CSMKL 9.1

CSM

ENVIRONMENTAL HEALTH AND SAFETY (EHS)

FAX COVER SHEET

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DATE: 5/22/2003

ATTENTION: **Maki Iatridis, Jonathan Spencer**
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TOTAL PAGES: 5
(INCLUDING COVER)

FROM: Linn D. Havelick

MESSAGE:

Gentlemen – I came across the attached document while sorting out the case discovery files. It may have a major bearing on options for disposal of Creekside material.

Let me know if you want the entire document.

Linn

Harding Lawson Associates

September 15, 1995

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Mr. Curtis Stovall, P.E.
BFI of Colorado, Inc.
8480 Tower Road
Commerce City, Colorado 80022

Fate, Transport, and Risk Evaluation
CSMRI Waste Material Disposal
Foothills Landfill
Jefferson County, Colorado

Dear Mr. Stovall:

Harding Lawson Associates (HLA) has completed a Fate, Transport, and Risk Evaluation (Phase 2 Evaluation) associated with the disposal of Colorado School of Mines Research Institute (CSMRI) waste materials at Browning Ferris Industries (BFI) of Colorado, Inc.'s Foothills Landfill in Jefferson County, Colorado. The Phase 2 Evaluation was prepared at BFI's request in response to questions raised by the Jefferson County Department of Health and Environment (JCDHE) at an August 9, 1995, working session regarding disposal of the CSMRI waste at Foothills Landfill. Specifically, JCDHE requested an evaluation of the potential long term risks associated with disposal of the CSMRI wastes in the landfill, (i.e. potential impact to hypothetical groundwater users downgradient of the landfill).

The conclusion reached in the Phase 2 Evaluation is that the potential for release of low-level radionuclides in the CSMRI waste from Foothills Landfill is extremely low. Numerous unrealistic modeling assumptions are required to obtain a scenario that resulted in a release for the landfill. However, even with the extremely conservative assumptions, potential risk to hypothetical groundwater users immediately downgradient of the landfill is less than U.S. Environmental Protection Agency's (EPA's) target range of 1 E-06 to 1 E-04. Thus, there should be no cause for concern regarding long-term impact to hypothetical groundwater users downgradient of the landfill. The attached Phase 2 Evaluation provides a detailed description of the methods and procedures used in reaching this conclusion.

As requested by BFI, HLA, by copy of this letter, is transmitting copies of the Phase 2 Evaluation to JCDHE and other interested parties.

If you have any questions regarding the Phase 2 Evaluation, please contact me.

Sincerely,

HARDING LAWSON ASSOCIATES

Rick Kinshella

Rick Kinshella, P.E.
Principal Engineer

RLK/ss
stoval01.ltr/RMC

Engineering and
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the relatively flat lying strata beneath the site and the nearby upturned bedding found in the hogback ridge. Unconsolidated alluvium overlies bedrock in the vicinity of site. The alluvium beneath the facility is completely excavated during the construction of the landfill. The bedrock unit to which the basegrade of the landfill will be excavated is the Upper Laramie Formation, a cretaceous silty claystone containing numerous pockets of black carbonaceous material and calcite filled vugs. This unit grades into the Lower Laramie Formation at approximately 400 to 600 feet. Given the proposed basegrade of the landfill, the claystone of the Upper Laramie Formation is considered the most probable unit through which potential leachate-derived contaminants would travel.

Site hydrogeology is illustrated in Figure 3. Groundwater flow is generally from north to south, with a zone of discharge near Leyden Gulch. On the western edge of the site, groundwater flows east from the hogback ridge toward to the site and then flows southwest. On the eastern edge of the site, groundwater flows west from hills bordering the eastern edge of the site and then flows south. A gradient of 0.041 ft/ft was calculated directly from the groundwater contour map included in Haley and Aldrich (1993). Because the Haley and Aldrich (1993) report states hydraulic gradients range from 0.05 to 0.2 ft/ft, the calculated value of 0.0415 was doubled to 0.083 as a conservative measure for this modeling effort. A conservatively high value of hydraulic conductivity for the claystone of the upper Laramie is reported by Haley & Aldrich (1993) to be 5 x 10^{-6} centimeters per second (cm/s). This relatively high value as compared with actual formation properties was used for the modeling effort. The average velocity (Darcy velocity) of groundwater beneath the site is very slow, due to the low permeability and small gradient of the groundwater table in the Upper Laramie Formation. The average lateral flow velocity ranges at the site range from 0.014 ft/day to 0.0035 ft/day (Haley and Aldrich, 1993) or from 4.9 x 10^{-6} cm/s to 1.3 x 10^{-6} cm/s. Therefore, the value of 5 x 10^{-6} cm/s is nearly equivalent to the highest groundwater velocities expected at the site.

1.2 Waste Characteristics

The CSMRI soil stockpile consists of a 1- to 2-foot surface cover that overlies the tailings. The cover material, described as a brown to reddish-brown clayey sand, using the Universal Soil Classification

System, contains approximately 3 to 4 percent cobbles and 1 percent debris consisting of plastic, glass, wood, pipes, tubes, concrete block, rebar, bricks, and other miscellaneous items. The tailings, which are generally black in color with yellowish streaks have a physical composition similar to the cover material (i.e., clayey sand) but typically contain less debris. Approximately 35 percent of the CSMRI waste passed a No. 200 sieve and 75 percent passed a No. 4 sieve.

Table 1 lists the maximum, mean, and upper 95 percent confidence limit of the concentrations of each COPC found in the CSMRI waste soil.

APPENDIX A

1.3 Chemicals of Potential Concern

The chemicals of potential concern (COPCs) for this report include the 11 metals and 7 radionuclides selected by U.S. Environmental Protection Agency (EPA) in the report "Final Risk Assessment, CSMRI Site" (E&E, 1993). The COPCs are listed below:

Inorganic Chemicals	Radionuclides
Arsenic	Actinium 227 + D
Barium	Lead 210 + D
Cadmium	Protactinium 231
Chromium	Radium 226 + D
Reactive Cyanide	Thorium 230
Lead	Uranium 235
Manganese	Uranium 238
Mercury	
Nickel	
Silver	
Vanadium	

APPENDIX B

The COPCs were chosen by EPA because of their mobility, concentration, and specific or total activity. The COPCs identified are thought to be best suited to evaluate potential health risks to workers and nearby receptors at the Foothills Landfill should contaminants be released to the environment.