is not available for similar operations or where that data is deemed not to be representative, reasonable assumptions have been made to estimate the GHG emissions (for example in respect of the quantity of explosives to be used or in relation to fuel consumption for plant equipment and machinery). An overview of the assumptions made in the preparation of the GHG assessment are outlined in Table 1. A detailed description of the assumptions has been provided in Appendix 3.

Table 1 : Assumptions for emission related activities

	Emission related activity	Assumptions
SCOPE 1 – DIRECT EMISSIONS		
a1	Onsite power generation	The quantity of fuel has been estimated using the annual fuel consumption data available for onsite power generation at Brenkley Lane site for 2014-2016. The resultant average annual fuel consumption figure derived from the Brenkley Lane data has been used for the Highthorn calculation. (Refer Table A3.1, Appendix 3)
a2	Plant equipment and machinery	An inventory of the plant compliment and the likely hours of operation for Highthorn was defined by the mining engineers based on their experience with similar projects. The fuel consumption data was estimated using the manufacturer's rating for each equipment and the likely hours of operation. The manufacturer's data has been validated against the primary data available for Banks Mining's existing fleet. (Refer Table A3.2 -A3.3, Appendix 3)
a3	Use of explosives	The quantities of explosives for Highthorn have been estimated based on operator's experience with similar projects. (Refer Table A3.4, Appendix 3)
a4	Fugitive emissions from coal mining and handling	The fugitive emissions associated with coal mining include: • Methane and CO_2 emitted during mining from breakage of the coal and associated strata and leakage from the pit floor and highwall; • Post mining seam gas emissions which includes emissions of methane and CO_2 emitted after coal has been mined, processed, stored and transported. The GHG emissions for this category have been estimated based on the total tonnes of coal being produced using standard emission factors provided for coal mining and handling[4].

[4] Standard factors as reported in UK's National Atmospheric Emissions Inventory and as used by UK government for its national GHG inventory

Table 1 : Assumptions for emission related activities		
	Emission related activity	**Assumptions**
SCOPE 2 – INDIRECT EMISSIONS		
b1	Electricity used	GHG emissions have been calculated based on the total units of electricity consumed. This has been estimated using the electricity bills for Brenkley Lane (averaged over three years). Standard emission factors provided in the UK database have been used. (Refer Table A3.5, Appendix 3)
SCOPE 3 - EMISSIONS NOT CONTROLLED BY THE COMPANY		
Upstream Emissions		
c1	Transportation of raw materials	The emissions from transportation of raw materials has been estimated based on the total quantity of material to be transported over the total distance. *Fuel(Diesel)*- Quantity of fuel has been estimated by considering the total volume of fuel required for onsite energy generation and for plant equipment and machinery. It has been assumed that the same supplier as for existing sites, will be used for Highthorn to estimate the distance to be travelled from supplier's site to Highthorn. It has been assumed that the total distance to be travelled for each journey would be approximately 150km (return trip). *Aggregates* – The quantity of aggregates to be used on site (e.g. for the construction of hardstanding areas within the compound) has been assumed to be the same as for Brenkley Lane. It has also been assumed that the same supplier will provide the aggregates for Highthorn. Total distance assumed to be 100km for each delivery (return trip). (Refer Table A3.6, Appendix 3) *Explosives* – The quantity of explosives to be used on site has been predicted based on operator's experience and the same supplier has been assumed as for Brenkley Lane. Total distance assumed to be 400km.
c2	Employee Commuting	Total distance covered by employees commuting from home-Highthorn-home has been estimated based on the following assumptions *Highthorn Staff* Recent travel survey for Banks Mining's staff at Shotton, Brenkley Lane and Rusha sites indicated the following: • 73% - Car Users • 24% - Car sharers • 3% - Cycle/motorbike Considering similar setup for Highthorn staff, for a total staff of 150 for the site there would be: • 110 car users • 36 employees carpooling (assumed 2 people share a car) • 4 cycle/motorcycle users Based on the numbers above the total number of car trips would be 110+(36/2), i.e. 128 trips each way and the total number of trips - 128*2 trips, i.e. 256 trips. It was assumed that 50% of the staff would live within 20 miles (approx. 32 km) and the rest within 40 miles (approx. 64km) of the site. The total distance travelled by the employees to commute to work was estimated considering 270 working days (excluding Sundays, bank holidays and annual holidays).

Table 1 : Assumptions for emission related activities		
	Emission related activity	**Assumptions**
		Staff from other Offices Based on a review of the existing operations at Brenkley Lane, it has been assumed that 2 staff members from the Lab would travel together to the site from Thrislington Industrial Estate in Durham 5 days in a week (approximately 68 miles'or 109km) roundtrip) and there would be two trips for staff from head office (Meadowfield Durham) in a week (approximately 60 miles' or 96km roundtrip). The total distance covered for such trips has been assumed to be 460 miles per week (approximately 740km).
Downstream Emissions		
c3	Waste Disposal	It has been assumed that a total of 50 tonnes of waste oil would be generated each year and 5 tonnes of industrial waste would be generated due to the mining operations.
c4	Transportation and distribution	**Coal** The following assumptions have been made for the transportation of coal: By road - The coal from the Highthorn SCM would be taken to one of the two rail loading facilities, either the Port of Blyth or the Butterwell Disposal Point. For the purposes of this assessment, it has been assumed that all the coal would be transported to the farthest port, i.e. Port of Blyth. As per the Transport Assessment, the identified haulage route to Port of Blyth is approximately 16 miles or 26 km (50 km round-trip distance). Further, it was assumed that 95% of the coal would be transported in articulated HGVs and 5% in rigid HGVs. (assumed distance - 50km) By rail - The coal from Banks Mining's existing sites at Brenkley Lane and Shotton is supplied to several of the UK's coal fired power stations. As part of the first auction in early 2015, 8.9GW of electricity capacity was awarded to several of the UK's coal fired power stations including Cottam, Ratcliffe on Soar, Drax and West Burton, which ensures that these power stations will remain active for a minimum of least three years beyond 2018. It is assumed that the coal from Highthorn can be supplied to all these sites and an average rail distance of 250km has been considered for the estimation of the GHG emissions. (assumed distance - 250km) **Sandstone** Assumed that all sandstone produced from Highthorn will be supplied to Newcastle as for existing sites (assumed distance - 40km) **Fireclay** Assumed that all fireclay will be supplied to Throckley Brickworks as for existing sites. (assumed distance - 50km)

Table 1 : Assumptions for emission related activities		
	Emission related activity	**Assumptions**
c5	Coal End use	For the purposes of the estimation of GHG emissions associated with Highthorn, the following assumptions have been made: • 65% of the coal produced will be used for electricity generation • 5% of the coal will be used for domestic heating • 30% of the coal will be used for industrial purposes The above assumptions are based on HJ Banks and Co Ltd's own estimation of the likely markets that will be available for the Highthorn coal. At this stage the anticipated quality of the coal has been established through the detailed geological assessment of the site.

2.4 Emission Factors

2.4.1 The DEFRA/Department of Energy and Climate Change (DECC) GHG conversion factors for UK emissions have been considered for the estimation of GHG emissions. Where an emission factor was not available in the DEFRA/DECC database, in accordance with DEFRA guidance, appropriate emission factors from other government sources and global emission factors provided by IPCC have been adopted. A summary of the emission factors used for the calculations are outlined in Table 2.

Table 2: Emission Factors				
	Emission related activity	**Emission Factor**	**Unit**	**Source of Information**
SCOPE 1 – DIRECT EMISSIONS				
a1	Fuel usage for onsite power generation	2.612	kg of CO_2e/litre of diesel	2016 Defra / DECC GHG conversion factors for UK emissions
a2	Fuel usage for plant equipment and machinery	2.612	kg of CO_2e/litre of diesel	2016 Defra / DECC GHG conversion factors for UK emissions
a3	Use of explosives – ANFO	189.0	kg of CO_2e/tonne of ANFO	http://publications.gc.ca/collections/Collection/En49-2-9-2E.pdf
	Use of explosives – Emulsion	170.0	kg of CO_2e /tonne of Emulsion	http://publications.gc.ca/collections/Collection/En49-2-9-2E.pdf
a4	Fugitive emissions	8.5[5]	kg of CO_2e/tonne of coal produced	UK's National Atmospheric Emissions Inventory (http://naei.defra.gov.uk/data/ef-all-results?q=97442) and UK

[5] The National Atmospheric Emissions Inventory provides an emission factor of 0.34kg per tonnes of coal produced for fugitive emissions from coal mining and handling. The CO_2e factors have been derived by using the Global Warming Potential of 25 for methane.

Table 2: Emission Factors					
	Emission related activity		**Emission Factor**	**Unit**	**Source of Information**
					Greenhouse Gas Inventory, 1990 to 2014 report available at https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/573172/UKnationalinventoryreport1990-2014.pdf
SCOPE 2 – INDIRECT EMISSIONS					
b1	Electricity used		0.4121	kg of CO_2e/kWh of electricity purchased	2016 Defra / DECC GHG conversion factors for UK emissions
SCOPE 3 - EMISSIONS NOT CONTROLLED BY THE COMPANY					
Upstream Emissions					
c1	Transportation of raw materials		0.13572[6]	kg of CO_2e/ tonnes.km	2016 Defra / DECC GHG conversion factors for UK emissions[7]
c2	Employee Commuting		0.187	kg of CO_2e /km	2016 Defra / DECC GHG conversion factors for UK emissions
Downstream Emissions					
c3	Waste Disposal	Waste oil	21.0	kg of CO_2e/tonne of waste disposed	2016 Defra / DECC GHG conversion factors for UK emissions
		Industrial waste	21.0		
c4	Transportation and distribution	Coal (by road) – Articulated HGVs	0.08672[8]	kg of CO_2e/ tonnes.km	2016 Defra / DECC GHG conversion factors for UK emissions
		Coal (by road) – Rigid HGVs	0.20916[8]		
		Coal – Rail	0.0295		
		Sandstone	0.1143[6]		
		Fireclay	0.1143[6]		
c5	Coal End use	Electricity generation	2258.495	kg of CO_2e /tonne	2016 Defra / DECC GHG conversion factors for UK emissions
		Domestic	2856.702		
		Industrial	2417.464		

2.5 Exclusions

2.5.1 The estimation of GHG emissions for the proposed development do not consider emissions or sequestration arising from land use change that results from the restoration of the site. The restoration proposals for Highthorn include significant

[6] Emission factor for 'All HGVs' for average laden conditions used
[7] Emission factor for 50% laden conditions used for return trips as it is expected that the heavy goods vehicles would be 100% laden when travelling from supplier's stock location to site and would return empty on the way back
[8] Emission factor for average laden conditions used

increases in areas of tree and hedgerow planting alongside the removal of areas from agricultural production. Once established the restored operations will emit less GHG per hectare compared to the site in its current condition. These emissions are however anticipated to be negligible and are unlikely to impact the Scope 1 and Scope 2 GHG emissions associated with the proposed development in a material way.

3 GHG EMISSIONS FOR THE PROPOSED DEVELOPMENT

3.1.1 The summary of the Scope 1, Scope 2 and Scope 3 emissions for the proposed development has been provided in Table 3.

Table 3 : GHG emissions for the proposed development (tCO_2e/Year)[9]								
Emission Source		**Year 1**	**Year 2**	**Year 3**	**Year 4**	**Year 5**	**Year 6**	**Year 7**
Scope 1 Emissions								
a1.	Stationary Combustion (Onsite power generation)	30.03	30.03	30.03	30.03	30.03	30.03	30.03
a2.	Mobile Combustion (plant Equipment and machinery)	4,091.46	24,923.41	24,704.80	24,340.77	24,140.57	13,532.20	2,187.19
a3	Explosives	-	96.20	96.20	96.20	96.20	96.20	-
a4.	Fugitive Emissions	-	5,194.45	5,666.67	5,666.67	5,666.67	3,305.56	-
	Total Scope 1 Emissions	***4,121.50***	***30,244.10***	***30,497.70***	***30,133.67***	***29,933.47***	***16,963.39***	***2,217.22***
Scope 2 Emissions								
b1.	Electricity Purchased from the grid	329.64	329.64	329.64	329.64	329.64	329.64	329.64
	Total Scope 2 Emissions	***329.64***	***329.64***	***329.64***	***329.64***	***329.64***	***329.64***	***329.64***
	Scope 1 and Scope 2 Emissions	***4,451***	***30,574***	***30,827***	***30,463***	***30,263***	***17,294***	***2,547***
Scope 3 Emissions								
Upstream Activities								
c1.	Purchased goods and services	27.22	191.14	189.71	187.33	186.02	116.65	14.77
c2.	Employee Commuting	630.94	630.94	630.94	630.94	630.94	630.94	630.94
c3.	Waste generation	1.16	1.16	1.16	1.16	1.16	1.16	1.16
Downstream Activities								
c4.	Transportation and distribution (road and rail transport of coal and other by-products)	-	7,369.56	8,037.18	8,037.18	8,037.18	4,673.352	-
c5.	Processing of sold products (Coal Combustion)	-	1,427,616.55	1,557,397.62	1,557,397.62	1,557,397.62	908,482.20	-

[9] This table refers to the financial years in accordance with Defra's 'Guidance on how to measure and report your greenhouse gas emissions' September 2009. HJ Banks and Co Ltd financial year runs from September 1st to August 31st.

Table 3 : GHG emissions for the proposed development (tCO_2e/Year)[9]							
Emission Source	**Year 1**	**Year 2**	**Year 3**	**Year 4**	**Year 5**	**Year 6**	**Year 7**
Total Scope 3 Emissions	***659.32***	***1,435,809.36***	***1,566,256.60***	***1,566,254.22***	***1,566,252.91***	***913,904.30***	***646.87***
Scope 1, 2 and 3 Emissions	***5,110***	***1,466,383***	***1,597,084***	***1,596,718***	***1,596,516***	***931,198***	***3,194***

3.2 Scope 1 and Scope 2 Emissions

3.2.1 The direct and indirect GHG emissions associated with the proposed development (Scope 1 and Scope 2 emissions) have been estimated to be 146,419 tonnes of CO_2e for the entire life of the mine (7 years). The GHG emissions for the project peak in Year 2 to Year 6 which is consistent with the peak coal production figures. The combustion of fuels for plant equipment and machinery represents 81% of the total GHG emissions, whereas the fugitive emissions account for 17% of the total emissions. The annual average emissions for the project (Scope 1 and 2) have been estimated to be approximately 20,917 tonnes of CO_2e.

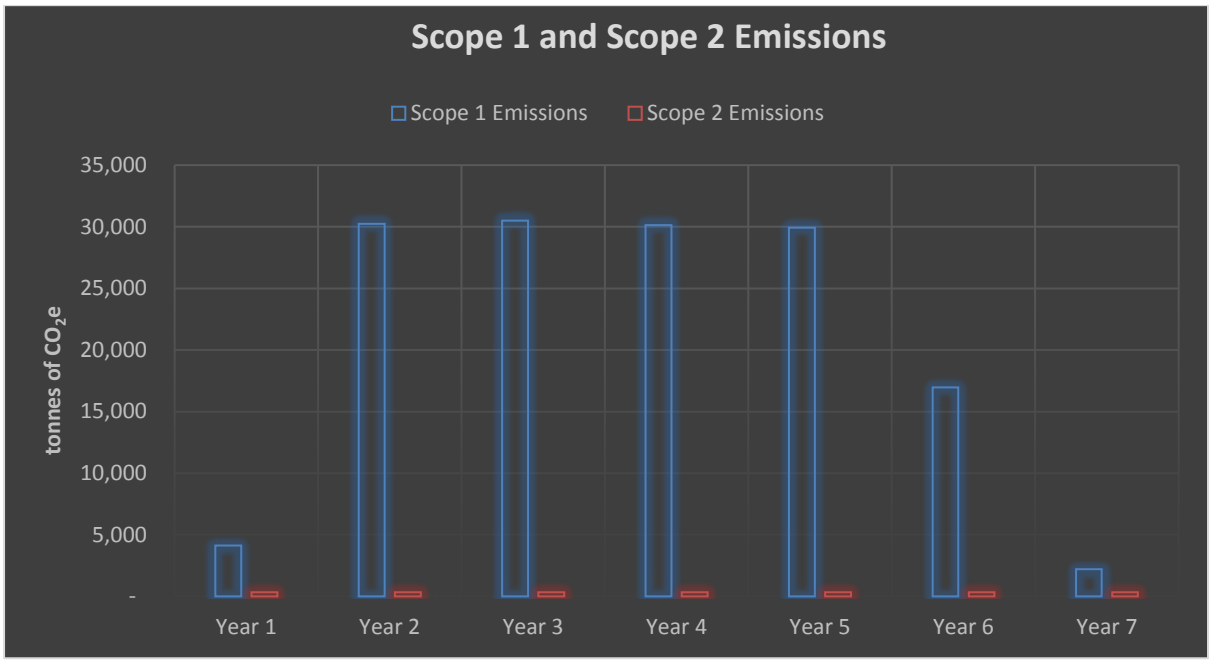

Figure 1: Scope 1 and Scope 2 emissions for the life of Highthorn

3.2.2 The GHG emissions associated with onsite power generation, use of explosives and purchase of electricity constitute a very small fraction of the total Scope 1 and Scope 2 emissions (less than 2% of the total GHG emissions). It is estimated that for every tonne of coal produced from Highthorn, 0.048 tonnes of CO_2e would be released with the intensity ratios estimated to be in the range of 0.044-0.050 tonnes of CO_2e per tonne of coal produced.

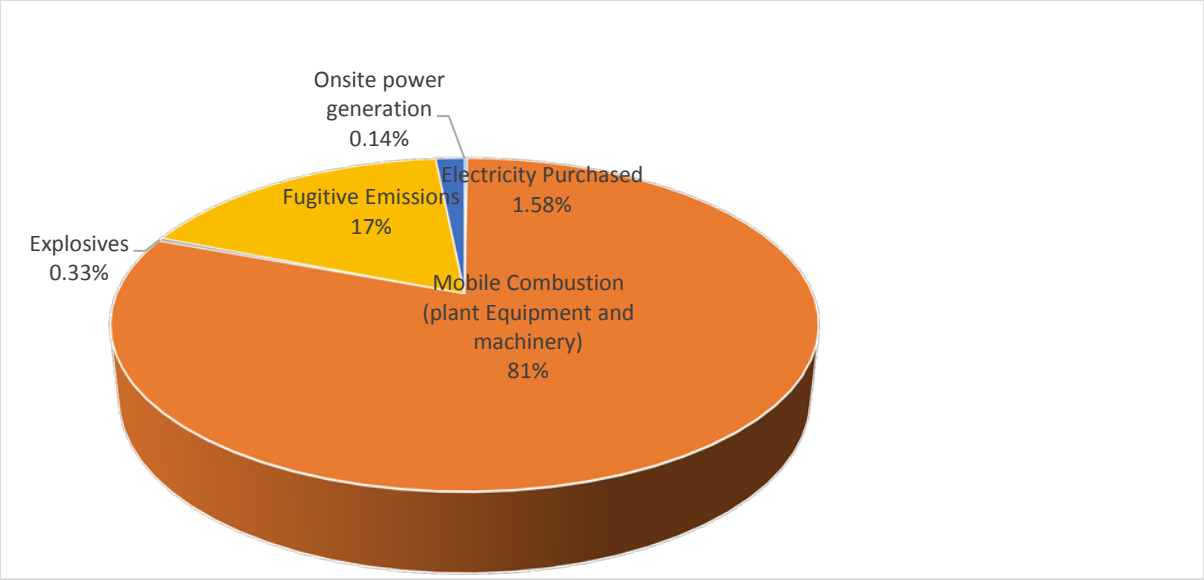

Figure 2 : Percentage breakup of Scope 1 and Scope 2 Emission Sources

3.3 Scope 1, Scope 2 and Scope 3 Emissions

3.3.1 The total GHG emissions for the entire life of the mine have been estimated to be 7.19 million tonnes of CO_2e. This estimate includes emissions associated with the upstream and downstream activities associated with the mine such as transportation of raw materials, transportation of coal and other by-products (sandstone and fireclay), employee commuting, disposal of waste and subsequent combustion of coal for thermal power generation, domestic heating and for industrial uses. The combustion of the coal accounts for 99.4 % of the total Scope 3 emissions.

3.3.2 The Scope 1 and Scope 2 emissions constitute only 2.03% of the total GHG emissions associated with the proposed development (Scope 1, 2 and 3 emissions). Therefore, Scope 3 emissions make up 97.96% of the total predicted GHG emissions from Highthorn.

3.4 Emissions associated with the proposed development (Scope 1 and Scope 2) in context of the total UK and European GHG emissions

3.4.1 The DECC has estimated UK's 2016 GHG emissions to be approximately 483.0 million tonnes of CO2e[10] whereas the European Union (EU-28), in 2015, emitted 3.47 billion

[10] Source – DECC's ' UK Greenhouse Gas Emissions – 1st Quarter 2016 Provisional Figures' published in June 2016. Available at : https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/533689/Quarterly_emissions_statistics_release_Q1_2016.pdf

tonnes of CO_2e[11]. The project's contribution (scope 1 and scope 2 emissions) to the UK's and Europe's total GHG emissions in an average year is estimated to be 0.004%. and 0.0006% respectively.

3.4.2 Even in the year 3 in which the Scope 1 and Scope 2 emissions from the project would be highest, the project's contribution would be to the UK's and Europe's total GHG emissions would be 0.0063% and 0.0008% respectively.

3.4.3 The UK government develops five-yearly carbon budgets, to ensure regular process towards its long-term target of reducing its emissions by at least 80% from 1990 levels by 2050. The fourth carbon budget for the year 2023-2027 is 1950 tonnes of CO_2e or 390 tonnes of CO_2e per year. Considering this, the projects contribution (Scope 1 and Scope 2 emissions) to the UK's total GHG emissions would be 0.005%.

3.5 Emissions associated with the proposed development in context of UK's GHG emissions from production of grid electricity

3.5.1 The Committee on Climate Change, which is a statutory body established under the Climate Change Act 2008 to advise the UK government on emissions targets has published a detailed set of data from the analysis that underpinned its advice for the fifth carbon budget (2015-2035). This dataset provides the following forecast of GHG emissions from various sectors, including generation of grid electricity from conventional and renewable energy sources, for the budget period.

Table 4: GHG emissions from UK's energy supply sector (grid electricity)

Year	2018	2019	2020	2021	2022	2023	2024
Emissions from grid electricity ($MtCO_2e$/yr)(all sources)	94.8	88.0	76.2	72.0	67.3	62.9	58.8
Total Electricity generated from all sources (TWH/yr)	342	340	336	339	338	340	344
Electricity generated from coal without CCS (TWH/yr)	55.6	52.7	43.2	37.0	20.0	17.1	14.7
Electricity generated from coal with CCS (TWH/yr)	0.0	0.0	2.6	2.6	4.8	6.0	6.0

3.5.2 The project's contribution (from 'Scope 1 and 2' and 'Scope 1, 2 and 3') to the UK's GHG emissions from production of grid electricity from different sources for each year is provided in Table 5.

[11] Source - Trends in Global CO_2 Emissions 2016 Report published by PBL Netherlands Environmental Assessment Agency and the European Commission's Joint Research Centre (JRC) available at: http://edgar.jrc.ec.europa.eu/news_docs/jrc-2016-trends-in-global-co2-emissions-2016-report-103425.pdf

Table 5: Project's Contribution to GHG emissions from UK's energy supply sector (grid electricity)							
Year	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**
Contribution from Project's Scope 1 and 2 emissions (%)	0.005	0.035	0.039	0.039	0.045	0.026	0.004
Contribution from Project's Scope 1, 2 and 3 emissions (%)	0.006	1.689	1.996	2.069	2.370	1.409	0.004

3.5.3 The Scope 1 and Scope 2 emissions from Highthorn to the GHG emissions associated with production of electricity in the UK is estimated to be in the range of 0.005-0.045%. If the Scope 3 emissions are also considered, the Highthorn proposal will contribute to a maximum of 2.37% of the UK's GHG emissions from production of electricity.

4 SUMMARY

4.1.1 The GHG emissions for the proposed development have been estimated using established DEFRA guidance and WRI's GHG reporting protocol.

4.1.2 The direct and indirect GHG emissions associated with the proposed development (Scope 1 and Scope 2 emissions) have been estimated to be 146,419 tonnes of CO_2e for the entire life of the mine. The annual average GHG emissions from the proposed development have been estimated to be approximately 20,917 tonnes of CO_2e with an intensity ratio of 0.044-0.05 tonnes of CO_2e per tonne of coal produced.

4.1.3 The majority (97.96%) of the GHG emissions resulting from the proposed development will occur because of the use of the extracted coal. The GHG emissions that result from the use of coal have already been incorporated in current forecasts of the UK GHG emissions due to the planned continued use of coal in the power generating sector for the life of Highthorn.

APPENDIX 1 : COAL PRODUCTION FIGURES

Description	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7
Estimated Coal Production (tonnes)	-	611,111	666,667	666,667	666,667	388,889	-
Estimated sandstone production (tonnes)	-	2,500	2,500	2,500	2,500	-	-
Estimated fireclay production (tonnes)	-	2,500	2,500	2,500	2,500	-	-

APPENDIX 2 : DESCRIPTION OF DIRECT AND INDIRECT EMISSION SOURCES

Scope 1 Emissions

a1. Onsite power generation

Diesel generators would be provided on site to power the lighting sets, the tea cabins and the toilets. The following arrangement is being considered for site

- 1 kVA x 2 diesel generators for tea cabins and toilets at site
- 6kVA x 11 diesel generators for lighting sets

a2. Plant Equipment and Machinery

The proposed plant fleet for Highthorn has been identified based on operator's experience at similar operations.

Table A2.1: Proposed Plant Fleet

Machine Type	Model*	Operations	Number
Large excavator	RH200	Main overburden excavation	2
Large excavator	CAT 6030	Main overburden excavation	3
Large dump truck	CAT 785	Main overburden haul	18
Large bull dozer	CAT D9	Shaping overburden and working within the excavation void	3
Small excavator	CAT 365	Soil removal	2
Small dump truck	Volvo A40F	Coal and soil haul	12
Small bull dozer	CAT D6	Shaping soil mounds	1
Wheeled dozer	CAT 824	Maintenance of excavation area	1
Small excavator	CAT 323	Coal extraction and loading	4
Tractor and water tank	N/A	Dust suppression	1
Water bowser	CAT D400	Dust suppression	1
Large water bowser	CAT 777	Dust suppression	2
Fuel bowser	CAT D400	Refuelling plant	2
Maintenance truck	CAT D400	Lubricating and power washing plant	2
Grader	CAT 16	Maintaining haul roads, excavator areas and overburden tips	2
Four-wheel drive vehicles	Land Rovers	Site supervisors and plant maintenance vehicles	5
Coal processing	Power screen	Crushing and screening within the compound	1
Wheeled loading shovel	CAT 980	Loading coal and other minerals onto HGVs and coal blending and processing	3
Water pumps	Godwins HL160	Dewatering operations	2
Auger	N/A	Coal recovery from high-wall	1

a3. Explosives

Based on the geotechnical investigations at site, it is anticipated that some overburden material may need to be blasted to fracture the rock that lies above the coal so that it is easy to lift with hydraulic excavators.

a4. Fugitive emissions

The fugitive emissions associated with site would include emissions of methane (CH_4) and carbon dioxide (CO_2) due to breakage of the coal and associated strata and leakage from the pit floor and highwall. Fugitive emissions will also include post mining seam gas emissions which includes emissions of methane and CO_2 after the coal has been mined, processed, stored and transported.

Scope 2 Emissions

Electricity from the grid will be used to provide electricity to the office, administrative buildings and the maintenance shed.

APPENDIX 3 : ASSUMPTIONS MADE FOR ESTIMATION OF ACTIVITY DATA

1. Scope 1 Emissions

a1. Onsite power generation

The fuel consumption for onsite power generation has been estimated using the annual fuel consumption data available for Brenkley Lane for 2014-2016. Average annual consumption for Brenkley Lane has been used as an estimate of fuel consumption for Highthorn.

Table A3.1: Fuel Consumption Data for Onsite power generation at Brenkley

Year	Diesel Consumption (litres)
2016	9,100
2015	12,056
2014	13,336
Average	11,497
Rounded figure used	**11,500**

a2. Plant Equipment and Machinery

The fuel consumption data for plant equipment and machinery has been estimated using the manufacturer's rating for each equipment and the likely hours of operation. The manufacturers provide the fuel consumption scenarios for different applications of the equipment. The application determines the engine load factors (LF) which refers to the instantaneous loading of the engine relative to its maximum capability. An engine continuously producing full rated horsepower is operating at a load factor of 100%. Earthmoving machines may reach a 100% load factor intermittently, but seldom operate at this level for extended periods of time. Periods spent at idle, dozer and pusher travel in reverse, haul units traveling empty, close manoeuvring at part throttle and operating downhill are examples of conditions which reduce load factor.

Appropriate application scenarios of the equipment have been considered to identify the fuel consumption rate for the equipment. The manufacturer's data has been validated against the primary data available for Banks Mining's existing fleet.

Make	Model	Description	Fuel Consumption - Litres/hour							Explanatory Notes	Description of Scenario Selected (As defined in Manufacturer's Handbook)	Source of Data
			Low		medium		High		Value used			
Terex	RH 200/CAT 6050	Large excavator	229	275	275	321	321	367	298	Equivalent CAT model (CAT 6050) considered. Medium load factor scenario considered. Values averaged for the range provided.	Continuous loading operations with frequent idling periods. (Applies for the clear majority of applications)	CAT Performance Handbook 45 (Equivalent model of CAT considered) - Pg 25-19
CAT	6030	Large excavator	134	161	161	188	188	215	174.5	Medium LF Scenario. Values averaged for the range provided.		CAT Performance Handbook - 45 - pg 25-19
CAT	785	Large dump truck	53.7	80.6	80.6	107.5	107.5	134.4	94.05	Medium LF Scenario. Tier 1 certified model available with Banks Mining.	Continuous operation at an average gross weight approaching recommended. Minimal overloading, good haul roads, moderate load factor	CAT Performance Handbook - 45 (Pg 25-25)
CAT	D9T	Large bull dozer	30.3	43.1	43.1	56.4	56.4	69.3	49.75	Different models available. Model selected based on existing fleet of Banks Group. Medium LF Scenario considered based on the expected use of the equipment and primary data available for Banks Mining 's existing fleet for the last three years.	Medium Production dozing in clays, sands, gravels. Medium impact conditions.	CAT Performance Handbook - 45 (Pg 25-9)

Make	Model	Description	Fuel Consumption - Litres/hour							Explanatory Notes	Description of Scenario Selected (As defined in Manufacturer's Handbook)	Source of Data
			Low		medium		High		Value used			
CAT	365C	Small Excavator (Tier 3)	15.5	31	31	46.9	46.7	62.8	38.95	Medium Scenario considered. Values averaged for the range provided.	Most residential pipeline and cabling applications. Continuous mass excavation and trenching in natural bed clay soils. Some traveling and steady, full throttle operation.	CAT Performance Handbook - 45 (Pg 25-15)
Volvo	A40F	Small Dump Truck	-	-	-	-	-	-	29.2	--	-	Volvo Construction Equipment - A40F Matris Report - Pg 5
CAT	D6T	Small Bull dozer	15.5	22.3	21.3	28.8	35.6	34	25.05	Medium LF Scenario considered appropriate based on the expected use of the equipment and primary data available for Banks Mining's existing fleet.	Medium Production dozing in clays, sands, gravels. Push loading scrapers, borrow pit ripping, most land clearing applications. Medium impact conditions. Production landfill work.	CAT Performance Handbook - 45 (Pg 25-9)
CAT	824H	Wheel Dozers	28.9	33.8	33.8	45.8	45.8	59.7	31.35	Low LF Scenario considered based on the expected use of the equipment. Values averaged for the range provided.	Light utility and stockpile work. Pulling compactors. Dozing loose fill. Considerable idling or travel with no load and no impact.	CAT Performance Handbook - 43 (Pg 24-25)

Make	Model	Description	Fuel Consumption - Litres/hour							Explanatory Notes	Description of Scenario Selected (As defined in Manufacturer's Handbook)	Source of Data
			Low		medium		High		Value used			
CAT	323D L	Small Excavator	5.8	11.7	11.7	17.5	17.5	23.3	20.4	High LF scenario selected. Values averaged for the range provided.	Continuous trenching or truck loading in rock or shot rock soils. Most pipeline applications in hard rocky material. Large amount of travel over rough ground. Constant high load factor and high impact.	CAT Performance Handbook - 43 (Pg 24-14)
Not defined at this stage. Assumed to be Volvo A35 bowser		Tractor and Water Tank	-	-	-	-	-	-	12.00	Information available from Bank's existing fleet used.--		Primary data collected by Banks for existing fleet
CAT	777	Large water bowser	37.5	56.3	56.3	75	75	93.8	65.65	Two models 777B and 777G - One with higher emissions considered. Medium LF Scenario considered. Values averaged for the range provided.	Continuous operation at an average gross weight approaching recommended. Minimal overloading, good haul roads, moderate load factor.	CAT Performance Handbook - 45 (Pg 25-25)
CAT	d400	Water Bowser	17.6	24.5	25.2	35.4	36.1	52.2	21.05	Low LF Scenario. Values averaged for the range provided.	Low - Large amount of idling. Short to medium hauls on well-maintained level haul roads. Minimum total resistance.	CAT Performance Handbook - Ed 29 (Pg 823)
CAT	d400	Fuel Bowser	17.6	24.5	25.2	35.4	36.1	52.2	21.05			
CAT	d400	Maintenance truck	17.6	24.5	25.2	35.4	36.1	52.2	21.05			

Make	Model	Description	Fuel Consumption - Litres/hour							Explanatory Notes	Description of Scenario Selected (As defined in Manufacturer's Handbook)	Source of Data
			Low		medium		High		Value used			
CAT	16M	Grader	11.9	17.5	17.5	27.9	27.9	46.6	22.7	High LF Scenario. Values average for the range provided.	Haul road maintenance. Average road maintenance, road mix work, scarifying. Road construction, ditching, loose fill spreading. Land forming, land levelling and elevating grader use. Medium to heavy snow removal.	CAT Performance Handbook - 45 (Pg 25-11)
Land Rovers		Four-wheel drive vehicles	-	-	-	-	-	-	11.5 litres/ 100 km	-	-	http://www.landrover.com/vehicles/defender/specifications.html
CAT C4.4-110		Engine for power screen	-	-	-	-	-	-	23.8l/ hr	-	-	Technical data Sheet (CAT)-Diesel Generator Set CAT C4.4-110 (DE110E3)

Make	Model	Description	Fuel Consumption - Litres/hour							Explanatory Notes	Description of Scenario Selected (As defined in Manufacturer's Handbook)	Source of Data
			Low		medium		High		Value used			
CAT	980H	Wheeled loading shovel	15.4	20.7	20.7	26.2	26.2	33.2	29.7	High LF scenario considered appropriate.	Continuous truck loading from stockpile and hopper charging. Loading from bank or load and carry on normal surfaces with low to medium rolling resistance and slight adverse grades. Low to medium density materials in properly sized bucket. Assumes normal travel distances associated with high productivity stockpile load-out and batch plant applications.	CAT Performance Handbook - 45 (Pg 25-37)
Godwins	HL160	Water Pumps	-	-	-	-	-	-	49	-		Primary data collected by Banks for existing fleet
Auger	N/A	Auger	-	-	-	-	-	-	72.45	-	-	Primary data collected by Banks for existing fleet

The fuel consumption for each year of operation has been estimated using the fuel consumption rates and estimated hours of operation.

Table A3.3: Estimated Fuel Consumption

Machine Type	Model*	Fuel Consumption Rate (litres/hr)		Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7
Large excavator	RH200	298	Total Hours	200	4,830	4,860	4,860	4,020	1,360	-
			Estimated Fuel Consumption	59,600	1,439,340	1,448,280	1,448,280	1,197,960	405,280	-
Large excavator	CAT 6030	174.5	Total Hours	1,670	7,320	7,290	7,290	7,290	4,770	-
			Estimated Fuel Consumption	291,415	1,277,340	1,272,105	1,272,105	1,272,105	832,365	-
Large dump truck	CAT 785	120.95	Total Hours	5,820	42,790	41,310	41,310	42,430	22,420	-
			Estimated Fuel Consumption	547,371	4,024,400	3,885,206	3,885,206	3,990,542	2,108,601	-
Large bull dozer	CAT D9	49.75	Total Hours	1,920	7,320	7,290	7,290	7,290	3,170	1,720
			Estimated Fuel Consumption	95,520	364,170	362,678	362,678	362,678	157,708	85,570
Small excavator	CAT 365	38.95	Total Hours	1,160	2,520	1,250	-	-	1,570	860
			Estimated Fuel Consumption	45,182	98,154	48,688	-	-	61,152	33,497
Small dump truck	Volvo A40F	29.2	Total Hours	-	19,120	21,980	19,440	21,780	10,960	-
			Estimated Fuel Consumption	-	558,304	641,816	567,648	635,976	320,032	-
Small bull dozer	CAT D6	25.05	Total Hours	1,160	1,260	660	-	-	900	-
			Estimated Fuel Consumption	29,058	31,563	16,533	-	-	22,545	-

Table A3.3: Estimated Fuel Consumption										
Machine Type	**Model***	**Fuel Consumption Rate (litres/hr)**		**Year 1**	**Year 2**	**Year 3**	**Year 4**	**Year 5**	**Year 6**	**Year 7**
Wheeled dozer	CAT 824	31.35	Total Hours	640	2,440	2,430	2,430	2,430	1,130	-
			Estimated Fuel Consumption	20,064	76,494	76,181	76,181	76,181	35,426	-
Small excavator	CAT 323	20.4	Total Hours	-	8,960	9,720	9,720	9,720	5,440	-
			Estimated Fuel Consumption	-	182,784	198,288	198,288	198,288	110,976	-
Tractor and water tank[12]	N/A	12.00	Total Hours	192	732	729	729	729	549	258
			Estimated Fuel Consumption	691	2,635	2,624	2,624	2,624	1,976	929
Large water bowser	CAT 777	65.65	Total Hours	741	857	850	850	850	-	-
			Estimated Fuel Consumption	48,646	56,248	55,802	55,802	55,802	0	0
Water Bowser	CAT D400	21.05	Total Hours	422	950	943	943	943	687	568
			Estimated Fuel Consumption	8,892	19,989	19,850	19,850	19,850	14,461	11,948
Fuel bowser	CAT D400	21.05	Total Hours	721	3,416	3,402	3,402	3,402	1,932	602
			Estimated Fuel Consumption	47,334	224,260	223,341	223,341	223,341	126,836	39,521
Maintenance truck	CAT D400	21.05	Total Hours	721	3,416	3,402	3,402	3,402	1,932	602
			Estimated Fuel Consumption	15,177	71,907	71,612	71,612	71,612	40,669	12,672

[12] Assumed to be operational for 30% of the total hours

Table A3.3: Estimated Fuel Consumption										
Machine Type	**Model***	**Fuel Consumption Rate (litres/hr)**		**Year 1**	**Year 2**	**Year 3**	**Year 4**	**Year 5**	**Year 6**	**Year 7**
Grader	CAT 16	22.7	Total Hours	1,280	4,880	4,860	4,860	4,860	2,050	860
			Estimated Fuel Consumption	29,056	110,776	110,322	110,322	110,322	46,535	19,522
Four-wheel drive vehicles[13]	Land Rovers	11.5 l/100km	Total Hours	2,560	9,760	9,720	9,720	9,720	6,864	1,376
			Estimated Fuel Consumption	7,581	28,901	28,783	28,783	28,783	20,326	4,075
Coal processing	Power screen	23.8l/hr	Total Hours	-	2,240	2,430	2,430	2,430	1,360	-
			Estimated Fuel Consumption	-	53,312	57,834	57,834	57,834	32,368	-
Wheeled loading shovel	CAT 980	29.7	Total Hours	-	6,720	7,290	7,290	7,290	4,080	-
			Estimated Fuel Consumption	-	199,584	216,513	216,513	216,513	121,176	-
Water Pumps	Godwins HL160	49 l/hr	Total Hours	6,552	13,104	13,104	13,104	13,104	13,104	12,852
			Estimated Fuel Consumption	321,048	642,096	642,096	642,096	642,096	642,096	629,748
Augers	N/A	72.45 l/hr	Total Hours	-	1,118	1,118	1,118	1,118	1,118	0
			Estimated Fuel Consumption	-	80,999	80,999	80,999	80,999	80,999	-
Total Fuel Consumption				**1,566,635**	**9,543,257**	**9,459,550**	**9,320,162**	**9,243,506**	**5,181,525**	**837,482**

[13] Assumed to be operational for 80% of the total hours. Total distance covered estimated using hours of operation and considering travel at maximum speed limit of 20 miles per hour (mph)/32kmph

a3. Quantities of Explosives

The quantities of explosives to be used on site have been estimated based on operator's experience with similar sites.

Table A3.4: Estimated quantities of explosives							
Explosive	**Year 1**	**Year 2**	**Year 3**	**Year 4**	**Year 5**	**Year 6**	**Year 7**
ANFO (tonnes)	0	500	500	500	500	500	0
Emulsion (tonnes)	0	10	10	10	10	10	0

2. Scope 2 Emissions

b1. Purchased electricity

The units of electricity likely to be consumed have been estimated using the electricity bills for Brenkley Lane (averaged over three years).

Table A3.5: Electricity Consumption data for Brenkley Lane	
Year	**Electricity consumption (kWh)**
2016	782,473
2015	766,849
2014	808,993
Average	786,105
Rounded figure used	**800,000**

3. Scope 3 Emissions

c1. Purchased Goods and Services

The transportation of the following materials from supplier's site to Highthorn have been considered:

Diesel - Quantity of fuel has been estimated by considering the total quantity of fuel required for onsite energy generation and for plant equipment and machinery. It has been assumed that the same supplier as for existing sites, will be used for Highthorn to estimate the distance to be travelled from supplier's site to Highthorn. It has been assumed that the total distance to be travelled would be approximately 150km for delivery and return trip.

Aggregates – The quantity of aggregates has been assumed to be the same as for Brenkley Lane and it has been assumed that the same supplier will provide the aggregates for Highthorn. Total distance assumed to be 100km for delivery and return trip.

Table A3.6: Quantity of Aggregates imported for Brenkley Lane	
Year	**Quantity of Aggregates imported (tonnes)**
2016	20 tonnes
2015	20 tonnes
2014	20 tonnes
Average	**20 tonnes**

Explosives – The quantity of explosives to be used on site has been predicted based on operator's experience and the same supplier has been assumed as for Brenkley Lane. Total distance assumed to be 400km for delivery and return trip.

Appendix 4 : Detailed GHG Calculations																	
S.N	Description	Emission Factor (kg of CO_2e per unit)	Unit of Activity Data	Year 1		Year 2		Year 3		Year 4		Year 5		Year 6		Year 7	
				Activity Data	GHG Emissions (kg of CO_2e)	Activity Data	GHG Emissions (kg of CO_2e)	Activity Data	GHG Emissions (kg of CO_2e)	Activity Data	GHG Emissions (kg of CO_2e)	Activity Data	GHG Emissions (kg of CO_2e)	Activity Data	GHG Emissions (kg of CO_2e)	Activity Data	GHG Emissions (kg of CO_2e)
A.	**Scope 1 Emissions (Direct Emissions)**																
a1.	***Onsite Power Generation (Stationary Combustion)***																
a1	Diesel Generators	2.612 per litre	Litres of diesel	11,500	30,034	11,500	30,034	11,500	30,034	11,500	30,034	11,500	30,034	11,500	30,034	11,500	30,034
a2.	***Plant Equipment and Machinery (Mobile Combustion)***																
a2	16H/16M	2.612 per litre	Litres of diesel	29,056	75,883	110,776	289,305	110,322	288,120	110,322	288,120	110,322	288,120	46,535	121,532	19,522	50,984
	CAT 323			-	-	182,784	477,363	198,288	517,854	198,288	517,854	198,288	517,854	110,976	289,828	-	-
	CAT 824C/824H			20,064	52,400	76,494	199,774	76,181	198,955	76,181	198,955	76,181	198,955	35,426	92,518	-	-
	CAT 980H			-	-	199,584	521,239	216,513	565,451	216,513	565,451	216,513	565,451	121,176	316,466	-	-
	CAT D400 Fuel bowser			47,334	123,618	224,260	585,684	223,341	583,284	223,341	583,284	223,341	583,284	126,836	331,248	39,521	103,215
	CAT D400 Maintenance truck			15,177	39,637	71,907	187,794	71,612	187,024	71,612	187,024	71,612	187,024	40,669	106,211	12,672	33,095
	CAT D400 water bowser			8,892	23,221	19,989	52,204	19,850	51,841	19,850	51,841	19,850	51,841	14,461	37,768	11,948	31,204
	CAT D6			29,058	75,889	31,563	82,431	16,533	43,178	-	-	-	-	22,545	58,879	-	-
	CAT365			45,182	117,998	98,154	256,341	48,688	127,154	-	-	-	-	61,152	159,705	33,497	87,482
	CAT777 water bowser			48,647	127,047	56,249	146,901	55,803	145,735	55,803	145,735	55,803	145,735	-	-	-	-
	CAT785			547,371	1,429,528	4,024,400	10,510,223	3,885,206	10,146,701	3,885,206	10,146,701	3,990,542	10,421,799	2,108,601	5,506,876	-	-
	D9R / D9T			95,520	249,462	364,170	951,076	362,678	947,178	362,678	947,178	362,678	947,178	157,708	411,873	85,570	223,477
	Landrovers			7,581	19,798	28,901	75,479	28,783	75,170	28,783	75,170	28,783	75,170	20,326	53,083	4,075	10,641
	Power screen			-	-	53,312	139,231	57,834	151,041	57,834	151,041	57,834	151,041	32,368	84,533	-	-
	RH120E/ CAT 6030			291,415	761,067	1,277,340	3,335,933	1,272,105	3,322,261	1,272,105	3,322,261	1,272,105	3,322,261	832,365	2,173,825	-	-
	RH200			59,600	155,653	1,439,340	3,759,017	1,448,280	3,782,365	1,448,280	3,782,365	1,197,960	3,128,623	405,280	1,058,439	-	-
	Tractor and water tank			691	1,805	2,635	6,882	2,624	6,854	2,624	6,854	2,624	6,854	1,976	5,162	929	2,426
	VOLVO A40E/A40F			-	-	558,304	1,458,081	641,816	1,676,183	567,648	1,482,484	635,976	1,660,931	320,032	835,804	-	-
	Water Pumps			321,048	838,457	642,096	1,676,914	642,096	1,676,914	642,096	1,676,914	642,096	1,676,914	642,096	1,676,914	629,748	1,644,666
	Auger			-	-	80,999	211,539	80,999	211,539	80,999	211,539	80,999	211,539	80,999	211,539	-	-
	Subtotal			**1,566,635**	**4,091,463**	**9,543,257**	**24,923,411**	**9,459,550**	**24,704,800**	**9,320,162**	**24,340,769**	**9,243,506**	**24,140,573**	**5,181,525**	**13,532,202**	**837,482**	**2,187,188**
a3.	***Explosives***																
a3	ANFO	189.0 per tonne	tonnes of ANFO	0	0.00	500	94500	500	94500	500	94500	500	94500	500	94500	0	0
	Emulsion	170.0 per tonne	tonnes of Emulsion	0	0.00	10	1700.00	10	1700.00	10	1700.00	10	1700.00	10	1700.00	0	
	Subtotal				***0.00***		96200.00	510	96200.00	510	96200.00	510	96200.00	510	96200.00	0	0
a4.	***Fugitive emissions***																
a4.	Fugitive Emissions	8.5 per tonne	tonnes of coal	0	0	611,112	5,194,452	666667	5666666.695	666667	5666666.695	666667	5666666.695	388889	3305556.5	0	0
Scope 1 Emissions					**4,121,496**		**30,244,097**		**30,497,700**		**30,133,670**		**29,933,473**		**16,963,992**		**2,217,222**
B. Scope 2 Emissions (Indirect Emissions)																	
b1.	***Energy imported from grid***																

Appendix 4 : Detailed GHG Calculations																	
S.N	Description	Emission Factor (kg of CO_2e per unit)	Unit of Activity Data	Year 1		Year 2		Year 3		Year 4		Year 5		Year 6		Year 7	
				Activity Data	GHG Emissions (kg of CO_2e)	Activity Data	GHG Emissions (kg of CO_2e)	Activity Data	GHG Emissions (kg of CO_2e)	Activity Data	GHG Emissions (kg of CO_2e)	Activity Data	GHG Emissions (kg of CO_2e)	Activity Data	GHG Emissions (kg of CO_2e)	Activity Data	GHG Emissions (kg of CO_2e)
b1	Energy imported from grid	0.4121 per kWh	kWh of electricity	800,000	329,640	800,000	329,640	800,000	329,640	800,000	329,640	800,000	329,640	800,000	329,640	800,000	329,640
Scope 2 Emissions					**329,640**		**329,640**		**329,640**		**329,640**		**329,640**		**329,640**		**329,640**
C. Scope 3 Emissions (Indirect Emissions)																	
Upstream Activities																	
c1	***Purchased goods and Services - Deliveries of Supplies***																
c1	Diesel	0.13572 per tonnes.km	tonnes.km	198,592	26,952.86	1,202,366	163,185.10	1,191,832	161,755	1,174,292	159,375	1,164,645	158,065.66	653,488	88,691.35	106,835	14,499.71
	Aggregates			2,000	271.44	2,000	271.44	2,000	271.44	2,000	271.44	2,000	271.44	2,000	271.44	2,000	271.44
	Explosives			-	-	204,000	27,686.88	204,000	27,686.88	204,000	27,686.88	204,000	27,686.88	204,000	27,687	-	-
	Subtotal				**27,224**		**191,143**		**189,714**		**187,333**		**186,024**		**116,650**		**14,771**
c2	***Employee Commuting***																
c2	Total Distance covered by Staff from home-office-home	0.187 per km	km	3,336,422	623,744	3,336,422	623,744	3,336,422	623,744	3,336,422	623,744	3,336,422	623,744	3,336,422	623,744	3,336,422	623,744
	Distance covered by staff from other offices			38,487	7,195	38,487	7,195	38,487	7,195	38,487	7,195	38,487	7,195	38,487	7,195	38,487	7,195
	Subtotal				***630,939***		***630,939***		***630,939***		***630,939***		***630,939***		***630,939***		***630,939***
c3	***Waste generated in operations***																
	Waste oil	21.0 per tonne of waste	tonnes of waste	50	1,050	50	1,050	50	1,050	50	1,050	50	1,050	50	1,050	50	1,050
	Other wastes	21.0 per tonne of waste		5	105	5	105	5	105	5	105	5	105	5	105	5	105
	Subtotal				***1,155***		***1,155***		***1,155***		***1,155***		***1,155***		***1,155***		***1,155***
Downstream activities																	
c4	***Transportation and distribution***																
	By road - Articulated HGVs	0.08672 per tonnes.km	tonnes.km	-	-	29,027,820	2,517,293	31,666,667	2,746,133	31,666,667	2,746,133	31,666,667	2,746,133	18,472,228	1,601,912	-	-
	By road - Rigid HGVs	0.20916 per tonnes.km		-	-	1,527,780	319,550	1,666,667	348,600	1,666,667	348,600	1,666,667	348,600	972,223	203,350	-	-
	By Rail	0.0295 per tonnes.km		-	-	152,778,000	4,507,004	166,666,668	4,916,725	166,666,668	4,916,725	166,666,668	4,916,725	97,222,250	2,868,090	-	-
	Sandstone	0.1143 per tonnes.km		-	-	100,000	11,430	100,000	11,430	100,000	11,430	100,000	11,430	-	-	-	-
	Fireclay	0.1143 per tonnes.km		-	-	125,000	14,288	125,000	14,288	125,000	14,288	125,000	14,288	-	-	-	-

Appendix 4 : Detailed GHG Calculations																	
S.N	Description	Emission Factor (kg of CO_2e per unit)	Unit of Activity Data	Year 1		Year 2		Year 3		Year 4		Year 5		Year 6		Year 7	
				Activity Data	GHG Emissions (kg of CO_2e)	Activity Data	GHG Emissions (kg of CO_2e)	Activity Data	GHG Emissions (kg of CO_2e)	Activity Data	GHG Emissions (kg of CO_2e)	Activity Data	GHG Emissions (kg of CO_2e)	Activity Data	GHG Emissions (kg of CO_2e)	Activity Data	GHG Emissions (kg of CO_2e)
	Subtotal				**-**		**7,369,565**		**8,037,176**		**8,037,176**		**8,037,176**		**4,673,352**		**-**
c5	***Processing of sold products***																
c5.	Thermal power generation	2258.495 per tonne	tonnes	-	-	397,223	897,125,899	433,333	978,681,380	433,333	978,681,380	433,333	978,681,380	252,778	570,897,632	-	-
	Household	2856.702 per tonne		-	-	30,556	87,288,262	33,333	95,223,420	33,333	95,223,420	33,333	95,223,420	19,444	55,547,011	-	-
	industrial	2417.464 per tonne		-	-	183,334	443,202,393	200,000	483,492,819	200,000	483,492,819	200,000	483,492,819	116,667	282,037,557	-	-
	Subtotal				**-**		**1,427,616,554**		**1,557,397,619**		**1,557,397,619**		**1,557,397,619**		**908,482,200**		**-**
Scope 3 Emissions					**659,319**	**-**	**1,435,809,356**	**-**	**1,566,256,603**	**-**	**1,566,254,222**	**-**	**1,566,252,913**	**-**	**913,904,296**	**-**	**646,866**
Scope 1 and 2 Emissions (tonnes of CO_2e/year)					**4,451**		**30,574**		**30,827**		**30,463**		**30,263**		**17,294**		**2,547**
Scope 1, 2 and 3 Emissions (tonnes of CO_2e/year)					**5,110**		**1,466,383**		**1,597,084**		**1,596,718**		**1,596,516**		**931,198**		**3,194**

wardell-armstrong.com

STOKE-ON-TRENT
Sir Henry Doulton House
Forge Lane
Etruria
Stoke-on-Trent
ST1 5BD
Tel: +44 (0)178 227 6700

BIRMINGHAM
Two Devon Way
Longbridge Technology Park
Longbridge
Birmingham
B31 2TS
Tel: +44 (0)121 580 0909

CARDIFF
22 Windsor Place
Cardiff
CF10 3BY
Tel: +44 (0)292 072 9191

CROYDON
Melrose House
42 Dingwall Road
Croydon
Surrey
CR0 2NE
Tel: +44 (0)20 8680 7600

CUMBRIA
Cocklakes Yard
Carlisle
Cumbria
CA4 0BQ
Tel: +44 (0)122 856 4820

EDINBURGH
Great Michael House
14 Links Place
Edinburgh
EH6 7EZ
Tel: +44 (0)131 555 3311

GLASGOW
2 West Regent Street
Glasgow
G2 1RW
Tel: +44 (0)141 433 7210

LONDON
46 Chancery Lane
London
WC2A 1JE
Tel: +44 (0)207 242 3243

MANCHESTER (City Centre)
76 King Street
Manchester
M2 4NH
Tel: +44 (0)161 817 5038

MANCHESTER (Greater)
2 The Avenue
Leigh
Greater Manchester
WN7 1ES
Tel: +44 (0)194 226 0101

SHEFFIELD
Unit 5 Newton
Business Centre Newton
Chambers Road Thorncliffe
Park Chapeltown
Sheffield
S35 2PH
Tel: +44 (0)114 245 6244

TAUNTON
Victoria House
Victoria Street
Taunton
Somerset
TA1 3JA
Tel: +44 (0)182 370 3100

TRURO
Baldhu House
Wheal Jane Earth Science Park
Baldhu
Truro
TR3 6EH
Tel: +44 (0)187 256 0738

International offices:
ALMATY
29/6 Satpaev Avenue
Regency Hotel Office
Tower Almaty
Kazakhstan
050040
Tel: +7(727) 334 1310

MOSCOW
21/5 Kuznetskiy Most St.
Moscow
Russia
Tel: +7(495) 626 07 67

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