

January 17, 2008

Date:

Project No.: 08-1-014

Vinyard & Associates, Inc.
8916-A Adams Street, NE
Albuquerque, New Mexico 87113

Prepared by:

Richardson & Richardson
P.O. Box 36627
Albuquerque, New Mexico 87176-6627

Prepared for:

LANDFILL GAS SURVEY
PROPOSED OFFICE BUILDING
LOT 21A OF THE DASKAY SUBDIVISION
2231 PHOENIX AVENUE
ALBUQUERQUE, NEW MEXICO

Geotechnical Engineering • Materials Testing • Environmental Engineering

Vinyard & Associates, Inc.

8916-A Adams Street, NE
Albuquerque, New Mexico 87113
(505) 797-9743 • Fax: (505) 797-9749
vinyardandassociates@comcast.net

Table of Contents

1.0 INTRODUCTION AND BACKGROUND 1

1.1 REASON FOR LANDFILL GAS ASSESSMENT 2

1.2 UNDOCUMENTED LANDFILL 3

2.0 SOIL GAS SURVEY 6

2.1 SAMPLE LOCATIONS 6

2.2 FIELD SCREENING 7

2.3 NMED SOLID WASTE BUREAU REGULATIONS 9

3.0 CONCLUSIONS AND RECOMMENDATIONS 11

4.0 QUALITY ASSURANCE/QUALITY CONTROL 14

5.0 LIMITATIONS AND CLOSURE 15

LIST OF FIGURES

Figure 1 Site Location Map

Figure 2 Landfill Gas Sample Locations

Figure 3 Utility Trench Venting Barrier

LIST OF TABLES

Table 1. Sample Locations

Table 2. Field Screening Results

1.0 INTRODUCTION AND BACKGROUND

Vinyard & Associates was retained by Mr. Brandon McCutcheon of Richardson & Richardson, to perform a Landfill Gas Survey for Lot Z1A of the Daskay Subdivision. The site is located at 2231 Phoenix Avenue in northeast Albuquerque, New Mexico (Figure 1) and is currently occupied by Advantage Barricades. The site is further described as being located in the southwest 1/4 of the northwest 1/4 of Section 10, Township 10 North, Range 3 East, New Mexico Principal Meridian (Zone Atlas page H-16). The site is zoned "M-1," a general designation for manufacturing use. The site contains approximately 0.8 acres of land.

The subject property is located within the historical alignment of the Embudo Arroyo. Historical site elevation was approximately 5,060 feet above mean sea level (msl), based on a review of the 1954 and 1972 topographic maps. Current site elevation is approximately 5,070 feet above msl, indicating that approximately 10 feet of fill has been imported. There were two buildings located within Lot Z1A prior to the start of field services. The north building is a metal shop building and is not a part of this assessment. The south office building was demolished in January 2008 to clear an area for construction of the new 2,800 square foot wood-frame office building. During demolition of the south office building, it was noted that subsurface debris (mostly concrete and asphalt) was present. Subsequently, several backhoe observation pits were excavated and the depth of debris was estimated to extend to approximately 5 feet below surface grade.

Underground sanitary sewer, storm sewer, potable water, and natural gas lines are present along Phoenix Avenue. Water, sewer, gas, and electric lines already cross the site because of previous development. Overhead electric lines are present along the north side of Phoenix Avenue. There is no intent to construct city infrastructure (curb and gutter, sidewalks, storm water drains, etc.) during redevelopment of the site.

No additional landscaping will be added to the site. Existing landscaping is present along the south side of the site. Vinyard & Associates recommends that only low-water use vegetation

V
&
A

(watered using a drip irrigation system) should be placed at the site. Vinyard & Associates recommends that no storm water ponding areas should be constructed on-site because wetting subsurface debris would have a potential to increase possible landfill gas generation. Storm water should be directed to Phoenix Avenue where it will enter the municipal storm sewer system. The paved area at the site will decrease slightly because the proposed office building is slightly larger than the old office building that was demolished.

Available information indicates that several distributed pockets of separate and undocumented solid waste disposal cells are located along the historical alignment of the Embudo Arroyo in the vicinity of the subject site. Sporadic dumping along the historical alignment of the arroyo has not been well enough defined to map the disposal cells or to identify the boundaries of the dumping. Therefore, the area has not been formally identified as a landfill. However, it still warrants investigation for subsurface debris (documented at the site and nearby properties) and landfill gases (documented at nearby properties). Therefore, Vinyard & Associates was retained to provide the following environmental services:

- Collect soil vapor samples at the approximate corners of the new building;
- Field screen the soil vapor samples for hazardous constituents;
- Develop recommendations for mitigating landfill gases (if appropriate); and
- Prepare this report.

Underground utilities were not encountered during field operations. Groundwater quality was not evaluated during this project.

1.1 REASON FOR LANDFILL GAS ASSESSMENT

The City of Albuquerque *Interim Guidelines for Development within City-Designated Landfill Buffer Zones (Interim Guidelines)* requires that an assessment for landfill gases should be performed for proposed construction projects that are located within specified buffer zones of documented landfills. The *Interim Guidelines* also establish a 1,000-foot buffer zone for

undocumented landfills. Landfill gas investigations are performed to evaluate whether migrating landfill gases are present or are likely to present health risks to construction crews or to the future occupants of the proposed structures.

In support of the proposed development, Vinyard & Associates also performed a geotechnical investigation (Project No. 08-1-013). That project consisted of drilling two boreholes to 20.5 feet at two corners of the proposed building for geotechnical considerations. Two additional boreholes were drilled in the other corners of the new office building, specifically for sampling for landfill gases.

No debris was encountered in the northwest corner of the site (sample point LFG-3). Subsurface debris was encountered in the other three boreholes drilled at the site. The maximum depth of debris encountered was approximately 7.5 feet in borehole no. 4 at the southeast corner of the building. Subsurface debris was observed to consist of brick, concrete, asphalt, wood, plastic, and paper.

1.2 UNDOCUMENTED LANDFILL

Available information indicates that several separate and undocumented disposal cells are located in the vicinity of the subject site.

- A soil gas survey was performed by others in 1990 at the southwest corner of Princeton Drive and Claremont Avenue (approximately 600 feet west of the site). A person familiar with the history of that property stated that it had been used for disposing of dead farm animals in the 1940s. Several methane (CH₄) measurements obtained during the soil gas survey exceeded the upper explosivity limit (UEL, more than 15% CH₄ by volume).

- A cellular communications tower was installed in December 1999 at the southeast corner of the Super 8 Motel east of University Boulevard (approximately 960 feet west of the

site). Drilling for the tower by others encountered landfill debris to approximately 30 feet below grade. This debris included tires, wire, and household trash. Landfill gases were not detected.

- A 1994 geotechnical investigation at the southeast corner of Princeton Drive and Claremont Avenue encountered landfill debris (approximately 260 feet west of the site). Subsurface debris was noted to approximately 27 feet below grade. The refuse consisted of household trash, paper, plastic, metal, and rubber. Landfill gases were not measured.

- During construction in 1976, concrete and tires were removed from beneath a commercial building that is located on Girard Boulevard (approximately 1,300 feet east of the site). Landfill gases were not measured.

- During a geotechnical investigation in 2005, subsurface construction debris was encountered in four boreholes at a property located at the intersection of Girard Boulevard and Phoenix Avenue (approximately 1,250 feet east of the site). Debris was encountered to approximately 20 feet below grade. Landfill gases were not detected.

- During an environmental and geotechnical investigation in September 2007 at a property on the south side of Phoenix Avenue (approximately 600 feet east of the site), subsurface debris was encountered in six of seven boreholes. Debris was as deep as 28 feet. Elevated concentrations of CH₄ were detected in four of the seven boreholes. Methane was detected at 23% of the LBL and hydrogen sulfide (H₂S) was detected at 5 parts per million (ppm) in one borehole. Volatile organic compounds (VOCs) were also detected.

This general area is not formally identified as a landfill by the Albuquerque Environmental Health Department (AEHD). Based on the information reviewed, it appears that portions of the historical Embudo Arroyo alignment were subjected to informal dumping (construction debris, dead farm animals, and general household trash) during the early history of Albuquerque. The area was eventually filled in and leveled, and the Embudo Arroyo was channeled along

V
&
A

Interstate 40. Specific information regarding the locations of debris, the depths of debris, the types of debris, the years of dumping, or who was (or what entities were) responsible for dumping is not known.

Degradation of organic debris in landfills may contribute to the generation of CH₄, H₂S, and other potentially hazardous landfill gases. Prior to development of environmental regulations, waste oil, chemicals, asbestos-containing materials, and other types of potentially hazardous debris were dumped at landfills (formal and informal). The dumped compounds often included volatile organic compounds (VOCs). In addition, degradation of organic debris results in the generation of CH₄ and other gases, which have been detected as far as 900 feet outside of landfill boundaries in the City of Albuquerque.

The City of Albuquerque *Interim Guidelines* requires that an investigation should be performed for proposed construction projects within 1,000 feet of an undocumented landfill to assess the potential for landfill gases to impact the proposed project.

V
8
A

2.0 SOIL GAS SURVEY

Four soil gas samples were collected on January 9, 2008, using a CME-55 drill rig and Geoprobe soil vapor sampling equipment. The drill rig was used to drill to a desired sampling depth for geotechnical purposes and the Geoprobe sampling system was then driven ahead of the disturbed soil. The Geoprobe system consists of driving hollow steel rods with a 30-pound slide hammer to the desired sampling depth. The Geoprobe sample probes were driven to approximately 1-2 feet below the augered depth. The rods were then retracted approximately 2-4 inches to displace the disposable tip and to allow for the collection of vapor samples through polyethylene tubing that was attached to a threaded adapter coupling. Soil vapor readings were obtained for three minutes at each sample location and the maximum readings (minimum readings for oxygen) were recorded on the field log.

2.1 SAMPLE LOCATIONS

Four sample locations (LFG-1 through LFG-4) were selected. Approximate sample locations are indicated on Figure 2. Soil vapor samples were collected from the following locations:

Table 1. Sample Locations

Sample	Depth	Description
LFG-1	6.5'	Southwest corner of the new building, near the electric and water lines.
LFG-1	6.5'	Duplicate for QA/QC purposes.
LFG-2	6.0'	Northeast corner of the building.
LFG-3	7.0'	Northwest corner of the new building.
LFG-4	7.5'	Southeast corner of the new building.

2.2 FIELD SCREENING

Soil vapors were field screened using a MultiRAE Plus multiple gas detector (Model No. PGM50-5P and Serial No. 095-511961). The MultiRAE has an internal pump that operates at 0.25 liters per minute. Peak readings were recorded for carbon monoxide (CO), VOCs, H₂S, and CH₄. VOCs were measured in meter units that vary by a contaminant's ionization potential. VOCs were screened using a 10.6 electron volt (eV) ultraviolet (UV) lamp photoionization detector (PID) that was calibrated with 100 ppm isobutylene. Hydrogen sulfide was measured as ppm. Methane was measured as a percentage of the lower explosivity limit (LEL; 5% CH₄ by volume is equivalent to 100% of the LEL in a normal environment). Minimum readings were recorded for oxygen (O₂). Oxygen was measured as a percent volume in air.

The MultiRAE was calibrated and serviced by the supplier on January 3, 2008. It was calibrated at the office with 2.5% CH₄, which is 50% of the LEL, and with 100 parts per million (ppm) isobutylene calibration gases. The sensors were found to be appropriately responsive at the time of the field services. Five vapor samples were collected at four locations. Readings were obtained at each sample location for a 3-minute interval using the Multi-RAE. Carbon dioxide (CO₂) was not measured for this project because the CO₂ meter had been shipped off for annual calibration.

- Low VOC concentrations were indicated at three of the four sample locations. VOC concentrations ranged between 0.1 meter units and 1.7 meter units. No geographic pattern was indicated. VOC readings are considered to be within the error range of the instrument and are not significant enough to warrant further assessment. The VOC measurements do not present a health and safety risk. The normal (New Mexico Environment Department (NMED) action level for VOCs is 100 ppm.

- Hydrogen sulfide is a landfill gas that is generated during the degradation of gypsum ($\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$) board and other sulfur containing products. Hydrogen sulfide is a colorless, toxic, and flammable gas with the smell of rotten eggs. However, it is a desensitizer and cannot be smelled for long. The OSHA Permissible Exposure (PEL) for H_2S is 20 ppm and it is immediately dangerous to life and health (IDLH) at 300 ppm. Hydrogen sulfide was not detected at the four soil gas sample locations.

- CH_4 is generated as a function of the degradation of organic compounds. Methane as a percentage of the LFL was not detected at any of the four soil gas sample locations. Methane is not considered to present a health and safety risk (explosion hazard) at the subject property.

- The ambient O_2 level in the atmosphere is approximately 20.8%. Reduced O_2 readings are normal for subsurface conditions. The low O_2 readings that were obtained are not considered to be unusual.

2.3 NMED SOLID WASTE REGULATIONS

Vinyard & Associates recommends that development of the site should proceed in accordance with NMED Solid Waste Bureau (SWB) guidelines. Part 20.9.2.10(15) of the regulations states "...no person shall excavate or trench a closed cell or solid waste disposal area without written approval by the department and a determination whether an excavation will be required, unless in response to an emergency situation; excavation and trenching do not include excavations or

trenches of less than 120 cubic yards or exploratory borings for the purpose of waste characterization, site investigation or mapping, nor does it include removal of waste for routine maintenance on gas collection and control and venting systems...”

Excavation and removal of the debris will require excavating more than 600 cubic yards of material, which is in excess of the regulatory guidelines. However, the subject property is not a closed cell or a defined solid waste disposal area. Therefore, applicability of the regulations may be subject to interpretation of the regulators.

V
&
A

3.0 CONCLUSIONS AND RECOMMENDATIONS

Conclusions and recommendations are presented in the following paragraphs. The sequence is not indicative of priority.

The AHHD and SWB have identified no landfills in the vicinity of the subject property. However, subsurface debris (mostly concrete and asphalt) was encountered in three of four boreholes. The depth of debris varied between 4 feet and 7.5 feet. No potentially hazardous materials were encountered.

Future development of the site should address both geotechnical and environmental issues. Vinyard & Associates recommends that the contractor excavate and remove all debris to native ground beneath the building pad, plus an area extending at least 5 feet to each side of the building. It may be possible to leave debris beneath paved areas where light vehicle traffic is expected. Excavation of debris from the entire property is an alternative option that can be considered.

Vinyard & Associates is of the opinion that the excavation is relatively minor and does not warrant development of a formal Waste Excavation Workplan that requires review and approval of the regulatory agency. However, the total excavation volume will be in excess of the 120 cubic yard limit. Therefore, Vinyard & Associates recommends contacting the regulators for their concurrence that a written plan is not required for excavation.

Vinyard & Associates should be notified if any debris contains roofing material, floor tile, vinyl sheet flooring, insulation, sheetrock, texture, or mastics. That material should be sampled for asbestos prior to disposal.

Vinyard & Associate should be notified if any intact containers, stained soils, unusual odors, or other evidence of potentially hazardous materials are exposed during excavation. Vinyard &

Associates will screen the material for hazardous constituents and assist with arranging for proper disposal if necessary.

VOCs, H₂S and CH₄ were not detected in elevated concentrations. Based on the results of the initial field investigation, it appears that landfill gases will not present health and safety risks to the construction workers or future tenants. No laboratory samples were collected for analyses.

The extent of subsurface debris has not been fully characterized and subsurface debris, with elevated methane and hydrogen sulfide concentrations, has been documented at nearby sites. Off-site areas of debris may contribute to landfill gases migrating into the vicinity of the subject property.

Vinyard & Associates recommends that each underground utility trench (private or public, wet or dry) to the building should receive at least one Landfill Gas Venting Barrier (Figure 3). A Landfill Gas Venting Barrier shall consist of rounded (not crushed) 1.5-inch diameter gravel that shall extend the full width and the full height of the utility trench. The gravel plug shall extend a minimum of 2 feet and a maximum of 4 feet along the length of the utility trench. Nonwoven filter fabric (7-ounce or heavier) shall be placed over the gravel so that overlying sand material does not infiltrate into the gravel pore space. A 2-inch diameter perforated vent pipe (galvanized metal) shall extend to the approximate mid-point of the gravel vent barrier. Perforations shall be at ½-inch diameter (maximum) on 6-inch centers all around the pipe. The vent pipe shall be at least 2 inches from the sides of the trench and from any utility line. The gravel layer shall extend at least 2 inches below the bottom of any utility line. Solid galvanized metal or PVC (UV-resistant) pipe will be used to extend the vent pipe above-grade. The vent pipe shall terminate in a gooseneck that opens between 1 foot and 3 feet above grade. The opening shall be covered with a wire screen to prevent rodents from entering the system. The Landfill Gas Venting Barrier will be placed in an area that is considered to present a low potential for pedestrian exposure. The vent pipe should be permanently labeled "Landfill Gas Vent".

Vinyard & Associates recommends placing an impermeable barrier (10-mil or thicker) beneath the concrete slab. The barrier should be attached to the concrete stemwalls using an appropriate adhesive. If the membrane sheets overlap, the overlap should be a minimum of 1 foot and the sheet seams should be fusion welded together (per manufacturer's specifications). If desired, two inches of clean sand may be placed over the plastic barrier to aid slab curing. Cracks and utility penetrations through the slab and membrane should be sealed using a utility boot and nonhardening caulk or mastic, as recommended by the manufacturer.

Construction of landfill gas mitigation measures should be photographed and documented.

Other landfill gas mitigation alternatives may include, but are not limited to:

- Venting underneath the building;
- Placing CH₄ and H₂S sensors in the building, which would require developing an Operations and Maintenance Program and periodic calibration; and
- Venting light poles, signs, and other structures with electrical systems.

The following recommendations should ensure that debris removed from the site will be kept to a minimum and that disposal costs will be reduced.

- Concrete and asphalt should be separated for recycling, and
- Clean soil should be re-used on-site if it is suitable for fill.

The Health and Safety Manager for construction workers at the site should incorporate typical landfill hazards into their site-specific Health and Safety Plan.

4.0 QUALITY ASSURANCE / QUALITY CONTROL

Sampling personnel wore appropriate personal protection equipment such as disposable latex gloves during the sampling and decontamination tasks. Disposable equipment was properly disposed and other equipment appropriately decontaminated to reduce the potential for cross-contamination of the samples. Equipment was cleaned of gross contamination by wiping with paper towels and rinsing with distilled water. A solution of distilled water and commercial-grade tri-sodium phosphate detergent was prepared in a clean plastic bucket. Equipment was immersed in this solution and scrubbed. The equipment was removed from the detergent solution and rinsed with distilled water. Decontaminated equipment was stored in a plastic bucket filled with distilled water. The field instruments were calibrated recently by qualified persons and field testing with calibration gases indicated that they were working properly.

One duplicate soil vapor sample was collected in the field. One background sample was collected at the office after completion of field services. The QA/QC checks indicated no problem with field procedures or equipment. No laboratory or split samples were collected during this Landfill Gas Survey.

The landfill gas survey that was performed is an assessment of representative subsurface conditions at a specific time and at discrete locations and depths. Landfill gases are dynamic and subsurface conditions may vary significantly over time.

V
&
A

5.0 LIMITATIONS AND CLOSURE

This report has been prepared for the use of Richardson & Richardson and their assigned parties, to assist in their evaluation of potential landfill debris and landfill gas conditions at the subject property. Any other use of this report may be inappropriate. If this report is submitted to the City of Albuquerque Environmental Health Department (AEHD), information contained in this report will become public domain and the AEHD may request additional information.

Project tasks were performed in accordance with generally accepted environmental investigation and assessment practices within New Mexico. This report's conclusions and recommendations are based on field screening results, the observations of the investigator at the time of the site visit, on reviews of publicly available information, and on information provided by persons familiar with the property. The information has been accepted at face value. The information and conclusions in this report are subject to the accuracy, completeness, and availability of the information obtained during the project.

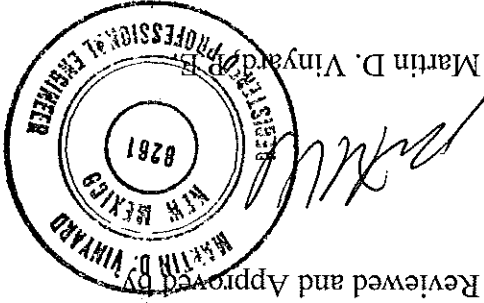
Contaminant concentrations may vary between data points and with time. If conditions are encountered during development of this property which differ from those presented herein, this office should be contacted for additional evaluation and recommendations. The staff of Vinyard & Associates, Inc. is available for additional consultation as necessary.

Vinyard & Associates, Inc.
Prepared by

Kenneth E. Hunter

Kenneth E. Hunter

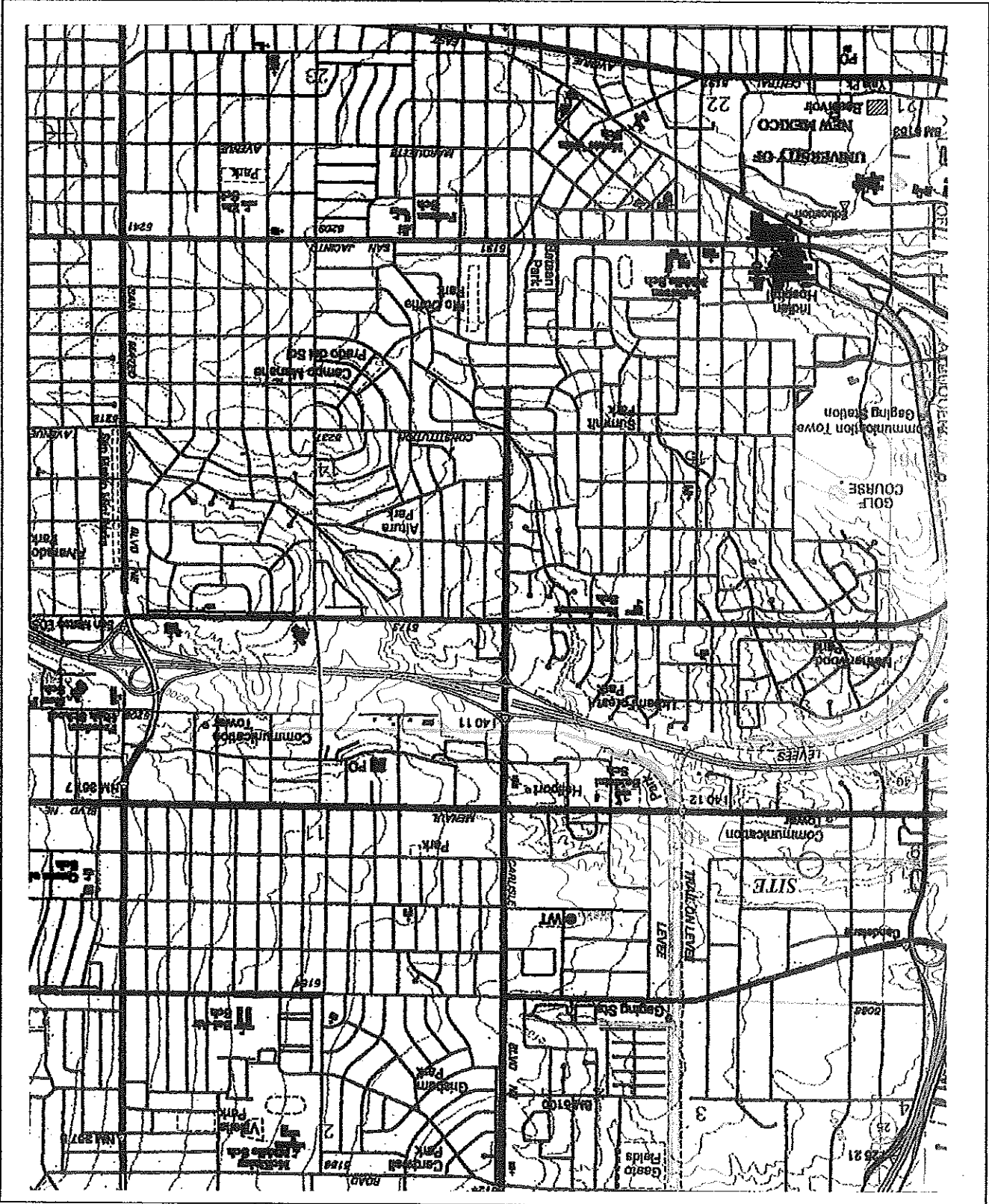
KBH/er



Martin D. Vinyard

Reviewed and Approved by

SITE LOCATION MAP - Lot 71A, JASKAY SUBDIVISION



Landfill Gas Survey

Site: 2231 Phoenix Avenue, NE

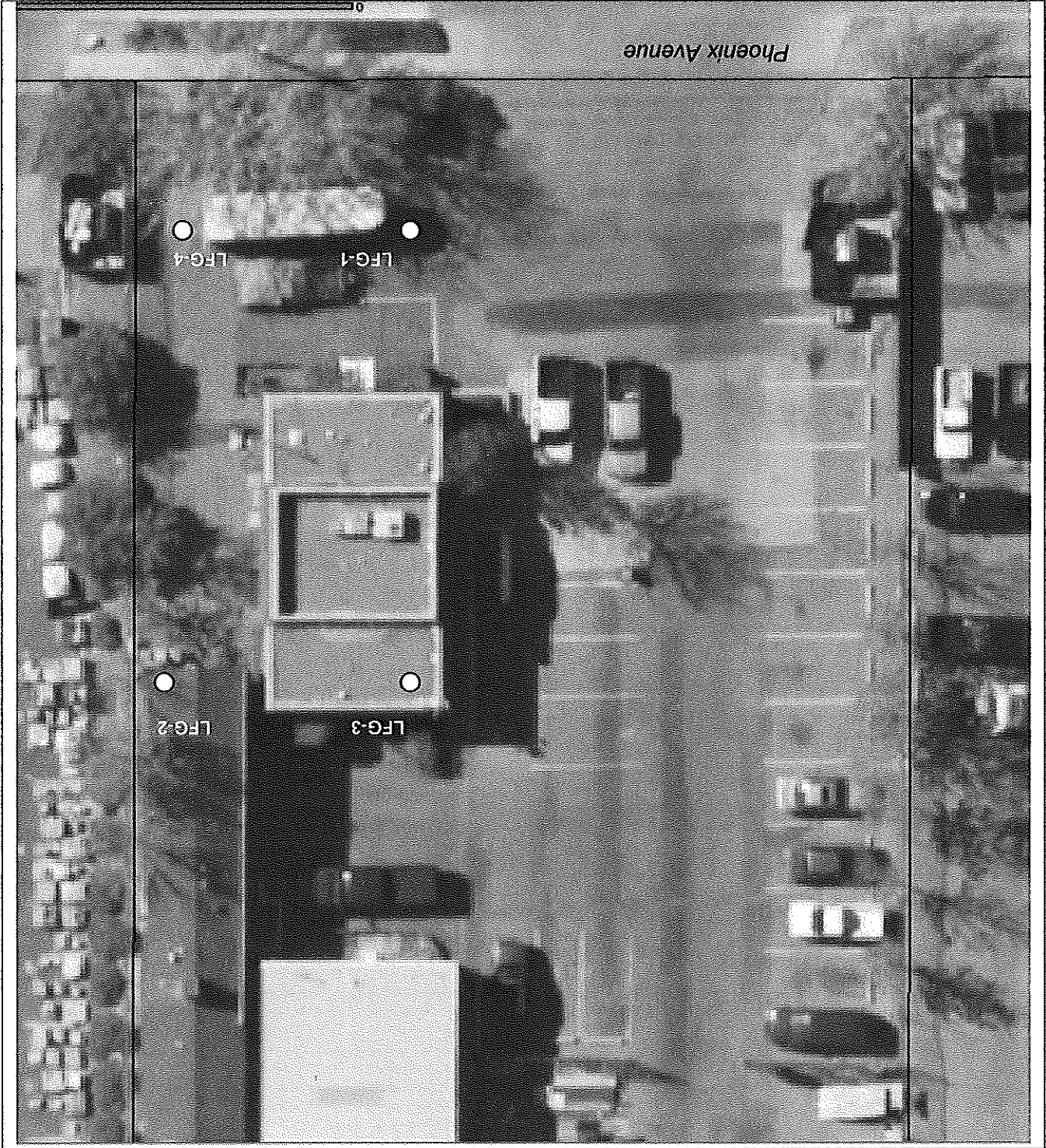


Client: Richardson & Richardson
 V&A Project No. 08-1-014
 Scale 1" = 2,000'

Source: 1990 USGS Albuquerque East Topographic Map

Figure 1

Landfill Gas Sample Locations



Landfill Gas Survey

Site: 2231 Phoenix Avenue, NE

Albuquerque, NM

Base Source: AGIS Website, 2006 Imagery



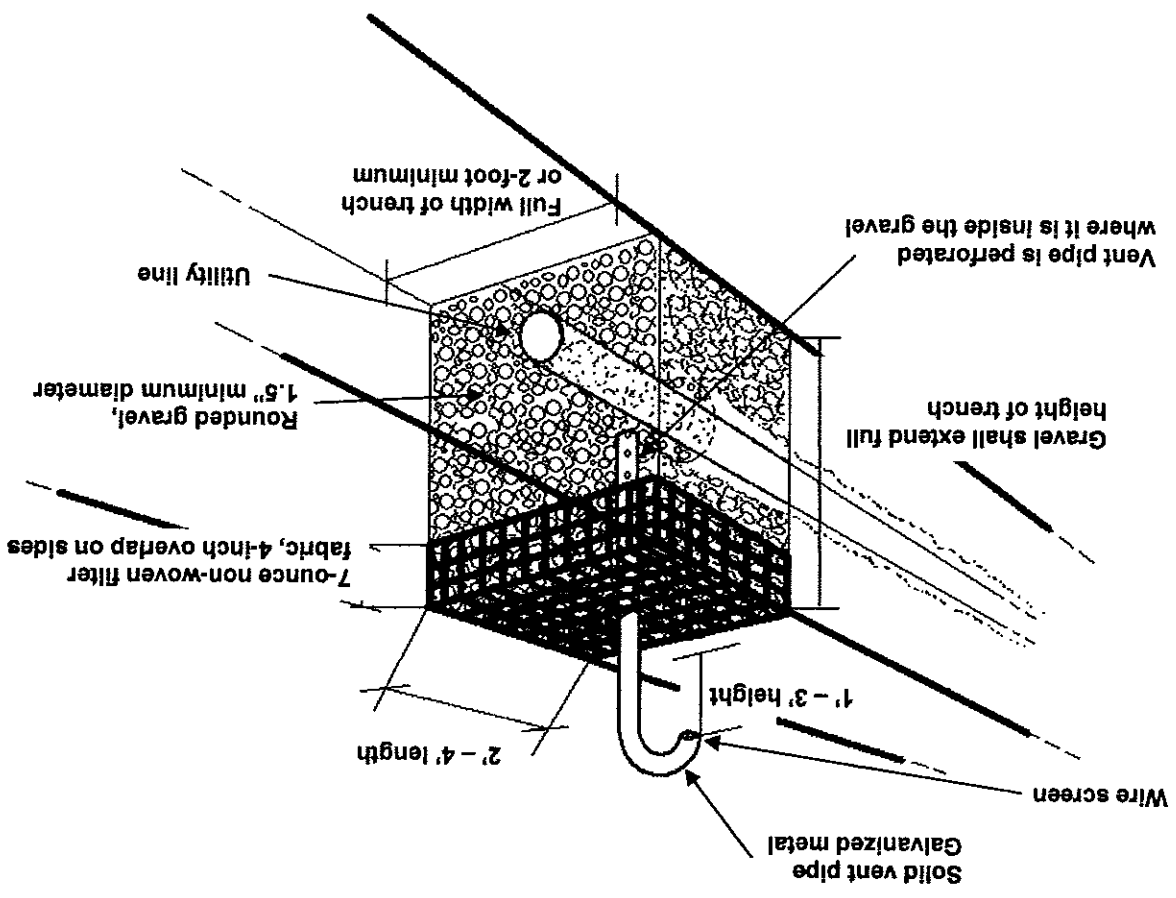
Sample Locations



Client: Richardson & Richardson
V&A Project No. 08-1-014
Approximate Scale: 1" = 23.5'
Figure 2

Utility Trench Venting Barrier

The utility trench venting barrier shall be placed in a landscaped area that is away from pedestrian and vehicular traffic.
 The vent opening shall not be within 10 feet of an HVAC air intake, entrance, or window to the building.
 Landscaping material (gravel, bark, etc.) should be placed over the filter fabric if the top of the gravel is at grade. If the top of the gravel is below grade, then compacted fill should be placed above the filter fabric.
 The metal pipe shall be permanently labeled "Landfill Gas Vent".



Bottom of vent pipe extends to the approximate mid-point of the gravel barrier. The sides of the vent pipe, where it penetrates the gravel, shall be located at least 2 inches from the sides and bottom of the trench and from all utility lines. Perforations in the vent pipe within the gravel barrier shall be 1/2-inch diameter, on 6-inch centers, and at 120° around the pipe. The vent pipe shall be 2-inch diameter and constructed of galvanized metal. Utility lines shall be placed at least 2 inches above the bottom of the trench

Landfill Gas Mitigation
 Site: 2231 Phoenix Avenue, NE
 Albuquerque, NM

Client: Richardson & Richardson
 V&A Project No. 08-1-014
 No Scale
 Figure 3

Table 2. Field Screening Results (January 9, 2008)

Point	Time	CO (ppm)	VOCs (meter units)	H ₂ S (ppm)	LEL (%)	O ₂ (%)
LF-G-1	14:09	15	1.7	0	0	Not measured
LF-G-1	14:12	16	1.3	0	0	19.7
LF-G-2	15:20	10	0.4	0	0	10.3
LF-G-3	14:57	0	0.0	0	0	17.8
LF-G-4	14:39	1	0.1	0	0	18.1
@7.5'						
@7'						
@6'						
@6.5'						

The temperature was approximately 40°F during field services. Sampling was performed in the afternoon, based on the availability of the drill rig for the concurrent geotechnical investigation.

Every instrument has an inherent range of error and the MultiRAE may have indicated low concentrations of gases when those gases were not actually present (false positives). Similarly, the field instruments may not have detected low concentrations of landfill gases (false negatives). Normally, readings below about 1-3 measurement units (ppm, meter units, or percent) are normally considered to be within the error range of the instrument. A brief discussion of each analyte follows:

- Elevated CO readings were obtained at two locations. No apparent source for CO was noted during the field services. The elevated CO readings are not considered to present a health and safety risk at this time.