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Noise & Vibration Management Plan (NVMP)

**Moreton C Cullimore (Gravels) Ltd
Sand & Gravel Extraction & Restoration Site
Land at Bow Farm
Ripple
Worcestershire**

**To Discharge Planning Conditions 29 & 38
(Worcestershire CC Planning Permission 19/000048/CM) &**

**Planning Condition 33
(Gloucestershire CC Planning Permission APP/T1600/W/23/3324695)**

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Member of Association of Noise Consultants
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Noise and Vibration Management Plan (NVMP)

Executive summary

Purpose of this report

This Noise & Vibration Management Plan (NVMP) has been produced on behalf of Moreton C Cullimore (Gravels) Ltd for the purpose of discharging Planning Conditions 29 & 38 (Worcestershire County Council Planning Permission ref. 19/000048/CM) & Planning Condition 33 (Gloucestershire County Council Planning Permission ref. APP/T1600/W/23/3324695) for the extraction of Sand & Gravel with restoration using site derived and imported inert material to wetlands, nature conservation and agriculture.

This document sets out the proposed NVMP, which will be used to control and monitor the noise and vibration emissions associated with the extraction and restoration works and their effects on nearest sensitive receptors (NSRs). The NVMP details noise and vibration control measures, which have been included as part of the scheme, and sets out the methods of ensuring their effective implementation.

The location, frequency and methodology of noise and vibration monitoring to be undertaken throughout the life of the project, along with noise emission and vibration limits are also presented. Actions to be undertaken in the event of a breach of the relevant limits, or on receipt of any complaints, are specified.

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Introduction

1.1 Purpose of Report

1.1.1 This Noise & Vibration Management Plan (NVMP) has been produced for the purpose of discharging Planning Conditions 29 & 38 (Worcestershire County Council Planning Permission ref. 19/000048/CM) & Planning Condition 33 (Gloucestershire County Council Planning Permission ref. APP/T1600/W/23/3324695) for the extraction of Sand & Gravel with restoration using site derived and imported inert material to wetlands, nature conservation and agriculture (referred hereafter as the 'Site').

1.1.2 Condition 29 (of WCC planning permission) states:

“Noise and Vibration

29. Notwithstanding the submitted details, no soil stripping operations shall take place until a Noise and Vibration Management Plan has been submitted to and approved in writing by the Mineral Planning Authority, which shall include a scheme for noise and vibration monitoring. Thereafter, the development shall be carried out in accordance with the approved scheme.”

Condition 38 (of WCC planning permission) states:

“38. No soil stripping operations shall take place until a scheme to monitor vibrations has been submitted to and approved in writing by the Mineral Planning Authority. The scheme shall include: method, nature, frequency, duration and locations of monitoring, trigger levels and contingency and mitigation proposals should a trigger level be breached. Thereafter monitoring shall be carried out in accordance with the approved scheme.”

Condition 33 (of GCC planning permission) states:

33. Notwithstanding the submitted details, no soil stripping operations shall take place until a Noise and Vibration Management Plan has been submitted to and approved in writing by the Mineral Planning Authority. This shall include a scheme for noise and vibration monitoring, including, method, nature, frequency, duration and locations of monitoring, trigger levels and contingency and mitigation proposals should a trigger level be breached. Thereafter, the development shall be carried out in accordance with the approved details.”

1.1.3 This document sets out the proposed NVMP, which will be used to control and monitor the noise and vibration emissions associated with the extraction and restoration works and their effects on nearest sensitive receptors (**NSRs**). The NVMP details noise and vibration control measures, which have been included as part of the scheme, and sets out the methods of ensuring their effective implementation.

1.1.4 The location, frequency and methodology of noise and vibration monitoring to be undertaken throughout the life of the project, along with noise emission and vibration limits are also presented. Actions to be undertaken in the event of a breach of the relevant limits, or on receipt of any complaints, are specified.

1.2 Report Structure

1.2.1 This report has the following structure broadly in line with the guidance provided by EA NMP guidance:

- Introduction
- Site location and description
- Review of sources, pathways and receptors
- Noise management
- Noise and vibration monitoring
- Reporting and complaints response
- Summary

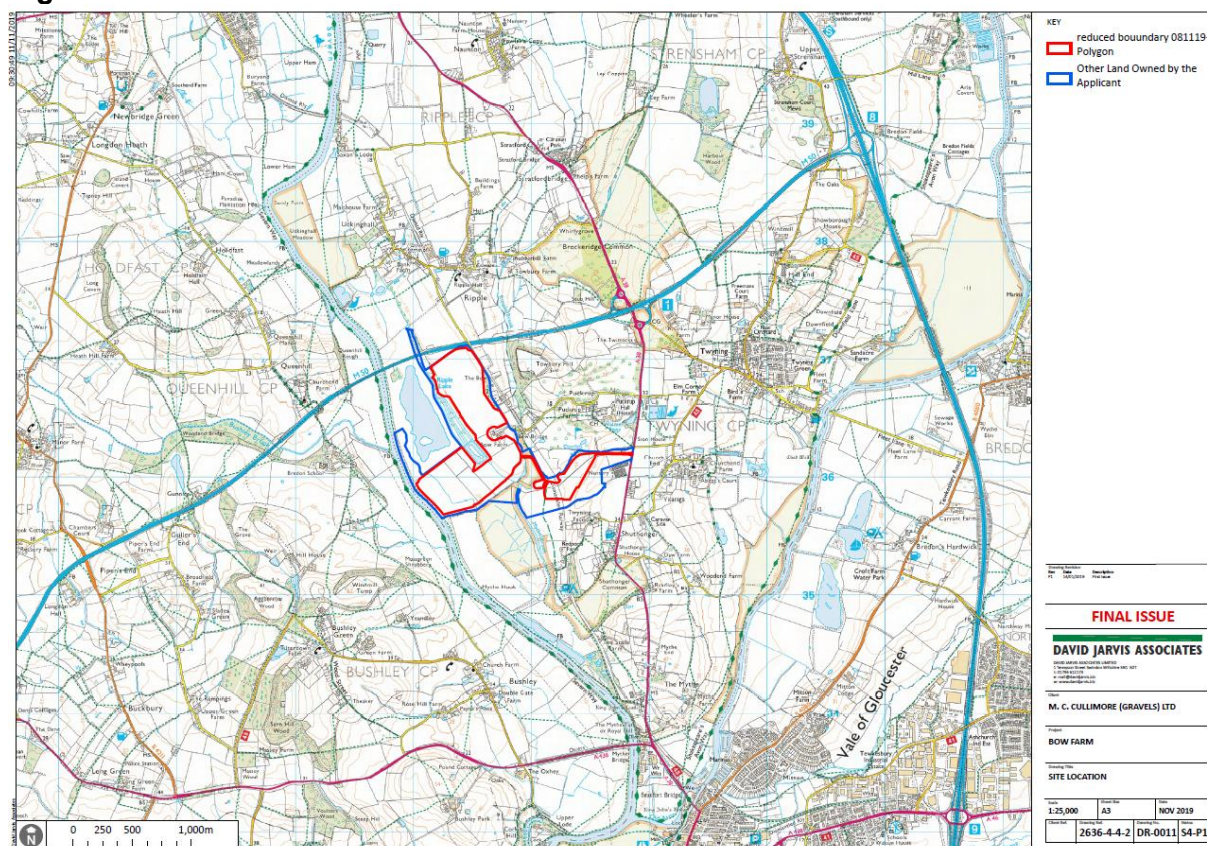
2.0 Site Location and Description

2.1 The Site

2.1.1 The approved mineral site comprises land at Bow Farm and lies on the border of the administrative boundaries of Worcestershire and Gloucestershire. The overall site extends to approximately 65ha of land, comprising approximately 55.9ha of land in Worcestershire and 9.1ha of land in Gloucestershire.

2.1.2 The site lies approximately 3.5km north-west of Tewkesbury. The closest surrounding settlements are Ripple (circa 1km to the north), Church End (circa 1.5km to the east) and Twynning (circa 2km to the northeast). The site is bound to the north by the M50 Motorway and to the west by the River Sever. Land also west of the site has previously been worked and restored. To the south is open agricultural land. Hilton Hall Hotel and Golf Course lies to the east of the extraction area and north of the processing plant site. Access to the Site would be via the A38 road at the southeast boundary.

Figure 1: Site Location



2.2 Site Address

2.2.1 The site address is as follows:

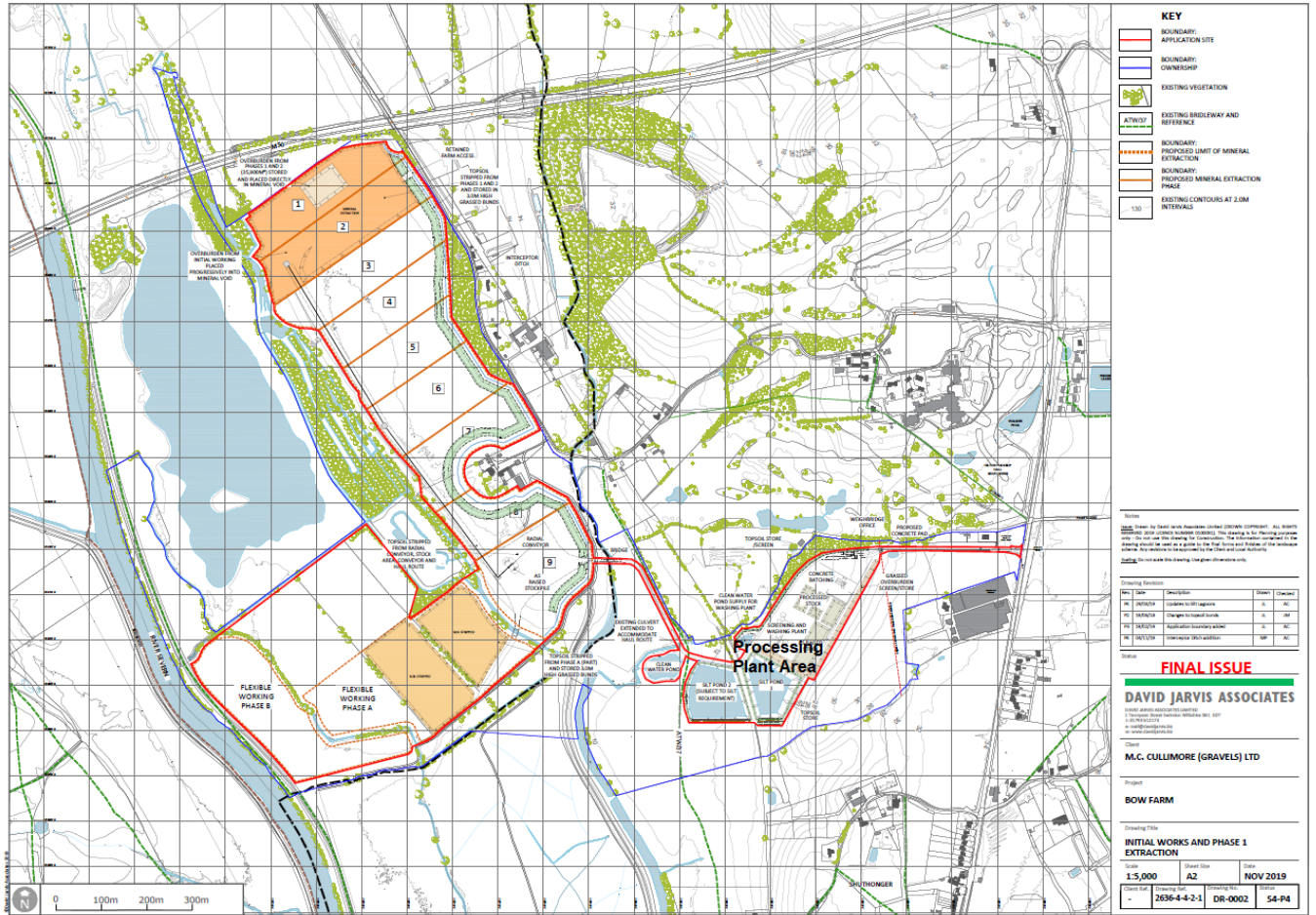
**Moreton C Cullimore (Gravels) Ltd
 Sand & Gravel Extraction & Restoration Site
 Land at Bow Farm
 Ripple**

Worcestershire

2.3 Summary of Operations

- 2.3.1 The working method is organised with the processing area located in the southeast area of the Site on a lower height datum to receptors in a southeast direction. The extraction areas are split into 9 phases running from north to south (refer to Figure 2 for phased working areas) with additional flexible working in two areas adjacent to the River Severn which will be worked during drier months of the year.
- 2.3.2 Mineral extracted from the quarry would be transported by dump trucks to an on-site conveyor system to Phase 9 and would then be stockpiled and moved to the processing area.
- 2.3.3 Initial on-site works will include the establishment of the site access via the A38 and processing plant compound. The next phase would include soil stripping by the removal of topsoil, which will be used to create earth mound screens around the eastern site boundary. Removal of overburden would be stored and used to place directly into the mineral void created by the extraction. The processing area would also be formed together with the installation of the associated plant including the conveyor system.
- a) Construction of silt settling and clean water lagoons and extraction of sand and gravel.
 - b) Phases 1 & 2 of the operations provide for the extraction of mineral along the northern end of the site. These areas would be restored using overburden from phases 1 to 4, topsoil from the northern section of the earth mound screen and inert fill.
 - c) Phases 3 to 6 of mineral extraction would continue southwards and commence with the topsoil used for restoration of phases 1 to 3. Mineral would be loaded and transported via the conveyor system to an area further south within phase 9 land area of the site. The earth mound screens to the east would remain in place.
 - d) Phases 7 & 8 will bring the extraction area closest to Bow Farm with earth mound screening remaining in place. The conveyor system would be removed as the extraction works head south as the activities are close to the stockpile area in Phase 9 area. The restoration of phases 4 to 6 are carried out using inert fill and overburden from phases A and phases 5 to 8.
 - e) Phase 9 works will involve movement of topsoil to restoration of phase A & B and phase 7 restoration using inert fill and overburden from phase 9. Extraction of phase 9 area would complete the mineral extraction phase and restoration of phases 8 to 9 would be completed by inert fill and restored soils.

Figure 2: Phased Working Plan



3.0 Review of Sources, Pathways & Receptors

Noise

3.1 Potential Noise Sources

3.1.1 The following plant has been identified as potential source of noise at the Site:

Processing Facility:

Power Screen & Wash Plant
Concrete batching plant
Concrete batching pump
HGV (static and mobile)
Front shovel loader (mobile)
Generator for wash plant

Extract & Restoration Works:

360deg Tracked Excavator
Dump Trucks
Bulldozer
Excavator
Loading hopper and conveyor
De-watering Pump

3.2 Noise Pathways

3.2.1 Airborne noise (i.e. the spreading of sound energy) radiated from mobile plant, vehicles and fixed plant on site has the potential to be transferred to nearby receptors through the air. The extent to which the noise is perceptible or where it breaches relevant noise limits at sensitive receptors is dependent upon the pathway. This is influenced by the separation distance, wind direction, wind speed, frequency of sound, obstructions along the pathway, type of ground cover, meteorological conditions, height of receiver and receptor above ground level and size and characteristics of noise source.

3.3 Nearest Sensitive Receptors (NSRs)

3.3.1 The NSRs identified as being appropriate to the development and subject to noise limits include:

R1: Silvermead
R2: Bow Farm
R3: Puck Cottage, Bow Cottage, Bowfields, Threshing Bow, The Bow
R4: Bowbridge Cottage, Scarecrow Stables, Dadsley Cottage
R5: Puckrup Lane (Puckrup Hall)
R6: Fairfield Bungalow
R7: Twyning Farms and Owls End
R8: Redpools Farm
R9: Windmill Tump and Bushley Green
R10: The Stall, Bredon School, and Church End Farm
R11: Far End / Church End Nursery

3.3.2 Table 3.1 provides the approximate distance and phase at which the site activity is at closest approach to the receptor. Figure 2 provides the location for the NSR.

Table 3.1: Relative separation distance and direction from NSRs

Ref.	NSRs (Refer to Figure 4)	Closest Working Phase to NSR (refer to Figure 2)	Approx. distance to site boundary (m)	Direction from site (north, south, east, west)
R1	Silvermead	Phase 1	430	North
R2	Bow Farm Farmhouse (property owned by Cullimore)	Phase 7 & 8	70	Between phases 7 & 8
R3	Puck Cottage, Bow Cottage, Bowfields, Threshing Bow, The Bow (East)	Phase 4 to 6	70-100	East of phases 4 to 6
R4	Bowbridge Cottage, Scarecrow Stables, Dadsley Cottage (East)	Phase 8 & 9	170-220	East of phases 7 & 8
R5	Puckrup Lane (Puckrup Hall)	Phase 9 & Processing Plant	580 250	East of phase 7 (north of processing plant)
R6	Fairfield Bungalow (property owned by Cullimore)	Access road Processing Plant	15 280	North of Site access (east of processing plant)
R7	Twyning Farms and Owls End	Phase 9 Processing Plant	750 310	South-East of phase 9 (south of processing plant)
R8	Redpools Farm (South)	Phase 9 & Processing Plant	680 490	South-East of phase 9 (south of processing plant)
R9	Windmill Tump and Bushley Green (South-West)	Flexible working A & B	620-750	South-West of flexible working area
R10	The Stall, Bredon School, and Church End Farm (West)	Flexible working A & B	640-820	West of flexible working area
R11	Far End / Church End Nursery	Phase 9 & Processing Plant	740 210	South-East of phase 9 (east of processing plant)

Vibration

3.4 Potential Vibration Sources

3.4.1 The following plant has been identified as potential source of vibration at the Site based on closest approach to Vibration NSRs.

Extract & Restoration Works:

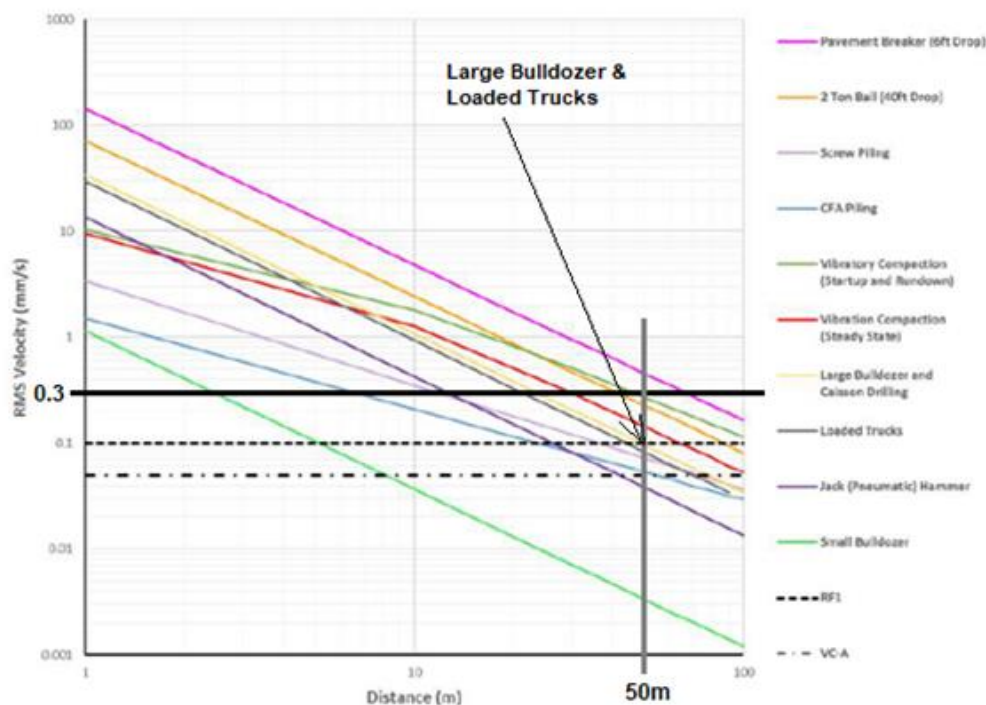
Bulldozer creating and removing earth mound screens and loaded trucks.

3.5 Pathways

3.5.1 Groundborne vibration (i.e. the spreading of compression or shear wave energy) radiated from plant on site has the potential to be transferred via the ground to vibration NSRs. The extent to which the vibration is perceptible or where it breaches relevant vibration limits at vibration NSRs is dependent upon the separation distance and pathway. When wave motion has been generated, the waves will be attenuated as they travel away from the source.

3.5.2 Examples of vibration levels relative to typical construction activities and separation distance are provided in Figure 3.

Figure 3:



3.5.3 The graph shows vibration generated by the highest likely vibratory plant on site (i.e. use of a large bulldozer and loaded trucks) at the closest likely approach to vibration NSRs (i.e. circa 50m to 70m during phase 4 to properties off Bow Lane). This shows a level of approximately 0.1mm/sec which is below the perceptible level of vibration (i.e. 0.3mm/sec).

3.6 Nearest Sensitive Receptors (NSRs)

3.6.1 The NSRs identified as being appropriate to the assessment of vibration limits (due to separation distance) include:

R2: Bow Farm (Landowner's property)

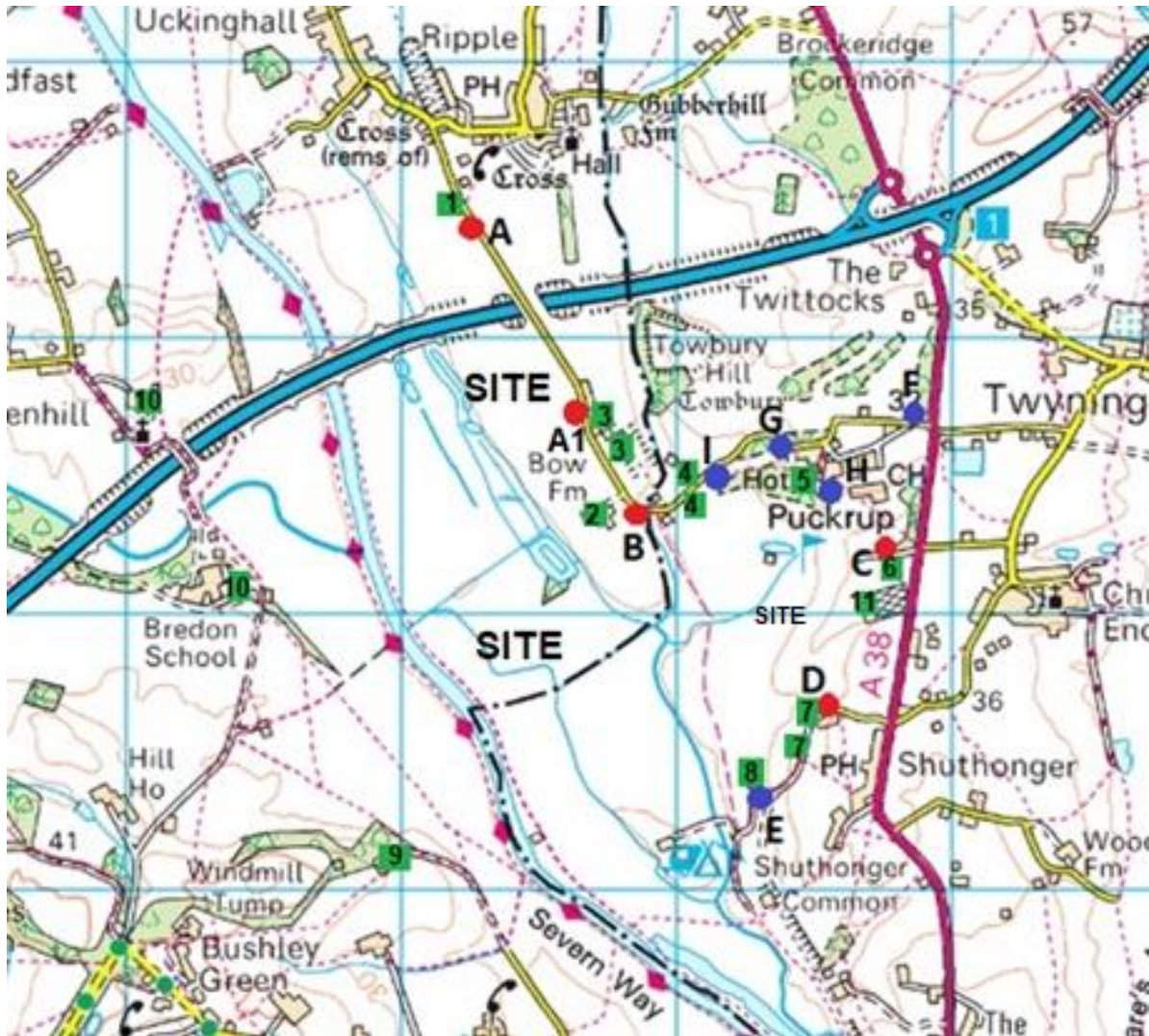
R3: Puck Cottage, Bow Cottage, Bowfields, Threshing Bow, The Bow (Puck Cottage is the closest NSR to the Site boundary)

3.6.2 Table 3.2 provides the approximate distance and phase at which the site activity is at closest approach to the VSR.

Table 3.2: Relative separation distance and direction from VSRs

Ref.	VSR (Refer to Figure 4)	Closest Working Phase to VSR	Approximate distance to site boundary (m)	Direction from site (north, south, east, west)
R2	Bow Farm Farmhouse (property owned by Cullimore)	Phase 7 & 8	70	Between phases 7 & 8
R3	Puck Cottage, Bow Cottage, Bowfields, The Threshing Bow	Phase 4 to 6	50-100	East of phases 4 to 6

Figure 4: Location of Noise & Vibration NSRs



4.0 Noise Management

4.1 Responsibility for implementation of this plan

- 4.1.1 This NVMP is a working document. Initially, it is intended to demonstrate that the control of noise and vibration has been considered as part of the day-to-day operation of the Site.
- 4.1.2 Moreton C Cullimore (Gravels) Ltd has responsibility for the implementation, reviewing and updating of the NVMP. Reviews are undertaken on an annual basis, and whenever new equipment or mitigation measures are implemented at the Site.
- 4.1.3 Moreton C Cullimore (Gravels) Ltd will ensure that any persons performing tasks for it, or on its behalf, which have the potential to cause significant environmental impact, are competent on the basis of appropriate education and training or experience. Key management roles at the Site include the Environment Health and Safety (EHS) Department and the Site Manager who are responsible for ensuring that procedures are in place for noise and vibration management on the Site and responsible for responding to and investigating off-site environmental noise or vibration complaints. The Site Manager is responsible for ensuring that noise control measures are in place, all employees are fully trained on noise and vibration control and all employees at the Site responsible for following procedures.
- Systems to assess competence and provide training for relevant staff.
 - Skills, competencies and training requirements for staff (such as understanding and implementation of the NVMP) are documented and recorded as part of the internal management systems at the Site.
 - The Site has an archiving procedure to ensure all training (including refresher training) is recorded and all associated records are retained.

4.2 Control of Noise

Noise Limits

- 4.2.1 The noise conditions relating to the Site as provided under the Appeal decision for Gloucestershire CC (via conditions 30 and 31) and the Worcestershire CC planning decision conditions 34 and 35 include the following limits:

30. The noise attributable to mineral operations from the site shall not exceed the levels set out below at the receptor locations identified in approved Appendix 5: 'Noise and Vibration Response and Noise Management Plan – NVC Ltd', dated July 2020 of the 'Environmental Statement – Regulation 25 Addendum', Revision P2, dated August 2020, as updated by Appendix 5: 'Noise Response', dated May 2021 of the 'Environmental Statement – Regulation 25 Addendum', Revision P2, dated August 2021, **when measured in terms of an LAeq 1-hour level (free field), as measured at a point closest to the noise source with the microphone at a height of 1.2 metres above ground level:**

- **Silvermead (North): LAeq, 1-hour 55dB**
- **Bow Farm: LAeq, 1-hour 54dB**
- **Puck Cottage, Bow Cottage, Bowfields, Threshing Bow, The Bow (East): LAeq, 1-hour 54dB**
- **Bowbridge Cottage, Scarecrow Stables, Dadsley Cottage (East): LAeq, 1-hour 54dB**
- **Puckrup Lane (Puckrup Hall): LAeq, 1-hour 53dB**
- **Fairfield Bungalow: LAeq, 1-hour 55dB**
- **Twyning Farms and Owls End (South-East): LAeq, 1-hour 54dB**
- **Redpools Farm (South): LAeq, 1-hour 55dB**
- **Windmill Tump and Bushley Green (South-West): LAeq, 1-hour 53dB;**
- **The Stall, Bredon School, and Church End Farm (West): LAeq, 1-hour 54dB**
- **Far End / Church End Nursery: LAeq, 1-hour 55dB.**

31. During the removal of soils and superficial deposits and the creation of any screen bunds or restoration works, the noise limit at the receptor locations identified in approved Appendix 5: 'Noise and Vibration Response and Noise Management Plan – NVC Ltd', dated July 2020 of the 'Environmental Statement – Regulation 25 Addendum', Revision P2, dated August 2020, as updated by Appendix 5: 'Noise Response', dated May 2021 of the 'Environmental Statement – Regulation 25 Addendum', Revision P2, dated August 2021, **shall not exceed 70dB LAeq 1-hour (free field), as measured at a point closest to the noise source with the microphone at a height of 1.2 metres above ground level.** Such temporary operations shall not exceed a total of 8 weeks duration at any of the identified receptor locations in any continuous 12-month period. Prior written notice of at least 5 working days, being Mondays to Fridays inclusive, shall be given to the Mineral Planning Authority of the commencement and the duration of such operations.

Noise Control (applying 'Best Practicable Means' BPM)

- 4.2.2 In accordance with BS5228-1:2009+A1:2014, 'best practical means' ('BPM') would be employed to control noise generation.

Operating Hours

In accordance with Condition 8 of the Appeal decision and Condition 8 of WCC decision:

"8. Except in emergencies, all operations and uses on the site including the running of any plant or machinery, shall only take place between 07:00 to 18:00 hours Mondays to Fridays, inclusive, and 07:00 to 13:00 hours on Saturdays, with no operations on the site at any time on Sundays, Bank or Public Holidays. The Mineral Planning Authority shall be informed in writing within 48 hours of an emergency occurrence that would cause working outside the stipulated hours."

4.2.3 Examples of measures adopted to control noise based on best practicable means in accordance with BS5228-1:2009+A1:2014 would include:

- a) Construction of proposed site boundary screening earth mounds behind closest residential properties at start of works (as indicated in Appendix B).
- b) Wherever practicable, sensible routing of the construction plant to avoid the nearest residential properties.
- c) All construction plant and equipment will comply with EU noise emission limits.
- d) Plant will be serviced regularly to minimise adverse noise impacts.
- e) All vehicles and mechanical plant used for the purpose of the works will be fitted with effective exhaust silencers and maintained in good efficient working order.
- f) Selection of inherently quiet plant where appropriate. All ancillary pneumatic percussive tools will be fitted with mufflers or silencers of the type recommended by the manufacturers.
- g) Machines in intermittent use will be shut down in the intervening periods between work or throttled down to a minimum.
- h) Materials will be handled with care and be placed, not dropped into skips or lorries and drop heights minimised.
- i) Materials will be delivered during normal working hours.
- j) All mobile plant fitted with SMART, broadband or 'white noise' reversing alarms (i.e. no tonal 'beeper' type reversing alarms).
- k) Keeping HGV tailgates (as appropriate) closed to avoid 'body slapping'.
- l) Use of rubber linings on chutes and material transfer points (as practicable).
- m) All ancillary plant such as generators, compressors and pumps will be positioned so as to cause minimum noise disturbance, i.e. furthest practicable position from receptors and where practicable behind close boarded noise barriers or fitted with acoustic enclosures. Use of electric powered pumps where practical, to minimise noise.
- n) Community Relations – this is one of the most important aspects of mitigation as providing the local residents with clear information of the activities that would be taking place and the length of time that any peak noise levels may occur will assist in allaying people's fears. BS5228 states *"It is suggested that good relations can be developed by keeping people informed of progress and by treating complaints fairly and expeditiously. The person, company or organisation carrying out the work on site should appoint a responsible person to liaise with the public."* Appointment of a site contact to whom complaints or queries about operational activities can be directed. Any complaints to be investigated and action taken where appropriate (see Sections 6.3 and 6.4 of this NVMP).
- o) Placing haul roads as far as practicable from nearest sensitive receptor locations. Haul roads kept clean and maintained in a good state of repair and subject to a 10mph speed limit so as to avoid unwanted rattle and 'body slap' from vehicles.
- p) Implementation of site rules related to considerate mineral working practices such as avoiding unnecessary revving of engines and switching off equipment when not required.
- q) Use of a one-way system/turning circles and/or use of a banksman to avoid/reduce the need for reverse alarms.
- r) Consideration of phasing noisy works to less sensitive times of day (i.e. first thing in the morning).

4.3 Control of Vibration

Vibration Limits

4.3.1 According to the Highways England Design Manual for Roads and Bridges (May 2020) LA 111 Noise and vibration (Rev 2) during construction type works the effect and impact from ground borne vibration is defined below.

4.3.2 The Lowest Observed Effect Level (LOAEL) and Significant Observed Adverse Effect Level (SOAEL) is set out below in Table 4.1.

Table 4.1: Construction Vibration LOAELs and SOAELs for All Receptors

Time Period	LOAEL	SOAEL
All time periods	0.3mm/sec PPV	1.0mm PPV

4.3.3 The magnitude of impact for construction vibration, shall be determined in accordance with Table 4.2 (as defined in DMRB LA 111).

Table 4.2: Magnitude of Impact at Receptors

Magnitude of Impact	Vibration Level
Negligible	Below LOAEL
Minor (Slight)	Above or equal to LOAEL and below SOAEL
Moderate	Above or equal to SOAEL and below 10mm/s PPV
Major	Above or equal to 10mm/s PPV

Note: Construction vibration shall constitute a likely significant effect where it is determined that a major or moderate magnitude of impact will occur for a duration exceeding:

- 1) 10 or more days or nights in any 15 consecutive days or nights; or
- 2) a total number of days exceeding 40 in any 6 consecutive months.

Vibration Control (applying BPM)

4.3.4 Best practice would be followed during the mineral workings in accordance with BS5228-2:2009+A1:2014. Typical methods used to control vibration could include, for example:

- Provision of cut-off trenches (if high levels of vibration expected/measured at residential receptors i.e. regular levels above 1mm/sec).
- Maximum practical separation distance of site plant from residential receptors to minimise vibration.
- Community relations to inform residents of peak activities.
- Monitoring of vibration where vibratory plant is being used within 30m to 50m of residential property boundaries.

5.0 Monitoring

5.1 Noise Monitoring

- 5.1.1 As required by Planning Conditions 29 & 38 (WCC Planning Permission ref. 19/000048/CM) & Planning Condition 33 (GCC Planning Permission ref. APP/T1600/W/23/3324695) a scheme of noise and vibration monitoring is required.

Additionally, under condition 36 the Mineral Planning Authority (MPA) require monitoring:

“36) Upon written request from the Mineral Planning Authority, the operator shall, at its expense, employ an independent qualified acoustic consultant to assess the noise impact from the development hereby permitted upon the nearest sensitive properties. The scope, methodology and timescales for delivery of the noise assessment shall be submitted to the Mineral Planning Authority within 21 days of such a request. The noise assessment shall not begin until the scope, methodology and timescales for delivery of the noise assessment has been approved in writing by the Mineral Planning Authority. Thereafter, the noise assessment shall be completed in accordance with the approved scope and methodology and shall be presented to the Mineral Planning Authority within the approved timescales for delivery.”

- 5.1.2 In terms of general Site noise monitoring, the following is proposed:

Stage 1: Monitoring of Baseline Sound Levels at NSRs

- 5.1.3 Prior to the commencement of soil stripping or processing, baseline sound levels are measured at NSRs to establish typical ambient noise (i.e. noise not associated with the Site in operation) for establishing the likely effect on overall noise levels during initial and future operational works monitoring (i.e. existing ambient noise could be higher than the LPA conditional noise limits or have a cumulative effect on the overall noise when the site is in operation). This data can then be used to calculate the site noise contribution by logarithmic subtraction from the site and ambient noise measurements.
- 5.1.4 This would involve taking sound level measurements at all NSRs in accessible position in proximity to NSRs (at least 3.5m away from any reflecting wall or object) under suitable weather conditions for monitoring [i.e. dry and light wind speeds (<4m/s)] and for example, over a minimum of 4 x 15-minute sequential measurement periods during normal operational hours. Measurements of LAeq, LA90 and LAm_{ax} indices (using a Type 1 or BS Class 1 quality microphone mounted on the integrating sound level meter with ‘fast time’ setting) to be recorded and observation notes made of noise climate during the measurements. Microphone mounted on a tripod with wind shield to a height of 1.2m above ground level.
- 5.1.5 Microphone to be calibrated before and at the end of each survey by applying an acoustic calibrator conforming to Type 1. Any drift in calibration to be noted to show drift within acceptable tolerances. The noise meter and microphone used are required to have undergone independent laboratory tests of performance within a 2-year period, with acoustic calibrators calibrated annually.

- 5.1.6 Monitoring of meteorological parameters to be measured during any survey work (via on-site weather stations or portable weather stations) to record wind speed, wind direction, temperature and any rainfall events. Any noise monitoring under rainfall conditions or high wind speeds should be removed from the data set. The 15-minute readings to be logarithmically averaged to obtain the equivalent 1-hour limit.

Stage 2: Monitoring of Site Activities

- 5.1.7 As explained in section 2.3 of this NVMP and Figure 2, the initial on-site works will include the creation of the site access and processing plant compound followed by the removal of topsoil, which will be used to create earth mound screens around the eastern site boundary. Removal of overburden would be stored and used to place directly into the mineral void created by the extraction. Extraction from the formation of silt settling and clean water lagoons would take place followed by the phased extraction (i.e. from 1 to 9 - north towards the south as indicated in Figure 2).
- 5.1.8 Monitoring to take place at the initial stages of the Site's development at the closest NSR to peak noise activities, as indicated below. This strategy will produce the highest likely measured noise levels and would therefore show that noise at other more distant NSRs would result in a lower noise level and impact.
- a) During soil stripping activities and construction of earth mound screens. According to noise prediction calculations, the most sensitive period would be when these activities occur at closest approach to NSR R3 within Phase 4 to 5 extraction areas (i.e. highest level occurring at Puck Cottage). Monitoring should therefore be timed when activities occur at closest approach during soil stripping/earth mound screen construction at this location. The noise limit imposed during these activities would be 70dB $L_{Aeq,1hr}$ (for up to 8 weeks in a year period) as defined at paragraph 4.2.1 (condition 31).
 - b) During extraction works during Phase 1 or 2 at NSR R3 (Puck Cottage/The Threshing Bow/Bow Cottage & Bowfields). Noise limits defined at paragraph 4.2.1 (condition 30).

Monitoring relating to a) and b) above would be required over a typical weekday under conditions described in paragraphs 5.1.4 to 5.1.6 with monitoring lasting over at least a 6-hour operational period (ideally between 0900-1500 hours outside of peak traffic flow conditions and including lunch break-time).

- c) In order to establish noise levels during the initial operation phase of the processing plant and for monitoring of ongoing noise levels from this working area, it is proposed that a continuous monitoring system station is set up on site. This will involve positioning the microphone at a suitable location that can establish general overall levels from the processing plant. This may involve, for example, setting up the monitoring station at an elevated and central location to the plant compound at a suitable distance in the direction of the nearest resident (e.g. R11 Far End side of the compound).

- d) The chosen location and resultant measurements at the monitoring station will need to be initially calibrated by an Acoustic Consultant by cross-checking site levels against simultaneous measurements at NSR R5 (Puckrup Hall), R6 (Fairfield Bungalow) and R11 (Far End) to determine what the maximum noise level would be at site to ensure that the receptor noise limits would be achieved. If noise levels are achieved at the closest receptor/s then those at greater distance would be achieved by proxy. Noise limits defined at paragraph 4.2.1 (condition 30).

Note: The measured levels at NSR would need to consider any influence of ambient noise (i.e. noise without site working) to correct the measured noise level. See Stage 1 survey works.

The monitoring station software would produce automated alerts where maximum levels are exceeded and weekly reports provided to download and log for reference.

Table 5.1: Summary of Noise Survey Work

NSRs	Site Activity/Phase	Number of Surveys	Survey Period at each NSR
R1 to R11	Pre-commencement baseline	1	4 x 15mins
R3 (Puck Cottage/ The Threshing Bow/ Bow Cottage & Bowfields)	Phase 4/5 zone soil strip/earth mound screen when at closest approach to Puck Cottage	1	6 hours (0900-1500 hrs)
R3 (Puck Cottage)	Phase 1 or 2 Extraction	1	6 hours (0900-1500 hrs)
R5 R6 R11 (Nearest NSR to processing plant working areas)	Processing plant operation (set up and calibration of location of fixed monitoring station at Processing Plant compound with synchronised measurements at NSRs to determine the maximum site level to meet noise limits).	1	6 hours (0900-1500 hrs)

5.2 Vibration Monitoring

- 5.2.1 Monitoring of ground borne vibration would be undertaken where vibratory machinery is being operated in proximity to residential buildings (e.g. normally within 30m of buildings) or as instructed by the Site Manager.
- 5.2.2 Monitoring should be undertaken by an experienced acoustic consultant who has appropriate seismograph equipment to carry out vibration measurements when bulldozers and/or dump trucks are operating at closest approach to NSRs.
- 5.2.3 The seismograph and transducers should be calibrated according to relevant standards and should have facility to record vibration in three directions simultaneously with a printout showing the amplitude and frequency of the vibrations.
- 5.2.4 Vibration measurements shall be taken external to the property and in proximity to the residential building. This should be on the side facing the source of vibration (e.g. at a location on the ground outside the building or in line with the building,

ideally on a hard surface or transducer appropriately weighted down). It is important that the location is away from human activities or household utilities that could affect the triggering of the seismograph (e.g. doorways, driveways, utility rooms, external plant such as heat source pumps, driers/washing machines in garages, air conditioning plant etc). Monitoring in proximity to NSR R3 would be required over a typical weekday with monitoring lasting over the operating period (i.e. 0700 to 1800 hours or when the plant starts and stops for the day). Vibration limits are provided under Tables 4.1 and 4.2.

5.2.5 The closest approach of any bulldozers and dump trucks would be during the soil stripping phase and construction/de-construction of earth mound screens opposite to NSR R3 (Puck Cottage) at circa 50m. As levels of vibration above perceptibility (i.e. >0.3mm/sec) are only likely to occur within circa 20m of bulldozers, then we would propose that vibration monitoring is limited to the following phase of works:

- a) During soil stripping activities and construction of earth mound screens at NSR R3 (Puck Cottage) within Phase 4 extraction areas when activities occur at closest approach at this location. Vibration methodology would be as described in paragraphs 5.2.2 to 5.2.4.
- b) During extraction at Phase 4 when plant at closest approach to eastern boundary. Vibration methodology would be as described in paragraphs 5.2.2 to 5.2.4.
- c) During restoration activities during the de-construction of the earth mound screens at NSR R3 (Puck Cottage) within Phase 4 extraction areas when activities occur at closest approach at this location. Vibration methodology would be as described in paragraphs 5.2.2 to 5.2.4.

5.3 Record Keeping

- 5.1.1 Records of noise and vibration monitoring are kept in a logbook in accordance with the procedures documented in the site Environmental Management System (EMS). Monitoring records are regularly reviewed with the aim of improving noise and vibration management measures at the site and reducing any significant noise or vibration levels.

5.4 Reporting of Data

- 5.4.1 Reporting of data to the MPA is undertaken as required in accordance with the conditions of the planning consent for the Site. Any complaints received are reported to MPA in accordance with the reporting and complaints procedure for the site – refer to section 6.0 for further details.
- 5.4.2 Condition 37 of the planning appeal consent details the information required following a request by the MPA for a noise assessment under condition 36, which is as follows:

“37) Upon receipt of the independent consultant’s noise assessment by the Mineral Planning Authority required under Condition 36 of this permission, including all noise measures and any audio recordings, where the Mineral Planning Authority is satisfied of an established breach of noise limits set out in

the Conditions 34 and/or 35 of this permission, and upon notification by the Mineral Planning Authority in writing to the operator, the operator shall within 21 days propose a scheme of mitigation for the written approval of the Mineral Planning Authority. The scheme of mitigation shall be designed to mitigate the breach and to prevent its future recurrence. This scheme shall specify the timescales for implementation. Thereafter, the approved scheme shall be implemented in accordance with the approved details.”

6.0 Reporting and complaints response

6.1 Introduction

- 6.1.1 The measures outlined in this NVMP are aimed at preventing emissions of noise and vibration to the extent where complaints may be reported by NSRs. Nevertheless, it is considered that having an established complaints procedure is an essential part of implementing a successful NVMP.
- 6.1.2 As such, the EMS includes procedures for managing external complaints. This includes for complaints in relation to noise and vibration emissions from the Site. The procedures include those for the recording of the initial complaint, the approach to investigation, and proposed response time. The Site Management are responsible for ensuring that procedures are in place for noise and vibration management on site and responsible for responding to and investigating off-site environmental noise complaints.
- 6.1.3 The EHS Department are responsible for logging any complaints received in the site's incident reporting system, with the MPA informed as soon as possible following receipt of a complaint. They are also responsible for submitting a short report to the MPA detailing the complaint and whether any remedial actions have been implemented.
- 6.1.4 Public comments, complaints and concerns could be received by email, telephone or letter, either directly to the site or via the relevant authorities (such as the MPA or Local Planning Authority). Moreton C Cullimore (Gravels) Ltd aims to respond to complaints within 2 working days of receipt and no later than 5 working days to respond to a complaint.

6.2 Engagement with the community

- 6.2.1 Moreton C Cullimore (Gravels) Ltd to appoint a Community Liaison Manager to host liaison meetings to allow drop-in sessions for the public to attend together with any local stakeholders. This provides feedback on any Site associated issues that can be dealt with prior to receipt of complaint and enable the NVMP to be updated as required.
- 6.2.2 Other contact to Moreton C Cullimore (Gravels) Ltd should be by name via the main site contact number.

6.3 Noise or vibration complaint investigation

1. Should any member of the public have any issues with noise or vibration from the Site, they should contact the Site (contact details will be made public at the start up on initial site operations) and provide details of the complaint giving the nature of the noise, details of their name and address, how often it occurs, what time of day and day of the week and where it was heard.
2. Complaints would be managed in accordance with the complaint procedure outlined below. Complaints received should be logged in the appropriate form and then investigated accordingly.
3. Where appropriate, the Site Manager undertake an investigation of the complaint. They decide upon the appropriate course of action and any corrective actions to be undertaken in response to this investigation.
4. In the event complaint of noise or vibration, the following investigations would be undertaken:
 - Notification of the complaint and actions taken are provided to the local authority. Actions to be taken as soon as possible by M.C. Cullimore (Gravels) Ltd or their representative.
 - Note the time, date, identity and contact details of complainant. Note if the complaint has been referred from the local planning authority ask complainant to describe the noise and vibration emission; is it constant or intermittent, how long has it been going on for, is it worse at any time of day, does it come from an identifiable source.
 - First action would be to check the fixed monitoring station report for the specific date of reported noise issue, to see if the maximum processing plant noise level had been exceeded.
 - Undertake a site inspection as soon as possible after receipt of a complaint. Note all noise and vibration producing activities taking place and the noise and vibration mitigation methods that are being employed. If the complaint was related to an event in the recent past, if possible, note any noise and vibration producing activities that were underway at that time and implement any remedial action necessary.
 - As soon as possible visit the area from where the complaint originated to ascertain if noise and vibration is still a problem.
 - If a source of noise and vibration other than the Site associated activities is causing the noise and vibration nuisance, verify the source. Photograph the source and emissions.
 - As soon as possible after the initial investigations have been completed contact the complainant to explain any problems found and remedial actions taken.
 - If necessary, update any relevant method statements to prevent any recurrence of problems.
 - File the noise and vibration complaint form on the complaint register.
 - Notify the appropriate project Management personnel and local authority as soon as practicable that a complaint has been received and what the findings of the investigation were, and any remedial measures taken.

- Inform workers on site of complaint and what the findings of the investigation were, and any remedial measures taken.

6.4 Action Plans

6.4.1 In the event that a noise or vibration complaint is proven to be justified and attributable to operations undertaken at the Site, or a 'non-conformance' otherwise occurs, a defined action plan will be implemented.

6.4.2 The following potential **noise** 'non-conformances' have been identified:

- abnormal noise emissions occur;
- significant noise emissions occur/are detected on site, that are believed to pose a risk of off-site impacts; and/or
- significant noise detected off-site during inspections or surveys, that are attributable to operations at the Site.

6.4.3 In the event that any of the above occurs, the following actions will be taken:

- If not previously undertaken, a walk-around / visual inspection of the entire Site and a review of the activities undertaken at the Site will be conducted in order to identify the likely cause(s) of the noise emissions.
- Upon identification of the likely source(s), appropriate corrective and preventative measures will be identified and implemented, depending on the outcome of the investigations. The measures will consider, but not be limited to the following:
 - a) Temporary screening of noise source.
 - b) Ceasing of noisy operations, until such time that the noise can be suppressed.
 - c) Implementation of additional noise control measures (such as installation of silencers, enclosures, acoustic screening, replacement of parts, modification of plant, maintenance).

6.4.4 The following potential **vibration** 'non-conformances' have been identified:

- abnormal vibration emissions occur from vibratory plant.
- significant vibration detected during off-site inspections or surveys, that area attributable to Site operations.

6.4.5 In the event that any of the above occurs, the following actions will be taken:

- If not previously undertaken, a walk-around / visual inspection of the location of the vibration detected and a review of the plant activities in proximity to the location in order to identify the likely cause(s) of the abnormal vibration emissions.
- Upon identification of the likely source(s), appropriate corrective and preventative measures will be identified and implemented, depending on the outcome of the investigations. The measures will consider, but not be limited to the following:

- a) Ceasing of processing operations, until such time that the noise can be suppressed, or plant changed for one having lower vibration.
 - b) Monitoring of vibration to assess impact and to identify action.
 - c) Implementation of vibration control measures (such as installation of cut-off trenches (if high levels of vibration expected/measured at residential receptors i.e. regular levels above 1mm/sec).
- 6.4.6 Details of any 'non-conformances' including the nature of the incident, results of investigations, action taken and any required amendments to the NVMP will be made available to the MPA on request.
- 6.4.7 Management at the Site handle any complaints that are received. Management is responsible for logging any complaints received in the site's incident reporting system, with the MPA informed as soon as possible following receipt of a complaint. They are responsible in submitting a short report to the MPA detailing the complaint and whether any remedial actions have been implemented.

7.0 Summary

- 7.1 This NVMP has been prepared to set out operational procedures to control and mitigate noise and vibration from the Site. It is to be reviewed on an annual basis. Reviews will serve to confirm the identification of any new sensitive receptors, sources of noise, monitoring equipment or changes to relevant procedures (such as complaints handling and reporting).

References

1. Appendix A: Glossary of noise and vibration technical terms
2. Appendix B: Location of earth mound screening
3. Noise Control Threshold/Trigger Values:

Planning Conditions 34 & 35 (Worcestershire County Council Planning Permission ref. 19/000048/CM)

Planning Conditions 30 and 31 (Gloucestershire County Council Planning Permission ref. APP/T1600/W/23/3324695)
4. Examples of noise and vibration control are detailed in the following documents:

BS5228-1:2009+A1:2014 'Code of practice for noise and vibration control on construction and open sites' Part 1 Noise.

BS5228-2:2009 'Code of practice for noise and vibration control on construction and open sites' Part 2 Vibration.
5. NVC Noise & Vibration Assessment for Proposed Sand & Gravel (ref. R18.1004/DRK dated 5th November 2018)
6. NVC Regulation 25 Addendum', Revision P2, dated August 2020, as updated by Appendix 5: 'Noise Response', dated May 2021 of the 'Environmental Statement – Regulation 25 Addendum', Revision P2, dated August 2021.
7. Environment Agency Noise and Vibration Management: Environmental Permits (January 2022).

Appendix A

Glossary

Appendix A – Glossary

Noise

A-weighting:	Normal hearing covers the frequency (pitch) range from about 20Hz to 20,000 Hz but sensitivity of the ear is greatest between about 500Hz and 5000Hz. The "A-weighting" is an electrical circuit built into noise meters to mimic this characteristic of the human ear.
Ambient noise:	The totally encompassing sound in a given situation at a given time usually composed of sound from many sources near and far.
Attenuation:	Noise reduction
Background noise:	The general quiet periods of ambient noise when the noise source under investigation is not there.
Decibel (dB):	The unit of measurement for sound based on a logarithmic scale. 0dB is the threshold of normal hearing; 140dB is the threshold of pain. A change of 1dB is only detectable under controlled laboratory conditions.
dB(A):	Decibels measured on a sound level meter incorporating a frequency weighting (A weighting) serves to distinguish sounds of different frequency (or pitch) in a similar way to how the human ear responds. Measurements in dB(A) broadly agrees with an individual's assessment of loudness. A change of 3dB(A) is the minimum perceptible under normal everyday conditions, and a change of 10dB(A) corresponds roughly to doubling or halving the loudness of sound.
Frequency (Hz):	The number of sound waves to pass a point in one second.
L _{Aeq} :	This is a noise index used to describe the "average" level of a noise that varies with time (T). It allows for the different sensitivities of the human ear to different frequencies (pitch), and averages fluctuating noise levels in a manner which correlates well with human perceptions of loudness.
L _{A90,T} :	This noise index gives an indication of the lower limit or levels of the fluctuating noise. It is the "A weighted" noise level exceeded for 90 per cent of the specified measurement period (T). e.g. If the measurement period was over 10 hours and the L _{A90} reading was say 50dB, then this means that for 9 hours out of 10 the level went above 50dB.
L _{Afmax} :	The maximum A-weighted sound level recorded during the measurement period. Measured with fast time weighting i.e. a 125 millisecond time constant.
Noise:	A sound that is unwanted by, or distracting to, the receiver.
Residual noise:	The ambient noise remaining at a given position in a given situation when the noise source under investigation is not there.

Vibration

BS 5228-2:2009+A1:2014	British Standard BS 5228-2:2009 “Code of practice for noise and vibration control on construction and open sites – Part 2: Vibration”. This is the standard adopted for this Project to assess human response to construction.
PPV	Peak Particle Velocity, measured in mm/s. This is the standard metric for assessing construction vibration levels.
BS7385:1990	Evaluation and measurement for vibration in buildings: Part 1 Guide for measurement of vibrations and evaluation of their effects in buildings. British Standards Institution.
ISO4866:1990(E)	Mechanical vibration and shock - Vibration in buildings - Guidelines for the measurement of vibrations and the evaluation of their effects on buildings. International Organisation for Standardisation.
BS7385:1993	Evaluation and measurement for vibration in buildings: Part 2 Guide to Damage Levels from Ground Borne Vibration. British Standards Institution.
BS6472: 2008	Evaluation of human exposure to vibration in buildings (1Hz to 80Hz). British Standards Institution

For any source of vibration on or near the surface of the ground, energy propagates away from the source via:

1. elastic body (or compression) waves – which radiate energy into the ground in all directions.
2. surface (or shear) waves – which carry energy along the ground surface, caused when body waves are reflected back into the ground at the ground-surface interface.

Thus, at any point away from that source, the ground motion is the sum of all the wave motions at that point. When wave motion has been generated, the waves will be attenuated as they travel away from the source. The two main mechanisms for attenuation are:

1. enlargement of the wave front as the distance from the source increases, and
2. internal damping of the transmitting medium (the ground)

Ground borne vibration is therefore made up of a combination of different waves, travelling in different directions, at different speeds and at different frequencies. The frequency component of the vibration will affect the rate at which attenuation occurs since the internal damping of the ground is frequency dependent.

Since vibration enters buildings through the foundations, the hard structure of the building is normally affected to a greater degree than by airborne vibration. Often ground borne vibrations are more noticeable when standing or sitting near the middle of suspended wooden floors.

Ground Borne Vibration Measurement Units

Ground borne vibration is caused when the individual particles making up the strata are caused to oscillate by the passage of a pressure wave. The resulting vibration can be summarized in terms of 4 main parameters:

- Velocity –** how fast the particles move when they are oscillating. Since the velocity of these particles continually change as the pressure wave passes the most useful value that is often reported is the maximum or peak particle velocity (PPV). PPVs are usually expressed in terms of ms^{-1} or mms^{-1} .
- Acceleration –** is the rate at which the particle velocity changes during oscillation. It is usually measured in ms^{-2} mms^{-2} or “g”s”. 1g is that acceleration imparted to an object by the earth’s gravitational pull and is approximately 9.81 ms^{-2} .
- Displacement –** is the distance moved by oscillating particles. This is usually very small and measured in mm or even μm .
- Frequency –** is the number of oscillations per second, which a particle undergoes due to the passage of a vibration wave. It is measured in cycles per second or Hertz (Hz).

The movement of particles induced to oscillate by vibration waves are usually measured in three mutually perpendicular directions to fully describe the vibration intensity, as particles will be oscillating in three dimensions. These are:

Longitudinal – back and forth particle movement in the same direction that the vibration wave is travelling.

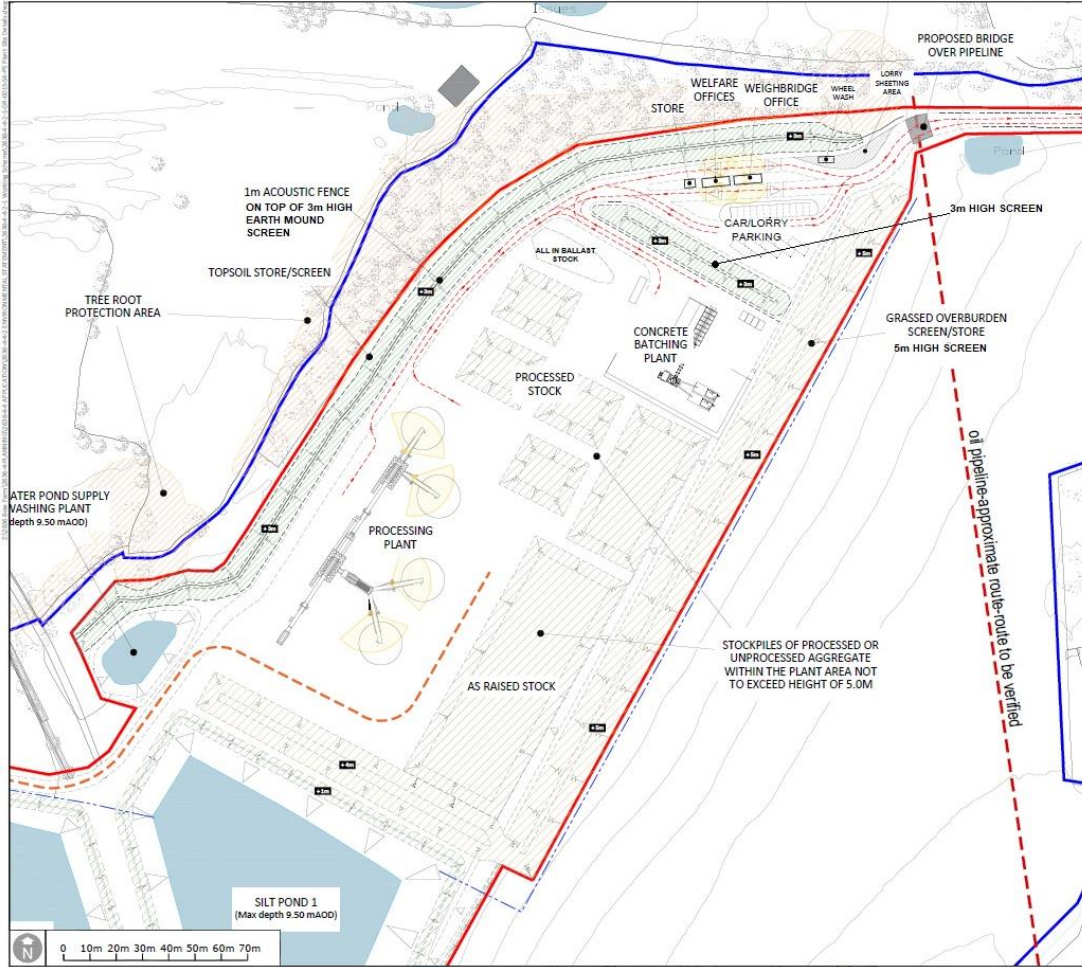
Vertical – up and down movement perpendicular to the direction the vibration wave is travelling.

Transverse – left and right particle movement perpendicular to the direction the vibration wave is travelling.

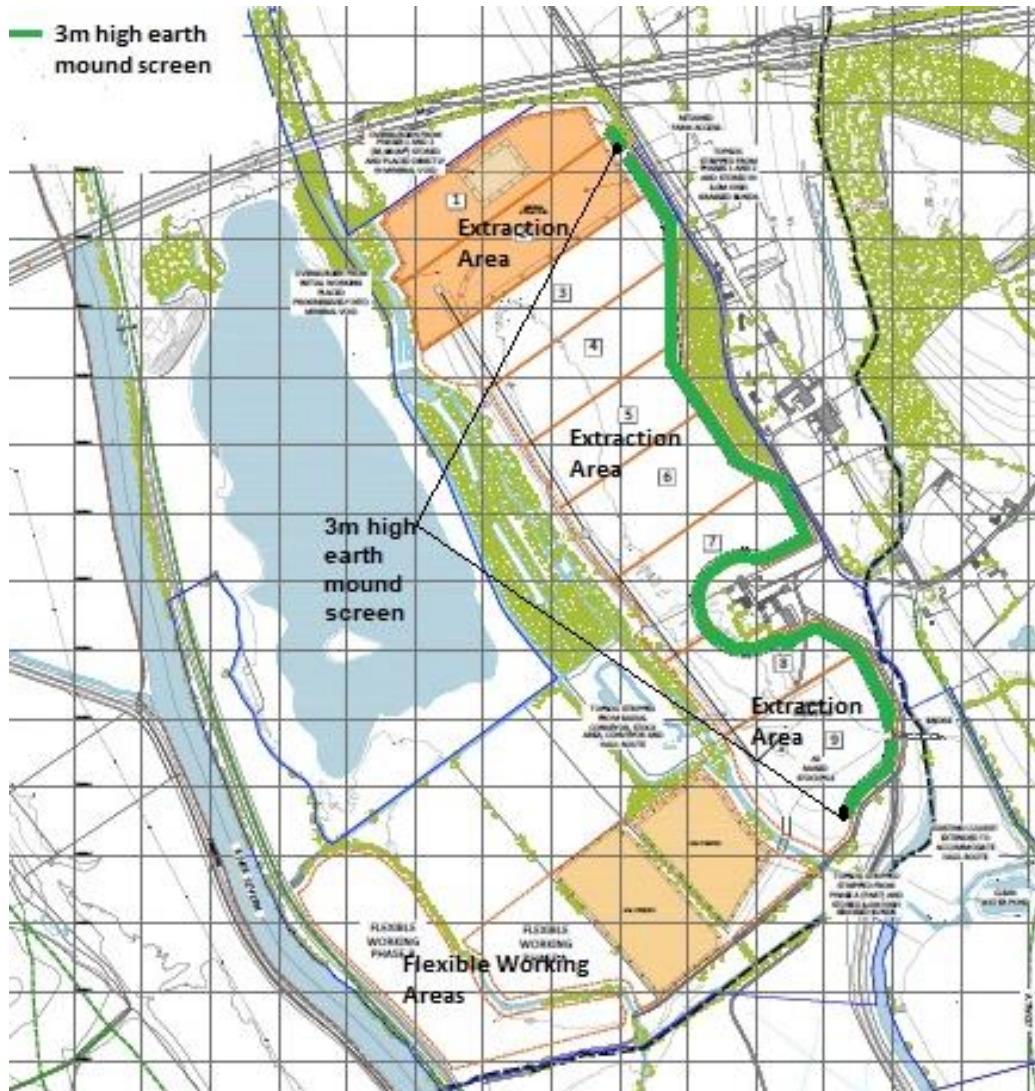
Appendix B

Location of Earth Mound Screening Plans

Processing Plant Compound Screening



Extraction Area Earth Mound Screening



Appendix C

Noise Complaint Form

Noise or Vibration Complaint Form

Customer details	
Customer Name -	
Address –	
Postcode –	
Customer Contact Details -	
Tel -	
Email -	
Date -	
Complaint Ref Number -	
Complaint Details –	
Investigation details	
Investigation carried out by -	
Position -	
Date & time investigation carried out -	
Weather conditions -	
Wind direction -	
Investigation findings -	
Feedback given to Local Planning Authority	
Date feedback given -	
Feedback given to public -	
Date feedback given -	
Review and improve	
Improvements needed to prevent a reoccurrence –	
Proposed date for completion of the improvements -	
Actual date for completion -	
If different insert reason for delay -	
Does the NVMP need to be updated -	
Date that the NVMP was updated -	
Closure	
Site manager review date	
Site manager signature to confirm no further action required	

