CONSULTING
EARTH
SCIENTISTS

ODOUR MANAGEMENT PLAN DURING THE EXCAVATION & RELOCATION OF MATERIAL FROM THE FILL MOUND

MANGROVE MOUNTAIN LANDFILL
HALLARDS ROAD, CENTRAL MANGROVE, NSW.
PREPARED FOR VERDE TERRA PTY LTD
CES DOCUMENT REFERENCED: CES110703-VDT-FF

Written by: J. Dobson
Reviewed by: D. Lowe

Authorised by: Duncan Lowe
Client: Verde Terra Pty Ltd
78 Hallards Road
Central Mangrove
NSW 2250
Date: 16 June 2016

Suite 3, Level 1 • 55-65 Grandview Street • Pymble, NSW 2073 • Australia
Telephone: 02 8569 2200 • Fax: 02 9983 0582

DOCUMENT CONTROL

ODOUR MANAGEMENT PLAN DURING THE EXCAVATION & RELOCATION OF MATERIAL FROM THE FILL MOUND

MANGROVE MOUNTAIN LANDFILL
HALLARDS ROAD, CENTRAL MANGROVE, NSW.
PREPARED FOR VERDE TERRA PTY LTD
CES DOCUMENT REFERENCED: CES110703-VDT-BQ-Rev B

Distribution Register

Hard Copy	Digital copy	Recipient	Location
	1	Mr. Damian Ryan	Verde Terra Pty Ltd

The Distribution Register identifies the recipients of issued copies of this report.

Revision Register

Revision Number	Revision Date	Description
1	21/07/15	Initial Issue to Client
BQ	19/08/2015	For Issue to EPA
BQ Rev B	26/08/2015	Following Hunt & Hunt Review
FF	16/06/2016	Updated document references

The revision register tracks changes to the document.

The latest revision of this document supersedes all previous revisions. It is the responsibility of the recipient to ensure that superseded revisions of this document are removed from circulation.

Documents are only valid if they are signed, original documents issued by CES. CES does not accept any liability for actions taken based upon incomplete photocopies of this document.

ODOUR MANAGEMENT PLAN DURING THE EXCAVATION & RELOCATION OF MATERIAL FROM THE FILL MOUND

CES DOCUMENT REFERENCED: CES110703-VDT-FF

CONTENTS

ODOUR MANAGEMENT PLAN DURING THE EXCAVATION & RELOCATION OF MATERIAL FROM THE FILL MOUND

CES DOCUMENT REFERENCE: CES110703-VDT-BQ-Rev B

1. INTRODUCTION AND PURPOSE

Verde Terra Pty Ltd (Verde Terra) operates a landfill on the northwest part of Lot 582 in Deposited Plan 1123656, Hallards Road, Central Mangrove, New South Wales, located in the City of Gosford local government area (Refer to Figure A of the Landfill Environmental Management Plan 2014 (LEMP 2014)). A plan showing the cadastre and lot boundary is presented in Figure B of LEMP 2014. The landfill is operated under Environmental Protection Licence (EPL) number 11395 issued by the NSW Environmental Protection Authority (EPA).

Verde Terra has engaged Consulting Earth Scientists Pty Ltd (CES) to prepare this Odour Management Plan (OMP) that details the associated management measures and procedures to be implemented during the exhumation of 6m in height of the landfill waste from the mound in Area B (Figure C of LEMP 2014) and subsequent relocation to Cell W (Figure D of LEMP 2014). This OMP is applicable to the exhumation and relocation works only and is not applicable prior to and to general landfilling activities following relocation of the fill mound.

For an operational facility the odour benchmark, as determined by *Odour Control (*NSW Office of Environment and Heritage) and *Technical framework for the Assessment and Management of Odour from Stationary Sources in NSW (DEC NSW, 2006),* is whether the emission of odour is "offensive" or is being prevented or minimised using the best management practices. Control measures are required to be imposed particularly if there is existing or potential conflict between neighbouring land uses. It is noted that 'no odour' is not a realistic objective.

In accordance with the above guidance, odour management can be implemented in six ways:

1. Undertake land-use planning to maximise the buffer (space) between the source and the receptor;
2. The appropriate selection of sites for potential malodours activities or site uses;
3. Management of the odour at the source, including:
    - Best practice management (relevant for diffuse sources); and
    - Best available control technology (relevant for discrete/point sources).

4. Management of the odour in the pathway;
5. Management of the odour at the receptor; and
6. Negotiated settlement between the operator of an existing facility and the affected individuals.

The first two management strategies are not considered relevant since it is an existing facility, the sources and receptors are already established.

The odour control measures identified in this report consider mitigation measures for controlling the source and pathways of the odours and are the initial changes required to be made to the current processes. After the changes are administered, if the malodours remain at an unacceptable level, then the more advanced odour control measures (treatment of the pathway) discussed in the secondary and tertiary management plan should be implemented.

2. OBJECTIVE

The objective of the OMP is to provide effective control measures for the malodorous gaseous emissions present during excavation and relocation of the fill material by reducing the mound in Area B by 6m. The malodorous gaseous emissions include but are not limited to Ammonia (NH_3), Hydrogen Sulphide (H_2S), Sulphur Dioxide (SO_2) and Methane (CH_4).

3. INITIAL MANAGEMENT PLAN

The following odour control measures are considered appropriate to manage malodours that may be generated during the waste exhumation and relocation works at the site. If, with the adoption of these measures, malodours are at an unacceptable level, then the more advanced odour control measures discussed in the secondary management plan should be implemented.

3.1. *DAILY COVER*

The amount of cover (compressed soil or earth) applied to exposed waste material per day in the areas of waste exhumation (Area B) and deposition at the tipping face in Cell W should be a minimum 150 millimetres (mm), this thickness should be increased as necessary to prevent odours emanating from the upper layers of the waste material.

Adequate application of daily cover will also reduce / minimise rainwater infiltration into the waste, which will in turn reduce leachate generation and the volume of leachate discharged to the leachate holding pond.

3.2. *LEACHATE AND LEACHATE CONTROL INFRASTRUCTURE*

Leachate in the waste cells should be emptied on a regular basis to prevent stagnation and putrefaction of leachate. The leachate head within landfill Cell W should be maintained at a level of no greater than 1000 mm in accordance with the Leachate Management Plan (2014) for the Site.

The leachate riser pipe covers should remain in place at all times, unless the riser pipes are being inspected or maintained, or used for landfill gas extraction purposes. Should malodours be detected emanating from the riser pipe / surrounding material interface, a clay bund collar should be placed around the riser pipe in close contact with and extending sufficient distance from the riser pipe to control the odour emission. Care should be taken during placement of the bund collar not to damage or block the leachate riser pipe. Low air permeability geosynthetic materials such as tarpaulin, HDPE, LDPE sheeting may also be placed around the collar of the riser pipes and weighted with adequate surcharge to reduce the potential for odours to be released from this potential source.

An aerator should be placed in the leachate pond and operated on a daily basis. This should provide sufficient mixing of the leachate water column and will enhance aerobic digestion, and prevent the leachate from becoming stagnant thereby reducing the risk of malodours being produced. Leachate sprays located at the leachate pond should also be used to re-circulate and aerate leachate in the holding pond. Leachate sprays should be used appropriately and not used when wind speeds are greater than 40 km/hour.

3.3. *ODOROUS MATERIAL*

Any waste material identified as extremely odorous during excavation and relocation of the material in the mound in Area B should be separated from the rest of the waste material during the active filling process. This can be achieved by filling the odorous material in an individual cell within the larger cell or in an individual pit. If possible the odorous material should also be covered at a faster rate and a greater thickness than normal.

3.4. *QUALITATIVE MONITORING*

Daily monitoring of the odours observed on and surrounding the site should be conducted in order to monitor the effectiveness of the initial management plans and identify any potential odour contributing sources or site activities. This can be done using a Daily Odour Diary whereby assigned personnel survey the site and record any malodours detected or complaints received by residents.

3.5. *TRAINING*

All personnel carrying out work at the site should be made aware of their personal environmental obligations. This should be regularly reinforced during inductions, toolbox talks and activity specific training.

All site personnel should undergo a general project induction prior to commencing work at the site. The induction should include education and training with regards to dust, odour and air quality control and management. The general induction should also detail relevant action to be taken when adverse weather conditions are monitored or forecast.

Site personnel should be frequently and regularly briefed to reinforce the importance of odour emissions and actions to be taken to protect the off-site sensitive receptors.

4. SECONDARY MANAGEMENT PLAN

The secondary management plan involves the application of professional odour controls and odour suppressant equipment. The following odour control measures are more intensive and as mentioned above, should be implemented if the initial management plan fails to adequately manage malodours generated during the waste exhumation and disposition works.

4.1. *ZEOLITE APPLICATION*

Zeolite is a non-toxic aluminosilicate mineral capable of absorbing odours. The Zeolite comes in granular or powder form and should be manually applied directly onto the odour source. By absorbing the underneath odour and excess moisture, the odours eliminated from the source are reduced and in some cases eliminated. It is important to note Zeolite application is not a practical solution in windy environments as it can be easily displaced.

4.2. *ODOUR NEUTRALISING FOAMS*

Odour neutralizing foams should be sprayed directly onto the odour source using a hand held foaming applicator gun or a trailer mounted unit (for larger areas). The foam blankets the surface, a deodoriser provides immediate odour relief and the micronutrient formulation promotes the growth of organic decomposition without producing odours. Frequency of application should depend on times and areas of high odour generation.

4.3. *PERIMETER SPRAYING*

A handheld pressure sprayer filled with a soluble odour control solution (deodoriser or an industrial formulation) should be used around the perimeter of the odour source to prevent the odour from escaping into the surrounding environment. These should be used manually around the site particularly when the odour generation is expected to be high.

4.4. *QUANTITATIVE MONITORING*

Quantitative monitoring should be conducted on site, in conjunction with or as a more specialised alternative to qualitative monitoring. Quantitative monitoring should be undertaken using a field Olfactometer, an Olfactometer is a portable odour measuring device that quantifies odour strength. It is used for determining odour concentration and source, monitoring operations and verifying the effectiveness of odour controls. Trained personnel are required to use the equipment and the frequency of the monitoring should be daily until significant malodours can no longer be smelled.

4.5. *SEMI-PERMANENT AUTOMATED SYSTEMS*

As a final solution to odour control, a semi-permanent automated system should be installed around the boundary of the identified odour source (e.g. face of the exhumation). Drum mounted fogger units are commonly used in landfills due to their variable application settings. The drum is filled with an odour-minimising solution and is applied as a fog onto or around the odour source. The units can be placed in permanent locations, repositioned when needed or used portably on the back of a vehicle. Frequency of fogging can be controlled using an automated timing system or alternatively can be used randomly when odour generation is predicted.

5. TERTIARY ODOUR MONITORING AND MANAGEMENT MEASURES

5.1. *QUANTITATIVE MONITORING*

Quantitative monitoring of odour using a field olfactometer. This is a portable odour measuring device that quantifies odour strength. It is used for determining odour concentration and source, monitoring daily operations, comparing operating practices and verifying the effectiveness of odour controls. Daily monitoring using an olfactometer will be recommended during periods when significant malodours are anticipated or detected to facilitate targeting odour mitigation treatment measures and provide a quantitative record of odour.

5.2. *IN-PLACE ACTIVE ODOUR MITIGATING SYSTEMS*

An in-place automated system should be considered, this would be installed around the boundary of the identified odour source. These systems typically involve the installation of drum mounted fogger units with the drum filled with an odour mitigating solution that is applied as a fog onto or around the odour source. The frequency of fogging would be controlled using an automated timing system or could be used randomly when odour generation is predicted.

6. CLOSURE

It is assessed that, subject to implementation of the odour management controls described in this OMP, the waste exhumation and relocation at the Mangrove Mountain site is unlikely to cause significant adverse impact on offensive odour release off-site. Implementation of this OMP will provide a pre-emptive, proactive and reactive mechanism to assess, monitor and manage odours emanating from the site to the most responsible best practice standards.