

REPORT

Phase 6 - Ladycross Plantation Noise and Vibration Management Plan

Ladycross Phase 6 - NVMP

Client: STRABAG AG

Reference: 40-ST5-LC-2100-EN-PL-00030 Rev B

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HASKONINGDHV UK LTD.

Marlborough House
Marlborough Crescent
Newcastle Upon Tyne
NE1 4EE
Industry & Buildings
VAT registration number: 792428892

+44 191 2111300 **T**

+44 1733 262243 **F**

email **E**

royalhaskoningdhv.com **W**

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Table of Contents

1	INTRODUCTION	1
1.1	Purpose of this Report	1
2	GUIDANCE	5
2.1	Legislation and British Standards	5
2.2	Construction Limits	5
2.3	Construction Method	5
3	PREDICTED CONSTRUCTION NOISE AND VIBRATION LEVELS	6
3.1	Baseline Receptor Locations	6
3.2	Predicted Noise Levels	6
3.3	Vibration	6
4	NOISE AND VIBRATION MONITORING PROGRAMME	8
4.1	Vibration Monitoring	8
4.2	Noise Monitoring	8
5	MITIGATION AND PROCEDURES	10
5.1	Purpose of the Section	10
5.2	Best Practicable Means	10
5.3	Specific Mitigation	11
5.4	Communications	12

Table of Tables

Table 1-1:	Condition NYMNPA 18 Noise and Vibration Management Plan	1
Table 1-2:	Condition NYMNPA 22 Noise and Vibration Management Plan	3
Table 1-3:	Condition NYMNPA 23 Noise and Vibration Management Plan	3
Table 1-4:	Condition NYMNPA 26 Noise and Vibration Management Plan	4

Appendices

Appendix A	Predicted Construction Noise Levels
Appendix B	Figures
Appendix C	Acoustic Terminology

1 INTRODUCTION

1.1 Purpose of this Report

- 1.1.1 In 2014 a planning application (reference NYM/2014/0676/MEIA) was submitted to North York Moors National Park Authority (NYMNPA) for permission to develop a polyhalite mine and underground Mineral Transport System (MTS). Planning permission was subsequently granted in 2015 subject to conditions, as varied in February 2018 by NYM/2017/0505/MEIA.
- 1.1.2 This document has been prepared on behalf of STRABAG AG, who are the contractor delivering the works on behalf of Anglo American Ltd (Anglo American); and details the requirements with respect to noise and vibration management for the Phase 6 Works (see Paragraph 1.1.4 below) at the Ladycross Plantation site.
- 1.1.3 This document is required to partially satisfy the requirements of Condition 18 of the NYMNPA planning permission. This planning condition states that:

Table 1-1: Condition NYMNPA 18 Noise and Vibration Management Plan

NYMNPA 18	Compliance with Condition NYMNPA-18
Prior to the commencement of each Phase of Construction at Dove's Nest Farm or Lady Cross Plantation, a Noise and Vibration Management Plan (NVMP) for the control, mitigation and monitoring of noise and vibration for both construction and operational phases at the two sites shall be submitted to and approved in writing by the MPA in consultation with the SBC EHO. The scheme shall set out the following:	This document addresses Phase 6 Works at Ladycross Plantation. Works at Woodsmith Mine are addressed in a site specific NVMP and are therefore not addressed in this Plan.
Noise-sensitive receptors for which predictions shall be made and at which the noise and vibration limits shall apply and which shall include recreational receptors.	Section 3.1
Predicted noise levels at the noise-sensitive receptors from noise and vibration generated at the DNF and LCP sites for the key construction phases during the forthcoming year including any periods in which the higher daytime limit of 70 dB L_{Aeq} shall apply (permitted 56 days for temporary works to create noise-reducing bunds and/or barriers as per Conditions 20 and 22).	Section 3, and Appendix A
The best practicable means which will be used to control noise and vibration levels on site including such measures proposed in the Environmental Statement (September 2014 as updated by the Supplementary Environmental Statement dated February 2015) and the Supplementary Environmental Statement dated July 2017 (updated by further information dated October and November 2017) as relevant. Such measures shall include, but are not limited to: the use of the quietest available plant, equipment and techniques; the regular maintenance and inspection of such plant and equipment; the use of cladding, attenuators and barriers to reduce noise levels from noisy plant and operations; the specification of appropriate reversing alarms to minimise annoyance; and, measures to reduce vibration and air overpressure during blasting.	Section 5
Details of the noise and vibration monitoring system to be installed around the DNF and LCP sites to continuously log noise levels during construction and operation. The system shall include at least six noise monitors installed around the boundary of the Dove's Nest site and at least four monitors at key residential receptors near the Dove's Nest site and at least four noise monitors around the Lady Cross Plantation Site and at least three monitors at key residential receptors near the Lady Cross Plantation site.	Section 4

NYMNP 18	Compliance with Condition NYMNP-18
The precise number and location of noise monitors shall be set out in the NVMP. The developer shall use reasonable endeavours to obtain access to the residential receptor properties for the installation of noise monitors and only if access cannot be obtained the number or location of noise monitors may be reduced. The MPA and the SBC EHO and/or their advisers shall be granted access to inspect the noise and vibration data whenever required, records of the data should be kept for a reasonable period and these records should be accessible by the public.	Section 3, Section 4 and Figure B.1
Details of the procedure to be followed in the event that the noise predictions detailed in the NVMP or the noise limits detailed in conditions 20 to 23 are exceeded. Such procedures shall require the investigation of the reasons for the breach of the limits and the cessation of the activity causing the breach until such a time as additional mitigation can be provided.	Section 5
Details of how the residents will be informed and consulted about the site operations and progress, particularly in regard to blasting and especially noisy operations including details of complaints logging and management procedures and a 24-hour telephone incident hotline. Details of the procedure for investigating complaints and informing complainants of the results of such investigations and of any actions resulting from them.	Section 5
The NVMP shall be adhered to at all times unless agreed previously in writing by the MPA.	
The NVMP shall be updated and agreed whenever appropriate to reflect changes in the programme during construction and operation and at intervals not less than 6 months after the initial start on site and thereafter annually.	Section 1

1.1.4 This NVMP relates to the Phase 6 Works at Ladycross Plantation only. These works comprise the following:

- Installation of shaft infrastructure including tally hut, communications and ventilation fan;
- Installation and use of temporary cable laying sub-bases, winch and emergency rescue winch;
- Installation of Alimak and associated infrastructure;
- Backfill of the Lagoon;
- Installation and use of temporary shaft head house and associated services;
- Installation and use of grout plant and associated services;
- Installation of emergency back-up generators; and
- Construction of temporary overflow car park including tarmac hardstanding for an additional 10 car parking spaces.

1.1.5 According to the Construction Method Statement (CMS; reference 40-STSLC-2100-CN-MS-00006), the following activities in the Phase 6 Works will be undertaken 24 hours per day: Use of shaft Infrastructure including tally hut and ventilation fan, use of cable laying winch and emergency generators, use of Alimak, use of grout plant and associated services and general site activities. All other works will be undertaken during daytime hours only (07:00 – 19:00). Contractors responsible for implementing the Phase 6 Works have confirmed that all works associated with previous phases at the site will be completed prior to the start of the Phase 6 Works.

Planning Conditions

- 1.1.6 In addition to Condition NYMNPA 18, two further conditions NYMNPA 22 and NYMNPA 23 establish noise limits relating to the Ladycross Plantation site (see **Section 2.2**). Planning condition detail is provided in Table 1-2 and Table 1-3.

Table 1-2: Condition NYMNPA 22 Noise and Vibration Management Plan

NYMNPA 22	Compliance with Condition NYMNPA-22
<p>Day-time (07.00 hrs to 19.00 hrs) noise levels $L_{Aeq,1hr}$ from mine construction at the Lady Cross Plantation site, excluding blasting operations, shall not exceed 55 dB $L_{Aeq,1hr}$ and for short-term, construction activities solely relating to the demolition of existing buildings and erection of new structures excluding earth mound and bunds shall not exceed 65dB $L_{Aeq,1hr}$. An upper limit of 70 dB $L_{Aeq,1hr}$ for the purposes of temporary noisy operations to provide noise-reducing earth bunds and / or barriers may be permitted for up to 56 days in any calendar year provided such temporary operations are specified and agreed in the NVMP described in Condition 18. Each calendar day when the higher temporary noise level is exceeded shall be counted as one day. Noise levels shall be measured in accordance with BS 4142:2014 and shall apply at the curtilage boundary of residential properties and at the following recreational receptors: on the open access land to the north and east of the site at OS Grid Reference locations 810684 and 819077.</p>	<p>Section 3, and Appendix A</p>

Table 1-3: Condition NYMNPA 23 Noise and Vibration Management Plan

NYMNPA 23	Compliance with Condition NYMNPA-23
<p>Evening (19.00 hrs to 22.00 hrs) and night-time (22.00 to 07.00 hrs) noise levels $L_{Aeq,1hr}$ from mine construction at the Lady Cross Plantation site, excluding blasting operations, shall not exceed 42 dB $L_{Aeq,1hr}$. Noise levels shall be measured in accordance with BS 4142:2014 and the limits apply at the curtilage boundary of residential properties.</p>	<p>Section 3, and Appendix A</p>

- 1.1.7 Condition NYMNPA 26 relates to vibration arising from construction activities other than blasting, details are provided in Table 1-4.

Table 1-4: Condition NYMNP 26 Noise and Vibration Management Plan

NYMNP 26	Compliance with Condition NYMNP-26
Vibration from construction work on site and during operation (but excluding blasting) shall not exceed 0.3mm/s (PPV) at any residential property at any time.	Section 3.3

- 1.1.8 In this document, the term “*construction*” includes all physical and related engineering and construction activities associated with the Phase 6 Works, as described above. Updates to this plan will be prepared and submitted to the NYMNP for approval in advance of subsequent construction phases and following any material design or method change.

2 GUIDANCE

2.1 Legislation and British Standards

2.1.1 Wherever practicable, construction will be carried out in accordance with:

- Planning Practice Guidance for Minerals (PPGM), 2014¹
- BS 5228:2009+A1:2014 *Code of Practice for noise and vibration control on construction and open sites*².

2.2 Construction Limits

2.2.1 The PPGM includes noise limits which align with the established noise limits detailed in NYMNPA Condition 22 and NYMNPA Condition 23.

2.2.2 The established noise limits detailed in NYMNPA Condition 22 and NYMNPA Condition 23 (as measured at the identified receptors) remain as:

- 55 dB L_{Aeq,1hr} for daytime (07:00 – 19:00);
- 65 dB L_{Aeq,1hr} for the demolition of buildings and erection of new structures;
- Up to 70 dB L_{Aeq,1hr} for temporary noisy operations to provide noise-reducing earth bunds and / or barriers; and
- 42 dB L_{Aeq,1hr} for evening and night-time (19:00 – 07:00).

2.2.3 Established vibration limits for construction works (other than blasting) shall not exceed 0.3 mm/s. Vibration limits for blasting activities are outlined in Conditions 27 and 28, however blasting works are not anticipated at the Ladycross Plantation Site and are therefore not considered in the NVMP.

2.3 Construction Method

2.3.1 Contractors responsible for implementing these Phase 6 Works have provided details of the construction plan, number and type of plant items to be used and location/duration of construction activities within the site. Further detail is provided in the Phase 6 Construction Method Statement (CMS) (reference 40-STC-LC-2100-CN-MS-00006).

2.3.2 **Appendix A** details the plant items included within the model, their sound power level and location on site. Predictions of noise levels based upon these details are assessed within this NVMP.

¹ *Planning Practice Guidance for Minerals (PPGM), 2014 Department for Levelling Up, Housing and Communities (/government/organisation/departments-for-levelling-up-housing-and-communities) and Ministry of Housing, Communities & Local Government (/government/organisations/ministry-of-housing-communities-and-local-government. (URL: <https://www.gov.uk/guidance/minerals>, accessed 03 February 2022)*

² *British Standards Institute (2014). BS 5228:2009+A1:2014 Code of Practice for noise and vibration control on construction and open sites*

3 PREDICTED CONSTRUCTION NOISE AND VIBRATION LEVELS

3.1 Baseline Receptor Locations

3.1.1 The Environmental Statement (ES) which accompanied the planning application included (Part 2, Chapter 8, Noise and Vibration) an assessment of construction noise at the following nearby residential locations:

- Ladycross Caravan Park Owner's Property, approximately 320m from the nearest site boundary;
- Davidson Farm, approximately 425m from the nearest site boundary; and
- Watergate Farm, approximately 365m from the nearest site boundary.

3.1.2 For the purposes of this NVMP the receptors detailed above are the residential receptors at which the noise limits in Conditions 22 and 23 apply, and for which predictions of construction noise were undertaken.

3.1.3 The following recreational receptors, detailed within Condition 22, were included within the construction noise calculations:

- Open access land to the north of the site (OS Grid Reference 816084), OSGB36 co-ordinates (m) X:481600, Y:508400; approximately 310m from the nearest site boundary; and
- Open access land to the east of the site (OS Grid Reference 819077), OSGB36 co-ordinates (m) X:481900, Y:507700, approximately 60m from the nearest site boundary.

3.2 Predicted Noise Levels

3.2.1 3-D noise modelling was undertaken using computational noise modelling software SoundPLAN (v8.2) to predict construction noise levels associated with the Phase 6 Works. **Table A.1** and **Table A.2** in **Appendix A** show the predicted construction noise levels for the Phase 6 Works.

3.2.2 Predicted noise levels from the Phase 6 Works do not exceed the agreed construction noise limits at any of the identified noise-sensitive receptors during the day or night-time when the activity timing and physical mitigation measures described in **Section 5.3** are adopted. It should be noted that the noise model setup and inputs are considered to be conservative and that exceedances of the noise limits during normal operations are therefore not anticipated.

3.3 Vibration

3.3.1 Ground-borne vibration assessments can be drawn from the empirical methods detailed in BS 5228-2:2009+A1:2014; in the Transport and Road Research Laboratory Research Report (TRRL) 246: Traffic induced vibrations in buildings 2; and within the Transport Research Laboratory (TRL) Report 429 (2000): Ground-borne vibration caused by mechanical construction works.

3.3.2 A series of calculations, in accordance with the empirical methods referred to above, were carried out based on typical construction activities, applying reasonable worst-case assumptions, in order to determine set-back distances at which critical vibration levels may occur. These were presented in the ES and are reproduced in **Appendix A, Table A.4**.

- 3.3.3 During Phase 6, the only potential source of vibration at residential receptors would be HGV movements along an uneven haul route.
- 3.3.4 The main haul routes through the site are shown on Drawing Phase 6 General Arrangement Plan (40-STC-LC-2100-PA-22-20119). The minimum distance between the primary haul route and any of the surrounding residential receptors is over 350m. At this distance, ground-borne vibration levels will be significantly lower than 0.3mm/s at all nearby sensitive receptors, i.e. significantly below levels which are considered to be "*just about perceptible in residential environments*"³.

³ British Standards Institution (2014). BS5228:2009+A1:2014 'Code of practice for noise and vibration control on construction and open sites – Part 2: Vibration'

4 NOISE AND VIBRATION MONITORING PROGRAMME

4.1 Vibration Monitoring

- 4.1.1 As detailed within Section 3.3 of this NVMP, construction activities during Phase 6 will not give rise to significant levels of vibration at nearby residential receptors.
- 4.1.2 The construction methodology for the Ladycross Plantation site is similar to works that are being undertaken at Lockwood Beck. There have been no complaints or incidents from vibration at the Lockwood Beck site
- 4.1.3 Given the experience and knowledge gained from the Lockwood Beck site and the distance between the Ladycross Phase 6 Works and the residential receptors, vibration impacts are not anticipated. Vibration monitoring is therefore not proposed.

4.2 Noise Monitoring

- 4.2.1 Condition NYMNP 18 specifies that continuous noise monitoring is undertaken during construction and operation at three key residential receptor locations near the Ladycross Plantation Site. Residential receptor locations are outlined in **Section 3.1.1**.
- 4.2.2 Monitoring is currently being undertaken both on and off site at the following monitoring locations:
- LC-NM1 – Ladycross Caravan Park Owner’s Property;
 - LC-NM2 – Centre of the site;
 - LC-NM3 – Davidson Farm; and
 - LC-NM4 – Barn Cottages (a temporary relocation from the North-east boundary of the site).
- 4.2.3 Noise monitoring locations are presented in **Appendix B, Figure B1**. The redline boundary shown on **Figure B1** is the land ownership boundary.
- 4.2.4 Although Watergate Farm is closer to the site boundary than Davidson Farm, similar construction noise is anticipated at these receptors due to the distance to the works and the intervening ground between the works and the receptors. This is confirmed by the noise predictions presented in **Appendix A**.
- 4.2.5 The noise measurements are conducted in accordance with the guidance contained in BS 7445 parts 1⁴ and 2⁵.

⁴ British Standard Institution (2003) BS 7445-1:2013 Description and measurement of environmental noise – Guide to quantities and procedures

⁵ British Standard Institution (1991) BS 7445-2:1991 Description and measurement of environmental noise – Guide to acquisition of data pertinent to land use

- 4.2.6 The sound level meters are fully calibrated, traceable to United Kingdom Accreditation Service (UKAS) standards and satisfy the requirements of BS EN 61672-1:2013⁶ for a 'Class 1' Sound Level Meter (SLM).
- 4.2.7 The SLMs record LAeq, LAmax, LA90, and LA10 data with a 'fast' time constant and A-weighting. **Appendix C** presents descriptions of these terms.
- 4.2.8 The noise measurements are being conducted in accordance with BS 7445 with the SLM microphone mounted on a tripod or secured mounting pole at 1.5m above ground level and 3.5m away from any reflecting surface other than the ground. The instruments will be calibrated at monthly intervals during the monitoring period, and before and after any battery change using a portable field calibrator. Any deviations in the calibration level will be noted and reported within the summary reports.
- 4.2.9 The SLMs operate using a system of real time alerting which allows remote monitoring of noise levels and indication of noise levels approaching and/or breaching the limits. Alerts are managed by the Contractors who, following an investigation as to the cause of any alert (assisted by live audio observations provided by the monitoring equipment located at the boundary), will report the alert to Scarborough Borough Council (SBC) and the NYMNPAs as necessary.
- 4.2.10 The SLMs are inspected during each field calibration and maintenance visit and any faults will be identified and rectified during the visits. Should faults require off-site repair a replacement SLM will be installed during the repair period.
- 4.2.11 Monitoring of weather conditions including wind speed and direction, rainfall, temperature and humidity is being carried out simultaneously at the Ladycross Plantation Site.
- 4.2.12 Reports will be provided monthly to SBC and NYMNPAs. The report will contain details of the type and system of sound level meters used and a summary of the measured noise data at each location with corresponding weather data and survey notes.

⁶ British Standard Institution (2013) BS EN 61672-1:2013 Electroacoustics. Sound level meters - Specifications

5 MITIGATION AND PROCEDURES

5.1 Purpose of the Section

- 5.1.1 This section outlines measures to be taken by the Contractors to limit, and manage the impact of, noise. This section also outlines the Best Practicable Means and specific mitigation actions to be adopted.

5.2 Best Practicable Means

- 5.2.1 The Control of Pollution Act 1974 and BS 5228 define a set of Best Practice working methods and mitigation measures, referred to as Best Practicable Means (BPM). The following measures will be adopted:

- Weekly construction meetings will take place to discuss the minimisation of noise emanating from the site, the potential for noise reduction for any upcoming activities and to identify any potential concurrent activities which may lead to noise levels requiring the upper limit of 70 dB $L_{Aeq,1hr}$. Occasions requiring these upper limits will be reported to the NYMNPA and SBC prior to the activities occurring and will be included within the regular communication to residents detailed within **Section 5.4**;
- Locating temporary plant so that it is screened from receptors by on-site structures, such as site cabins;
- Where practicable, not undertaking noisy activities concurrently close to residential receptors;
- Using modern, quiet equipment and ensuring such equipment is properly maintained (see **Section 5.2.8** below) and operated by trained staff (see **Section 5.2.10** below);
- Applying enclosures to particularly noisy equipment where possible;
- Ensuring that mobile plant is well maintained such that loose body fittings or exhausts do not rattle or vibrate;
- Ensuring plant machinery is turned off when not in use; undertaking daily, pre-start inspections of plant and machinery;
- Providing local residents with 24-hour contact details for a site representative in the event that disturbance due to noise from the construction works is perceived (see **Section 5.4.1**); and
- Informing local residents about the construction works, including the timing and duration of any particularly noisy elements (see **Section 5.4.3**).

Management Structure and Responsibilities

- 5.2.2 Anglo American are accountable for compliance with environmental and approvals requirements. Contractors on site are responsible for undertaking construction activities in accordance with the requirements of this NVMP.
- 5.2.3 The CEMP provides details of the lines of responsibility for environmental management during the Phase 6 Works.
- 5.2.4 The Environmental Manager/Project Manager (or deputy) for each Contractor will be on site during working hours and will be responsible for robust implementation of noise management and mitigation measures.
- 5.2.5 The Operations Director/Project Manager (or deputy) for each Contractor is responsible for implementation of the appropriate Environmental Policy and the CEMP through:
- Compliance with contractual requirements regarding environmental matters;

- Adherence to the NVMP and associated control measures;
 - Designated responsibility for environmental control during the works;
 - Regular meetings with project team members to review environmental matters;
 - Regular reporting to the employer on environmental matters;
 - Ensuring adequate resources are made available;
 - Managing and advising on environmental matters affecting the Project with the assistance of the Employer's Environment Manager, the Contractor's Environmental Manager and Environmental Inspector;
 - Reporting to the Employer's Environment Manager on implementation of the NVMP;
 - Carrying out regular internal audits and procedure review on environmental matters;
 - Reviewing and mitigating all environmental impacts identified in submitted method statements;
 - Recording and maintaining all environmental matters/incidents in accordance with reporting procedures; and
 - Ensuring all team members work in accordance with the NVMP.
- 5.2.6 The Operations Director/Environmental Manager/Project Manager for the contractors, and their appointed subcontractors, engaged for the Phase 6 Works will, with the Employer's Environment Manager acting as coordinator, liaise to ensure regular review of environmental matters and appropriate assignment of responsibilities for Contractors' specific site activities.

Maintenance

- 5.2.7 Maintenance of plant will be carried out routinely and in accordance with the manufacturers' guidance.
- 5.2.8 A daily safety inspection of all plant and equipment will be undertaken to ensure that, as a minimum:
- all plant is in a good state of repair and fully functional;
 - any plant found to be requiring interim maintenance has been identified and taken out of use;
 - acoustic enclosures fitted to plant are in a good state of repair;
 - doors and covers remain closed during operation (self-closing doors/covers are recommended); and
 - any repairs are being undertaken by a fully qualified maintenance engineer.

Training

- 5.2.9 The site induction programme and site rules will include good working practice instructions for site staff, managers, visitors and contractors to help minimise noise whilst working on the site.
- 5.2.10 The good working practice guidelines/instructions will include, but not be limited to, the following points:
- avoid unnecessary revving of engines;
 - plant used intermittently will be shut-down between operational periods, where possible;
 - avoid reversing wherever possible;
 - contractors to be advised that reversing alarms on mobile equipment must be specified as low/white noise where safety requirements allow;
 - report any defective equipment/plant as soon as possible so that corrective maintenance can be undertaken; and
 - handle material in a manner that minimises noise.

5.3 Specific Mitigation

Bunds and barriers

- 5.3.1 Temporary storage bunds northeast of the Works, constructed during Phase 2, were included in the noise model, providing screening between the proposed construction works and the residential receptors. Lagoon backfilling activities proposed as part of the Phase 6 works will involve modifications to these bunds. Modelling scenarios were created of the Phase 6 activities with and without these modifications and the worst-case impacts have been reported in this NVMP.
- 5.3.2 The grout plant and associated services will operate 24 hours a day. Without mitigation, the predicted construction noise levels at Davison Farm would slightly exceed the night-time limit. To reduce the noise levels at Davison Farm from this activity, the temporary 4m height absorptive barrier erected during the phase 5 works will be maintained. As stated in **Section 3.2**, with this barrier in place, the predicted noise levels do not exceed the limits.

5.4 Communications

- 5.4.1 If monitoring indicates that the noise limits are being exceeded as a result of the works, or a complaint is received from a local resident, an investigation will be instigated in accordance with the Complaints Procedure provided in Appendix B to the Phase 3 CEMP.
- 5.4.2 Good relations with local residents in nearby noise-sensitive receptors will be maintained.
- 5.4.3 A Community and Stakeholder Engagement Plan is provided in Appendix A to the Phase 6 CEMP which details actions to be taken by Anglo American and the Contractors.

Appendix A Predicted Construction Noise Levels

The predicted noise levels detailed within the tables below are considered to represent the most conservative scenario. The modelled results for Phase 6 daytime construction works are detailed in **Table A.1**.

Table A.1 Calculated noise levels during Phase 6 – Daytime

Receptor location	Daytime (07:00–19:00)	
	Limit $L_{Aeq,1hr}$ dB	Maximum predicted $L_{Aeq,1hr}$ dB
Ladycross Caravan Park Owners Property	55	41
Davison Farm	55	44
Watergate Farm	55	43
Recreational Receptor OS Grid 816084	55	33
Recreational Receptor OS Grid 819077	55	54

The modelled results for Phase 6 evening and night-time construction works are detailed in **Table A.2**.

Table A.2 Calculated noise levels during Phase 6 – evening and night-time

Receptor location	Night time (19:00–07:00)	
	Limit $L_{Aeq,1hr}$ dB	Maximum predicted $L_{Aeq,1hr}$ dB
Ladycross Caravan Park Owners Property	42	40
Davison Farm	42	42
Watergate Farm	42	42
Recreational Receptor OS Grid 816084	N/A	31
Recreational Receptor OS Grid 819077	N/A	52

Modelling Assumptions

The works at the site are considered to comprise mineral extraction and the conditioned noise limits are in accordance with the Planning Practice Guidance for Minerals (PPGM). The PPGM does not specify the method to be used to predict noise propagation; therefore, in line with acoustics industry best practice, noise propagation from the site was calculated using the ISO 9613-2 methodology.

The contractor responsible for the works provided a schedule of construction activities. This has been used to identify the following weeks of the schedule which potentially result in the worst-case impacts:

- Week 1:
 - Installation of shaft infrastructure including tally hut, communications and ventilation fan;
 - Installation of emergency back-up generators ;
 - General site activities; and
 - Construction of temporary overflow car park including tarmac hardstanding for an additional 10 car parking spaces.
- Week 16:
 - Use of shaft infrastructure including tally hut, communications and ventilation fan;
 - Installation of temporary cable laying sub-bases, winch and emergency rescue winch;
 - Installation and use of Alimak and associated infrastructure;
 - Backfill of the Lagoon;
 - Use of three emergency backup generators; and
 - General site activities.
- Week 20:
 - Use of shaft infrastructure including tally hut, communications and ventilation fan;
 - Use of temporary cable laying sub-bases, winch and emergency rescue winch;
 - Use of Alimak and associated infrastructure;
 - Backfill of the Lagoon;
 - Use of three emergency backup generators; and
 - General site activities.
- Week 23:
 - Use of shaft infrastructure including tally hut, communications and ventilation fan;
 - Backfill of the Lagoon;
 - Installation of temporary shaft head house and associated services;
 - Use of two emergency backup generators; and
 - General site activities.
- Week 33:
 - Use of shaft infrastructure including tally hut, communications and ventilation fan;
 - Installation and use of temporary shaft head house and associated services;
 - Installation and use of grout plant and associated services;
 - Use of two emergency back-up generators; and
 - General site activities.

Separate modelling was undertaken for each potentially worst-case week, including the simultaneous operation of all the identified activities and changes to the ground levels due to the ongoing works. The maximum of the predicted noise levels from each modelled scenario at each receptor are provided in Tables A1 and A2.

Overall, the model setup and assumptions made on the number of plant and their location within the site were conservative, and therefore the predicted impacts are considered to be worst-case.

Acoustic modelling input data

Data sources used for this modelling are shown in **Table A-3**.

Table A-3 Data sources

Data	Source file	Origin
Nearby building locations	OS Buildings.geo	Ordnance Survey Vectormap
Site topography	CAD drawing entitled '221013 - LDX TIN_2.dwg'	Anglo American
Wider area topography	NZ80NW _DTM_2m.tif	Defra LiDAR survey data (available at Defra Survey Data Download)
Site layout	CAD drawing entitled 'Ladycross Plantation Phase 6 General Arrangement', drawing number 40-STC-LC-2100-PA-22-20119. On-site structures drawing reference 40-STC-LC-2100-PA-22-20119_A_PLA_2022-12-22_BH.pdf	STRABAG

Acoustic model settings

Acoustic modelling was undertaken using the following model settings:

- Maximum search radius of 5000m.
- Maximum number of reflections: 3
- Noise predictions carried out at each floor level of sensitive receptors, ground floor level is 1.5m above ground, each storey is 2.5m high.
- Side diffraction enabled.
- Ground absorption was set as:
Areas within site red line boundary and roads/haul routes within site set to G=0;
Ground outside of site red line boundary set to G=1 (representing soft ground).

The following Phase 6 equipment, associated sound power levels and conservative assumptions regarding plant 'on-times' were used within the SoundPLAN noise model:

General site activities

1 x 12T Excavator, 10% 24 hours per day, 103dB LwA
 1 x 12T Dump Truck, 10% on-time 24 hours per day, 102dB LwA
 1 x Ride on Roller, 5% on-time 24 hours per day, 103dB LwA
 1 x 60T Mobile Crane, 25% on-time 24 hours per day, 95dB LwA
 1 x Telehandler, 25% on-time 24 hours per day, 99dB LwA
 1 x Road Sweeper, 25% on time 24 hours per day, travelling at 5 km/h, 104dB LwA
 1 x Skid Steer, 25% on-time 24 hours per day, 104dB LwA
 45 ft MEWP, 10% on-time 24 hours per day, 95dB LwA
 Lorry movements, 2 per hour daytime only traveling at 16.1 km/h, 111dB LwA

General Site Activities Equipment

1 x 250kVa Generator (Welfare), 100% on-time 24 hours per day, 95dB LwA
 1 x 60kVa Generator (Workshop), 100% on-time 24 hours per day, 96dB LwA
 1 x 60kVa Generator (Siltbuster), 25% on-time 24 hours per day, 96dB LwA
 1 x 60kVa Generator (Wheelwash), 25% on-time Daytime only, 96dB LwA
 6 x Supersilent Pumps, 25% on-time 24 hours per day, 87dB LwA
 1 x Static Fuel Bowser, 50% on-time 24 hours per day, 101dB LwA
 12 x Lighting Towers, 50% on-time 24 hours per day, 85dB LwA
 1 x Vibrating Poker, 25% on-time Daytime only, 99dB LwA
 1 x Towable Jet wash, 25% on-time Daytime only, 91dB LwA
 1 x Towable Water Bowser 7000L, 25% on-time Daytime only, 109dB LwA
 1 x 6m Ecowash Wheelwash, 25% on-time Daytime only, 91dB LwA
 1 x Siltbuster, 25% on-time 24 hours per day, 93dB LwA

Installation and use of shaft infrastructure including tally hut, communications and ventilation fan

1 x 130T mobile Crane, 50% on-time Daytime only, 105dB LwA
 1 x 250T Mobile Crane, 50% on-time Daytime only, 107dB LwA
 1 x Ventilation Fan, 100% on-time 24 hours per day, 70dB LwA

Installation and use of temporary cable laying sub-bases, winch and emergency rescue winch

1 x 20T excavator, 50% on-time daytime only, 101dB LwA
 1 x 20T Dumper, 10% on-time daytime only, 102dB LwA
 1 x Telehandler 5T, 50% on-time 24 hours per day, 105dB LwA
 1 x Vibratory Roller, 25% on-time daytime only, 103dB LwA
 1 x Concrete Pump, 100% on-time 24 hours per day, 96dB LwA
 1 x Cable Laying Winch, 50% on-time 24 hours per day, 106 LwA
 1 x 500kVa Emergency Generator 100% on-time 24 hours per day, 100dB LwA

Installation of Alimak and associated infrastructure

1 x 130T mobile Crane, 50% on-time Daytime only, 105dB LwA
 1 x 250T Mobile Crane, 50% on-time Daytime only, 107dB LwA
 1 x Alimak, 15% on-time 24 hours per day, 94dB LwA

Backfill of the Lagoon

1 x 20T excavator, 100% on-time daytime only, 101dB LwA
 1 x 30T excavator, 100% on-time daytime only, 103dB LwA
 1 x 20T wheeler tipper, 25% on-time daytime only, 102dB LwA
 2 x 20T Dumper, 60% on-time daytime only, 102dB LwA
 1 x Dozer, 75% on-time daytime only, 105dB LwA

Installation and use of temporary shaft head house and associated services

1 x 130T mobile Crane, 50% on-time Daytime only, 105dB LwA
 1 x 250T Mobile Crane, 50% on-time Daytime only, 107dB LwA
 1 x MEWP, 75% on-time Daytime only, 95dB LwA
 1 x Alimak, 15% on-time 24 hours per day, 94dB LwA

Installation and use of grout plant and associated services

1 x 20T excavator, 50% on-time daytime only, 101dB LwA
 1 x 20T Dumper, 10% on-time daytime only, 102dB LwA
 1 x 130T mobile Crane, 50% on-time Daytime only, 105dB LwA

- 1 x Mobile Welding Unit, 20% on-time Daytime only, 101dB LwA
- 1 x MEWP, 20% on-time Daytime only, 95dB LwA
- 1 x Roller vibrator, 25% on-time Daytime only, 103 LwA

Installation of emergency back-up generators

- 1 x 130T mobile Crane, 50% on-time Daytime only, 105dB LwA
- 1 x 5T Telehandler, 50% on-time Daytime only, 105dB LwA
- 1 x 500kVa Emergency Generator (Emergency Winch), 10% on-time 24 hours per day, 100dB LwA
- 1 x 1000kVa Generator (Shaft fit-out), 100% on-time 24 hours per day, 99dB LwA
- 1 x 250kVa Generator, 50% on-time 24 hours per day, 95dB LwA

Construction of temporary overflow car park including tarmac hardstanding for an additional 10 car parking spaces

- 1 x Dozer, 75% on-time daytime only, 105dB LwA
- 1 x Vibratory Roller, 50% on-time daytime only, 103dB LwA
- 1 x Tarmac Paver, 50% on-time daytime only, 103dB LwA
- 1 x 20T excavator, 10% on-time daytime only, 101dB LwA

Noise propagation was calculated using the ISO 9613-2:1996 methodology.

Table A.4 Predicted Distances at which Specific Vibration Levels Occur

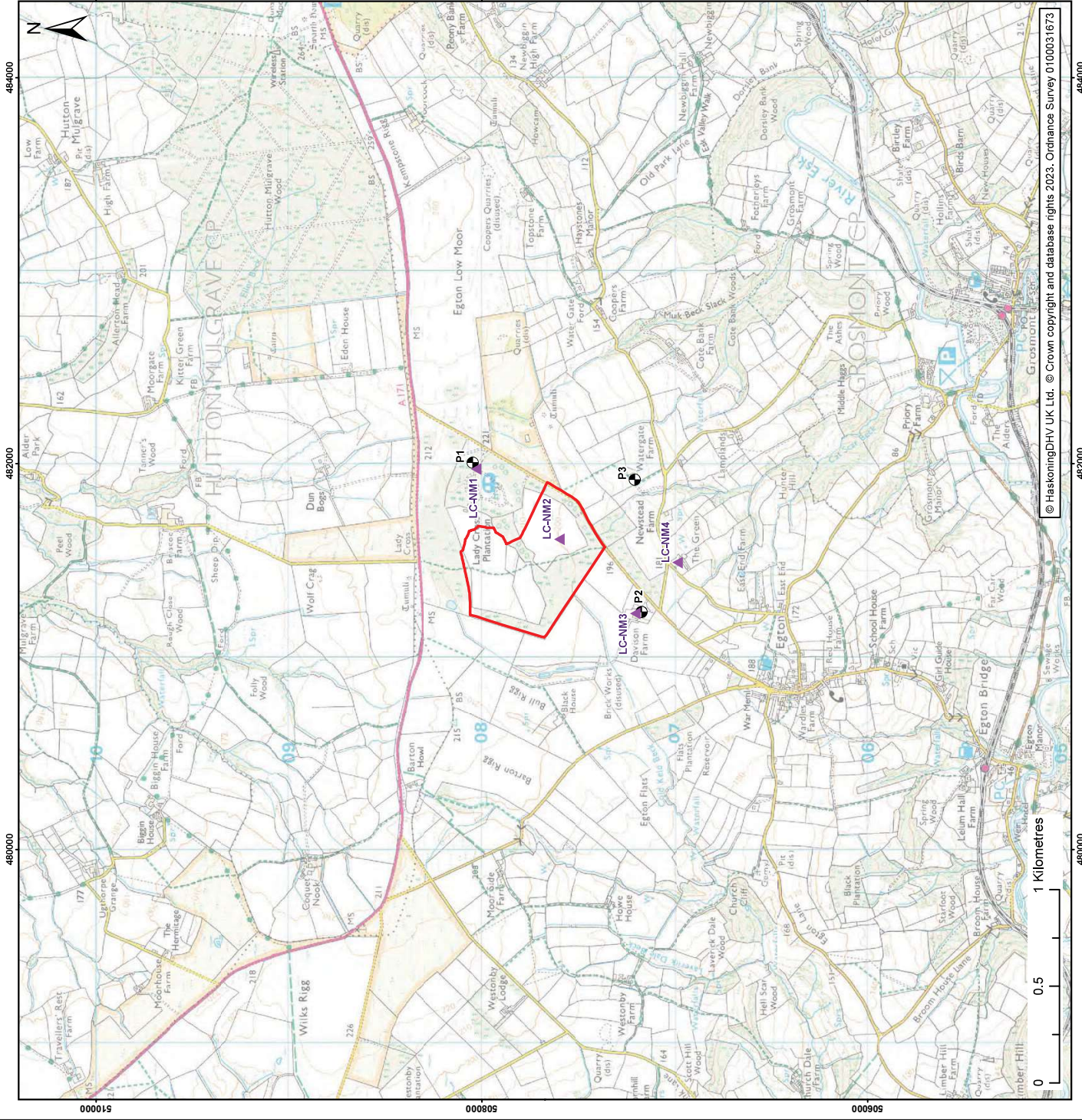
Activity	Set-back distance at which vibration level (PPV) occurs			
	0.3 mm/s	1.0 mm/s	10 mm/s	15 mm/s
Vibratory compaction (start-up)	116m*	65m	9m	6m
Vibratory compaction (steady state)	102m	44m	8m	6m
Vibratory piling (start-up)	154m*	56m	8m	6m
Vibratory piling (steady state)	75m	32m	6m	5m
Tunnelling	137*	54m	9m*	7m*

Activity	Set-back distance at which vibration level (PPV) occurs			
	0.3 mm/s	1.0 mm/s	10 mm/s	15 mm/s
HGV movements on uneven haul route (assuming Alluvium surface)	277m	60m	3m	2m

Note These predicted distances are outside the limitations of the calculations and are therefore provided for information only.*



Appendix B Figures



Legend:

- Ladycross Freehold Boundary
- ▲ Monitoring locations
- Receptor Location

<p>Client:</p> <p style="text-align: center;">Anglo American</p>	<p>Project:</p> <p style="text-align: center;">The Woodsmith Project</p>
<p>Title:</p> <p style="text-align: center;">Residential Receptor Locations and Monitoring Locations for Ladycross Plantation Site</p>	
<p>Figure:</p> <p style="text-align: center;">B1</p>	<p>Drawing No:</p> <p style="text-align: center;">PB1110-RH-00-XX-DR-2-0001</p>
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<p>Size:</p> <p style="text-align: center;">A3</p>	<p>Scale:</p> <p style="text-align: center;">1:20,000</p>
<p>Co-ordinate system:</p> <p style="text-align: center;">British National Grid</p>	

Royal HaskoningDHV
Enhancing Society Together

ROYAL HASKONINGDHV
INDUSTRY, ENERGY & MINING
RIGHTWELL HOUSE
BREITON
PETERBOROUGH
CB3 6DZ
+44 (0)1733 344555
www.royalhaskoningdhv.com

Appendix C Acoustic Terminology

Term	Definition
Noise sensitive receptors	People, property or designated sites for nature conservation that may be at risk from exposure to noise and vibration that could potentially arise as a result of the proposed development/project
Noise and Vibration study area	The area assessed for noise and vibration impacts during this assessment
Baseline scenario	Scenarios with the proposed development/project not in operation
Decibel (dB)	A unit of noise level derived from the logarithm of the ratio between the value of a quantity and a reference value. It is used to describe the level of many different quantities. For sound pressure level the reference quantity is 20 μ Pa, the threshold of normal hearing is 0dB, and 140dB is the threshold of pain. A change of 1dB is only perceptible under controlled conditions. Under normal conditions a change in noise level of 3dB(A) is the smallest perceptible change.
dB(A)	Decibels measured on a sound level meter incorporating a frequency weighting (A weighting) which differentiates between sounds of different frequency (pitch) in a similar way to the human ear. Measurements in dB(A) broadly agree with people's assessment of loudness. A change of 3 dB(A) is the minimum perceptible under normal conditions, and a change of 10 dB(A) corresponds roughly to halving or doubling the loudness of a sound. The background noise level in a living room may be about 30 dB(A); normal conversation about 60 dB(A) at 1 metre; heavy road traffic about 80 dB(A) at 10 metres; the level near a pneumatic drill about 100 dB(A).
$L_{Aeq,T}$	The equivalent continuous sound level – the sound level of a notionally steady sound having the same energy as a fluctuating sound over a specified measurement period (T). $L_{Aeq,T}$ is used to describe many types of noise and can be measured directly with an integrating sound level meter.
$L_{A10,T}$	The A weighted noise level exceeded for 10% of the specified measurement period (T). L_{A10} is the index generally adopted to assess traffic noise
$L_{A90,T}$	The A weighted noise level exceeded for 90% of the specified measurement period (T). In BS 4142:2014 it is used to define the 'background' noise level.
L_{Amax}	The maximum A-weighted sound pressure level recorded during a measurement.
PPV	Instantaneous maximum velocity reached by a vibrating element as it oscillates about its rest position.
'A' weighting	A frequency weighting to compensate for the varying sensitivity of the human ear to sound at different frequencies.
Fast time constant	Sound level meters have two conventional time weightings, F = Fast and S = Slow with time constants of 125ms and 1000ms respectively. Fast time constant relates to the response time of the meter which allows rapid variations in noise level to be registered.

NYMNPA
02/03/2023



Project Title / Facility Name:

Woodsmith Project

Document Title:

EMISSIONS TO ATMOSPHERE - PHASE 6 - NYMNPA CONDITION 91 (ROYAL HASKONINGDHV) - LADYCROSS

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**WOODSMITH PROJECT
(788.5030)****EMISSIONS TO ATMOSPHERE
- PHASE 6 - NYMNPA
CONDITION 91 - LADYCROSS
PLANTATION**

/

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REPORT

NYMNPA-91 Emissions to Atmosphere

Ladycross Plantation Phase 6

Client: STRABAG AG

Reference: 40-ST5-LC-2100-EN-PL-00031 REV B

Status: 00/Final

Date: 31 January 2023

HASKONINGDHV UK LTD.

Manchester One
53 Portland Street
Manchester
M1 3LF
United Kingdom
Industry & Buildings
VAT registration number: 792428892

+44 161 2361018 **T**
email **E**
royalhaskoningdhv.com **W**

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Table of Contents

1	Introduction	1
2	Assessment	2
3	Conclusions/Condition Discharge	3

Table of Tables

Table 1.1	Condition NYMNPA-91 Emissions to Atmosphere	1
Table 2.1	Comparison of Emission Sources between Phase 6 and the York Potash ES and SEI	2

Table of Figures

Figure 1	Location of Ladycross Plantation in Relation to Designated Ecological Sites	4
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1 Introduction

1.1.1 In 2014 a planning application (reference NYM/2014/0676/MEIA) was submitted to North York Moors National Park Authority (NYMNPAA) for permission to develop a polyhalite mine and underground Mineral Transport System (MTS). Planning consent was subsequently granted in 2015, subject to conditions, as varied in February 2018 by NYM/2017/0505/MEIA.

1.1.2 This document has been prepared on behalf of STRABAG AG, the contractor delivering the Phase 6 Works on behalf of Anglo American, and details the requirements with respect to emissions to atmosphere for the Phase 6 Works of the development at Ladycross Plantation (see paragraph 1.1.6 below). This document is required to partially discharge Condition 91 of the NYMNPAA planning permission NYM/2017/0505/MEIA and has been prepared in accordance with current good practice. The planning condition states that:

“The final specification and configuration of generators to be employed at Doves Nest Farm and Ladycross Plantation, such to be fitted with Selective Catalytic Reduction (SCR), or other such emissions control measures as are necessary, will be submitted to the MPA for approval prior to commencement of their use. Results of air dispersion modelling will be submitted at the same time to verify that the identified configuration will lead to nutrient nitrogen and acid deposition at levels no greater than those that were demonstrated in the York Potash Environmental Statement (September 2014 as updated by the Supplementary Environmental Statement dated February 2015) as not leading to a significant effect on the integrity of the North York Moors SAC, SPA and SSSI.”

1.1.3 The specific requirements of Condition NYMNPAA-91 are detailed in Table 1-1.

Table 1.1 Condition NYMNPAA-91 Emissions to Atmosphere

Condition NYMNPAA-91	Compliance with Condition NYMNPAA-91
The specification and configuration of generators and Selective Catalytic Reduction (SCR) / emission control measures.	Section 2
Confirmation that Phase 6 nutrient nitrogen and acid deposition rates are below those presented in the York Potash Environmental Statement (ES) and Supplementary Environmental Information Report (SEI).	Section 3

1.1.4 This assessment considers only the Phase 6 Works at Ladycross Plantation. Updates to this assessment will be prepared for subsequent construction phases and following any design review or method change. The approach adopted in this document was agreed with Natural England and NYMNPAA for previous Phases at Woodsmith Mine.

1.1.5 The scope of Phase 6 described by this document is as follows:

- Installation of shaft infrastructure including tally hut, communications and ventilation fan;
- Installation and use of temporary cable laying sub-bases, winch and emergency rescue winch;
- Installation of Alimak and associated infrastructure;
- Backfill of the Lagoon;
- Installation and use of temporary shaft head house and associated services;
- Installation and use of grout plant and associated services;

- Installation of emergency back-up generators; and
- Construction of temporary overflow car park including tarmac hardstanding for an additional 10 car parking spaces.

2 Assessment

2.1.1 This assessment considers the impact of nutrient nitrogen and acid deposition from emissions arising from the Phase 6 Works. During Phase 6, an electrical grid supply will be in use on the site, which will be supplemented with additional diesel generation to ensure there is sufficient power for the proposed activities. As a proportion of the power requirement will be provided by electrical means, it was not considered that detailed dispersion modelling was necessary to undertake the assessment for this Phase of works. This document therefore presents a comparison of the power demand required during Phase 6, hours of working and duration, with the power demand and working hours presented within the York Potash Environmental Statement (ES) and Supplementary Environmental Information report (SEI) (Royal HaskoningDHV, 2014 and 2015), upon which the consented nutrient nitrogen and acid deposition values were based. The expected impact upon designated ecological sites was then evaluated.

2.1.2 A comparison of the atmospheric emission sources operating during Phase 6 with those considered in the York Potash ES and SEI (Royal HaskoningDHV, 2014 and 2015) is shown in **Table 2.1**.

Table 2.1 Comparison of Emission Sources between Phase 6 and the York Potash ES and SEI

Parameter	Phase 6	ES and SEI
Number of generators and capacity	1 x 400 kVA generator 1 x 250 kVA generator 2 x 60 kVA generators 12 x 6 kVA generators 842 kVA total	7 x 1,290 kVA generators with SCR at 88% efficiency 9,030 kVA total
Stack height	Approx. 2.5 m	30 m
Other emission sources	Road traffic Plant emissions	Road traffic Plant emissions Blasting emissions
Working hours	Some activities 7am to 7pm Other activities 24 hours a day	24 hours a day
Duration	34 weeks	26 weeks

- 2.1.3 As shown in **Table 2.1**, there is significantly less power generation capacity required during the Phase 6 Works in comparison to the level of generation assessed in the York Potash ES and SEI (9%). In the ES and SEI, the generator emissions were assumed to be abated using Selective Catalytic Reduction (SCR) technology; given the lower power demand during Phase 6 in comparison to the ES and SEI assessment scenario, SCR or other emissions abatement technology is not considered to be required to mitigate impacts at designated ecological sites. In addition, the assessment presented in the ES and SEI included emissions from blasting which would not occur during Phase 6. The 400 kVA generator would be used for the shaft fit out works and would be operated at 100% load for up to 24 hours per day as a worst-case scenario. The 250 kVA generator will also be operated at 100% load; however, it will be used only for a five-week period to power the cable laying winch. In addition, the 60 kVA generators will be used to power the siltbuster and wheelwash and will therefore be used only intermittently when these items of plant are in use, at a low load (10%). As such, emissions from the onsite generators will be relatively low.
- 2.1.4 Whilst higher stack heights typically reduce off site effects by allowing greater dilution and dispersion of emissions before reaching receptors at ground level, they also carry pollutants across greater distances from the source. The lower stack heights utilised during Phase 6 will prevent emissions from dispersing further from the site towards designated habitats. As shown in **Figure 1**, the Ladycross Plantation site is situated at a distance from the North York Moors SAC and SSSI boundaries (3.5 km at its closest point). Whilst the total duration of diesel power usage at Ladycross Plantation has exceeded the six-month duration assessed in the ES and SEI, it is considered highly unlikely that emissions from the relatively small onsite generators would give rise to effects on designated sites given that emissions would be well dispersed and diluted across a 3.5 km distance. As such, emissions from plant and generators operating as part of the Phase 6 works would not lead to nutrient nitrogen and acid deposition of a greater magnitude than that presented in the ES and SEI at designated ecological sites.
- 2.1.5 If required, additional assessments will be carried out for future Phases of construction as the power demand at Ladycross Plantation increases.

3 Conclusions/Condition Discharge

- 3.1.1 This emissions to atmosphere assessment shows that emissions from the Phase 6 Works will result in no greater nutrient nitrogen and acid deposition at ecological receptors than those values presented in the ES and SEI. Additional mitigation controls are therefore not required for Phase 6.
- 3.1.2 The assessment thereby demonstrates that the requirements of Condition NYMNPA-91 are met.

Key:

-  Lady Cross Plantation
-  Special Protection Area
-  Site of Special Scientific Interest
-  Special Area of Conservation

Title

Location of Lady Cross Plantation in Relation to Designated Ecological Sites

Project

PB1110 Woodsmith Project

Client

STRABAG AG

Date

21/09/2021

Scale

1:65000

Figure

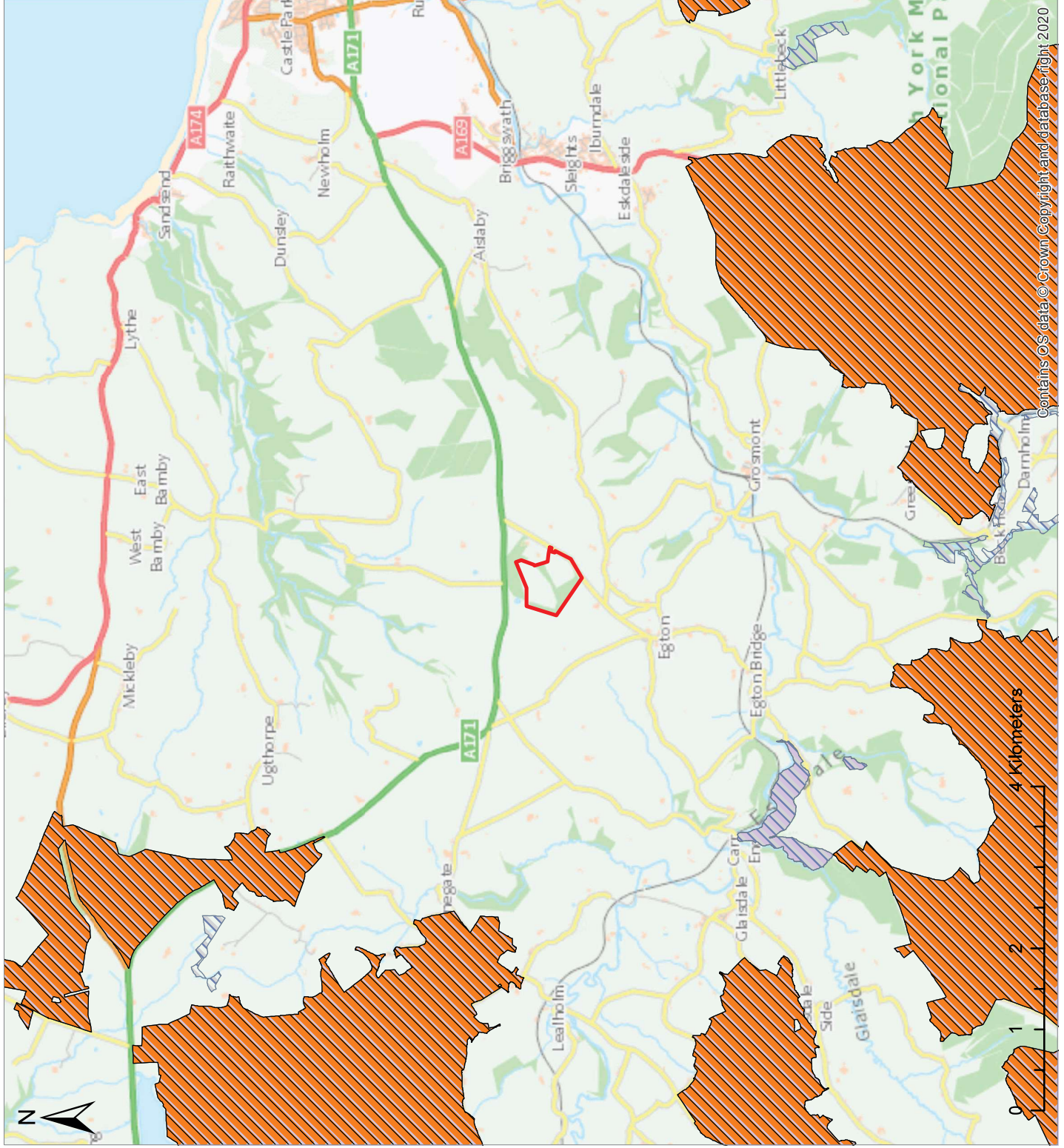
Figure 1

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Royal HaskoningDHV
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NYMNP

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**WOODSMITH PROJECT
(788.5030)**

**CONSTRUCTION VEHICLE &
PLANT MANAGEMENT PLAN -
PHASE 6 - NYMNPA
CONDITION 92 - LADYCROSS
PLANTATION**

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REPORT

NYMNP-92 Construction Vehicle and Plant Management Plan

Ladycross Plantation Phase 6

Client: STRABAG AG

Reference: 40-ST-LS-LC-2100-LG-PL-00006 Rev B

Status: 00/Final

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HASKONINGDHV UK LTD.

Manchester One
53 Portland Street
Manchester
M1 3LF
Industry & Buildings
VAT registration number: 792428892

+44 161 2361018 T
email E
royalhaskoningdhv.com W

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Table of Contents

1	Introduction	1
2	Baseline Conditions	3
2.1	Definitions of Dust and Fine Particulate Matter	3
2.2	Site-Specific Dust Deposition Survey	3
2.3	Background Particulate Matter Concentrations	3
2.4	Additional Monitoring	4
3	Predicted Traffic Movements Associated with Phase 6 Works	5
3.1	Construction Phase Road Traffic Movements	5
3.2	On-Site Plant	5
4	Predicted Particulate Emissions from Plant and HGVs during Phase 6	7
4.1	Methodology	7
4.2	Assumptions	8
4.3	Emissions from Construction Phase Road Traffic Movements	8
4.4	Emissions from the Operation of On-Site NRMM and Generators	9
4.5	Total Particulate Emissions Generated During Phase 6	10
5	Mitigation Measures	12
5.1	Construction Dust and NRMM Mitigation Measures	12

Table of Tables

Table 1-1	Condition NYMNP-92 Construction Vehicle and Plant Management Plan	1
Table 3-1	Traffic Movements Generated During Phase 6 at Ladycross Plantation	5
Table 3-2	Plant Required During Phase 6	5
Table 4-1	Total PM ₁₀ Emissions from NRMM during Phase 6	9
Table 4-2	Total PM Emissions from Construction Traffic, NRMM and Generators	10

Figures

Figure 1 – Dust Monitoring Locations	14
Figure 2 – 2019 PM ₁₀ Emissions Mapping	15

Appendices

- A1** Definitions of Dust and Fine Particulate Matter
- A2** Background Particulate Matter Concentrations
- A3** Inputs and Outputs of the Emission Factor Toolkit
- A4** Calculation of Emissions from NRMM
- A5** Calculation of Emissions from Generators

1 Introduction

1.1.1 In 2014 a planning application (reference NYM/2014/0676/MEIA) was submitted to North York Moors National Park Authority (NYMNPA) for permission to develop a polyhalite mine and underground Mineral Transport System (MTS). Planning permission was subsequently granted in 2015, subject to conditions, as varied in February 2018 by NYM/2017/0505/MEIA.

1.1.2 This document has been prepared on behalf of STRABAG AG, the contractor delivering the Phase 6 Works on behalf of Anglo American, and details the requirements with respect to construction vehicles and plant for Phase 6 of the development at Ladycross Plantation (see paragraph 1.1.5 below). This document is required to partially discharge Condition 92 of the NYMNPA planning permission NYM/2017/0505/MEIA and has been prepared in accordance with current good practice. The planning condition states that:

“Prior to the commencement of each Phase of Construction at either Dove’s Nest Farm or Ladycross Plantation, a Construction Vehicle and Plant Management Plan (CVPM) shall be submitted to and approved in writing by the MPA. The CVPM shall include details of monitoring locations and baseline particulate emissions; predicted traffic movements into/out of the sites including levels at the A171/Mayfield junction; predicted particulate emissions from plant and HGVs during the construction period; proposed particulate control levels; proposed avoidance or mitigation measures to comply with control levels, and arrangements for monitoring over the construction period. Development shall only occur in strict accordance with the measures set out in the CVMP [sic], unless otherwise agreed in writing with the MPA.”

1.1.3 The specific requirements of the planning condition are detailed in **Table 1-1**.

Table 1-1 Condition NYMNPA-92 Construction Vehicle and Plant Management Plan

Condition NYMNPA-92	Compliance with Condition NYMNPA-92
Details of monitoring locations and baseline particulate emissions	Section 2
Predicted traffic movements into/out of the sites including levels at the A171/Mayfield junction	Section 3
Predicted particulate emissions from plant and Heavy Goods Vehicles (HGVs) during the construction period	Section 4
Proposed avoidance or mitigation measures to comply with control levels	Section 5
Proposed particulate control levels	Section 5
Arrangements for monitoring over the construction period	Section 2

1.1.4 This management plan details only the Phase 6 Works at Ladycross Plantation. Updates to this plan will be prepared for subsequent construction phases (as required) and following any design review or method change. The NYMNPA has confirmed that it supports this approach.

1.1.5 The activities required for the Phase 6 Works comprise the following:

- Installation of shaft infrastructure including tally hut, communications and ventilation fan;

- Installation and use of temporary cable laying sub-bases, winch and emergency rescue winch;
- Installation of Alimak and associated infrastructure;
- Backfill of the Lagoon;
- Installation and use of temporary shaft head house and associated services;
- Installation and use of grout plant and associated services;
- Installation of emergency back-up generators; and
- Construction of temporary overflow car park including tarmac hardstanding for an additional 10 car parking spaces.

1.1.6 Meetings to discuss the scope and content of this document were held with the Environmental Health Officer (EHO) of Scarborough Borough Council (SBC) and NYMNPA on 17 March 2016 and 27 April 2016 respectively for earlier Phases of Works at Woodsmith Mine. The scope was re-confirmed with the EHO in a meeting on 1 December 2016. This document follows the agreed approach, and is in line with the CVPMPs previously submitted for Woodsmith Mine.

2 Baseline Conditions

2.1 Definitions of Dust and Fine Particulate Matter

2.1.1 Definitions of dust and fine particulate matter are provided in **Appendix A1**.

2.2 Site-Specific Dust Deposition Survey

2.2.1 Baseline dust deposition monitoring was not undertaken at Ladycross Plantation as part of the Environmental Statement (ES) which supported the planning application. As such, there are no historical baseline datasets at the site.

2.2.2 Dust deposition monitoring is now undertaken at four locations around the site, as shown in **Figure 1**, which will continue throughout the construction works.

2.2.3 Wind roses of hourly sequential meteorological data from the Fylingdales recording station were provided in the ES¹. The predominant wind direction is from the south-west, and locations downwind of particulate sources are likely to experience the greatest deposition.

2.2.4 Regulatory authorities conventionally consider a threshold of 200 mg/m²/day^{2,3} to be the dust deposition rate above which complaints are likely⁴. It is expected that, given the nature of the area and that the ground has a covering of vegetation, baseline dust deposition rates would be below 200 mg/m²/day. This would be expected in a rural and relatively undeveloped location.

2.3 Background Particulate Matter Concentrations

2.3.1 Background PM₁₀ and PM_{2.5} concentrations were sourced from pollutant maps provided by Defra⁵ for a 1km x 1km resolution of the UK. The relevant 2023 background pollutant concentrations at Ladycross Plantation were obtained for the grid squares covering the area, and are detailed in **Appendix A2**.

2.3.2 Background PM₁₀ and PM_{2.5} concentrations at Ladycross Plantation are well below the annual mean Air Quality Objectives (in England) of 40µg.m⁻³ and 25µg.m⁻³ respectively. The main contributor to PM₁₀ concentrations within the above grid squares is secondary PM₁₀ (aerosols formed in atmospheric condensation reactions), sea salt and calcium and iron rich dusts, reflecting the proximity of Ladycross Plantation to the coast.

¹ Royal HaskoningDHV (2014) York Potash Project Mine, MTS and MHF Environmental Statement: Part 2 Chapter 9 Air Quality

² Environment Agency (2013) Technical Guidance Note (Monitoring) M17 Monitoring Particulate Matter in Ambient Air around Waste Facilities

³ Institute of Air Quality Management (2016) Guidance on Air Quality Monitoring in the Vicinity of Demolition and Construction Sites

⁴ Vallack & Shillito (1998) Suggested guidelines for deposited ambient dust, Atmospheric Environment **16** (32), 2737-2744

⁵ Defra (2020) 2018-based background maps <https://uk-air.defra.gov.uk/data/laqm-background-maps?year=2018>

2.4 Additional Monitoring

- 2.4.1 Construction activities will be subject to a range of dust and vehicle management measures, as set out in the Construction Environmental Management Plan (CEMP), submitted to partially discharge planning condition NYMNPA-93. The measures detailed in the CEMP include regular visual site inspections to monitor compliance with dust control procedures set out within the document. The results of the inspections will be recorded within the site log book, and included in monthly reporting. Details around dust management are included within the Phase 5 CEMP, and within the Phase 3 Dust Management Plan which remains applicable for this Phase.
- 2.4.2 The programme of site inspections will assist with interpretation of the results of the ongoing dust deposition monitoring which will be undertaken throughout the construction works, and which will provide retrospective information about dust levels generated during construction to inform site management practices.

3 Predicted Traffic Movements Associated with Phase 6 Works

3.1 Construction Phase Road Traffic Movements

3.1.1 The anticipated traffic movements associated with Phase 6 align with the targets for vehicle movements presented in the Construction Traffic Management Plan (CTMP), submitted to partially discharge planning condition NYMNP-34, and are based on the peak number of movements permitted at Ladycross Plantation. The Phase 6 Works will be undertaken over a 34 week period, totalling approximately 238 working days. It is expected that due to their scale, the Phase 6 Works would not generate the peak number of permitted vehicle movements; the assessment is therefore conservative.

3.1.2 The number of traffic movements generated during the Phase 6 Works is detailed in **Table 3-1**.

Table 3-1 Traffic Movements Generated During Phase 6 at Ladycross Plantation

Vehicle Type	Number of Vehicles During Phase 6 (Two-Way)*	Maximum Number of Vehicles per Day (Two-Way)
HGV	11,628	56
Light Goods Vehicles (LGVs)**	28,560	120

*HGVs are restricted on Sundays and therefore the total number of HGVs during Phase 6 does not equate to the duration multiplied by the number of HGVs per day

**Includes cars, minibuses and vans

3.1.3 As the primary source of construction materials within the area will be from Teesside, no HGVs would travel through the A171/Mayfield junction. It is expected that, based upon forecast employee distribution, there would be a negligible increase in traffic movements through the A171/Mayfield junction.

3.2 On-Site Plant

3.2.1 The number and types of plant that would be operating for the duration of Phase 6 at Ladycross Plantation are provided in Table 3-2. A number of generators will be on site in Phase 6 for emergency use. Whilst these generators will be routinely tested and maintained, as they will be used only in exceptional circumstances, emissions from emergency generators were not included in this assessment. In the table below, the generators for powering the siltbuster and wheelwash are noted as being in use for the full duration of Phase 6; however, these generators would be used periodically and only when required, and therefore the assessment is considered to be conservative.

Table 3-2 Plant Required During Phase 6

Task	Plant Type	Duration of Phase 6 That Plant Will Be Used*
General site use	12T Excavator	75%
	12T Dumper	75%
	Ride on Roller	75%

Task	Plant Type	Duration of Phase 6 That Plant Will Be Used*
	60T Mobile Crane	75%
	Telehandler	75%
	Road Sweeper	75%
	Skid steer	75%
	Mobile Elevated Working Platform (MEWP)	25%
Installation of shaft infrastructure including tally hut, communications and ventilation fan	130T mobile crane	18%
	250T mobile crane	18%
Installation of cable sub-bases, winch and emergency winch	Tracked Excavator 20T	4%
	Roller Vibrator	4%
	Dumper Truck 20T	4%
	Telehandler 5T	4%
Installation of Alimak and associated infrastructure	130T mobile crane	29%
	250T mobile crane	29%
Lagoon Backfill and Restoration	Tracked Excavator 20T	7%
	Tracked Excavator 30T	7%
	Dozer	7%
	Dumper Truck 20T	7%
	Dumper Truck 20T	7%
	20T 8 Wheeler Tipper	7%
Installation and use of temporary shaft head house and associated services	Crane 135T	9%
	Crane 240T	9%
Installation and use of grout plant and associated services	Tracked Excavator 20T	9%
	Roller Vibrator	9%
	Dumper Truck 20T	9%
	MEWP	3%
	130T mobile crane	9%
Installation of emergency back-up generators	130T mobile crane	4%
	Telehandler 5T	4%
Construction of temporary overflow car park including tarmac hardstanding for an additional 10 car parking spaces	Dozer	1%
	Roller	1%
	Tarmac Paver	1%
	Tracked Excavator 20T	1%

Task	Plant Type	Duration of Phase 6 That Plant Will Be Used*
General equipment	Concrete pump	75%
	4" Supersilent Pump x6	75%
	Lighting Tower x 12	50%
	Towable Jet Wash	75%
	Towable Water Bowser 7000l	75%
	400kVA generator (Shaft fit-out)	94%
	250kVA generator (cable laying winch)	15%
	60kVA generator (Siltbuster) (Rain Dependant)	100%
	60kVA generator (Wheelwash)	100%
* This takes into account the utilisation of the plant throughout the 34-week construction period and the expected on-time of the plant		

4 Predicted Particulate Emissions from Plant and HGVs during Phase 6

4.1 Methodology

4.1.1 Particulate matter will be generated by the combustion of fuel and brake and tyre wear associated with the following activities during Phase 6:

- Transportation of workforce to site;
- HGV deliveries and movements; and
- The operation of on-site plant (referred to as Non-Road Mobile Machinery (NRMM)) and generators.

4.1.2 Data on the above activities are provided where the required information is known. Where data were not available, information used in the assessments undertaken for the Environmental Statement are used, which included the average trip length and speeds. This is considered to be a reasonable worst-case scenario.

4.1.3 The quantification of emissions from road traffic was undertaken using the Defra Emission Factor Toolkit (version 11.0). The Emission Factor Toolkit is regularly updated to reflect the latest vehicle technologies and fleet compositions, and is the primary method of deriving emissions from road transport in the UK. The standard UK fleet composition for 2023, built into the Emission Factor Toolkit, was utilised.

- 4.1.4 The Emission Factor Toolkit does not provide specific emission factors for NRMM. As such, emissions of NRMM were calculated using the methodology detailed in European Environment Agency (EEA) Guidance⁶. This document details specific emission factors for NRMM, based on the power rating of the plant and the various emission stages, which correspond to the emission standards set out in relevant EU Directives.
- 4.1.5 The guidance provides three tiers of emission factors; the appropriate tier for use is dependent on the level of information available on the types of plant. As specific information on the make and model of plant used at Ladycross Plantation were provided by STRABAG, Tier 3 emission factors were used.
- 4.1.6 Emissions associated with generators were derived using the Tier 1 approach in EEA Guidance⁷. Fuel consumption was derived using the electrical power of the plant, the electrical efficiency, the anticipated load and hours of use per day as provided by STRABAG. Emission factors were obtained from the EEA Guidance.

4.2 Assumptions

- 4.2.1 The following assumptions were made in the assessment of particulate emissions from NRMM and vehicle movements:
- NRMM was assumed to be in operation for 75% of the working day, with more specialist items of plant (the MEWP) and the wheel wash generator assumed to be in operation for 25% of the working day;
 - Phase 6 will commence in 2023 – emission factors for 2023 were therefore used;
 - Some activities will be undertaken during a 12-hour working day, with others undertaken 24/7. This has been reflected within the calculations;
 - All generators were assumed to operate at 40% efficiency;
 - The duration of Phase 6 will be 34 weeks, with all Sundays worked; and
 - HGV deliveries are restricted to 10% of weekday volumes on Sundays (as per the CTMP). It was therefore assumed that, on Sundays, HGV deliveries would be 10% of weekday trips.
- 4.2.2 Data were provided by STRABAG on the expected loading for all items of plant during their use, and this information was applied in the assessment.
- 4.2.3 Average HGV speeds were obtained from GIS smartphone data on the road links that comprise the haul route, and average speeds of cars were obtained from route mapping and estimated distance over time.

4.3 Emissions from Construction Phase Road Traffic Movements

- 4.3.1 The quantification of particulate emissions generated by construction-phase traffic movements was undertaken using the following input data:
- Number of daily HGV and car movements;

⁶ EMEP/EEA (2019) *Emission Inventory Guidebook – Non-Road Mobile Sources and Machinery*

⁷ EMEP/EEA (2019) *Emission Inventory Guidebook – Small Combustion*

- Average trip lengths (km);
- Average speed vehicles will be travelling; and
- Emission factors for each vehicle type.

4.3.2 Input and output data from the Emission Factor Toolkit are detailed in **Appendix A3**.

4.4 Emissions from the Operation of On-Site NRMM and Generators

4.4.1 The input data used to calculate particulate (PM₁₀) emissions from NRMM and generators are detailed in **Appendix A4** and **Appendix A5**. The calculated particulate emissions from NRMM and generators are detailed in **Table 4-1**.

Table 4-1 Total PM₁₀ Emissions from NRMM during Phase 6

Task	Plant Type	Total PM ₁₀ Emission (tonnes)
General site use	12T Excavator	0.0018
	12T Dumper	0.0252
	Ride on Roller	0.0061
	60T Mobile Crane	0.0128
	Telehandler	0.0470
	Road Sweeper	0.0136
	Skid steer	0.0021
	Mobile Elevated Working Platform (MEWP)	0.0030
Installation of shaft infrastructure including tally hut, communications and ventilation fan	130T mobile crane	0.0068
	250T mobile crane	0.0068
Installation of cable sub-bases, winch and emergency winch	Tracked Excavator 20T	0.0076
	Roller Vibrator	0.0029
	Dumper Truck 20T	0.0048
	Telehandler 5T	0.0028
Installation of Alimak and associated infrastructure	130T mobile crane	0.0111
	250T mobile crane	0.0111
Lagoon Backfill and Restoration	Tracked Excavator 20T	0.0124
	Tracked Excavator 30T	0.0101
	Dozer	0.0004
	Dumper Truck 20T	0.0048
	Dumper Truck 20T	0.0048
	20T 8 Wheeler Tipper	0.0022
	Crane 135T	0.0034

Task	Plant Type	Total PM ₁₀ Emission (tonnes)
Installation and use of temporary shaft head house and associated services	Crane 240T	0.0034
Installation and use of grout plant and associated services	Tracked Excavator 20T	0.0153
	Roller Vibrator	0.0036
	Dumper Truck 20T	0.0059
	MEWP	0.0018
	130T mobile crane	0.0021
Installation of emergency back-up generators	130T mobile crane	0.0011
	Telehandler 5T	0.0028
Construction of temporary overflow car park including tarmac hardstanding for an additional 10 car parking spaces	Dozer	0.0001
	Roller	0.0004
	Tarmac Paver	0.0001
	Tracked Excavator 20T	0.0012
General equipment	Concrete pump	0.0471
	4" Supersilent Pump x6	0.2726
	Lighting Tower x 12	0.1010
	Towable Jet Wash	0.0179
	Towable Water Bowser 7000l	0.5452
	400kVA generator (Shaft fit-out)	0.3251
	250kVA generator (cable laying winch)	0.0318
	60kVA generator (Siltbuster) (Rain Dependant)	0.0052
60kVA generator (Wheelwash)	0.0052	

4.5 Total Particulate Emissions Generated During Phase 6

4.5.1 The total particulate predicted to be generated during Phase 6 as a result of emissions from construction-phase traffic, NRMM and generators is detailed in **Table 4-2**.

Table 4-2 Total PM Emissions from Construction Traffic, NRMM and Generators

Source	Total PM Emission (tonnes)
Construction Traffic	0.107
NRMM and Generators	1.592
TOTAL	1.700

- 4.5.2 The total PM₁₀ emission within the SBC area was derived from National Atmospheric Emission Inventory (NAEI) mapping⁸, as detailed in **Figure 2**.
- 4.5.3 The total PM₁₀ emission within the whole SBC area of jurisdiction was 255.29 tonnes in 2019. Whilst the NAEI mapping was recently updated with data for 2020, the website notes that the Covid-19 pandemic resulted in significantly lower PM₁₀ emissions from road transport, aviation and railways in 2020 in comparison to 2019. As such, 2019 data are considered to provide a more robust baseline for comparison. Particulate emissions generated during Phase 6 will therefore contribute 0.67% of the total emissions within this local authority area.

⁸ National Atmospheric Emission Inventory (2019) Emission Maps for the UK http://naei.defra.gov.uk/data/map-uk-das?pollutant_id=24&emiss_maps_submit=naei-20160526090831

5 Mitigation Measures

5.1 Construction Dust and NRMM Mitigation Measures

5.1.1 Details of mitigation measures to minimise construction phase dust emissions are included in the CEMP.

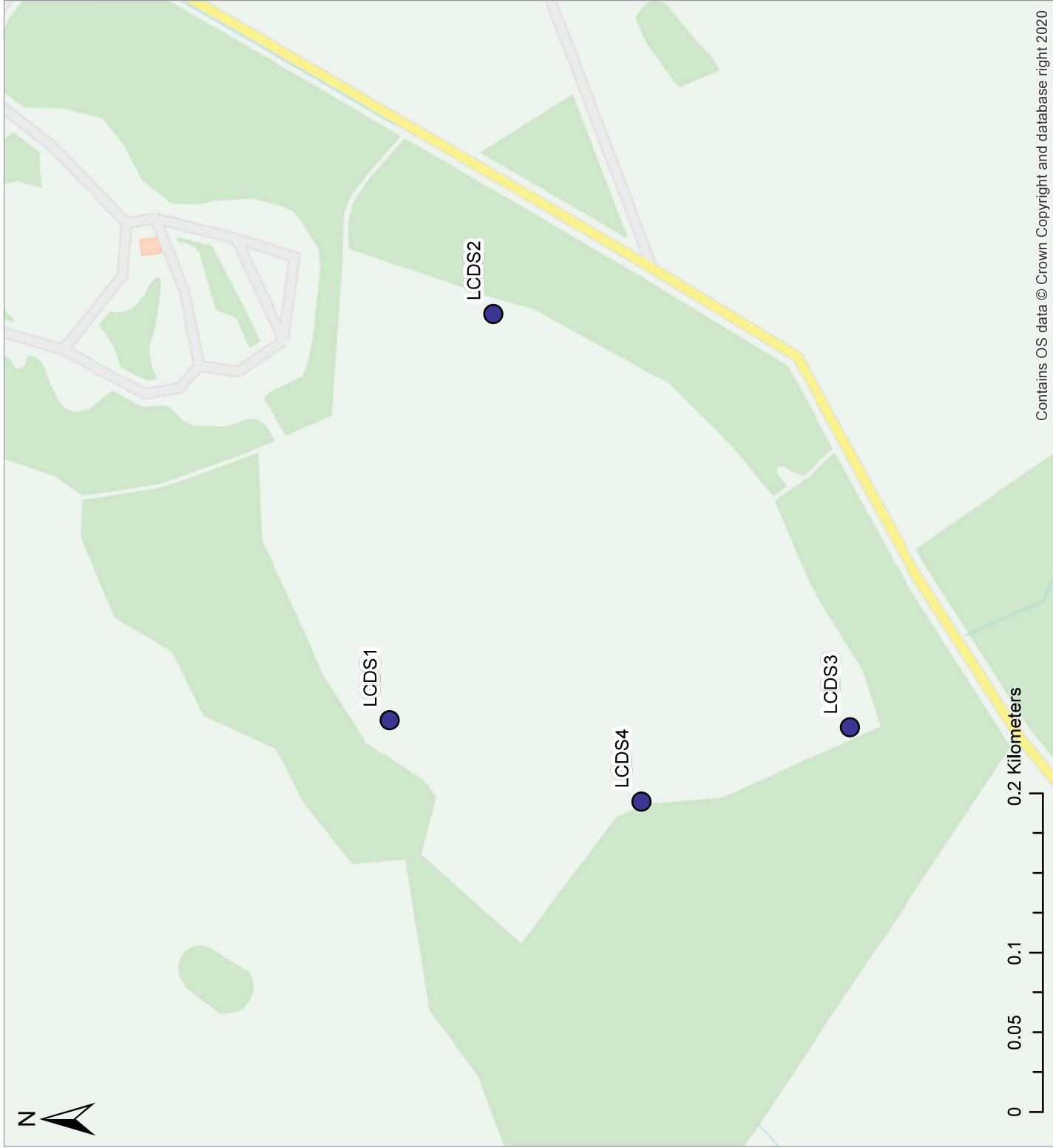
5.1.2 All NRMM and plant will be well maintained. If any emissions of dark smoke occur then the relevant machinery will stop immediately and any problem rectified. In addition, the following controls will apply to NRMM:

- All NRMM should use fuel equivalent to ultralow sulphur diesel (fuel meeting the specification within EN590:2004);
- All NRMM will comply with the appropriate NRMM emission standards;
- All NRMM will be fitted with Diesel Particulate Filters (DPF) conforming to defined and demonstrated filtration efficiency (load/duty cycle permitting);
- The ongoing conformity of plant retrofitted with DPF, to a defined performance standard, will be ensured through a programme of onsite checks; and,
- Fuel conservation measures will be implemented, including instructions to:
 - throttle down or switch off idle construction equipment;
 - switch off the engines of trucks while they are waiting to access the site and while they are being loaded or unloaded; and,
 - ensure equipment is properly maintained to ensure efficient fuel consumption.

5.1.3 The vehicle fleet accessing Ladycross Plantation will be fitted with DPFs, which will control particle emissions⁹.

⁹ DPFs are commonly fitted to cars and commercial vehicles to reduce particulate emissions and ensure compliance with the latest Euro standards. It is an offence under the Road Vehicles (Construction and Use) Regulations (1986) to use a vehicle that has had the DPF removed.

Figures



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Key:



Location of Dust Monitor

Title

Ladycross Plantation Dust Monitoring Locations

Project

PB1110 Woodsmith Project

Client

STRABAG AG

Date

07/07/2022

Scale

1:3300

Figure

Figure 1

Checked by

JD

Number

1

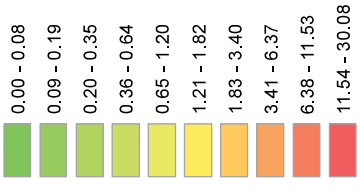


**Royal
HaskoningDHV**
Enhancing Society Together

Key:

- Ladycross Plantation
- Scarborough Borough Council Area

Tonnes PM10/km2 2019



Title

2019 NAEI PM10 Emissions Mapping

Project

PB1110 Woodsmith Project

Client

STRABAG AG

Date

07/07/2022

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Figure

Figure 2

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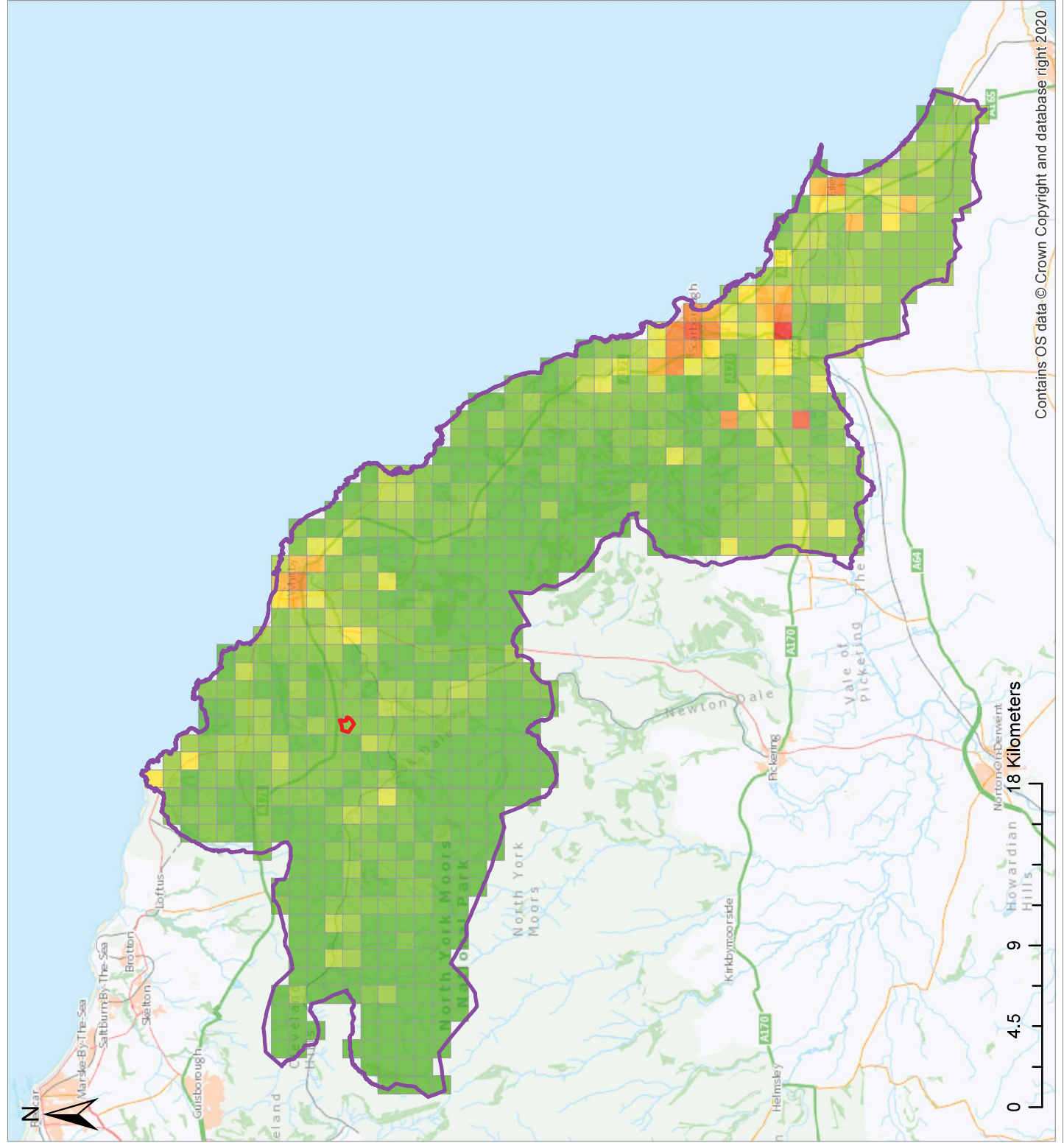
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Appendix A

A1 Definitions of Dust and Fine Particulate Matter

Atmospheric particles are generally categorised by size fraction and by their source, and are usually measured by mass concentration (although particle number and 'black carbon' techniques are available). The generic term of 'dust' and the two size fractions most commonly used to consider human health environmental effects are defined below.

'Dust' is considered to be the mass of solid particles that are suspended in air or have settled out onto a surface after having been suspended in air. In IAQM Guidance¹⁰ and within this document, the term 'dust' has been used to include the particles that give rise to soiling, and to potential human health and ecological effects. BS 6069:1993 provides a definition of dust as particles up to 75µm in diameter.

The smaller size fractions considered in the UK Local Air Quality Management regime are defined in Regulations¹¹ as follows:

- "PM₁₀" means particulate matter which passes through a size-selective inlet as defined in the reference method for the sampling and measurement of PM₁₀, EN 12341, with a 50% efficiency cut-off at 10µm aerodynamic diameter; and,
- "PM_{2.5}" means particulate matter which passes through a size-selective inlet as defined in the reference method for the sampling and measurement of PM_{2.5}, EN 14907, with a 50% efficiency cut-off at 2.5µm aerodynamic diameter.

The term 'aerodynamic diameter' is a reference to the terminal velocity in air of a spherical particle of unit density, therefore this is a way of standardising the range of irregular airborne particle loading for measurement and standard-setting.

Particulate matter is generally described by source as being either 'primary' or 'secondary'. Primary particles such as carbon particles from fuel combustion, sea salt and mineral particles derived from construction activities are released directly into the air, whereas secondary particles are formed in the atmosphere by chemical reactions that lead to the formation of low volatility compounds that condense into particles.

The main sources of primary particulate are road transport (combustion emissions, brake and tyre wear and re-entrainment of dust from road surfaces); stationary combustion (such as domestic coal burning); and industrial processes (production of metals, cement, lime, coke and chemicals, bulk handling of dusty materials, construction, mining and quarrying).

Secondary particles are less easy to ascribe to their original sources. They are comprised mainly of ammonium sulphate and nitrate, originating from the oxidation of sulphur and nitrogen oxides in the atmosphere to acids, which are then neutralised by atmospheric ammonia derived mainly from agricultural sources. The chemical processes involved in their formation are relatively slow and their persistence in the atmosphere is prolonged. Thus, secondary particles are distributed more evenly

¹⁰ Institute of Air Quality Management (2016). Guidance on the assessment of dust from demolition and construction.

¹¹ The Air Quality Standards Regulations 2010 (SI 2010 No.1001)



throughout the air with fewer differences between urban and rural areas. They can also travel large distances, resulting in the transport of particles across national boundaries (AQEG, 2005)¹².

¹² Air Quality Expert Group (AQEG), (2005). Particulate Matter in the United Kingdom. Defra, London

A2 Background Particulate Matter Concentrations

Table A2 2023 Background Particulate Matter Concentrations

Grid Square	PM ₁₀ Background Concentration (µg.m ⁻³)	PM _{2.5} Background Concentration (µg.m ⁻³)
481500,507500	9.56	5.87
481500,508500	9.31	5.84

A3 Inputs and Outputs of the Emission Factor Toolkit

Table A3 Input Data into the Emission Factor Toolkit

Vehicle Type	Number of Vehicles During Phase 6	Number of Vehicles per Day (Averaged over Phase 6)	Speed (kph)	Trip Length (km)
HGV	11,628	49	69	46
Cars	28,560	120	62	45.5

Table A4 Output from the Emission Factor Toolkit

Vehicle Type	Emissions of PM ₁₀ over Phase 6 (kg)
HGV	66.4
Cars	40.9
Total	107.3

A4 Calculation of Emissions from NRMM

The European Monitoring and Evaluation Programme (EMEP)/European Environment Agency (EEA) Emission Inventory Guidebook 2019¹³ provides the following equation to calculate emissions from NRMM:

$$E = N \times \text{HRS} \times P \times (1 + \text{DFA}) \times \text{LFA} \times \text{EF}_{(\text{base})}$$

Where:

- E = mass of emissions generated
- N = source population
- HRS = hours of use over the period
- P = engine size (kW)
- DFA = deterioration factor adjustment
- LFA = load factor adjustment
- EF_(base) = base emission factor (g/kWh).

The average kilowatt (kW) power ratings for the proposed NRMM are provided in **Table A5**.

Table A5 Power Ratings of Required Plant During Phase 6 at Ladycross Plantation

Task	Plant Type	Power in kW
General site use	12T Excavator	74
	12T Dumper	160
	Ride on Roller	24
	60T Mobile Crane	270
	Telehandler	74.5
	Road Sweeper	172
	Skid steer	52.2
	Mobile Elevated Working Platform (MEWP)	36
Installation of shaft infrastructure including tally hut, communications and ventilation fan	130T mobile crane	230
	250T mobile crane	230
Installation of cable sub-bases, winch and emergency winch	Tracked Excavator 20T	128.4
	Roller Vibrator	24
	Dumper Truck 20T	160
	Telehandler 5T	74.5
Installation of Alimak and associated infrastructure	130T mobile crane	230
	250T mobile crane	230
Lagoon Backfill and Restoration	Tracked Excavator 20T	128.4
	Tracked Excavator 30T	210
	Dozer	161
	Dumper Truck 20T	160

¹³ EMEP/EEA (2019) *Emission Inventory Guidebook – Non-Road Mobile Sources and Machinery*

Task	Plant Type	Power in kW
	Dumper Truck 20T	160
	20T 8 Wheeler Tipper	309
Installation and use of temporary shaft head house and associated services	Crane 135T	230
	Crane 240T	230
Installation and use of grout plant and associated services	Tracked Excavator 20T	128.4
	Roller Vibrator	24
	Dumper Truck 20T	160
	MEWP	36
	130T mobile crane	230
Installation of emergency back-up generators	130T mobile crane	230
	Telehandler 5T	74.5
Construction of temporary overflow car park including tarmac hardstanding for an additional 10 car parking spaces	Dozer	161
	Roller	24
	Tarmac Paver	129
	Tracked Excavator 20T	128.4
General equipment	Concrete pump	110
	4" Supersilent Pump x6	18
	Lighting Tower x 12	2.5
	Towable Jet Wash	0.59
	Towable Water Bowser 7000l	18
	400kVA generator (Shaft fit-out)	320
	250kVA generator (cable laying winch)	200
	60kVA generator (Siltbuster) (Rain Dependant)	48
	60kVA generator (Wheelwash)	48

The input data used to calculate emissions from NRMM are detailed in **Table A6**.

Table A6 Input Data Used to Calculate Particulate Emissions from NRMM

Plant	kW	Hours of Use During Phase 6	Deterioration Factor	Load Factor	Emission Factor Stage	Emission Factor (g/kWh)
12T Excavator	74	5,712	0.473	0.25	Stage 5	0.015
12T Dumper	160	5,712	0.473	0.25	Stage 3A	0.1
Ride on Roller	24	5,712	0.473	0.1	Stage 3A	0.4
60T Mobile Crane	270	5,712	0.473	0.5	Stage 5	0.015
Telehandler	74.5	5,712	0.473	0.5	Stage 3A	0.2
Road Sweeper	172	5,712	0.473	0.5	Stage 4	0.025
Skid steer	52.2	5,712	0.473	0.25	Stage 4	0.025

Plant	kW	Hours of Use During Phase 6	Deterioration Factor	Load Factor	Emission Factor Stage	Emission Factor (g/kWh)
Mobile Elevated Working Platform (MEWP)	36	5,712	0.473	0.1	Stage 3A	0.4
130T mobile crane	230	1,344	0.473	0.8	Stage 4	0.025
250T mobile crane	230	1,344	0.473	0.8	Stage 4	0.025
Tracked Excavator 20T	128.4	336	0.473	0.8	Stage 3A	0.2
Roller Vibrator	24	336	0.473	0.8	Stage 3A	0.4
Dumper Truck 20T	160	336	0.473	0.8	Stage 3A	0.1
Telehandler 5T	74.5	336	0.473	0.5	Stage 3A	0.2
130T mobile crane	230	2,184	0.473	0.8	Stage 4	0.025
250T mobile crane	230	2,184	0.473	0.8	Stage 4	0.025
Tracked Excavator 20T	128.4	1,092	0.473	0.8	Stage 3A	0.2
Tracked Excavator 30T	210	1,092	0.473	0.8	Stage 3A	0.1
Dozer	161	1,092	0.473	0.25	Stage 5	0.015
Dumper Truck 20T	160	1,092	0.473	0.5	Stage 3A	0.1
Dumper Truck 20T	160	1,092	0.473	0.5	Stage 3A	0.1
20T 8 Wheeler Tipper	309	1,092	0.473	0.8	Stage 5	0.015
Crane 135T	230	672	0.473	0.8	Stage 4	0.025
Crane 240T	230	672	0.473	0.8	Stage 4	0.025
Tracked Excavator 20T	128.4	672	0.473	0.8	Stage 3A	0.2
Roller Vibrator	24	672	0.473	0.5	Stage 3A	0.4
Dumper Truck 20T	160	672	0.473	0.5	Stage 3A	0.1
MEWP	36	672	0.473	0.5	Stage 3A	0.4
130T mobile crane	230	672	0.473	0.5	Stage 4	0.025
130T mobile crane	230	336	0.473	0.5	Stage 4	0.025
Telehandler 5T	74.5	336	0.473	0.5	Stage 3A	0.2
Dozer	161	168	0.473	0.5	Stage 5	0.015
Roller	24	168	0.473	0.5	Stage 3A	0.4
Tarmac Paver	129	168	0.473	0.5	Stage 4	0.025
Tracked Excavator 20T	128.4	168	0.473	0.5	Stage 3A	0.2
Concrete pump	110	5,712		0.5	Stage 3A	0.2
4" Supersilent Pump x6	18	5,712	0.473	0.25	Stage 3A	1.6
Lighting Tower x 12	2.5	5,712	0.473	0.5	Stage 3A	1.6
Towable Jet Wash	0.59	5,712	0.473	0.25	Stage 3A	1.6
Towable Water Bowser 7000l	18	5,712	0.473	0.25	Stage 3A	1.6

A5 Calculation of Emissions from Generators

The EMEP/EEA Emission Inventory Guidebook 2019¹⁴ provides the following equation to calculate emissions from small combustion sources such as generators:

$$E_{\text{pollutant}} = AR_{\text{fuelconsumption}} \times EF_{\text{pollutant}}$$

Where:

$E_{\text{pollutant}}$ = the emission of the specified pollutant (g.h⁻¹)

$AR_{\text{fuelconsumption}}$ = the activity rate for fuel consumption (GJ.h⁻¹)

$EF_{\text{pollutant}}$ = the emission factor for the pollutant (g/GJ)

The fuel consumption (AR) of each generator was derived using the power rating of the generators, the load, the electrical efficiency and the utilisation percentage. The EF was taken from EMEP/EEA Guidance. The inputs are detailed in **Table A7**.

Table A7 Input Data Used to Calculate Particulate Emissions from Generators

Generator	Power (kVA)	Power (kW*)	Power Load (%)	Percentage of Phase 6 Used (%)	Efficiency (%)	AR Fuel Consumption (GJ.h ⁻¹)	EF (Emission Factor) PM ₁₀ (g/GJ)**
400kVA generator (Shaft fit-out)	400	320	100	94	40%	2.88	21
250kVA generator (cable laying winch)	250	200	100	15	40%	1.80	21
60kVA generator (Siltbuster)	400	320	10	94	40%	2.88	21
60kVA generator (Wheelwash)	250	200	10	15	40%	1.80	21

*Based on kVA to kW conversion of 0.8

** The Emission Factor for liquid fuel was used

NYMNP
02/03/2023



Project Title / Facility Name:

Woodsmith Project

Document Title:

**CONSTRUCTION TRAFFIC MANAGEMENT PLAN - PHASE 6 - NYMNP
CONDITION 34 (ROYAL HASKONINGDHV) - LADYCROSS**

Document Review Status

- 1. Reviewed – Accepted – Work May Proceed By: Robert Staniland
- 2. Reviewed – Accepted As Noted, Work May Proceed, Revise & Resubmit On: 10 Feb 2023 16:42
- 3. Reviewed – Work May Not Proceed, Revise & Resubmit
- 4. For information only
- 5. On Hold – Pending Project Restart & Ramp Up

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A	16-Jan-2023	Planning	PLA			
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**WOODSMITH PROJECT
(788.5030)**

**CONSTRUCTION TRAFFIC
MANAGEMENT PLAN - PHASE
6 - NYMNPA CONDITION 34 -
LADYCROSS PLANTATION
/
40-STS-LC-2100-LG-PL-00007**

(Royal HaskoningDHV)

Revision	Date of issue	Prepared by	Checked by	Approved by	Changes
A (PLA)	16/01/2023	Sam Taylor (RHDHV)	John Drabble (RHDHV)	John Drabble (RHDHV)	First Draft
B (PLA)	01/02/2023	Sam Taylor (RHDHV)	John Drabble (RHDHV)	John Drabble (RHDHV)	Final Issue