BERKSWELL QUARRY RECYCLING FACILITY

ODOUR MANAGEMENT PLAN

FOR BERKSWELL QUARRY

BY

BERKSWELL RECYCLING LIMITED
Berkswell Quarry
Cornet End Lane
Meriden
West Midlands
CV7 7LH

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1. Introduction

1.1 Background

1.1.1 Berkswell Quarry Composting facility has been developed by Berkswell Recycling Limited as a modern centralised green waste windrow composting facility. The site has been licensed by the Environment Agency receive 30,000 tonnes per annum of green waste with storage for 7,500 tonnes per annum (Environmental Permit No. EPR/DB3508MA).

1.1.2 As set out in section 3.3 of the Environmental Permit, Berkswell Recycling Limited is required to prepare an odour management plan to ensure that emissions from the activities on site are free from odour at levels likely to cause annoyance outside the site, as perceived by an authorised officer of the Environment Agency. The permit holder for the site under section 3.3 is required to prepare an odour management plan. An odour management plan has been prepared in line with Environment Agency guidance Controlling and monitoring your emissions for an Environmental Permit (1st February 2016).

1.1.3 The Odour Management Plan has been prepared to set out how the appropriate methods, monitoring and contingencies are employed to control and minimise odour pollution from the site. The plan will address issues regarding: the prevention of unacceptable odour pollution; the reduction of the risks of odour releasing incidents; and appropriate and measured contingency planning.

1.2 Site Description

1.2.1 Berkswell Quarry composting facility is suited at Cornets End Road, Meriden, CV7 7LH. The location of the facility is shown in the site location plan, Appendix B. The site is located within a worked-out part of Berkswell Quarry (see Figure 1). The quarry, which extracts sand and gravel, is located 2 km south west of Meriden, on the south side of Cornets End Lane and extends to land on the western side of the A452 Kenilworth Road.

1.2.2 The composting facility has been constructed in a worked-out part of the quarry and will be well screened from the public. The site will not be visible from outside the quarry. The development of this site addresses a need for greater composting capacity in the West Midlands for green waste. Composting and recycling of green waste has successfully sustained strong growth over the last decade and to continue the rise in recycling and composting rates (and to divert material from landfill), more waste management infrastructure is required. This site has been designed in accordance with best practice guidance and knowledge transfer from other composting operations developed and managed by Berkswell Recycling Limited.

1.2.3 The site includes perimeter bunding that have been created from overburden material during the quarrying activities and during the development of the site. The bunds will attenuate noise generated from site operations and will provide additional visual screening of the site operations.

1.2.4 The boundary of the application area within the quarry is shown on drawing number WM02691/03 (Appendix B). The green waste composting facility has been designed to process green waste using an open-air windrow composting system. The outputs from the facility have been designed to PAS100:2018 standards (as at other Berkswell Recycling Limited composting sites) and recycled as a quality compost product into a well-established end market for soil blending and horticultural markets.

Figure 1. Location of green waste composting facility at Berkswell quarry

1.3 Site Process

1.3.1 The current site layout is shown in Appendix B. The open-air windrow composting process is a robust and well-established technique for the processing of green wastes. The process typically includes the following stages (that have been set out in detail in the SOP): waste reception and receptions, windrow formation, turning and material handling and product screening. The process will be actively managed (by a competent operator) with routine process monitoring providing feedback information on the sanitisation and stabilisation of the composting material.

1.3.2 All composting operations will be carried out on an impermeable concrete composting pad to minimise/prevent the risks of groundwater and surface water contamination. The surface water collection system will comprise two independent systems to separate the runoff water from the access road and the composting slab. Runoff from the access road will fall to a collection channel (i.e. a dished channel for low maintenance) and drain to a compartment of the surface water storage tank.

1.3.3 Runoff from the operational area will be collected using dish channel drainage and be collected in a brick construction lagoon with a capacity of approximately 1,000m3.

1.4 Structure of the Odour Management Plan

1.4.1 The structure of the odour management plan is in accordance with the guidance document Controlling and monitoring your emissions for an environmental permit (1st February 2016). Consistent with guidance document, this odour management plan has been designed to address:

- Activities that have the potential to produce odour and sources of release
- Process/control failures or abnormal events that could lead to an increased level of emission or exposure
- Potential outcomes of each failure scenario in respect to odour impact
- Actions to mitigate the effect of odour release during normal and abnormal operations

1.4.2 The odour management plan considers sources, releases and impacts, and use these to identify cost-effective solutions for odour management. This document is a 'live' document: the monitoring procedures, responsibilities and compliance actions will be updated as appropriate.

2. Composting Activities and Odour Assessment

2.1 Reception and management of odorous materials

2.1.1 The composting of green waste typically generates very little odour when adequately managed and controlled. Green waste inputs vary throughout the year in both quality and quantity and the current management systems at Berkswell have been developed to adequately address the subtle changes required in processing techniques. For example, in winter periods when inputs are lower than the spring and summer periods, green waste tends to comprise woody green materials such as pruning's, hedge cuttings and unwanted plant material. When this material has been shredded and mixed, it composts in a progressive and controlled manner; the rate of

composting being moderated by a higher carbonaceous fraction, lower outside temperature and higher moisture content.

2.1.2 In the spring and summer period, the material tends to be greener and in greater quantity. Prunings tend to be much younger growth and the grass cutting form a substantial part of the inputs. This material (comprising largely kerbside material) is shredded with other carbonaceous material to improve the structure and balance of the material (e.g. woodchip or oversize material). Unlike the autumn and winter input material, the rate of material breakdown can be significantly higher and can result in sub-optimal conditions for composting including low oxygen content, high temperature and poor structure.

2.1.3 The quality of green waste inputs from HWRC and kerbside collections will be carefully controlled by Berkswell Recycling Limited at both the contract stage (specifying limits on contamination levels) and at waste reception where every load will be inspected prior to tipping. The characteristics of the waste (e.g. how fresh the waste appears, its odour note etc) will be assessed by the training site operator and where appropriate may blend additional material to adjust C:N ratio and moisture content.

2.1.4 Peak input rates for green waste are managed at the facility design stage. The site is designed to achieve a minimum processing period (timescales) (e.g. minimum 6 weeks) at peak input (essentially a worst-case scenario). When waste inputs fall (in the autumn and winter), the operators shall either processes the green waste at a slower rate (i.e. greater than 6 weeks processing timescales) or the site will have less material for processing.

2.1.5 The management system used by Berkswell Recycling Limited provides control systems to handle these different types of input materials. Through routine monitoring and active management of the composting process and input material, the potential for odour can be virtually eliminated throughout the year. The potential sources of odour have been set out in Table 1 below.

Table 1. Potential sources of odour at a green waste composting facility

Source Term	Description

Green waste reception	There is potential for material to be received on site that is already odorous. Grass cutting, and other putrescible material may be stored for 2 weeks prior to collection and this may give rise to odour during the reception of the waste. Condensate may also give rise to odour that may be generated during the storage of green waste with high ambient temperature.
Green waste storage	The storage and management of green waste for long periods (in excess of 2 weeks) may give rise to odours. The rate of material breakdown during storage (unshredded material) will be significantly less than during active composting but the rate may still be capable of depleting the oxygen held in the pore space. This may give rise to reduced conditions which when moved may release odour.
Sanitisation	When green waste has been shredded, it accelerates the natural breakdown processes of the organic matter which in turn place a greater demand for adequate oxygen, sufficient moisture and control of temperatures. A sanitisation temperature of over 60□C will produce the desired pathogen kill but will also restrict the efficiency of oxygen and nutrient movement through the biofilm. As temperature increases the solubility of oxygen decreases progressively and at temperatures of 65□C, the solubility is surprisingly low. This can thus give rise to anaerobic conditions which when moved and may generate an odour. It should be noted that aerobic conditions may also give rise to odours, particularly ammonia when found at elevated concentrations.
Screening & material movement	Whenever the material is moved or displaced on site during turning, screening or shredding, the potential risks of odour being generated rises. Hence, screening and movement of the composting material during stabilisation needs to be carried out alongside careful monitoring of the composting material. With the material being physically displaced (actually essential for thorough mixing), any potential odour 'locked up' in the material structure is likely to be released.

Storage of screened and oversize material	Long-term storage of material can be associated with odour release particularly when the material may have some residual activity. The storage of screened compost needs to be carefully managed to ensure that the material is turned whenever possible and monitored routinely for odour during displacement.
Drainage and leachate storage	The collection, storage and reuse of surface runoff water and leachate from the composting slab can give rise to odour particularly during long periods of storage. With adequate containment and design, the potential for odour can be minimised.

2.1.6 A list of odour source points has been set out in Table 2 and would form the basis for routine odour monitoring carried out at the site.

Table 2. Odour source release points

Source	**Description**
Green waste storage area	Vehicles entering and leaving the composting facility. Stockpiling of received green waste.
Shredding	Material handling and shredding of green waste and other organic wastes.
Formation of windrows	Movement of shredded material into windrow.
Aeration of windrows	Material displacement during aeration of the composting material.
Screening	Movement of stabilised material from the windrow to the screener and during the screening process.
Material storage	Stockpiling and movement of products and oversize material.

Drainage & standing water	Storage tanks, dished channels and standing water.

2.2 Pathways

2.2.1 In the event that an odour source is generated on site, it is typically considered to be at ground level (circa 3m) and is considered a low-level area source term with negligible upward velocity or discharge. The pathway for any odours from the site is atmospheric dispersion and the climatic conditions will affect odour release from the site. Quiescent conditions may be unlikely to release or transmit significant quantities of odour (but have a low dilution factor) as opposed to highly turbulent conditions that would results in rapid dispersion from the site (but also a high factor of dilution).

2.2.2 The general direction of the wind at Berkswell Quarry is from the south west.

2.3 Receptors

2.3.1 The potential receptors within the vicinity of Berkswell Quarry are set out in the table 3 below and Figure 2:

Table 3. Potential receptors at Berkswell Quarry Composting Facility

Ref	Name	Direction	Distance (m)
01	CEMEX	West	500
02	Ready mix concrete facility	North	650
03	Residential property (off Cornets End Lane)	Northeast	650
04	Residential property (off Cornets End Lane)	East	400
05	Residential property (off Mercote Hall Lane)	Southeast	450
06	Farm and out buildings off Kenilworth Road	Southwest	600
07	Farm and out buildings (Mercote Farm	West	280

Figure 2. Berkswell Estate composting facility showing position of sensitive receptors to assist with any potential odour complaints at the facility.

3. Control Measures

3.1 Introduction

3.1.1 Berkswell Recycling Limited has consistently taken a systematic approach to the development of control measures for green waste composting over more than a decade of composting activities. With considerable operational experience and know-how, the composting of organic waste and the potential for odour release from the material is continuously reviewed as new developments in technology and better understanding of compost science become available. The strategies adopted at Berkswell for controlling green waste composting will involve careful consideration and planning. Where appropriate, the early implementation or intervention of specific strategies will be made to avoid or prevent any potential release of odour.

3.1.2 Berkswell Quarry will operate to BSI PAS100:2018 composting standard and will adhere to the principles of the Standard Operating Procedures prepared by the Association for Organics Recycling (formerly the Composting Association).

3.1.3 The design and site practice will reflect the latest guidance included in the Compost Quality Protocol (2010); DEFRA guidance on good practice and regulatory guidance on composting and odour control for local authorities (2009); and the composting industry code of practice prepared by The Composting Association (2005).

3.1.4 Berkswell Recycling Limited's operating procedures for green waste open windrow composting are set out in the PAS100:2018 standard operating procedures and the site working plan ensure that good operational practices are employed. The effective management and control of the composting process through standard practices and procedures will ensure efficient operation of the facility and minimise the potential for odour generation. The following sections 3.2 to 3.6 detail management techniques, procedures, and odour control measures to minimise the potential for odour generation for each aspect of the composting operation.

Table 4. Key feedstock and processing parameters

Ref	Parameter	Control
1	Feedstock characteristics	Control - C:N of incoming wastes at least 15-25:1. Limit nitrogenous fraction of waste, ensure adequate woody fraction, moisture content, maturity of feedstock.

2	Moisture	Control – Index score 3 to 4. Moisture is essential for microbially mediated degradation. Insufficient moisture may slow degradation; excessive moisture may also hinder degradation.
3	Aeration & oxygen	Control – maintain a positively oxygenated environment. Composting is an aerobic process; the microorganisms require the presence of oxygen to breakdown the organic material to release energy for respiration. Aeration is achieved through turning the composting material, stored in windrows, on a weekly basis. This also provides mixing of the substrate and the moisture throughout the material.
4	Temperature	Control – 60 to 65°C for sanitisation and stabilisation. Composting generates substantial amounts of energy from the degradation of organic matter. Temperature within a compost windrow is essentially self-regulating at 55-65□C. The benefit of this heat generation is sanitisation of pathogenic organisms that render a pathogen free final compost product.
5	Storage requirements	Control – maintain a positively oxygenated environment. The storage of unprocessed material and of screened product will require regular monitoring to evaluate physical and biological conditions. Under PAS100:2018, a compost will only be certified once it has achieved quality defined by chemical, biological and physical characteristics.

3.2 Feedstock and Physical Characteristics

3.2.1 The definition of green waste as set out in the licence/permit conditions describes the source of the material and general characteristics. Green wastes usually comprise organic material generated from the garden and may include: pruning's from trees and shrubs, discarded plant material, leaves, grass cuttings, rootstocks and associated soils. The composition of green waste has a high seasonal variability, as does the quantities of green waste that are produced. Hence, the composting site and the processing techniques it employs have to be capable of managing changes in feedstock composition and substantial variations in input quantities.

3.2.2 At Berkswell Quarry, the feedstock material will be monitored with every incoming load consistent with section 4.2 of the working plan (waste acceptance and control). Each load weight will be recorded at the weighbridge as the material enters the site (the first point of control). The material will be inspected and directed to the waste reception area where upon tipping, the material is further inspected for contrary or odorous materials. The trained compost operatives will evaluate each load for odour, quantities of wet putrescible matter, amount of woody fraction and maturity of input material (e.g. has the material been freshly cut from the garden or stored for several months prior to recycling).

3.2.3 The controls over the feedstock characteristics will be achieved through blending different materials stored in the reception area, principally wood chip, wood chip fines and compost oversize material. The quantity of the additive will depend on the characteristics of the feedstock material but where appropriate, a minimum carbon to nitrogen ratio of 15-25:1 shall be maintained.

3.2.4 The carbon to nitrogen ratio (C:N) is used as a process control stage that allows an appropriate mix of materials to be achieved for composting. Generally, high C:N wastes (e.g. wood, leaves, tree trunks, root stock etc) are blended with lower C:N waste types such a green pruning's, plant material and grass cutting to achieve the desired C:N ratio. If the C:N ratio was allowed to fall below 15-20 (essentially more nitrogen in the system), there may be a greater risk of odour release due the higher 'activity' of the material that may encourage rapid oxygen depletion and liberation of free ammonia. By blending woody wastes in with the material, it essential slows down the process and provides a greater degree of control.

3.2.5 The feedstock material (including the blending material where appropriate) will typically be processed on the same day though to account for weekend and bank holidays, a maximum period of 3 days storage prior to shredding is set out in the working plan (see section 4.3.1).

3.2.6 The incoming material sources from municipal household waste recycling centres and kerbside collections will be shredded using a specialist green waste shredder. The shredder will be operated on a daily basis by an approved and skilled operator (minimum NVQ Level 3 qualification). Routine maintenance & servicing will be programmed in with site operation to ensure that it is carried out at quiet period when the shredder in not in use (i.e. afternoon periods where waste inputs are low or at weekends). In the unlikely event of a breakdown (e.g. a hydraulic hose ruptures or a conveyor belt bearing ceases up), these will be placed without delay by site staff or where appropriate external service engineers. Where more significant breakdowns may occur (e.g. gear box failure, engine failure), a replacement shredder will be provided to ensure that waste is not stored on site beyond the permit condition of 3 days.

3.2.7 The shredded material is formed into windrows that are constructed to a width of 7m and a height of 3m. This is a typical size of windrow for green waste composting as

it provides sufficient volume and insulation to achieve the temperature required for sanitisation (i.e. +60°C) without restricting the aeration of the windrow or promoting collapse of the open structure of the compost due to excessive self-weight. The prevailing wind direction at the site is south westerly. The direction of the windrows is approximately east-west.

3.3 Moisture Content

3.3.1 Water is essential for the breakdown of organic matter. For bacteria and other microorganisms to utilise a substrate such as organic matter, it has to be solubilised (in a process called hydrolysis) before it may be absorbed into the cells. Once in solution, the substrate can be further degradation to release energy for respiration and cell growth. The moisture content range specified under the composting standards of BSI PAS100:2018 is 40% to 60% (expressed as wet weight), which accounts for a large variation in moisture held by the compost, as shown in the example below.

3.3.2 Typically, the green waste moisture content decreases gradually throughout the composting process (essentially drying). The wetter, more active compost at the start of the process benefits the generation of high temperatures for sanitisation while the dryer compost towards the end of the process aids screening and quality of the graded compost product.

3.3.3 Water may be added to compost to assist degradation and the amount controlled with careful monitoring (see section 4.5 of the working plan). The use of a grasping and clenching method provides a useful indication of moisture content at various stages throughout the composting process. Only clean surface water or RO water will be used for water addition

3.3.4 A sample of compost from a windrow is grasped firmly with a gloved hand for approximately 10 seconds. The hand is then opened, and the moisture content assessed as follows:

Table 5. Moisture assessment index

Index No.	Sample moisture behaviour	Interpretation
1	Water seeps out	Too wet
2	More than one droplet appears	Too wet
3	One droplet appears	OK

4	Compost particles remain packed together and no droplets appear	OK
5	Compost particles fall away from each other	Too dry

3.3.5 Where water is required, it will be sourced from its surface water storage lagoon or the RO tanks and added to windrows when a moisture index score of 4 or 5, though this will depend on the age of the material. Directly prior to screening for example, an index no. 5 may be ideal. Alternatively, at the start of the process, an index no. 5 may highlight that water is required. The amount of water added to each windrow is recorded in the site diary or batch record sheets to ensure that windrows are not overwatered or remain too dry.

3.4 Aeration, Turning, Temperature and Oxygen Concentration

3.4.1 Composting is an aerobic process that degrades spent organic matter in a stable end product. The process relies on sufficient oxygen being made available to satisfy the stoichiometric oxygen demand (the oxygen required by bacteria). In advanced forced aeration systems, the oxygen can be managed and manipulated to optimise the composting process. In windrow systems, however, regular turning has to be deployed to replenish the air (oxygen) held in the pore space of the compost.

3.4.2 This remains the most popular form of composting in the UK, accounting for 74% of all composting sites, with a processing capacity in excess of 3.76 million tonnes[1]. Turning also provides mixing and better distribution of substrate and moisture. A number of methods are employed for windrow turning and these include straddle turners, side turners and manual turning with a loading bucket or excavator. Berkswell Recycling Limited will use wheeled loaders to turn their windrows as these are multi-functional vehicles.

3.4.3 Turning a windrow to provide aeration requires displacement of the composting material and it is because of this action, that it can be associated with the release of odour. It should be noted that odour release from compost may be offensive (foul) or hedonic (delicious). Not all compost odours are offensive, freshly shredded woody green waste material has a particular hedonic note to some observers.

[1] Survey of the UK organics recycling industry 2008/09, July 2010.

3.4.4 The turning frequency is determined by BSI PAS100:2018 compost standard and site operations. Berkswell Recycling Limited will ensure a minimum turning frequency of at least once a week, for all material being processed.

3.4.5 The temperature of the compost is governed by a number of factors including feedstock composition, moisture content, nutrient balance, material size etc. In windrow systems, it is effectively self-regulating: stable temperatures are achieved when the heat output from the microbial degradation is balanced by the heat loss to the surroundings. The sanitisation temperature has risen over the years and currently PAS100:2018 requires a minimum temperature of 65□C.

3.4.6 Berkswell Recycling Limited will monitor at a frequency consistent with BSI PAS100:2018 and section 4.6 of the working plan. With open air windrows, these systems essentially self-regulate. When the material becomes too hot, the microbial activity drops off (non-optimal conditions) and after a while temperatures begin to fall as a result of reduced heat output. Likewise, where temperatures are low (e.g. following turning or freshly shredded waste), the microbial activity rises, heat output increases and the temperatures rises (see Figure 2).

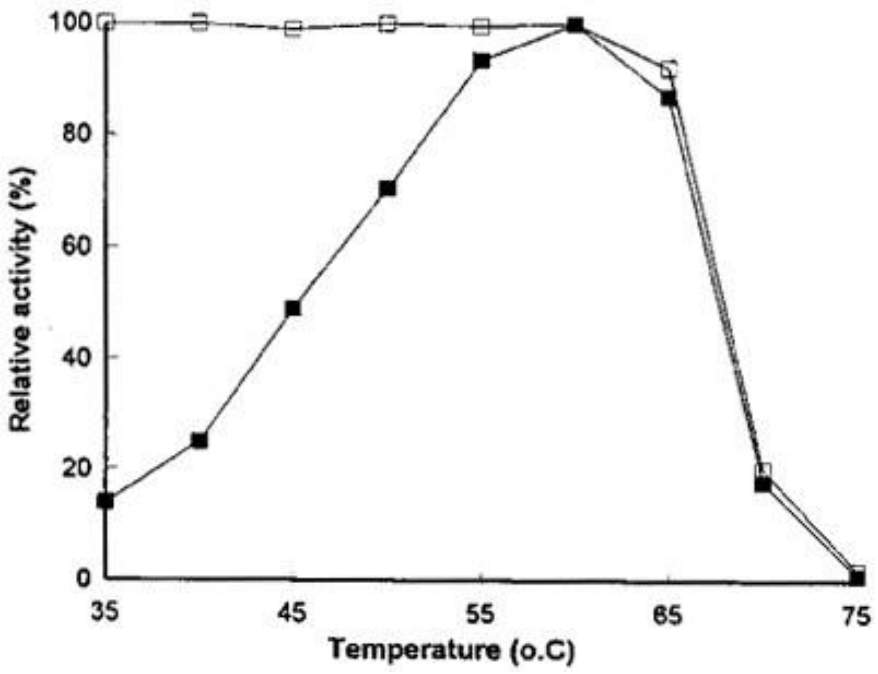


Figure 2. Relationship between microbial activity and temperature (after Cruz et al., 1998 & Haug, 1993).

3.4.7 Windrow temperatures will be maintained above 60-65°C throughout the active and maturation phases. The temperature will be affected by the frequency of turning,

moisture content and feedstock composition and with good site management practice, Berkswell Recycling Limited will ensure the target temperature range for composting is maintained. Temperatures are checked daily at 4 locations in each windrow using a hand-held probe. A system (iTOM) is being trialled to use telemetry linked probes to give continuous readings.

3.5 Storage

3.5.1 The storage of green waste (unshredded) and of composted material prior to and post screening will be carefully managed to ensure the material is moved regularly in a consistent manner (i.e. old material moved out of storage areas before new material is placed in storage). This will allow good stock control and ensure consistent product delivery throughout the year.

3.6 Control Summary

3.6.1 A summary of the control system in place at Berkswell Quarry have been set out in Table 6.

Table 6. Control strategy for Berkswell Quarry Composting Facility

Ref	Parameter	Control Strategy
1	Feedstock characteristics	A. Every load received on site is weighed and inspected prior to shredded. B. If feedstock appears to contain a high percentage of putrescible material (greater than 30% by volume), wood chip or oversize material will be mixed with the putrescible fraction at a ratio of approximately 1 part woodchip to 2 parts putrescible fraction. Mixing will be carried out prior to shredding. C. Following placement of the shredded green waste into a windrow, the material will be assessed within the first 3 days for moisture content and structure.

		D. Very odorous wastes will be rejected from site.
2	Moisture	A. The moisture content will be monitored on a weekly basis using the standard grab test described in section 3.3. Results will be recorded on batch information sheet. Target moisture content index scores are 3 to 4 during sanitisation and maturation. Target moisture content index score may rise to 5 prior to screening. B. If moisture index score 5, water will be added using an overhead sprinkler system. The amount of water will be recorded. C. Water will only be added during the sanitisation phase to avoid the potential for reintroducing pathogenic bacteria. D. If the moisture index score is 1, the turning frequency will be doubled until the moisture index score is improved to 3.
3	Aeration & oxygen	A. Turning will be carried out at a minimum frequency of once a week unless triggered by other factors (e.g. wet compost requires accelerated drying). B. Turning will be influenced by the weather, to be avoided where achievable on windy days.
4	Temperature	A. Temperature will be monitored in all windrows daily during the period of sanitisation and weekly on completion of the sanitisation phase. Temperature to exceed 65□C for a period of 7 days but not necessarily consecutive days. Lower temperature may be permitted for example, a temperature of 55□C for a period of 21 days. B. The normal range of compost temperature is 55□C to 70□C. Within this temperature range, normal operating conditions should prevail. C. When temperature is found below 55□C, the compost will be monitored for moisture, structure and composition. If moisture is considered too low (index score 5), water will be added. If moisture is considered too high (index score 1), the turning frequency will be raised. If the structure is considered too dense, organic amendment material (e.g. woodchip, oversize material) will be added to the windrow and mixed in using the turning machine.

		D. When temperature is found above 70□, the compost will be monitored for moisture, structure and composition. If the elevated temperature persists for more than 10 days, the frequency of the turning will be increased and additional moisture may be added to prevent the compost from drying out.
5	Storage requirements	A. Green waste will be stored for a maximum of 3 days prior to shredding though this is typically carried out on a daily basis. Any putrescible material received will be immediately mixed with other green wastes to distribute the material prior to shredding. Course woody material may be stored for up to 5 days prior to shredding. B. Compost prior to screening will be stored for no longer than 14 days. C. The storage of screened compost will be managed to ensure a constant turnover of compost (i.e. to prevent where possible fresh compost being placed in front of older compost).

4. Odour Control during Abnormal events

4.1 Introduction

4.1.1 Under the requirements of Environment Agency's Guidance Controlling and monitor your emissions for an environmental permit (1st February 2016), a number of abnormal events have been considered in relation to the potential of odour being released from the facility. The abnormal events have been identified as abnormal meteorological conditions and failure of certain aspects of the composting process.

4.2 Abnormal Meteorological Conditions

4.2.1 The development of extreme meteorological conditions (e.g. high pressure, high temperature stable conditions) may result in the increased risk of odour generation at the site and at receptor locations.

4.2.2 Applying control measures, such as using meteorological forecasts and good site management (maintaining aerobic conditions within the windrows) will minimise the potential impact of abnormal meteorological conditions. However, should extreme circumstances occur potential odour impact may be more likely.

4.3 Process Equipment – Mechanical Failure

4.3.1 The breakdown of key processing equipment or control systems has the potential to raise the risk of odour impact at the receptor locations. Potential failures in the composting process have been set out in sections 4.3.2 to 4.3.4 (and see table 7).

4.3.2 Breakdown of shredding equipment may result in a delay in processing the material received. The extent of the impact will be influenced by the down time of the machine; the type and volume of waste being received and the prevailing meteorological conditions.

4.3.3 The failure to maintain aerobic conditions within the composting windrows in both the active and the maturation phase. The magnitude of impact will be influenced by the volume of material under anaerobic conditions and the prevailing meteorological conditions.

4.3.4 The surface water lagoon develops septic conditions. This event could be readily contained by ensuring the water was not used in the composting process and some

simple aeration equipment installed to maintain aerobic condition in the water storage lagoon.

Table 7. Abnormal event management system

Odour generating process	Release points	Abnormal situation & failure	Potential outcome	Control measure	Action (responsible person)
Waste reception, shredding, maturation and screening	Reception area, processing area and final storage area	Extended duration of abnormal (e.g. stable) meteorological conditions	Elevated odour at sensitive receptors	Weather forecast manage reception and window turning in response to wind/weather conditions. Olfactory survey and complain forms.	Progressive initiation of control measures as necessary and complaint investigation (site manager)
Decomposition of waste in reception area	Reception area	Breakdown of shredding equipment	Elevated odour at sensitive receptor	Manage deliveries of green waste during breakdown to reduce quantities accumulating. Hire replacement equipment if repairs to machine cannot be made within 3 days.	Rapid repair of shredding equipment or hire replacement shredder (site manager)
Composting and maturation process	Composting and maturation area	Formation of anaerobic conditions within the composting materials	Elevated odour at sensitive receptor	Manage turning and aeration activities to minimise release of odours in unfavourable conditions	Evaluate cause of anaerobic conditions and adjust turning frequency/moisture content/structure as appropriate (site manager)

Surface water storage lagoon	Lagoon surface	Septic conditions develop	Elevated odour at sensitive receptor	Monitor odour levels, potential to install aeration system	Consider installation of aeration system (site manager)

5. Monitoring Plan

5.1 Introduction

5.1.1 Monitoring compost and composting facilities is essential to gain a better understanding and control of the transformations that are undertaken as fresh green waste breaks down to a mature stable product. Monitoring will be carried out in agreement with the procedures set out in the plan, the Environmental Permit (EPR/DB3508MA), planning permission and BSI PAS100:2018.

5.1.2 The monitoring plan (set out herein) will assess and evaluate the conditions that may affect the composting process and may indicate the potential for generation of odour and elevated odour levels at the sensitive receptors. Monitoring will be carried pre-emptively and will continually assess the conditions of the composting material (essentially critical control points under HACCP) as opposed to monitoring odour once it has been generated.

5.2 Monitoring Potential Sources of Odour

5.2.1 Feedstock composition: feedstock will be monitored on a daily basis for potential odour and any presence of potentially odorous material (i.e. high percentage of putrescible waste, wet waste, poor structure etc) will be recorded in the site diary.

5.2.2 Windrow processing: windrows will be monitored for temperature, moisture and oxygen throughout the sanitisation and stabilisation process (consistent with the Environmental Permit and PAS100:2018).

5.2.3 Olfactory analysis will be carried out twice a week and more frequently when required. Monitoring will be carried out at established points on the site boundary and at sensitive receptor locations where necessary. Additional locations beyond the site boundary may include upwind and down positions. At each location, the standard sniff test and odour report forms will be used to record the data as per Appendix A. In addition to these observations, the meteorological conditions will be described together with the current activities both on and off site (see odour complaint form, Appendix A).

5.2.4 All collated data will be entered into a site odour diary that will be held at the site office (see odour diary, Appendix A).

5.2.5 The odour assessor will be selected on criteria set out in the guidance notes that include not being subject to significant compost odour within 30 minutes of carrying out the assessment and shall be compliant with the requirements laid down in the Olfactory

Survey procedure. This will ensure that monitoring staff are not suffering from odour fatigue but will be sensitive to any composting odours.

5.3 Monitoring Potential Pathways

5.3.1 Meteorological monitoring will be routinely carried out on site (with the use of a fully automated weather station). This data will provide vital evidence of potential pathways for any odour generated on site. This data will include but not limited to: wind speed, wind direction, temperature, barometric pressure, humidity, cloud cover, rainfall.

5.4 Monitoring Potential Receptors

5.4.1 Daily monitoring records will be maintained at the site as a requirement under the Environmental Permit and PAS100:2018. The records will include inspections, olfactory monitoring and weather conditions. Any operational problems will be recorded and will include date, time, duration and prevailing weather conditions. The cause of any problems, any complaints received, details of any corrective action taken and subsequent change to operational procedures will all be recorded in site records.

5.4.2 The Environment Agency guidance states that engaging neighbours should be an important component of the odour management plan. Berkswell Recycling Limited will seek to inform the surrounding neighbours of its current activities, its proposed developments and how it seeks to continually improve its operations. Berkswell Recycling Limited will hold open days (when appropriate) to show how green waste is composted at a best practice site. This odour management plan formalises the current arrangements by providing the neighbours with a formal letter stating the contact name and details should an odour issue arise. As part of its complaint's procedure, Berkswell Recycling Limited will seek to take immediate action to define the problem and once the potential cause has been identified, to resolve the problem without undue delay.

5.5 Responding to Complaints

5.5.1 Berkswell Recycling Limited has set up a complaints procedure for any issues that may arise from the site. These may include odour, dust, noise etc. All complaints will be investigated promptly and where remedial action is required, it shall be carried out without delay. A complaints procedure has been included in the appendices and shall be used anytime an odour complaint is raised.

5.6 Complaints Data & Sniff Testing

5.6.1 A formal complaints procedure for reporting odour related to Berkswell Recycling Limited has been set out in appendix A.

5.6.2 The sniff test is the basic form of odour monitoring and the procedure has been set out in appendix A. The monitoring will be carried out by a representative not working directly with the compost.

5.7 Actions & Abatement System

5.7.1 Following the identification of odour generation at the site, an action plan will be set out as part of the odour complaint form. A description of the odour source will be included together with the nature of the odorous material, the containment or release point and a description of the odour. The intensity of the odour at or near the source will be determined together with a pattern for release.

5.7.2 The type of action will depend on the cause of odour. As set out in Table 5 (see section 3.5), a number of controls will be confirmed and if required amended to address and prevent the cause of odour from site.

5.7.3 The abatement system will follow a logical response to the odour complaint. Following the recording and verification of the complaint, the source of the odour will be investigated. This will include a thorough review of the site and the current processes being undertaken. Grab samples will be taken if required for further analysis.

5.7.4 Once the source of the odour has been identified, a correction action plan will specifically address the cause of the odour. Typically, the action plan may include a number of items address in Table 5 (control strategies).

5.8 Cold Drainage

5.8.1 Cold drainage flow occurs on cool, clear nights when cooled air flows downhill at slow speeds, normally 3-5m/s. It is responsible for frost pockets and can cause pockets of odour released from ground sources to accumulate in low lying areas. The site typography and creation of sizeable perimeter bunding will minimise the potential for cold drainage.

6. Review Procedure for the Odour Management Plan

6.1 Introduction

6.1.1 The odour management plan for Berkswell Quarry will be reviewed annually or when significant changes to site operations or infrastructure have been made.

6.1.2 Berkswell Recycling Limited will ensure that all its employees receive basic training on the composting of green waste, the principles of odour management and good site practice.

7. Actions and Contingencies

7.1 Introduction

7.1.1 In accordance with the Environment Agency guidance, a series of actions have been described that may be triggered in response to situations when site monitoring has indicated a potential source of odour is not completely under control, or adverse weather conditions or specific operational circumstances on site may exacerbate a potential odour source (see table 7, section 5).

7.2 Feedstock Composition

7.2.1 The site acceptance procedures will prevent the acceptance of highly odorous feedstock material. On occasions, odorous material may only be identified once it has been tipped and on discovery of this material, site management will decide whether to blend in additional materials to abate the odour or to reject the odorous waste from site.

7.2.2 At specific times of the year, feedstock material has a greater potential to generate odour. This is noticeable during the spring and summer months when there is a higher proportion of grass cutting and putrescible material. Grass cuttings are readily compostable but due to their high moisture content and relative high nitrogen value, controls are often required to manage the rate of composting.

7.2.3 At these specific times, mixing and blending with dry oversize material or wood chip will be a routine procedure to avoid any adverse conditions. Cardboard and paper are good amendment material though there may be restrictions on their acceptance and use.

7.2.4 The use of amendment material will also apply to wet material particularly during the spring, summer and autumn periods. Where wet material is received on site (due to heavy rains, for example), it can be managed effectively. With the introduction of additional amendment material and an increased frequency of turning during the initial weeks of composting, the material can be managed to prevent odour generation on site.

7.2.5 In the late autumn and winter months, the opposite situation can occur although this rarely gives rise to odours because of the lack of readily degradable material present. In the event of dry material being received on site, water will be added routinely to the shredded material to raise the moisture content to a moisture index No. 3-4.

7.3 Windrow Composting

7.3.1 Where olfactory analysis indicates an unacceptable intensity of odour or complaints have been received on site, the conditions of the compost in the windrows will be reviewed to determine the cause of the complaints.

7.3.2 If there is too much material in the windrows, the inputs to the site will be scaled back to allow the size of the windrows to be reduced to ensure better aeration is achieved (though this is unlikely to be the situation at Berkswell Quarry because its windrows are a standard dimension).

7.3.3 An increase in turning frequency would be implemented with other measures to improve the aeration of the sample. It should be noted that increased turning will be influenced by the weather and where high wind speeds are being experienced, the turning frequency may be reduced temporarily. The frequency of turning may be reduced in adverse weather conditions and increased in favourable conditions.

7.3.4 Additional material may be added or applied to the windrows. Woodchip may be placed over the windrow to act as an in-situ biofilter and this has proved highly effective. Amendment material can be added to the windrows prior to turning to improve both the structure and the material composition.

7.4 Maturation and Storage

7.4.1 Where olfactory analysis indicates an unacceptable intensity of odour in the windrow maturation and storage area; the source of the odour will be investigated. Where structure has been identified as a potential source, oversize material from the screening facility will be blended with the material to increase the poor space and assist aeration of the material.

7.4.2 Rapid processing of material can eradicate odour by thorough aeration of the sample during the screening operation. Furthermore, ensuring the compost products are continually exported from site will minimise storage volume and hence potential for odour.

7.5 Abnormal Weather

7.5.1 Extreme weather may prevent or exacerbate the transmission pathways for odour. In breezy conditions, the mixing and dilution of the odour may be greater but the speed of travel to the potential receptors may also be increased. In stable, high pressure conditions, any odour that may be generated on site may be held within the vicinity of the site for protracted periods. In these conditions, the movement of

material from turning, should be minimised to reduce the potential liberation of odour from the composting material.

7.6 Emergency Plans

7.6.1 The implementation of an emergency plans seeks to minimise the impact on site of any breakdowns, incidents or accidents (see table 7, section 5). The breakdown of any processing equipment from loading shovels and shredders through to turning and screening equipment may result in a delay to operations or processing the material. The magnitude of the impact will depend on the severity of the breakdown but Berkswell Recycling Limited has emergency call out for its plant and machinery.

7.6.2 The potential failure of the equipment is effectively managed at Berkswell Quarry through standard repair and maintenance contract with equipment suppliers. These contracts include regular servicing, routine repairs and emergency call with vehicle replacement where required.

7.7 Odour Suppression

7.7.1 Berkswell Recycling Limited no longer uses a perimeter odour suppression system. The system is well established in the composting industry and relies on a series of atomisers to release specific odour abatement compounds into the air. These typically include surfactant technology that agglomerates the airborne particles to encourage settlement out of the waste stream. The chemical also includes a perfume or masking agent that improves the hedonic quality of the odour. These systems have been operational for a number of years in the industry and have reliably been used as one of the contingency measures against the transmission of odour from sites. It was requested by the EA that during the 2016 season the odour suppression system is not used.

Appendix A – Odour Complaints Form

Odour Complaint Form

BERKSWELL QUARRY ODOUR COMPLAINT FORM	
Time and date of complaint:	
Name of complainant:	
Address of complainant:	
Telephone No of complainant:	

Date and time when odour detected	
Location of odour	
Weather conditions (e.g. dry, wet, foggy)	
Temperature (from weather station)	
Wind strength (from weather station)	
Wind direction (from weather station)	
Complainants description of odour	
- description of the type of odour	
- intensity (1 – not detectable, 5 very strong)	
- duration	
- constant or intermittent	
- other information on odour	
Have any other complaints been made	
Any other relevant information	

Define likelihood of odour occurring at your site	
What activities were being carried out at the time of the odour complaint?	
Describe the remedial action taken	
Form completed by (sign and date)	

BERKSWELL QUARRY ODOUR DIARY	
Time and date of inspection	
Name of inspector	
Activities being carried out on site	
Locations inspected	
Weather conditions (e.g. dry, wet, foggy)	
Temperature (from weather station)	
Wind strength (from weather station)	
Wind direction (from weather station)	
Odour characteristics	
- description of the type of odour	
- intensity (1 – not detectable, 5 very strong)	
- duration	
- constant or intermittent	
- other information on odour	

Have any other complaints been made	
Any other relevant information	
Define likelihood of odour occurring at your site	
Describe any the remedial action taken	
Form completed by (sign and date)	

Complaint, Actions and Outcome Record Sheet

Complainant

Record name, or 'withheld' if requested but not given by complainant, or 'not supplied' if was not requested by person receiving the complaint.

Name of person	
Organisation name	
Address	
Telephone	
Fax	
E-mail	

Complaint about

Organisation name	
Composting process location	
Compost grade(s)	
Certification assessment code(s)	

Nature and record of complaint

Product / Service / Action / Document / Other (describe):

Person who used / expected it:

Date used / expected:

Nature of the deficiency:

Complaint number: __ __ __

Complaint handled by

Name of person	
Role	
Received by	Letter / email / telephone / fax / meeting
Date received	

Actions and issues being investigated

[Record details of any another organisation / external person involved, if applicable. Add more action rows if necessary.]

Action 1 (description)	

Action by (name of person)	
Date by	
Action 2 (description)	
Action by (name of person)	
Date by	
Action 3 (description)	
Action by (name of person)	
Date by	

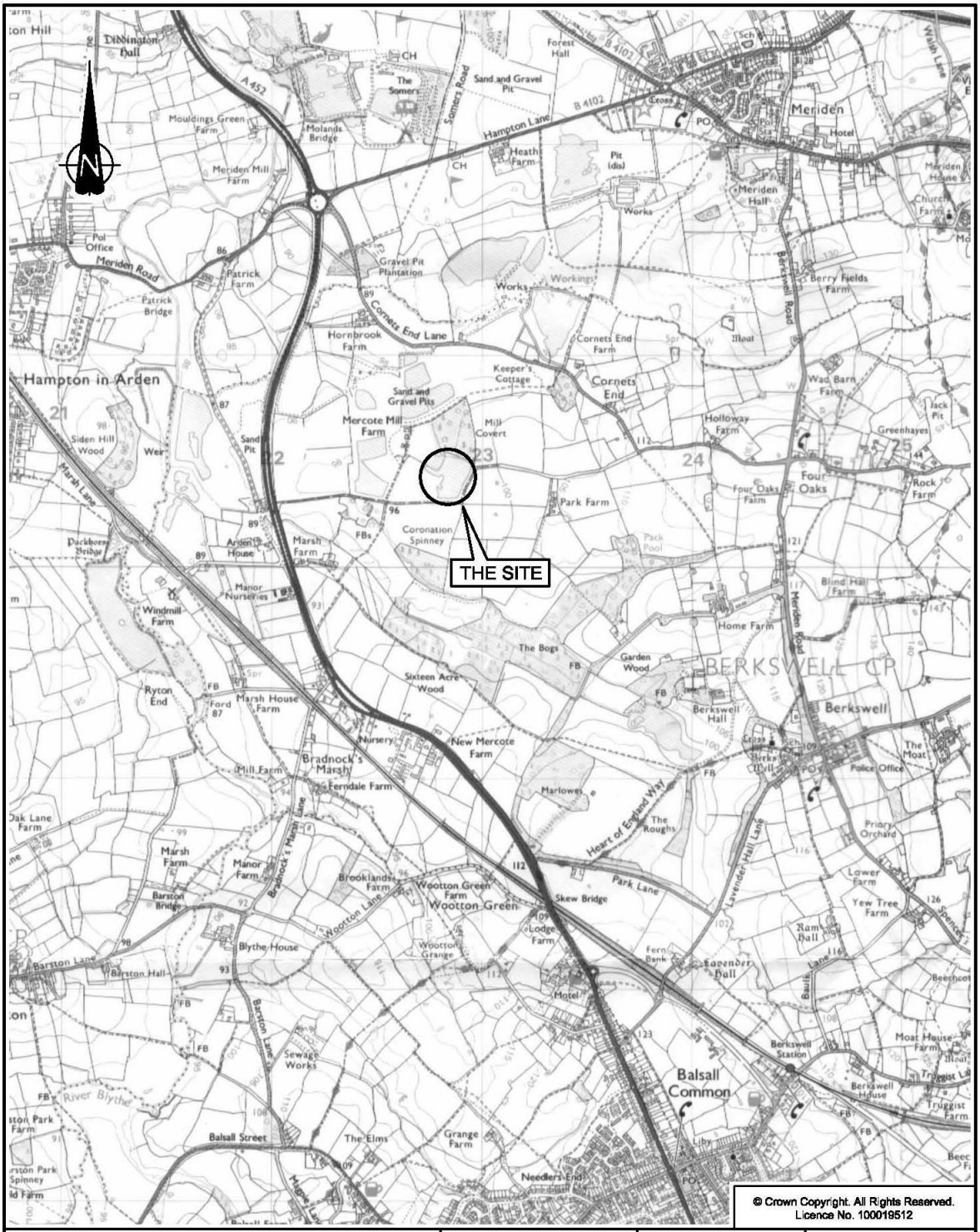
Outcome

Communicated to

Date complainant notified	
Date any other relevant parties notified	
Names of any other relevant parties (for each, state person and organisation)	

Keep a copy of this record file with it any other documents associated with the complaint, actions taken and the outcome.

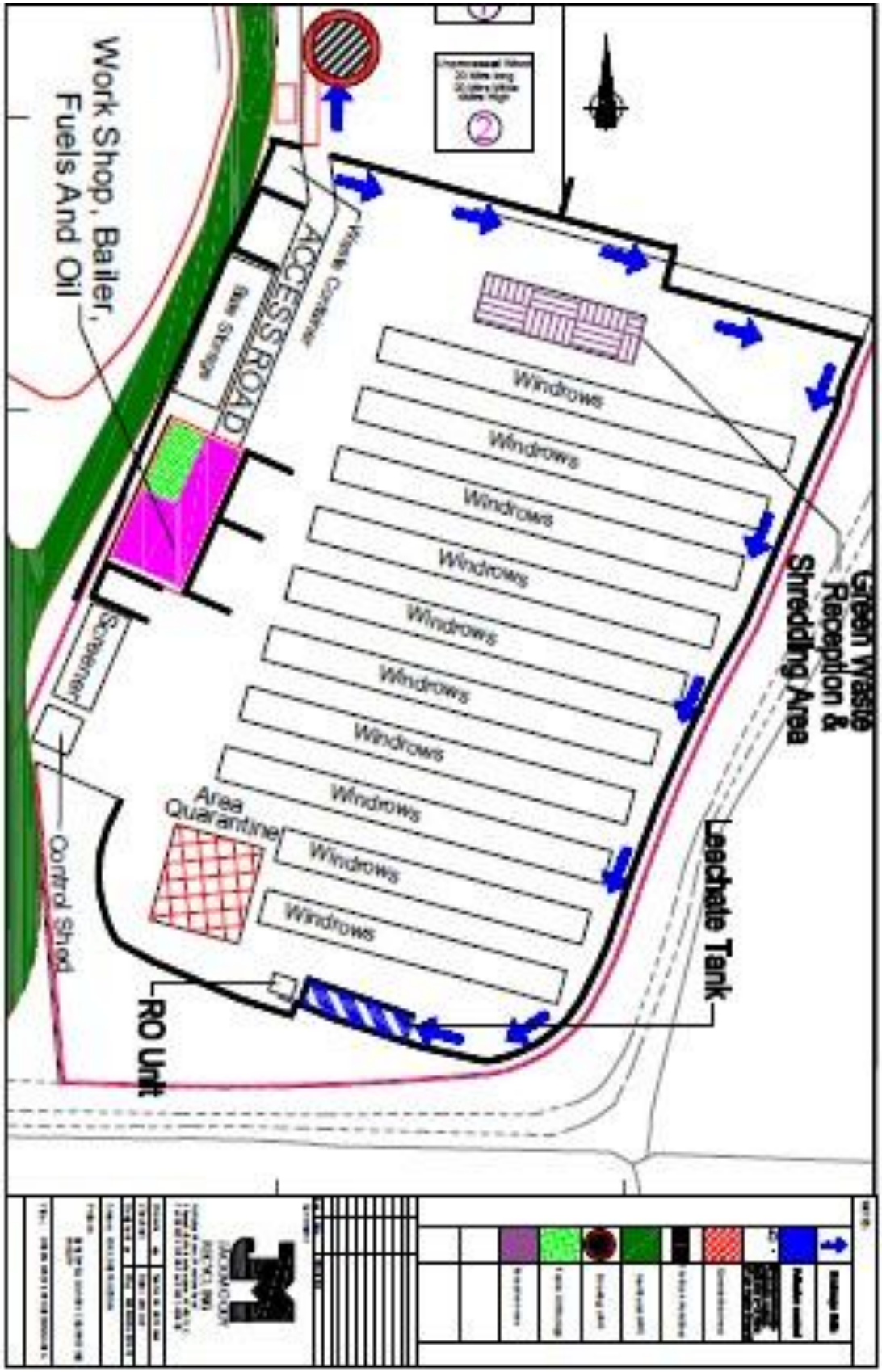
Appendix B – Site Layout Drawings

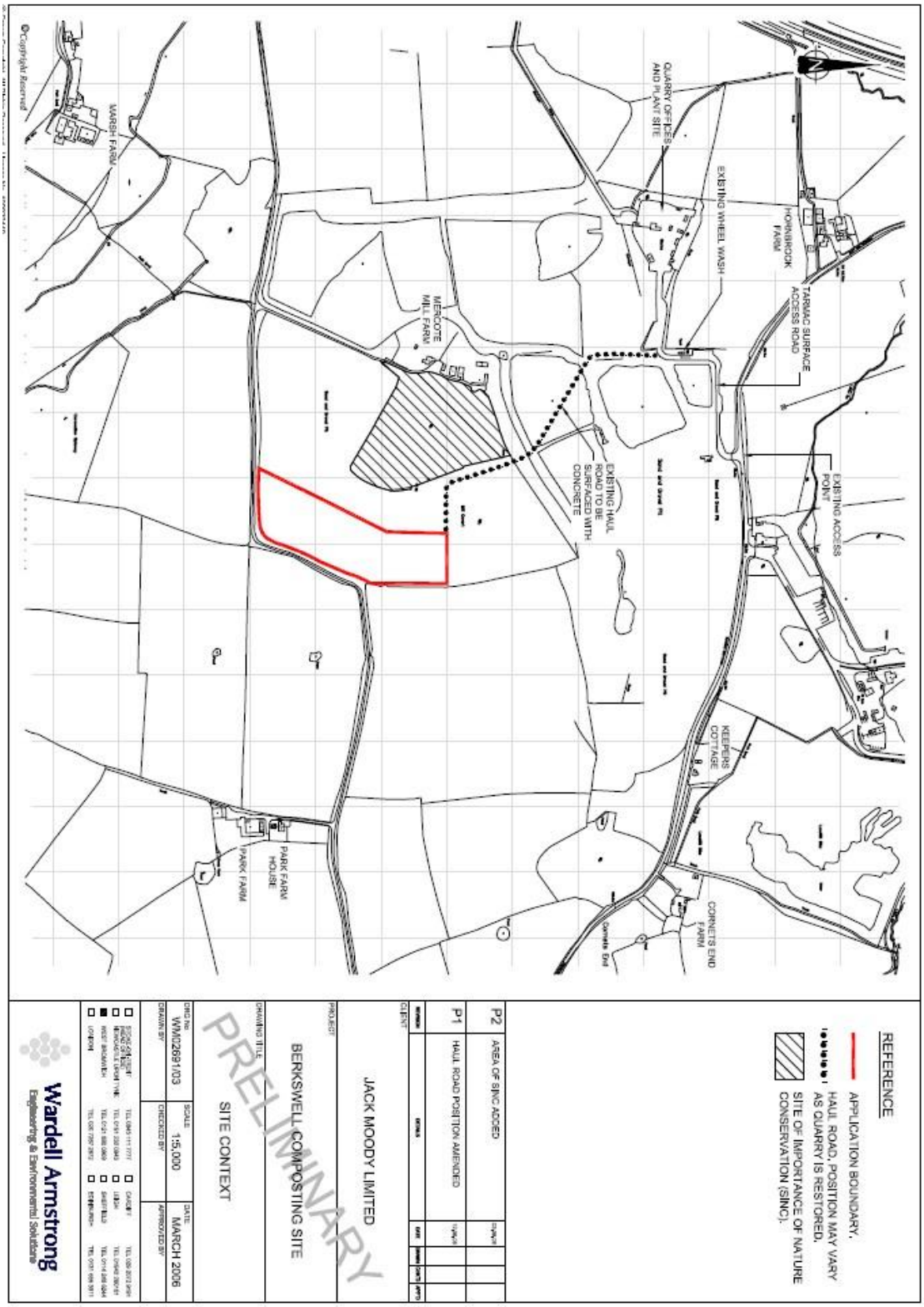


CLIENT	DRG No	SCALE	DATE
JACK MOODY LIMITED	WM02691/01	1:25,000	MARCH 2006
PROJECT	**DRAWN BY**	**CHECKED BY**	**APPROVED BY**
BERKSWELL COMPOSTING SITE			
DRAWING TITLE			
SITE LOCATION			

PRELIMINARY

Wardell Armstrong
Engineering & Environmental Solutions


Work Shop, Bailer, Fuels And Oil
ACCESS ROAD
Screener
Control Shed
Area Quarantine
RO Unit
Windrows
Windrows
Windrows
Windrows
Windrows
Windrows
Windrows
Windrows
Windrows
Windrows
Green Waste Reception & Shredding Area
Leachate Tank


REFERENCE
APPLICATION BOUNDARY.
HAUL ROAD, POSITION MAY VARY AS QUARRY IS RESTORED.
SITE OF IMPORTANCE OF NATURE CONSERVATION (SINC).
P2
AREA OF SINC ADDED
P1
HAUL ROAD POSITION AMENDED
CLIENT
JACK MOODY LIMITED
PROJECT
BERKSWELL COMPOSTING SITE
DRAWING TITLE
SITE CONTEXT
PRELIMINARY
DRG No
WM02691/03
SCALE
1:5,000
DATE
MARCH 2006
DRAWN BY
CHECKED BY
APPROVED BY
Wardell Armstrong
Engineering & Environmental Solutions
©Copyright Reserved
TARMAC SURFACE ACCESS ROAD
HORNIBROOK FARM
EXISTING WHEEL WASH
QUARRY OFFICES AND PLANT SITE
MARSH FARM
MERCOTE MILL FARM
EXISTING HAUL ROAD TO BE SURFACED WITH CONCRETE
EXISTING ACCESS POINT
KEEPERS COTTAGE
CORNETS END FARM
PARK FARM HOUSE
PARK FARM

Appendix C – Site Monitoring Plan

Infrastructure Monitoring Plan

BERKSWELL QUARRY INFRASTRUCTURE MONITORING PLAN		
Date		**Inspection by:**
Conditions of visit		
Reference	**Parameter**	**Comments**
1	Site roads	
2	Site buildings	
3	Site storage areas	
4	Site processing area	
5	Site drainage	
6	Pipes, gullies and ducts	
7	Surface water storage	
8	Control equipment	
9	Process equipment all functional	
10	Site security	