PART III, ATTACHMENT 6

LANDFILL GAS MANAGEMENT PLAN

Temple Recycling & Disposal Facility

Temple, Bell County, Texas

TCEQ Permit MSW-692B

Owner/Site Operator/Permittee:

City of Temple
201 N. Main
Temple, Texas 76501

GOLDER ASSOCIATES INC.
Professional Engineering Firm
Registration Number F-2578

INTENDED FOR PERMITTING PURPOSES ONLY

Operator:

WASTE MANAGEMENT

Waste Management of Texas
9708 Giles Lane
Austin, Texas 78781

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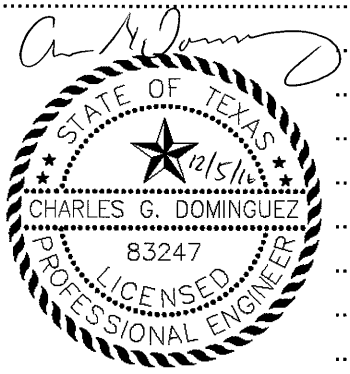

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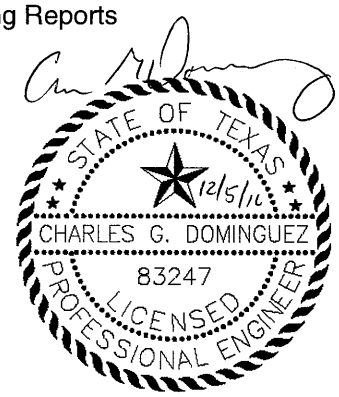

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1.0 INTRODUCTION

This landfill gas management plan (LFGMP) has been developed for the Temple Recycling and Disposal Facility. The purpose of this LFGMP is to provide a site-specific approach for managing landfill gas (LFG) at the Temple Recycling and Disposal Facility. This plan implements a routine Methane Monitoring Program in accordance with the requirements of Title 30 to the Texas Administrative Code (TAC) §330.371(b). This regulation requires monitoring on a quarterly basis, at a minimum, unless otherwise directed by the Texas Commission on Environmental Quality (TCEQ). The purpose of the program is to ensure that the site remains within applicable regulatory and safety guidelines regarding the control of LFG generated by the facility.

The Temple Recycling and Disposal Facility is located at 706 Landfill Road, approximately 0.25 miles east of the intersection of Loop 363 and Little Flock Road in Bell County, Texas. The facility is bounded by Little Flock Road on the north; Bob White Road to the east; an unnamed tributary of Little Elm Creek to the south; and City of Temple facilities to the west. Figure III-6-1 provides the site location.

The Temple Recycling and Disposal Facility is an existing 269-acre Type I municipal solid waste (MSW) facility owned by the City of Temple, Texas under Permit No. MSW-692A. The Temple Recycling and Disposal Facility is used for the disposal of authorized wastes in accordance with the TCEQ requirements.

This Permit Amendment Application (PAA) is for a lateral expansion to the east, and a vertical expansion within the permitted landfill footprint. The proposed lateral expansion area is immediately adjacent to the existing MSW-692A permit boundary. The proposed expansion will increase the permit boundary to 443 acres.

The Temple Recycling and Disposal Facility accepts MSW, as defined by 30 TAC §330.3(88) to include "solid waste resulting from or incidental to municipal, community, commercial, institutional, and recreational activities, including garbage, rubbish, ashes, street cleanings, dead animals, abandoned automobiles, and all other solid waste other than industrial solid waste." The facility also accepts industrial solid waste, defined as by 30 TAC §330.3(66) to include "solid waste resulting from or incidental to any process of industry or manufacturing, or mining or agricultural operation." Special wastes, as defined in 30 TAC §330.3(148), may be accepted in accordance with 30 TAC §330.15, §330.171 and §330.173. Hazardous and radioactive wastes are not accepted except for hazardous wastes from conditionally exempt small quantity generators.

The principal source of waste is expected to be primarily daily residential and commercial/industrial waste collection. The current disposal rate for the Temple Recycling and Disposal Facility is approximately 1,550 tons/day. As of 2015, approximately 7.76 million cubic yards (CY) of capacity

remained in the facility. The expansion proposed in this application will add to the capacity of the site. Using the current disposal rate and taking into account the annual growth rate, the site life is estimated to be 58 years for the facility. A complete set of site life calculations is included in Part III, Attachment 3, Appendix III-3A.

2.0 SITE CONDITIONS

2.1 Surrounding Land Use, Structures and Habitable Buildings

The majority of land within 1-mile of the site is agricultural or undeveloped. The eastern edge of urban development within Temple coincides with the western edge of the 1-mile radius. There are 291 single family residences (288 occupied homes plus 3 additional homes presently under construction) within 1-mile of the permit boundary: 126 on individual lots and 165 within four subdivisions. A detailed Land Use Analysis is included in Part II, Appendix IIB. A Structures Location Map is shown on Figure II-11 in Part II. The landowners' map is included in Part I, Appendix IB.

Seven industrial uses comprise 2.2 percent of the area within the 1-mile radius. The largest use is the Panda Temple Power Plant on a 250-acre tract to the south at the 1-mile radius.

An electrical substation is located adjacent to the northwest corner of the site. Multiple high voltage electric lines radiate outward from the substation across the 1-mile radius area.

3.0 SUBSURFACE CONDITIONS

3.1 Geology

The regional and local geologic settings, fault areas, seismic impact zones, unstable areas, and erosion potential present at the Temple Recycling and Disposal Facility are discussed in Part III, Attachment 4, Geology Report. The report describes a generalized regional stratigraphic column of the area. The stratigraphy, including geologic age, lithology, and variations in lithology, thickness, depth, geometry, hydraulic conductivity, and depositional history (as available through current geologic information) are included in the Geology Report; Table III-4-1, Regional Geologic Units and Their Water Bearing Properties, includes the system, series, group, stratospheric unit, hydrologic unit, approximate maximum thickness in feet, character of rocks, and water bearing properties.

The results of the subsurface investigations show that the site is underlain by three distinct strata, namely (in order from ground surface down):

- Stratum I: Stiff to hard, dark brown to tan, low plasticity clay, with high plasticity clay with organic content comprising the top of the stratum in some areas.
- Stratum II: Weathered, extremely weak to weak, tan and light gray, with orange mottling, claystone.
- Stratum III: Slightly weathered to fresh (unweathered), massive, weak to strong, light gray claystone.

3.2 Hydrogeologic Conditions

The regional hydrogeology surrounding the Temple Recycling and Disposal Facility and the site-specific hydrogeology are discussed in detail in Part III, Attachment 4, Geology Report. The report examines the most significant regional aquifers in the vicinity of the site. These are, in the order of their importance, the Cretaceous Edwards Limestone, the Cretaceous Trinity Group, and Quaternary alluvial deposits. The stratigraphy of the Temple area and water-bearing characteristics are summarized on Table III-4-1 of the Geology Report. Chemical characteristics of the aquifer units are also summarized on Table III-4-2 in the Geology Report.

3.3 Hydraulic Conditions

Hydraulic conditions at the Temple Recycling and Disposal Facility are discussed in Part III, Attachment 2, Surface Water Drainage Report. This report provides a detailed description of the hydrologic and hydraulic analyses performed for the Temple Recycling and Disposal Facility PAA.

4.0 LANDFILL DESIGN FEATURES

Forrest-Cotton, Inc. developed the original landfill design for Tracts 1, 2, and 3 in 1979. The design consisted of a below-grade progressive trench fill and an above-grade areal fill operation. Trenches were generally unlined, 100 feet wide, and 20 feet deep with vertical sideslopes. The trenches were generally covered with several feet of soil prior to constructing the above-grade areal fill, which was extended to approximately 8 feet above original ground surface elevations. The aerial fill was reportedly capped with 2 feet of soil cover. This design was used for areas of Tract 1 filled by the City. In 1987, Jones and Neuse, Inc. modified the design for the City to include filling below-grade within power line easements.

The currently permitted design (MSW-692A) consisted of a continuous excavation and areal fill, which is non-contiguous to previously filled areas in Tract 1 (Tract 1A and 1B closed in 1994). The initial cell, developed in the southeast corner of Tract 3, has a 3-foot thick recompacted clay liner. There is no leachate collection system in this portion of the landfill or in areas of Tract 1A and 1B, although Soil Liner Evaluation Reports dating back to the1980s are on file.

The first Subtitle D cell was constructed at the site during the fall and winter of 1993/1994. Filling in this area was initiated on April 1, 1994.

Lining systems used at the site consist of compacted clay liners in those areas constructed prior to Subtitle D (October 9, 1993). Compacted clay/geomembrane composite liners have been used since that time and are proposed for use in future cells.

This PAA proposes to amend the existing Permit No. MSW-692A by increasing the permitted acreage from 269 to approximately 443 acres, and increasing the maximum fill elevation from 759 to approximately 835 feet above mean sea level (ft-msl).

5.0 LANDFILL GAS CONTROL PLAN

In accordance with 30 TAC §330.63(g) and 30 TAC §330, Subchapter I, a LFGMP has been developed for the facility to provide a site-specific approach for implementing LFG monitoring and control. This plan includes the requirements and procedures for: LFG monitoring using perimeter probes; combustible gas monitors in site structures; control of LFG using gas wells installed in the waste mass that convey LFG through a piping system to a LFG flare; recordkeeping and reporting; and a contingency plan to be implemented in the event that concentrations of methane in excess of the regulatory limits are measured at the site permit boundary or in on-site structures.

Figure III-6-3 depicts the existing active LFG system at the Temple Recycling and Disposal Facility. The Temple Recycling and Disposal Facility will expand the existing LFG system as the remaining waste disposal areas are developed and filled. Figure III-6-5 shows the most current gas collection system operational phase (year 2015). This figure will be updated as the LFG system expands. The timing for installation of the active LFG control system will depend on fill patterns. The future LFG system will be expanded at final closure and will be similar to the layout shown on Figure III-6-6.

5.1 New Source Performance Standards Compliance

The landfill is currently subject to 40 CFR Part 60, Subpart WWW, which requires landfills modified after May 30, 1991, to determine and submit an Initial Design Capacity Report. Those landfills with 2.5 million megagrams (3,674,333 CY) or more of waste must calculate non-methane organic compound (NMOC) emission rates on an annual basis. Upon approval of this permit amendment application, the site will be subject to 40 CFR Part 60, Subpart XXX.

Tier 2 testing was performed at the site in 2016 and the emission rate is greater than 50 megagrams per year of NMOC (See Appendix III-6C).

A Gas Collection and Control System (GCCS) Plan will be submitted to the TCEQ for the existing permitted site within 1 year of the Tier 2 testing. While the site has a LFG system for odor control and to prevent methane migration, a LFG collection system designed for compliance with 40 CFR Part 60, Subpart WWW will be installed within 30 months after the first annual report in which the emission rate exceeds or equals 50 megagrams per year. The GCCS may be installed and expanded prior to the regulatory timeframe to control odors or potential methane migration. The components of the GCCS include:

- LFG wells extending into the waste
- LFG collection system
- LFG flare station

A Permit Modification (PM) Request will be submitted in accordance with TCEQ requirements documenting the as-constructed phased installation of the GCCS. An as-constructed record drawing will be prepared documenting the GCCS installation (LFG well locations, header piping locations, lateral piping locations, etc.) and will be maintained as part of the SOR.

In accordance 30 TAC §330.371(f), gas control system will be revised and maintained as needed.

5.2 Gas Collection and Control System Design

The GCCS consists of vertical and horizontal gas extraction wells installed over disposal areas that have been constructed to final grade and closed with final cover. Each gas well is connected to laterals that convey flow to headers around the perimeter of the landfill. A vacuum is induced on the header by a blower located at the flare station on the northwest side of the site. The applied vacuum pulls the gas from the extraction wells into the header, which conveys the gas to the flare for combustion. As additional waste is placed, the existing LFG extraction wells will either be extended and/or redrilled. Details of the gas extraction wells are included in Figures III-6-4.1 and III-6-4.2.

As the site develops, additional extraction wells will be installed over the active waste disposal area as needed to enhance gas recovery as waste in place increases and to meet New Source Performance Standards (NSPS) requirements. Vertical and horizontal gas wells will be constructed through the final cover components or intermediate cover soils and into the underlying waste. The vertical gas wells will consist of a high-density polyethylene (HDPE) or polyvinyl chloride (PVC) pipe. The lower portion of the pipe will be perforated or slotted HDPE or PVC pipe. The perforated or slotted pipe will be embedded in aggregate backfill.

Horizontal LFG wells may be installed within the waste. The horizontal gas wells will consist of HDPE or PVC pipe. The initial 20 feet (minimum) of the well will consist of non-perforated HDPE or PVC pipe. The remaining pipe will be perforated or slotted HDPE or PVC and will be embedded in aggregate backfill.

A wellhead will be attached to the top of each gas well to monitor and control the rate of LFG extraction from the well. The wellhead will include a valve for LFG flow control, access, and sample ports for measuring pressure, vacuum, flow, and gas composition and for collecting LFG samples.

HDPE piping will be installed below the surface of the final cover system to convey LFG to the LFG flare station. Installation of the LFG collection piping below the landfill surface will avoid damage to the LFG collection system by site maintenance activities. Condensate knockouts and condensate sumps will be provided to remove condensate accumulations in the LFG collection piping. Liquids collected from the condensate knockouts and condensate sumps will be transferred to the leachate storage

system or to a separate condensate tank. Liquids from the LFG system may be recirculated in the landfill.

The gas control system will be installed in a manner that protects the integrity of the liner, leachate collection, and final cover systems. Gas wells will be drilled such that they terminate at least 15 feet above bottom of waste. Penetrations in the final cover system will be sealed appropriately to minimize the intrusion of water and air into the waste.

Operational activities for the GCCS typically include periodic maintenance activities and system balancing. Wellfield technicians visually check the active gas extraction wells for excessive settlement, well head integrity, and to verify the condition of seals, monitoring ports, and connections. All monitoring and inspection reports will be maintained in the SOR. As needed, wells will be adjusted so that flow volumes will minimize potential air intrusion into the waste.

The LFGMP covers the evaluation of LFG migration at the points of compliance (permit boundary) and in structures on the permitted site. Compliance with the above standards will be verified by monitoring LFG concentration at or within the facility permit boundary and within on-site buildings. This gas monitoring system will be modified as needed to reflect changing on-site and adjacent land uses.

5.3 Landfill Gas Blower-Flare Station

A LFG blower-flare station with a candlestick flare will be used for combustion of the LFG. The LFG blower-flare station will include the following components:

- An inlet knockout vessel to remove suspended particles and entrained liquid from the LFG
- A flow meter to record the LFG flow
- Blower/compressor equipment to create vacuum and withdraw the LFG from the landfill
- Automatic valves to prevent backflow of air into the LFG collection system
- A flame arrestor to prevent the flame from entering the LFG collection system piping
- Miscellaneous electrical controls and monitoring equipment

5.4 Repairs and Replacement / Backup Plan

In the event that a unit or piece of equipment (part) for the main gas monitoring and extraction/control systems malfunctions or is no longer effective, the applicable part will be taken offline and repaired or replaced. A rental or spare part will be used to replace the affected part until a new part or the repaired part is ready for service.

If due to equipment breakdown or overload, backup equipment is required, the equipment will be obtained from LFG specialty firms. Backup equipment may include a rental flare, blower skid, flowmeters, or other equipment required for operation of the LFG system. All replacement or new parts

will be of a similar design and capabilities as the original part, so as to meet the requirements of its service.

6.0 PERMANENT METHANE MONITORING SYSTEM

6.1 General

The Temple Recycling and Disposal Facility has been designed to inhibit lateral methane migration from the site. A permanent methane monitoring system has been previously installed at the site for the existing waste placement area. This system will be expanded in phases to include the expansion area. Methane probes currently located in the expansion area will be abandoned as required. The existing and proposed methane probes installed around the perimeter of the site are shown on Figure III-6-2, and will be used to detect the subsurface migration of methane.

In accordance 30 TAC §330.371(f), the methane monitoring system will be revised and maintained as needed. Post-closure care shall not interfere with the gas monitoring system and all utility trenches crossing the facility shall be vented and monitored.

6.2 Monitoring Probe Placement

A network of permanent gas monitoring probes will be in place at key locations around the permit boundary to provide data on the presence of methane in the unsaturated subsurface zone. Probe locations and spacing are a function of site geology/hydrogeology, adjacent land use, and site geometry.

Probe locations have been selected to provide monitoring points between the waste disposal areas and nearby off-site receptors and other structures. The overall network of probes reflects the general perimeter of the waste placement areas and facility boundary. Permanently installed gas monitoring probes have been designed to monitor both the unsaturated zone beneath the ground surface and the depth to the elevation of the base of the nearest waste placement. The depth of gas monitoring probes must be equal to the seasonal low groundwater table, or the maximum depth of waste as measured within 1,000 feet of the monitoring point, whichever is shallower. Since the base of the landfill is near the Stratum II/III interface, the gas probes will extend to the top of the unweathered claystone.

The LFG monitoring probe network at the landfill incudes 11 existing LFG monitoring probes located along the perimeter of the active waste fill area. LFG monitoring probes GMP-1 through GMP-11 have previously been installed and monitored at the locations shown on Figure III-6-2. There will be eight new LFG monitoring probes installed as part of the phased development of the expansion area, in addition to the abandonment of four existing LFG monitoring probes. LFG monitoring probes GMP-6, GMP-7, GMP-8, and GMP-9A will be replaced, as indicated in the phasing schedule on Figure III-6-2, to account for the expansion associated with this PAA.

The proposed perimeter probes for the expansion area will be spaced at no more than 1,000 feet apart along the expansion area. Refer to Figure III-6-2 for the proposed LFG monitoring probe

network, which includes the phasing schedule for the installation of the proposed LFG monitoring probe network and the abandonment of the existing gas monitoring probes. A typical gas monitoring probe detail is provided as Figure III-6-4.2. Copies of the installation logs for the existing permanent LFG monitoring probes are included Appendix III-6A.

Permit boundary monitoring will consist of sampling permanently installed gas monitoring probes on a quarterly or more frequent basis, if necessary, or as otherwise required by the TCEQ. The methane monitoring program outlined herein shall be performed on a quarterly basis throughout the active life and post-closure period of the facility.

Typical example field data sheets will be prepared to maintain a record of the monitoring. Sample data sheets are included in Appendix III-6B.

6.3 Monitoring Probe Construction Details

Borings for permanent gas monitoring probes will be drilled by drillers registered in the State of Texas and will be supervised by either a qualified professional geologist or a registered professional engineer. The holes will be drilled with a hollow-stem auger and will be logged. Each permanent gas monitoring probe will consist of a riser and a screened section, with both sections fabricated from 1- to 2-inch diameter PVC pipe. The riser will consist of solid pipe and will extend from approximately 3 feet above ground level to approximately 5 feet below ground level. The screened section will be connected to the base of the riser and will extend to the final depth of the probe. The annular space will be filled with sand or pea gravel approximately 6 inches above the screened section, and will be topped with approximately 6 inches of sand and an 18- to 24-inch bentonite seal. A continuous cement/bentonite seal will extend from a minimum 6 inches below the ground surface to form a nominal 6-inch thick, 4-foot by 4-foot concrete apron at the surface. The probes will be protected as necessary with bollards. A typical gas monitoring probe detail is provided in Figure III-6-4.2.

Upon installation of the permanent probes, documentation will be placed in this plan detailing information of probe construction including construction logs and probe location map.

These probe specifications are preliminary and actual field conditions will be evaluated prior to probe installation. Any adjustments necessary will be made at that time.

The borehole logs, surveyed coordinates, and construction summaries of installed gas monitoring probes will be submitted to the TCEQ and placed into the SOR.

6.4 Enclosed Structure Monitoring

The landfill administrative office and the gatehouse are enclosed structures at the site that will be monitored with either a portable gas analyzer in conjunction with quarterly monitoring or a stationary

continuous combustible gas monitor, which activates an audible alarm when preset combustible gas concentrations are exceeded. If the alarms are used, they will be calibrated to detect methane concentrations below 25 percent of the lower explosive limit (LEL) for methane (or 1.25 percent methane by volume).

If allowable concentration limits are exceeded within enclosed structures, the enclosed structure will be immediately evacuated and ventilated by opening doors and windows. Notification procedures, described in Section 7.6, will be implemented.

If continuous LFG monitor/alarms are used, they will be maintained and tested in accordance with the manufacturer's recommendations. The maintenance requirements and testing specifications for the continuous LFG monitors will be available with the LFG monitoring records.

7.0 METHANE MONITORING

7.1 Monitoring Frequency and Methods

Methane monitoring during landfill operations will be performed quarterly using portable equipment, which can be used to detect methane concentrations. The methane monitoring will continue on a quarterly schedule for the operating life of the landfill and the post-closure care period, unless directed otherwise by the Executive Director of the TCEQ. During this period, the facility will monitor more frequently those locations where monitoring results indicate that LFG migration is occurring or is accumulating in structures.

In accordance 30 TAC §330.371(e), the methane gas monitoring and control program shall continue for a period of 30 years after certification of final closure of the facility. Authorization to reduce gas monitoring and control shall be based on a demonstration by the owner or operator that there is no potential for gas migration beyond the property boundary or into on-site structures. Demonstration of this proposal shall be supported by data collected and additional studies as required.

7.2 Sampling

The type of gas monitoring equipment utilized at the facility will vary over the operational life and post-closure periods; therefore, manufacturers' specifications are not included with this plan.

A hand-held Landtec GA-90 Infra-Red Gas Analyzer, a Landtec Gem 2000, or a similar instrument, which is capable of measuring methane gas concentrations in an oxygen deficient environment, may be used to measure methane gas concentrations at the site. The calibration of the methane monitoring equipment will be verified using standard calibration gas.

Methane monitoring will be performed at each probe and the methane concentration will then be recorded on the typical form shown in Appendix III-6B.

Methane readings will also be performed in enclosed structures. As with the methane probe readings, the methane concentrations will be recorded on the typical form shown in Appendix III-6B.

In accordance 30 TAC §330.371(j), sampling of specified trace gas will be performed if required by the Executive Director.

7.3 Reporting

Routine quarterly gas monitoring data will be maintained in the SOR during the lifetime of the landfill and post-closure care period of the facility, and will be made available to the TCEQ upon request. Record retention will consist of either electronic storage of data in proprietary software and/or in electronic or hardcopy form in the SOR. The TCEQ will be notified in the event that methane gas

exceeds the concentration identified in 30 TAC §330.371(a). The notification will comply with 30 TAC §330.371(c).

Records of all Gas Monitoring Reports will be retained at the landfill until closure. During the post-closure care period, Methane Monitoring Reports will be maintained by the District Manager (DM) or designated alternate, as provided in Attachment III-8, Post-Closure Care Plan.

7.4 Methane Action Levels

Methane action levels for the site are:

1. Concentrations greater than 5 percent methane in air by volume at the methane monitoring probes
2. 1.25 percent methane in air by volume in enclosed facility structures

7.5 Action Plan

7.5.1 Initial Response Measures

This action plan has been prepared to ensure the protection of human health in the event concentrations of methane exceed allowable limits, either within enclosed structures or at the perimeter methane monitoring probes. As the appropriate emergency response is different for each situation, the plan will address the situations for enclosed structures and the perimeter methane monitoring probes separately.

7.5.2 Enclosed Structures

If 1.25 percent methane by volume has been exceeded, the enclosed structure will be evacuated immediately and the Landfill Manager (LM), or other appropriate personnel, will be notified. For continuous monitors, the continuous monitor will be evaluated to determine if the excess indication is due to a power surge or other condition causing the monitor to malfunction. Personnel (except for monitoring personnel) will not be allowed to re-enter the affected enclosed structure until a determination of the structure's safety is completed.

7.5.3 Perimeter Methane Monitoring Probes

If quarterly monitoring of the gas probes indicates that 5 percent methane by volume in air has been exceeded, the LM, or other appropriate personnel, will be notified immediately. The immediate emergency response measures will be for the LM, or other appropriate personnel, to determine if nearby enclosed structures are at risk and if evacuation of the enclosed structures is necessary.

7.6 Notification Procedures

If methane concentrations exceed the limits specified in 30 TAC §330.371(a), immediate steps will be taken to ensure protection of human health. The LM, or designated alternate, will notify by phone call, voicemail, email, or facsimile the Executive Director of the TCEQ, the TCEQ Region 9 office, and the Public Works Director

City of Temple
3210 East Avenue H, Building A, Suite 130
Temple, TX 76501
(254) 298-5621 (Phone)
(254) 298-5479 (Fax)

In addition to the above notifications, property owners within 1,000 feet of the probe/facility structures with a LFG exceedance, building occupants, or other members of the public, as identified by the LM, or designated alternate, will be notified. Such notification may first be made verbally, followed by written notification.

A report will be placed in the SOR within seven days after detection of the methane concentrations above action levels, which provides the methane levels detected and the steps taken to protect human health.

A detailed evaluation will be prepared and submitted to the TCEQ, and a Remediation Plan (if necessary) will be implemented within 60 days after detection of methane concentrations above action levels.