WILLAMETTE GEOLOGICAL

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Philomath, OR 97370
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PETROLEUM EXPLORATION CONSULTING CLAY MINERALOGY SEDIMENTARY PETROLOGY

[redacted]

MORDENITE
TEST - YACOLT MTN.

March 20, 2013

Dear [redacted]

I examined the sample of road dust that you sent me using X-ray diffraction to determine the identification of the minerals that compose the dust. I first sieved the material into 2 different size fractions, separating the dust into a <200 mesh (0.075-mm) sample and a >200 mesh fraction. The sand fraction (>200 mesh) was ground to fine powder using a McCrone micronizing mill and this powder was used for X-ray diffraction analysis. I did not grind the <200 mesh sample prior to X-ray analysis, but probably should have done so, as the pattern showed some effects of crystal orientation from feldspar components. I also broke several chips off the rock specimen you provided and pulverized this material for analysis of the powder.

The X-ray analysis of both dust samples indicates that the road dust is composed of plagioclase feldspar with intermediate composition (this means the plagioclase has both sodium and calcium in its structure), pyroxene (augite), quartz, and very minor amounts of magnetite and a zeolite mineral (mordenite). These minerals occur in both the <200 and >200 mesh samples in nearly similar amounts. Silica is represented by quartz. The other common phases of silica (cristobalite and tridymite) were not present in the sample. Silica is not the dominant mineralogical component of the sediment, as the sample contains a variety of minerals. Plagioclase and pyroxene are aluminosilicate minerals that have not been associated with significant health issues in humans, at least not in the literature related to silicosis from inhalation of quartz, tridymite, or cristobalite forms of silica. Since quartz comprises a relatively small component of the total road dust and generally is concentrated in particles >15 microns in diameter, the silicosis hazards of this road dust are probably not significant, as long as a person is not breathing the material for long periods of time. Certainly, quarry workers involved with stone crushing would want to wear breathing protection to reduce risks associated with dust inhalation. The occurrence of small amounts of mordenite in the native rock sample could be a problem for long term dust inhalation, as mordenite has a pronounced fibrous crystal habit that is similar to asbestos, although it does not have the same chemistry as asbestos. The mordenite is concentrated in the very fine particle sizes, as shown by the sediment analysis I did for [redacted] last month. The clay particle size fraction analysis showed clay minerals and a zeolite phase (mordenite), in addition to minor amounts of plagioclase, quartz, and augite. However, the total abundance of clay-size particles was <1% of the sample by weight, so mordenite abundance would be much less than 0.5% of the sediment I analyzed.

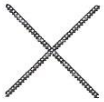
The X-ray patterns of your road dust sample are very similar to the material that I received from [redacted] last month. Both of these samples are plagioclase-rich silty sands with very low clay content. Most of the material in your road dust sample consists of particles larger than 15-microns. In [redacted] sample of bridge sediment, over 95% of the sample was coarser than 15-microns. This is significant for health reasons as the danger of inhaled dust increases as particles become finer than 5-microns. Our lungs can deal with larger particles pretty well,

limit the dust exposure in the surrounding environment. Mordenite does have some toxicology issues because of its fibrous crystal habit. The mining folks may not be aware that this mineral occurs in their product.

If I can be of further assistance, let me know.

Regards,

Dr. J. Reed Glasmann
Willamette Geological Service
31191 Peterson Rd
Philomath, OR 97370



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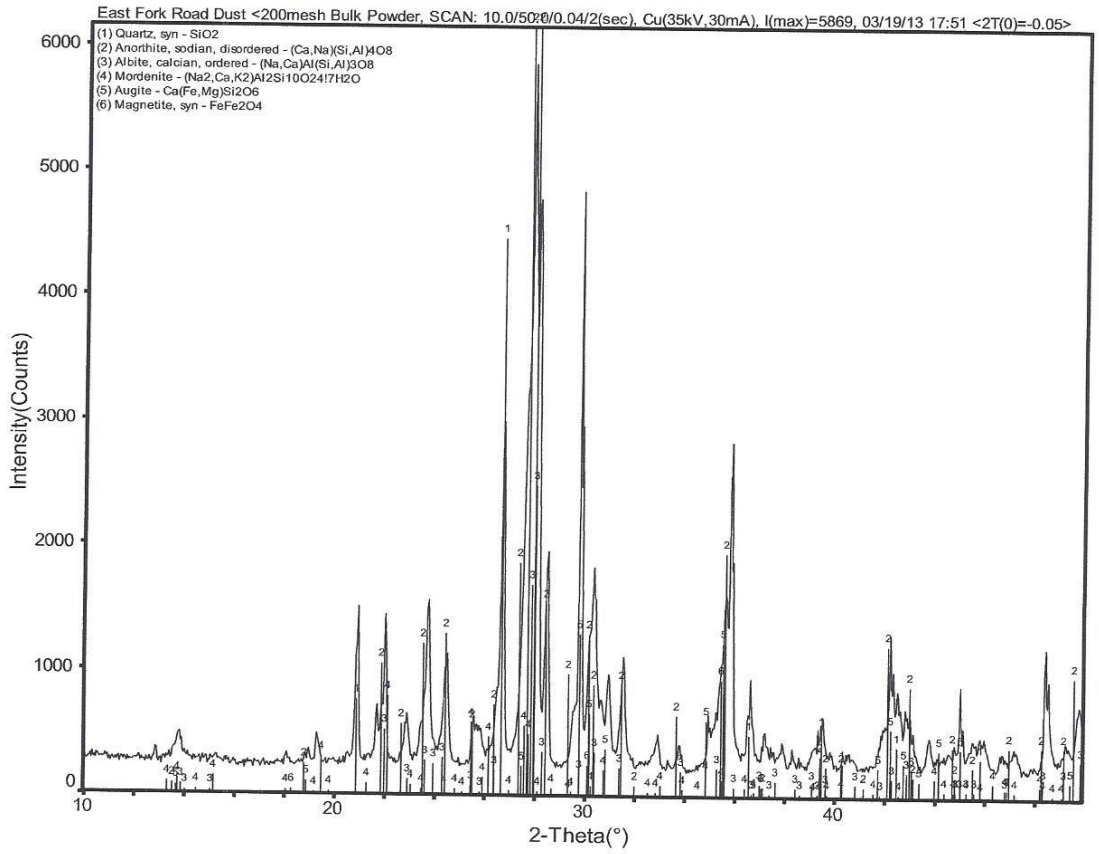

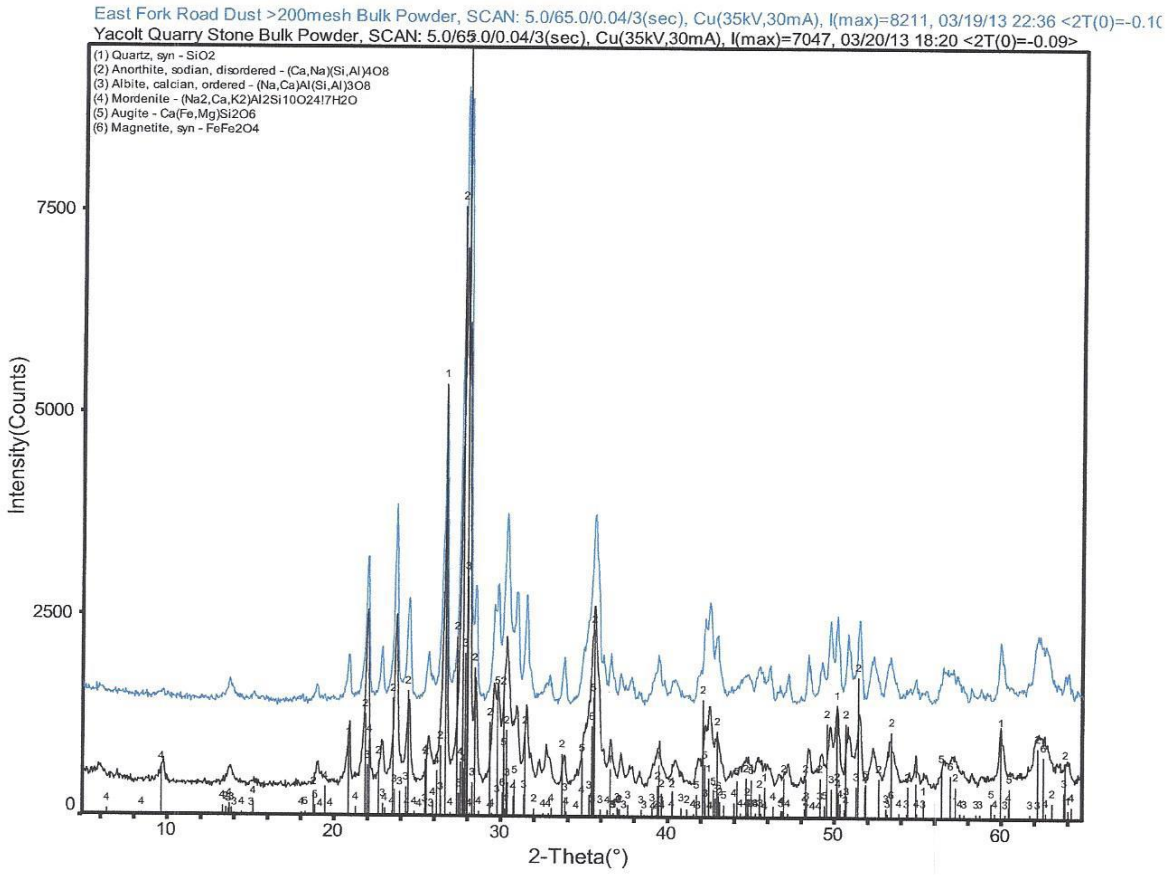
East Fork Road Dust >200mesh Bulk Powder, SCAN: 5.0/65.0/0.04/3(sec), Cu(35kV,30mA), I(max)=8211, 03/19/13 22:36 <2T(0)=-0.1(
Yacolt Quarry Stone Bulk Powder, SCAN: 5.0/65.0/0.04/3(sec), Cu(35kV,30mA), I(max)=7047, 03/20/13 18:20 <2T(0)=-0.09>
(1) Quartz, syn - SiO2
(2) Anorthite, sodian, disordered - (Ca,Na)(Si,Al)4O8
(3) Albite, calcian, ordered - (Na,Ca)Al(Si,Al)3O8
(4) Mordenite - (Na2,Ca,K2)Al2Si10O24!7H2O
(5) Augite - Ca(Fe,Mg)Si2O6
(6) Magnetite, syn - FeFe2O4
Intensity(Counts)
7500
5000
2500
0
10
20
30
40
50
60
2-Theta(°)

[redacted]

Zeolite

1 message

American Cancer Society - Contact Us <undl@emailcenter.cancer.org> Mon, Oct 5, 2015 at 9:53 AM
Reply-To: American Cancer Society - Replies <replies@emailcenter.cancer.org>
To: rogersbertie776@gmail.com

Dear [redacted]

Thank you for contacting your American Cancer Society. My name is Donna, I am an oncology nurse and will be further assisting you by email.

You wonder more about zeolite and mordenite and if they may be dangerous. Zeolites are minerals zeolites are a group of minerals that contain mostly hydrated aluminum and silicon compounds. These minerals are chemically related to asbestos. Exposure to zeolite dust is associated with an increased risk for developing malignant mesothelioma. Zeolites are carcinogenic when inhaled. The International Agency for Research on Cancer lists zeolite as a Group 1 Carcinogen, a categorization used when there is sufficient evidence of carcinogenity in humans.

To learn more, you may find the following website helpful:

http://www.mesothelioma.com/mesothelioma/risk-factors/zeolite.htm#ixzz[illegible]

I hope this information proves helpful. Please contact your American Cancer Society if we can be of additional assistance. Thank you.

Keep in mind as well that your American Cancer Society (ACS) saves lives by helping people stay well and get well, by finding cures, and by fighting back. ACS offers varied programs which include but are not limited to support groups, Relay for Life, Making Strides Against Breast Cancer, and lodging information to name a few resources. If you find this type of information is needed, please know we are happy to help.

Donna
Cancer Information Nurse

New Report Underscores Lung Cancer Risk From Silica

By Elizabeth Mendes
December 10, 2013

A new report, published in *CA: A Cancer Journal for Clinicians*, highlights the link between silica and **lung cancer**. The paper, authored by researchers from the American Cancer Society and Emory University, reviewed recent studies that "provide new information about silica and lung cancer." They note that the findings underscore what more than 100 other studies conducted to date have shown – that there is "strong and consistent evidence that silica exposure increases lung cancer risk."

"It often takes very large and complex studies to demonstrate the link between environmental and occupational exposures and cancer, but it is important that such studies be conducted because they provide information that protects workers and people in general from hazards," says **Elizabeth Ward**, Ph.D., National Vice President of Intramural Research for the American Cancer Society and one of the authors of the report.

Lung cancer is the leading cause of cancer death among both men and women in the United States. Tobacco smoke is the greatest risk factor, but exposure to substances like **radon**, **asbestos**, silica, and **air pollution** also increase the risk of developing this disease.

Silica is a mineral found in materials such as sand, stone, rock, concrete, and brick that is used in numerous industries including construction, mining, and manufacturing. Workers can be exposed to silica in a variety of ways. For example, they might inhale particles when cutting, sawing, or drilling a product that contains silica. About 2.2 million U.S. workers are exposed to silica particles each year, according to the U.S. Occupational Safety and Health Administration (OSHA).

The paper comes as OSHA pushes to further limit workers' exposure to silica. Silica can also cause other health issues for the millions of workers who are or have been exposed to it, most notably silicosis, a disabling lung disease.

OSHA, in August of this year, proposed a new rule that would cut in half the amount of inhalable crystalline silica particles a worker can be exposed to in an 8-hour shift. OSHA estimates that doing so could "save nearly 700 lives and prevent 1,600 new cases of silicosis per year." Ward and her co-author, Kyle Steenland, Ph.D., of the Rollins School of Public Health, suggest in their paper that the new regulation is well-supported by scientific evidence.

Beyond what employers can do to limit workers' exposure to silica, Ward and Steenland suggest in their paper that health providers play an active role in protecting workers from silica illnesses. They recommend that clinicians ask patients about their work history to determine if silica exposure has occurred, and if it has, "implement the early detection of silicosis and lung cancer." Doctors should also encourage patients exposed to silica who also smoke to quit, the researchers say, as smoking and silica exposure together create a greater risk for lung cancer than either factor alone.

FOR RESEARCHERS: **Learn how to apply for a research grant from the American Cancer Society**.

Read more about **American Cancer Society researchers**.

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