STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY
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July 26, 2011

Mr. Carl Bach
The Boeing Company
PO Box 3707, M/C 1W-12
Seattle, WA 98124-2207

Re: Opinion pursuant to WAC 173-340-515(5) on Proposed Gas Extraction System Modifications for the following Hazardous Waste Site:

- Name: Eastgate Landfill
- Address: 2805 160th Avenue SE, Bellevue, WA 98008
- Facility/Site No.: 2017
- VCP No.: NW0471

Dear Mr. Bach:

Thank you for submitting documents regarding your proposed remedial action for the Eastgate Landfill facility (Site) for review by the Washington State Department of Ecology (Ecology) under the Voluntary Cleanup Program (VCP). Ecology appreciates your initiative in pursuing this administrative option for cleaning up hazardous waste sites under the Model Toxics Control Act (MTCA), Chapter 70.105D RCW.

This letter constitutes an advisory opinion regarding whether your proposed remedial action is likely to be sufficient to meet the specific substantive requirements of MTCA and its implementing regulations, Chapter 70.105D RCW and Chapter 173-340 WAC, for characterizing and addressing the following release(s) at the Site:

- Methane, benzene, vinyl chloride, and dichlorofluoromethane in Air
- Benzene, 1,2-dichlorobenzene, 1,4-dichlorobenzene, and dieldrin in Landfill Refuse
- Arsenic, iron, manganese, benzene, 1,2-dichlorobenzene, 1,4-dichlorobenzene and dieldrin in Soil and Ground Water

Ecology is providing this advisory opinion under the specific authority of RCW 70.105D.030(1)(i) and WAC 173-340-515(5).

This opinion does not resolve a person's liability to the state under MTCA or protect a person from contribution claims by third parties for matters addressed by the opinion. The state does not have the authority to settle with any person potentially liable under MTCA except in accordance with RCW 70.105D.040(4). The opinion is advisory only and not binding on Ecology.

Ecology's Toxics Cleanup Program has reviewed the following information regarding your proposed remedial action(s):

1. April 27, 2011, *Subject: 2010 Annual Summary Report for Operation and Monitoring of the Landfill Gas (LFG) Migration Control Facilities at the Eastgate Area Properties Landfill, Bellevue, Washington,* letter from SCS Field Services

2. November 2, 2010, *Subject: Summary of Proposed Changes to the Blower/Flare Station at the Eastgate Landfill, Bellevue, Washington,* letter from SCS Engineers

3. May 24, 2010, *Residual Risk Evaluation for the Eastgate Landfill, Landfill Gas Collection System – Final,* report by Shaw Environmental, Inc.

3. April 9, 2010, *Subject: 2009 Annual Summary Report for Operation and Monitoring of the Landfill Gas (LFG) Migration Control Facilities at the Eastgate Area Properties Landfill, Bellevue, Washington,* letter from SCS Field Services

The reports listed above will be kept in the Central Files of the Northwest Regional Office of Ecology (NWRO) for review by appointment only. Appointments can be made by calling the NWRO resource contact, Sally Perkins, at 425 649-7190.

The Site is defined by the extent of contamination caused by the following release(s):

- Methane, benzene, vinyl chloride, and dichlorofluoromethane in Air
- Benzene, 1,2-dichlorobenzene, 1,4-dichlorobenzene, and dieldrin in Landfill Refuse
- Arsenic, iron, manganese, benzene, 1,2-dichlorobenzene, 1,4-dichlorobenzene and dieldrin in Soil and Ground Water

Based on a review of supporting documentation listed above, pursuant to **requirements contained in MTCA and its implementing regulations, Chapter 70.105D RCW and Chapter 173-340 WAC, for characterizing and addressing the following release(s) at the Site, Ecology has determined:**

Background: Gas collection system data obtained during 2009 and 2010 has shown two problems with the current system. One is that too little methane is being produced by the landfill as a whole to maintain combustion at the existing LFG flare. The other problem is that methane gas concentrations in excess of the lower explosive limit are consistently being detected in some probes outside the perimter of the landfill. These two issues and the City of Bellevue's (Bellevue) proposed remediation approach to each are discussed below.

Issue 1: Too Little Methane: As the landfill ages, methane production has declined. Current gas production rates are estimated to be slightly more than 1% of the peak LFG rate in 1965. The gas collection system has also aged and been subject to the effects of differential settlement. These factors have resulted in areas of the collection system being blocked, particularly during the wet season. The blockage has, in turn, reduced the overall capacity of the system to deliver gas to the LFG flare. The combination of lower gas production rates and partial collection system blockages has reportedly made it so that the flare can operate for only short periods of time, and must be supplied with supplemental propane to maintain ignition. In 2010, the flare operated for an average of only 30 hours per month, or slightly more than two full-time days.

Bellevue has proposed to address this issue by eliminating the flare and modifying the blower facility to directly vent landfill gas into the air. The blower would be allowed to run nearly full time, thus providing more continuous removal of gas from the within the landfill. Ecology **does not accept** the proposal as currently set forth for the following reasons:

- It is not clear to Ecology why the flare can't be run more than 30 hours per month, when a direct venting system could be run almost continuously. If it is strictly a cost issue, that information needs to be provided, and a cost-benefit evaluation made in accordance with MTCA.

- The potential to replace the existing flare with a more appropriately sized or updated flare has not been evaluated. Flare systems at landfills do get outdated and are often replaced as the volume and composition of the LFG changes over time.

- Direct venting to the atmosphere would do nothing to address the problem of system blockage.

- Volatile organic chemicals will be vented into the atmosphere at concentrations above MTCA air cleanup levels. Samples obtained at the Site showed detectable benzene, vinyl chloride (VC), dichlorodifluoromethane (Freon), and a chlorinated ethane in the landfill gas. The benzene, VC, and Freon concentrations were all above Method B carcinogen cleanup levels. Although TSCREEN modeling showed that the benzene and VC were below Acceptable Source Impact Levels (ASILs) as calculated at a distance of 1 meter from a stack discharge, MTCA does not provide for a dilution zone and requires cleanup levels be met at the point of discharge.

Issue 2: Elevated Methane Concentrations Outside Landfill: The gas collection system was modified in 2006 and 2007 during the construction of three new office towers at the south end of the landfill. The gas system modifications included the

removal and replacement of extraction wells and monitoring probes, along with new header piping. Gas probe monitoring since then has shown gas pressures relatively close to atmospheric pressure, but methane concentrations in excess of 5% in a broad zone adjoining the new buildings (as measured at MW-2, MW-3, and MW-4), and in a single well on the east side of the landfill (MW-15). The maximum concentration recorded was 57% methane by volume in probe MW-2M. These high concentrations indicate LFG is continuing to move outward in the subsurface beyond the landfill boundaries, and that the extraction system is not effective in maintaining the soil vapor concentrations below an explosive level (methane is explosive between 5 and 15 % by volume)

Bellevue proposes to address this issue by modifying the collection system to vent directly to the atmosphere and thus operate continuously, rather than intermittently, as described previously. It is thought the greater time of operation will be effective in reducing methane concentrations at the landfill perimeter. Ecology **does not accept** the proposal at this time and requires the following:

- Engineering analyses must be completed to determine whether more consistent extraction through the existing extraction system will reduce methane concentrations at the perimeter. Pilot testing will likely be necessary to have some degree of confidence that the continuous operation approach will be effective. Also, other engineering improvements must be evaluated including the construction of additional extraction wells and repairing system blockages.

Immediate Action: Ecology understands Bellevue has taken steps to address the elevated methane concentrations in probes outside the southern boundary of the landfill. Beginning in about February, 2011, the flare was run more consistently and for longer periods using substantially greater quantities of propane to maintain combustion. The result is that methane concentrations have dropped in this area. Specifically, methane concentrations in probe 2M were measured at 58 and 60 % in March and at 28.2 and 0.1% in June. In probe 3M, methane concentrations were 9.2 in March and 6.4 and 7.3 in June. In probe 4M, methane concentrations were 12.9 and 14.4 in March and 11.3 and 0% in June. Further reductions are needed to drop methane concentrations below explosive levels.

Ecology recommends Bellevue consider and implement other means to continue to reduce gas in areas where the concentrations are elevated outside the landfill boundary, while continuing to work with Ecology on a longer-term option. These other means should be implemented as soon as possible, and should include inspecting methane monitors within the office towers to make sure they are operating, and testing for methane concentrations within the buildings and in subsurface structures such as manholes or vaults.

This opinion does not represent a determination by Ecology that a proposed remedial action will be sufficient to characterize and address the specified contamination at the Site or that no further remedial action will be required at the Site upon completion of the proposed remedial action. To obtain either of these opinions, you must submit appropriate documentation to Ecology and request such an opinion under the VCP. **This letter also does not provide an opinion regarding the sufficiency of any other remedial action proposed for or conducted at the Site.**

Please note that this opinion is based solely on the information contained in the documents listed above. Therefore, if any of the information contained in those documents is materially false or misleading, then this opinion will automatically be rendered null and void.

The state, Ecology, and its officers and employees make no guarantees or assurances by providing this opinion, and no cause of action against the state, Ecology, its officers or employees may arise from any act or omission in providing this opinion.

Again, Ecology appreciates your initiative in conducting independent remedial action and requesting technical consultation under the VCP. As the cleanup of the Site progresses, you may request additional consultative services under the VCP, including assistance in identifying applicable regulatory requirements and opinions regarding whether remedial actions proposed for or conducted at the Site meet those requirements.

If you have any questions regarding this opinion, please contact me at 425 649-7107.

Sincerely,

Mark Adams
NWRO Toxics Cleanup Program

ma/kh

cc: Pam Fehrman, City of Bellevue
Ted Massart, SCS Engineers
Eric Sonsthagen, SCS Engineers