Zion Landfill
Odor Control and Monitoring Plan

TABLE OF CONTENTS

Attachments

1.0 INTRODUCTION

This odor control plan (Plan) was prepared to provide Zion Landfill (Site) personnel as a guide for addressing odors that may originate from the landfill facility. Odors originating from a landfill facility generally do not present a health risk, but objectionable odors can sometimes be considered a nuisance if exceeding an established threshold of measurable concentration for an extended duration. This plan will assist Zion Landfill personnel with:

- Monitoring the landfill and associated facility features for odors
- Identifying the source of objectionable odor(s)
- Responding to odor complaints
- Minimizing the potential for odor migration

2.0 POTENTIAL ODOR SOURCES

Potential sources at the Site that may generate odor include:

- Landfill gas (LFG) generated by decomposition of waste
- Daily waste handling and disposal, especially certain WWTP sludges
- Components of leachate and landfill gas collection systems (i.e., sumps, lift stations, tanks, vaults, forcemain air release valves, etc.)

Non-facility sources of odors in the vicinity of the Site may include:

- Surrounding agriculture and industrial land uses

3.0 ODOR MONITORING

3.1 General

Early detection of odors ensures that potential odor sources can be reviewed and appropriate actions to address odors are taken as quickly as possible. Site personnel will regularly monitor the perimeter of the landfill for the presence of odors utilizing olfactory senses and other methods outlined in this Plan. Monitoring will also take place as soon as practical after receipt of an odor complaint. Odor monitoring will primarily be the responsibility of the general manager and the operations manager, because of their overall knowledge of Site operations. Additional measures such as surface emission monitoring (SEM), as discussed in this Plan, will also be utilized to proactively identify areas of the landfill with insufficient gas collection.

3.2 Odor Monitoring Techniques and Equipment

The following odor monitoring techniques/equipment will be utilized as part of the odor monitoring program:

- Olfactory senses will be utilized to characterize the odor level and source (i.e., garbage, leachate, landfill gas (LFG), other).

- A handheld or portable field meter (Scentometer) will be used to measure the odor concentration based on the dilution to threshold (D/T) ratio as defined by equation No. (1). Readings will be taken per manufacturer recommendations and industry protocols.

$$I = \frac{\qquad\qquad\qquad\qquad\qquad\qquad}{} \quad (1)$$

- A handheld or portable field meter (Jerome Series 600 Model or equivalent) will be used to monitor for Hydrogen Sulfide (H_2S) at levels as low as 5 parts per billion by volume (ppbv).

- A full meteorological station will be installed on the roof of the landfill office or equivalent location within the facility boundary. This station will measure wind speed and direction, temperature, humidity, and precipitation. A data logger will record and transmit these measurements to a centralized location.

- Permanent H_2S meters may be installed around the perimeter of the Site and will be designed for continuous monitoring and recording of low-level hydrogen sulfide concentrations (<5 ppbv). The monitors will be housed inside weatherproof enclosures and will provide continuous real time data. Please refer to **Section 3.5** for the landfill gas quality criteria for installation of the permanent H_2S meters.

3.3 On-Site Odor Monitoring

On-site odor monitoring using olfactory senses will occur once daily whenever the landfill is open and will be performed by site personnel. Any odors detected at the perimeter of the landfill will be characterized and documented in the facility's operating record along with any incorporated corrective actions.

At least once weekly, the landfill site personnel will perform on-site odor monitoring at locations shown on **Attachment A**. If an odor is detected at a sample location using olfactory senses, then field scentometer (D/T) and H_2S readings (if weather conditions are within manufacturer's recommended operational range) will be measured and recorded. Additional data as described in **Section 3.9** "Recordkeeping" will be collected and recorded. At least once per month, a third-party contractor will perform the weekly on-site odor monitoring.

3.4 Off-Site Odor Monitoring

At least once weekly, the landfill site personnel will perform off-site odor monitoring at locations shown on **Attachment A**. At each sample location, field scentometer (D/T), and H_2S concentrations (if weather conditions are within manufacturer's recommended operating range) will be measured and recorded. Additional data as described in **Section 3.9** "Recordkeeping" will be collected and recorded. At least once per month, a third-party contractor will perform the weekly off-site odor monitoring.

3.5 Continuous Perimeter H_2S Sampling

One of the primary sources of odors at landfill is H_2S in the landfill. As the H_2S concentration in landfill gas increase the potential for off-site odors increases. The concentration of H_2S is controlled by several factors including the types of waste the landfill accepts.

If the landfill gas H_2S concentration, measured at the flare inlet, is greater than 2,000 ppm for more than three consecutive months, the Site will submit to the City of Zion and Lake County a plan for permanent perimeter H_2S monitoring. This plan will be submitted within 20 business days

of receipt of the third monthly H_2S laboratory data. The instrumentation will be installed within 60 business days of approval by the City of Zion and Lake County.

The monitoring of H_2S at the centralized flare station or permitted centralized destruction unit shall be performed at the following frequency:

- Annual H_2S monitoring when H_2S concentrations are less than 1,000 ppm;
- Semi-annual monitoring when H_2S concentrations are between 1,001 ppm and 1,500 ppm;
- Quarterly monitoring when H_2S concentrations are between 1,501 ppm and 1,750 ppm; and
- Monthly monitoring when H_2S concentrations are greater than 1,750 ppm and the Site is not performing continuous perimeter H_2S Sampling.

3.6 Event Driven Monitoring

If the Site, City of Zion, Lake County, SWALCO or the IEPA receives an odor complaint believed to be caused by the Site, and the Site is timely notified of the complaint and location of complaint, landfill personnel and/or contractors will perform odor monitoring at the location of the odor complaint. Odor monitoring will include the elements required under **Section 3.4** "Off-Site Odor Monitoring". During landfill operating hours, event driven monitoring will be performed within 2 hours of receipt of an odor complaint in which a location was provided. If an odor complaint is received during non-operating landfill hours, the event driven monitoring will be performed at the reported location of the complaint during the next operating day. If multiple complaints are received from the same general area, odor monitoring within that general area will be performed rather than from each individual location.

3.7 Odor Monitoring Schedule

A summary of the different odor monitoring that will be performed at the facility is summarized in **Table 1**.

Table 1
Odor Monitoring Schedule

	Olfactory	Scentometer (D/T)	H_2S Meter
On-site Monitoring - Daily	X		
On-site Monitoring Locations - Weekly (except during week 3rd party conducts monthly monitoring)	X	X	X
Off-site Monitoring Locations - Weekly (except during week 3rd party conducts monthly monitoring)	X	X	X
Third Party On-Site and Off-Site Locations - Monthly	X	X	X
Permanent Perimeter Locations (see **Section 3.5**)			X
Note: If H_2S monitoring cannot be completed due to weather conditions outside manufacturer's recommended operating range, documentation of those conditions will be recorded on an "Odor Monitoring Form" (see **Attachment B**).			

3.8 Confirmation Sampling Procedures

In the event of a field scentometer D/T reading of 4 or greater (a D/T level of 4, 5 or 6 is designated on the scentometer as a reading of <7), or an instantaneous or continuous H_2S reading of 15 ppb above background readings, the landfill will perform confirmation sampling procedures as outlined below:

- Review odor descriptor to typical odor descriptors related to landfills (i.e., rotten egg, leachate, fresh trash, etc.).
- Location of odor reading in relationship to landfill (i.e., upwind or downwind); and
- Confirmation sample taken between 30 and 60 minutes after the initial reading for both field scentometer and H_2S sampling.

If the odor is confirmed based on the procedures listed above (i.e., the follow-up D/T reading remains at 4 or greater, or H_2S reading remains greater than 15 ppb above background), the corrective actions to address the odor will be implemented as discussed in **Section 4.0**. All confirmed odors will be reported to the City of Zion and Lake County Health Department, Environmental Health within 24 hours.

3.9 Recordkeeping

During weekly monitoring, the location of all odor measurements, associated values and description of any detected odor will be recorded. The date, time, temperature, precipitation, humidity, barometric pressure, and wind speed and direction at the time of odor monitoring will also be recorded. Additional comments regarding odor description and characteristics and possible source of the detected odor may also be recorded. This information will be recorded on an "Odor Monitoring Form" (example in **Attachment B**). Similar information will be recorded for responses to odor complaints (i.e., event driven monitoring).

Access to review the continuous H_2S raw data will be transmitted to a central computer system and will be available to City of Zion or Lake County representatives during normal business hours. All odor monitoring data will be maintained in the Site's operating record and made available for review to the City of Zion or Lake County representatives with prior notice.

4.0 CONFIRMED ODOR CORRECTIVE ACTION RESPONSE

4.1 Short-term Corrective Actions

If site personnel confirm the Site is the source of an odor using the procedures set forth in **Section 3.8**, the Site will implement appropriate and necessary corrective actions. Corrective actions implemented and timing of the actions to address the odor will depend on the source of the odor and the time of day. Short-term corrective actions will be initiated within 24 hours of a confirmed odor event as defined by **Section 3.8**. Appropriate short-term odor control actions may include but are not limited to:

- Placement of additional cover materials
- Adjustments to the Site's gas system
- Evaluate and make repairs to cover penetrations (i.e., boots)
- Evaluate LFG pump repair or replacement
- Use of odor neutralizers

Additional descriptions of these corrective actions are presented in **Section 5.0**.

4.2 Long-term Corrective Actions

If the Site determines, using the confirmation sampling procedures set forth in **Section 3.8**, that the short-term corrective actions implemented under **Section 4.1**, did not remedy the confirmed odor event attributed to the landfill facility within 3 business days, the Site will initiate development of a long-term corrective action plan to address the confirmed odors by a combination of field investigation and review of gas monitoring data. Potential long-term corrective actions may include but are not limited to:

- Enhanced daily cover, intermediate cover, or the use of temporary geomembrane cover
- Additional temporary or permanent landfill gas collectors (vertical, horizontal, etc.)
- Upsizing, replacing, or regrading of landfill vacuum piping
- Upsizing, replacing, or installation of additional landfill gas blowers
- Installation, repair or replacement of pumps to dewater landfill gas collectors
- Revised waste acceptance and/or waste handling practices

Notification that the Site will be implementing long-term corrective actions will be submitted to the City of Zion and Lake County Health Department within 5 business days of the initial confirmed odor monitoring event as defined by **Section 3.8**. A conceptual long-term corrective action plan will be submitted to the City of Zion and Lake County Health Department within 15 business days of the initial confirmed odor event.

4.3 Corrective Action Recordkeeping

The Landfill will log corrective actions that were taken to address odors attributed to the Site that were confirmed per **Section 3.8**. The log will discuss what corrective actions were implemented, when they were implemented, the effectiveness of the corrective actions and if additional corrective actions are necessary. The corrective action log will be submitted to City of Zion and the Lake County Health Department on a monthly basis.

5.0 ODOR PREVENTION

Odor minimization and control is a priority at the Site. The following is a discussion of the efforts that will be made to prevent or minimize the occurrence of off-site odors which could result in odor detections equal to or greater than a D/T value of 4 on the scentometer scale and/or H_2S concentrations above 15 ppb of background levels as discussed in **Section 3.8**.

5.1 Covering of Waste

5.1.1 Daily Cover

Odors will be minimized by keeping the working face as small as practical and placing daily cover at the end of each working day. Site personnel will cover the working face with a minimum of 6 inches of daily cover soil or approved alternate daily cover materials at the end of each operating day. The Facility's Operating Plan will discuss how alternate daily cover materials that have the potential to generate odors (i.e. landscape waste, C&D materials, petroleum contaminated soils) will be managed to minimize odor generation.

Certain types of waste may have stronger odors than other waste. Acceptance of wastes known to have stronger odors will generally be limited to before 1:00 p.m. These wastes will be placed in the working face and immediately covered with other waste, daily cover soil, or alternate daily cover materials.

5.1.2 Intermediate Cover

Placement of intermediate cover and construction of the final cover system helps minimize landfill odors. Areas of the landfill not covered within 60 days of placement with additional waste or final cover shall have an intermediate cover of compacted clean soil with a minimum thickness of one foot applied to it. The intermediate cover shall be monitored and maintained until the area is filled over with additional waste, or final cover is applied. All cracks, rills, gullies and depressions shall be repaired to minimize infiltration, prevent standing water and reduce landfill gas seepage through the soil cover. To the extent possible, intermediate cover will be removed prior to placing additional waste to minimize leachate ponding in the waste mass.

5.1.3 Final Cover

The final cover consists of two feet of clay covered by a geomembrane with three feet of protective cover above the geomembrane. Final cover will be constructed during the construction season that follows a large contiguous area (5 acres or greater) receiving the final lift of waste, including sides slopes.

5.1.4 Supplemental Cover

Supplemental soil cover may be applied to areas with daily or intermediate cover determined to be sources of off-site odor. The use of temporary geomembrane cover over areas with intermediate cover may be utilized to address problem areas if supplemental soil cover is not effective as discussed in **Section 4.2** "Long-Term Corrective Actions".

The landfill expansion siting and IEPA permit applications shall include design and operating plans for addressing surface emissions and "fresh waste" odors from the proposed eastern waste slope adjacent to N. Kenosha Road.

5.2 Landfill Gas Management

5.2.1 Landfill Gas Extraction

The landfill gas collection and control system (GCCS) is an important tool necessary to reduce landfill gas odors and greenhouse gas emissions. The Site's gas collection system consists of horizontal and/or vertical gas wells installed as areas are filled. Landfill gas may also be extracted from leachate collection and cleanout pipes. Expansion of the system will occur as needed. The landfill's GCCS will be designed, operated, and maintained in accordance with the Site's GCCS Design Plan and applicable municipal solid waste landfill New Source Performance Standards (NSPS), Emission Guidelines (EG) and National Emission Standards for Hazardous Air Pollutants (NESHAP) regulatory requirements.

The Site will continue taking a proactive approach to gas collection by installing gas system infrastructure in new cells as the cell is being filled vs. waiting until final grades are reached. Additional horizontal or vertical gas wells will be installed if surface emissions monitoring (SEM), or odor monitoring, indicate the improvements are warranted.

5.2.2 Landfill Gas Extraction and Conveyance System Monitoring and Repair

Odor prevention is further enhanced by regular monitoring of the gas extraction system. The landfill gas extraction system is monitored monthly for vacuum (wellhead and system), and gas quality. Gas quality readings include percent methane, percent oxygen, percent carbon dioxide, balance gas, and temperature. The physical condition of the individual gas wellhead is also reviewed monthly.

Water levels within vertical landfill gas wells will be performed on an annual basis while the landfill is operational. Gas wells outside of final cover areas exhibiting less than 50% open screening available due to the accumulation of liquids will be monitored quarterly until 2 consecutive readings indicate greater than 50% open screening is available.

Site personnel will review wellfield monitoring data and, if excessive pressure drops impacting gas collection are noted, investigate potential causes and implement necessary and appropriate corrective actions.

In the event that repair or construction of the system is necessary, Site personnel will use isolation valves within the system to isolate the area where work is being conducted. This practice allows those areas of the landfill gas collection system where construction is not being performed to continue extracting landfill gas.

5.2.3. Landfill Gas Flares

The flare temperature is monitored with one or more thermocouples to confirm the presence of a flame whenever landfill gas is routed to the flare. In the event the flame goes out, or thermocouple temperature drops below programmed set points, the blowers shut down and the automated fail-safe valve closes to prevent free venting of landfill gas. The flare control system is also connected to an automatic dialer that notifies appropriate landfill personnel via phone and e-mail of any alarm issues. These notifications allow for staff to provide a prompt response to conditions in order to minimize the amount of time the flare is not running. The Site will maintain destruction capacity for 100% of the collected landfill gas flows.

5.2.4 Gas System Preventive Maintenance

Preventive maintenance of the gas system helps ensure that the gas system is always working properly. The main mechanical components of the landfill gas extraction system are the blowers, flares and 3rd party Landfill Gas to Energy (LFGTE) facility. Scheduled preventive maintenance is performed on the landfill owned components dedicated to the proper operation of the gas collection system. Major repairs or scheduled rebuilds are normally performed by an outside contractor. The landfill is not dependent on the operation of the LFGTE plant, as the capacity of the existing landfill blowers/flares exceeds the projected gas generation flows for the landfill.

The Site has backup blowers for both the open and enclosed flares. These have been purchased to avoid significant down time in the event of unexpected total failure of one of the blowers. Maintenance and repairs of the GCCS should be scheduled to ensure continuous operation of at least one flare to reduce back-up of landfill gas in the waste mass to reduce the potential gas malodors.

5.3 Odor Neutralizers or Masking Agents

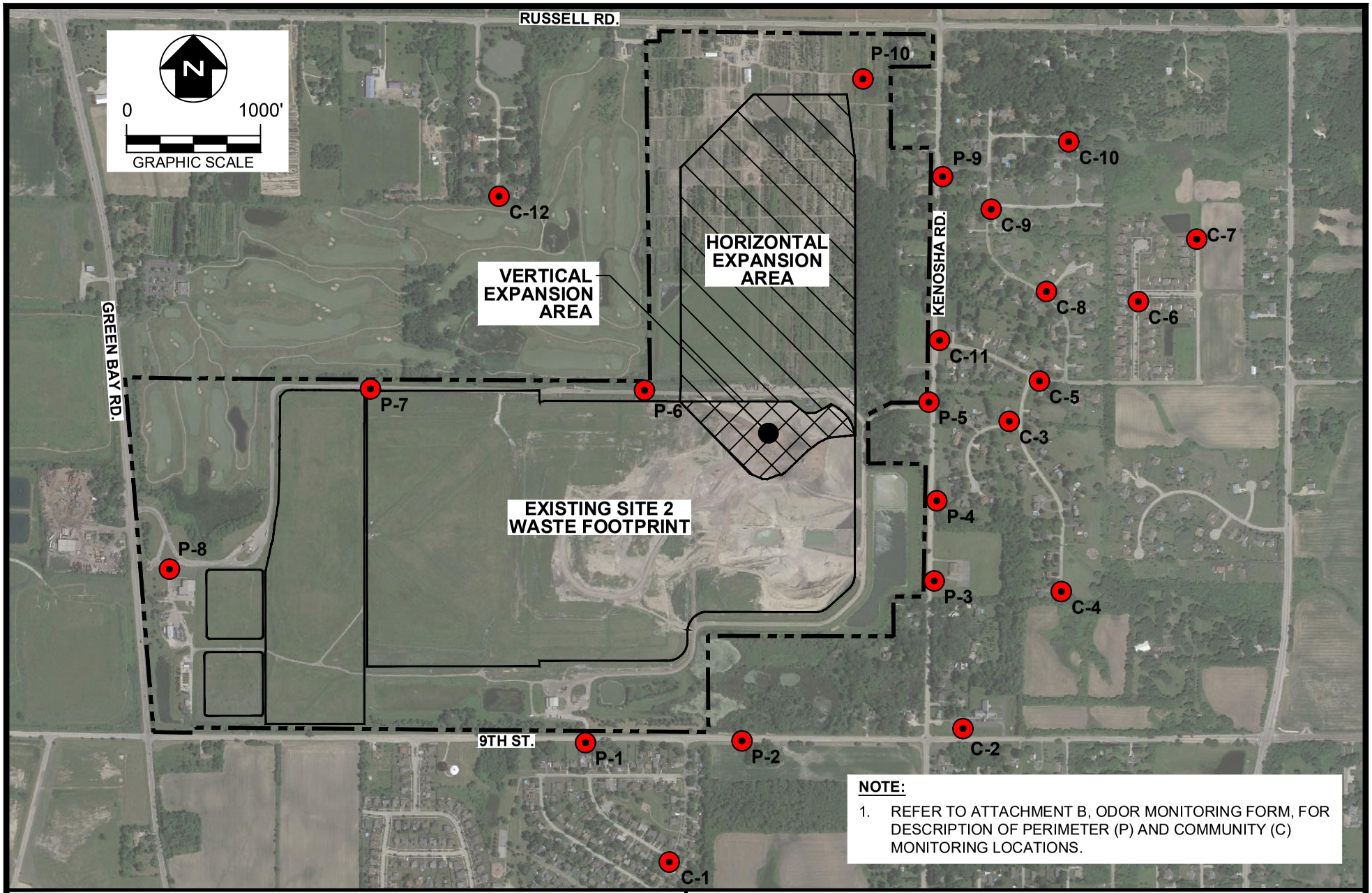
Odor neutralizers or masking agents may be used to enhance odor control. Prior to the use of masking agents, approval will be obtained from the IEPA, if needed.

5.4 Surface Emission Monitoring (SEM)

A scan of the landfill surface will be performed in accordance with the Site's Illinois EPA CAAPP Permit and applicable NSPS, EG and NESHAP requirements to identify areas where landfill gas may be escaping through the surface. In the event that methane is detected above 500 ppmv (parts per million volume), prompt action (i.e., short-term corrective actions) will be taken in accordance with the Site's Illinois EPA CAAPP Permit and applicable NSPS, EG and NESHAP regulations to reduce the emissions below 500 ppmv. All safely traversable perimeter slopes will be included in the monitoring.

6.0 PROVISIONS FOR PLAN AMENDMENT

This odor control plan has been developed as a guide to identify, prevent and address potential odor issues at the Site. This plan will be amended as needed.



ZION LANDFILL - SITE 2 NORTH EXPANSION
CITY OF ZION, ILLINOIS

ATTACHMENT A
ODOR MONITORING LOCATIONS

Attachment B - Odor Monitoring Form

Date: _____ **Inspector Name:** _____ **Temperature:** _____

Precipitation: _____ **Humidity:** _____ **Barometric Pressure:** _____ **Wind Speed & Direction:** _____

Location		Reading 1			Reading 2 (if applicable per Section 3.8, Confirmation Sampling Procedures)			Notes / Comments
		D/T Ratio	H_2S	Time	D/T Ratio	H_2S	Time	
P-1	South LF Entrance							
P-2	9th St & Lorelei Dr							
P-3	N Kenosha Rd at Church Parking							
P-4	East LF Area							
P-5	N. Kenosha Rd & Forman Rd							
P-6	SE Corner of Golf Course							
P-7	NW Road Curve							
P-8	Office Parking Lot							
P-9	N. Kenosha Rd & Block Ln							
P-10	NE Corner of LF							
C-1	Lorelei Dr & Timothy St							
C-2	9th St at Church Parking Lot							
C-3	Meadow Ct & Meadow Ln							
C-4	End of Meadow Ln							
C-5	5th St & Meadow Ln							
C-6	Prairie Ridge Dr & 4th St							
C-7	End of N Fossland Ave							
C-8	N Prairie Ave & Clearview Ct							
C-9	N Prairie Ave & 3rd St							
C-10	W Oak Ln (NE Curve)							
C-11	N Kenosha Rd & 5th St							
C-12	End of Oakcrest Ln							

(Continued on Next Page)

Attachment B - Odor Monitoring Form (cont'd.)

Date: _____ **Inspector Name:** _____

Corrective action* taken:

_____

_____

_____

_____

*Corrective action to be taken if 2 Scentometer readings in one location within 1 hour result in a D/T ratio > 4 or 2 H_2S readings in one location within 1 hour result in sustained concentrations > 15 ppb above background.

Attachment C - Odor Complaint Response Form

Log #:	
Complainant Information	
Name:	
Phone Number:	
Address:	
Complaint Details	
Date Complaint Received:	
Time Complaint Received:	
Date of Incident (if different):	
Time of Incident (if different):	
How Reported:	
Location:	
Level of Odor, Scale (1 to 4):	
Type of Odor (Gas / Garbage / Other):	
Temperature:	
Wind Speed & Direction:	
Precipitation:	
Skies:	
Barometric Pressure:	
Response:	