ENVIRONMENTAL HEALTH & SAFETY
UNIVERSITY of WASHINGTON

Montlake Landfill Methane Action Plan

February 25, 2014

Introduction

The Montlake Landfill was operated by the City of Seattle on University property between 1926 and 1971, and covers one the largest peat bogs in Washington State. The exact boundaries of the Montlake Landfill are not precisely known, but available documentation shows the landfill is bounded on the west by Montlake Boulevard NE, on the north by NE 45th Street, on the east by Mary Gates Memorial Drive, and on the south by Union Bay and the Intramural Activities Building. The approximate landfill boundaries are delineated in Figure 1. The City of Seattle, Critical Area Map, Plate #11 (http://maps.ci.seattle.wa.us/) aids in delineation of the 1000 foot landfill buffer zone.

When the landfill was closed in 1971 approximately 2-3 feet of earth was used to cap the landfill. Methane gas is produced as a normal decomposition product in landfills and in peat bogs. Methane gas is lighter than air and is explosive within the range of 5% to 15% by volume of methane in air (50,000 to 150,000 PPM).

In 2004 the University of Washington Department of Environmental Health & Safety (UW EH&S) oversaw the installation of multiple methane detection wells on and around the perimeter of the landfill for the purposes of monitoring methane gas from the landfill. The UW conducts landfill gas monitoring in accordance with the Department of Ecology's Solid Waste Landfill Design Manual and has documented the methods, frequency and monitoring locations in the *Landfill Gas Monitoring Plan*, *University of Washington, Montlake Landfill* dated November 5, 2013. Methane monitoring activities are currently conducted quarterly or semi-annually at wells, buildings, and parking lot mitigation systems depending on past methane monitoring results, see Table 1. The methane monitoring results are shared with public health officials and the Montlake Landfill Oversight Committee.

Purpose

This document is designed to guide University actions taken on University properties and buildings within the boundaries of the former Montlake Landfill, or within 1000 feet of the closed landfill when methane gas is found above regulatory driven action levels.

Regulations

Regulatory action levels were derived by state and public health officials to protect the public from the risks of migrating landfill gases.

Seattle Municipal Code 25.09.220 (Environmentally Critical Areas Code) indicates that development on abandoned landfills is subject to Seattle-King County Health Department requirements. The code also specifies methane barriers or appropriate ventilation per Title 22, Subtitle I, Building Code, and the Seattle King County Health Department regulations.

The Title 10 King County Board of Health Solid Waste Regulation governs construction standards and methane controls on abandoned landfills. Authority is established under RCW Chapter 70.05 and Washington State Administrative Code WAC 173-304, Minimal Functional Standards for Solid Waste Handling, and WAC 173-351, Criteria for Municipal Solid Waste Landfills.

Section 10.09.050 of the Title 10 regulation states:

> "All landfills except inert waste landfills shall provide for adequate venting, collecting or redirecting of gases generated by solid wastes. No methane shall be allowed to migrate to or beyond the property boundary above or below the ground in concentrations greater than the lower explosive limit for methane, or in excess of one hundred (100) parts per million by volume of hydrocarbons (expressed as methane) in offsite structures, or in

> excess of twenty-five percent (25%) of the lower explosive limit in on-site structures…. It shall be the responsibility of the landfill operator and/or owner to develop a sampling and testing program to monitor gas production and migration, and to obtain approval from the health officer for such program."

With regard to construction on or within one thousand feet of an abandoned landfill, Section 10.09.060 (B) states:

> "All enclosed structures to be built within the one-thousand-foot (1,000') landfill zone must be protected from potential methane migration. The method for insuring a structure's protection from methane shall be addressed in a report submitted by a licensed professional engineer to the local building department for approval. Such a report shall contain a description of the investigation and recommendation(s) for preventing the accumulation of explosive concentrations of methane gas within or under enclosed portions of the proposed building or structure. At the time of final inspection, the professional engineer shall furnish a signed statement attesting that the building or structure has been constructed in accordance with his/her recommendations for addressing methane gas migration."

Methane Action Levels and Actions

Methane action levels and actions vary by sample location (well, building or parking lot vent) and by past sampling results. Environmental professionals at UW EH&S and Public Health, Seattle & King County review methane monitoring results and determine if any actions beyond those listed should be implemented.

The University implemented passive methane gas ventilation systems in parking lots surrounding the landfill. New construction in and within 1000 feet of the Montlake Landfill has been constructed with a vapor barrier and a methane gas collection system as required. Please contact UW EH&S for assistance with construction standards and methane controls when working in or within 1000 feet of the Montlake Landfill.

The Montlake Landfill methane monitoring wells were divided into two groups as shown in Table 1 based on sampling results over the last two years. Group 1 monitoring wells are sampled semiannually due to historically low methane gas detections, while group 2 monitoring wells are sampled quarterly due to methane gas detections above the action level.

Figure 1-Landfill Boundaries

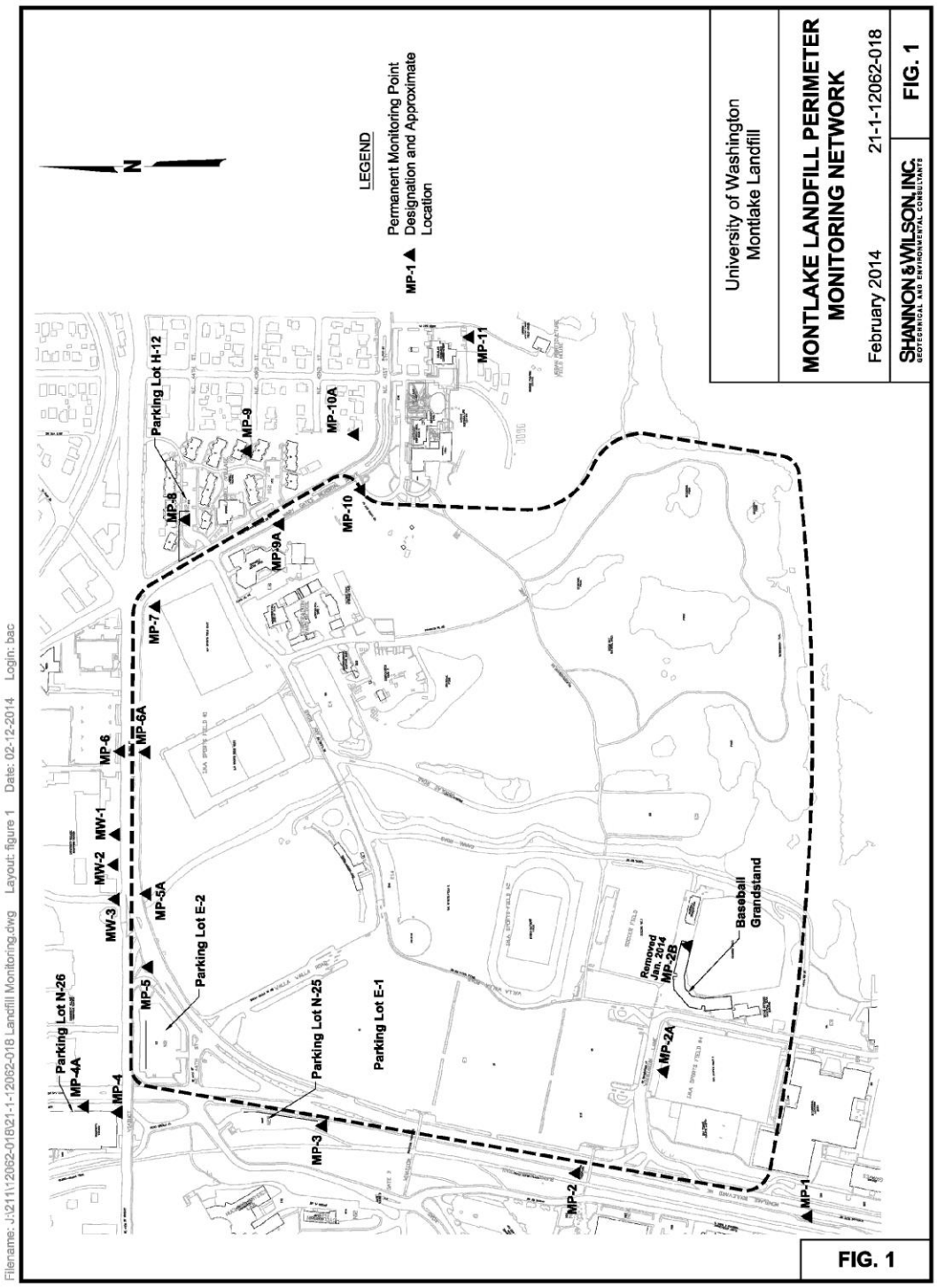

Table 1 - Methane Action Levels and Actions

Monitoring Area	Monitoring Frequency	Action Level	Actions
Group 1 Perimeter Monitoring Wells MP-1, MP-2, MP-3, MP-5, MP-6, MP-6A, MP-7, MP-9, MP-10A, MP-11 and MW-1 through MW-3	sample semi-annually in 2nd and 4th quarter	50,000 ppm or 5% by volume methane (100% of LEL)	• If results are above the action level, notify Public Health, Seattle, and King County and move affected well to Group 2. • Notify and consult with Department Administrator or Facility Coordinator, as appropriate. • Notify the Risk Management Office.
Group 2 Perimeter Monitoring Wells MP-4, MP-4A, MP-5A, MP-8, MP-9A and MP-10	sample quarterly	50,000 ppm or 5% by volume methane (100% of LEL)	• If results are less than the action level for 2 years, notify Public Health, Seattle and King County and request that the affected well be moved to Group 1.
On-site Buildings: CMA, ESB, ESO, Cage, BTB, BGS, PDB, GDR and IMA	sample semi-annually in 2nd and 4th quarter	12,500 ppm or 1.25% by volume methane (25% of LEL)	• Monitor daily for a week to verify results. • Evacuate buildings if methane concentration reaches 5,000 ppm for two or more consecutive days. • Occupants may return if methane concentration falls below 5,000 ppm for three consecutive days. • Notify Department Administrator or Facility Coordinator, as appropriate. • Notify the Risk Management Office. • Evaluate for sources of combustible gases other than landfill gas. • Where necessary, implement mitigation measures on UW property such as increasing building ventilation or the installation of active or passive ventilation systems, based on location, geology, depth to groundwater, existence of landfill debris, peat, etc.
Off-site Buildings: Laurel Village, Plant Services, Conibear Shell House and CUH	sample semi-annually in 2nd and 4th quarter	100 ppm or 0.01% by volume methane (0.2% of LEL)	• Monitor daily for a week to verify results. • Evacuate buildings if methane concentration reaches 5,000 ppm or more for two or more consecutive days. • Occupants may return if methane concentration falls below 5,000 ppm for three consecutive days. • Notify Department Administrators or Facility Coordinators, as appropriate. • Notify the Risk Management Office. • Conduct environmental assessments to determine gas source (landfill or otherwise). • Where necessary, implement mitigation measures on UW property such as increasing building ventilation or the installation of active or passive ventilation systems, based on location, geology, depth to groundwater, existence of landfill debris, peat, etc.
Parking Lot Methane Vents	sample semi-annually in 2nd and 4th quarter	No Action Level	• None
Monitoring well 2A	sample semi-annually in 2nd and 4th quarter	No Action Level	• Continue to monitor nearby UW buildings quarterly as stated in the monitoring plan. • Notify and consult with Department Administrators, Facility Services, and Capital Projects, as appropriate. • Assess the location further when undertaking future construction or renovation projects at the site. • Ensure that future building designs implement methane mitigation systems appropriate for the location.

Cage = Baseball Batting Cage
BTB = Baseball Team Bldg
PDB = Player Development Bldg
CMA = Ceramic and Metal Art Bldg
BGS = Baseball Grandstands Bldg
GDR = Golf Driving Range
CUH = Center for Urban Horticulture
IMA = Intramural Activities Bldg
ppm = parts per million
ESO = Environmental Safety Office Bldg
ESB = Environmental Safety Storage Bldg
LEL = Lower Explosive Limit