TRANSCRIPT OF PROCEEDINGS

IN THE MATTER OF:)
)
Public Meeting on Asbestos)
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MINE SAFETY AND HEALTH ADMINISTRATION
ASBESTOS HEARING PANEL

IN THE MATTER OF:)
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Public Meeting on Asbestos)
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Holiday Inn

1901 Emmet St.

Charlottesville, Virginia

Thursday,

June 20, 2002

The parties met, pursuant to the notice, at 9 a.m.

APPEARANCES:
REBECCA SMITH, DEPUTY DIRECTOR
DAVE LAURISKI, ASSISTANT SECRETARY
DR. CAROL JONES, PROGRAM MANAGER
JIM LYNCH, OFFICE OF STANDARDS
AL DUCHARME, SOLICITOR'S OFFICE
CARLOS MOSLEY, COAL ORGANIZATION
SHARON AINSWORTH, TECHNICAL SUPPORT
DEBRA JANES, OFFICE OF STANDARDS

P R O C E E D I N G S

MS. SMITH: Good morning. My name is Rebecca Smith. I'm the Deputy Director of the Office of Standards, Regulations and Variances for the Mine Safety and Health Administration. On behalf of Dave Lauriski, who is our Assistant Secretary of Labor for Mine Safety and Health, I welcome you this morning to this public meeting.

With me also this morning are several other individuals from Mine Safety and Health. On my immediate left, Dr. Carol Jones, who is our program manager for our metal/non-metal program; Jim Lynch, who is from our Office of Standards in Arlington; Al Ducharme, who is from our Solicitor's Office in Arlington, Virginia. On my right is Carlos Mosley, who is from our Coal Organization; Sharon Ainsworth, who is from our Technical Support Organization; Debra Janes is from our Office of Standards also.

This is the seventh and last of seven public meetings that we have held on this issue. The previous meetings were held in Pittsburgh, Pennsylvania; Spokane, Washington;

Vacaville, California; Canton, New York; Phoenix, Arizona; and Virginia, Minnesota.

The initial announcement of these public meetings was contained in the Advance Notice of Proposed Rulemaking published on March 29th, 2002 in the "Federal Register." A subsequent "Federal Register" notice, published on April 18th, announced that the date of the Charlottesville, Virginia meeting was changed to June the 20th, and a public meeting would also be held in Phoenix, Arizona on June 5th. These two "Federal Register" notices are available to you in the back of the room.

The purpose of these meetings is to obtain information from the public that will help us evaluate the following five issues: (1) whether to lower our asbestos permissible exposure limit; (2) whether we should replace our existing fiber analysis method, referred to as phase contrast microscopy, with a more sensitive method which is known as transmission electron microscopy; (3) whether we should implement safeguards to limit take-home exposure; (4) whether our field

sampling methods are adequate, and how our sampling results are being used; (5) what is the likely benefit and cost impact of any rulemaking action we would take on these five issues.

These five issues were discussed in the March 29th Federal Register document. The scope of the issues we're addressing with this Advanced Notice of Proposed Rulemaking is limited; therefore, this public meeting will be limited to hearing public input on these five issues I just mentioned.

In the Advanced Notice of Proposed Rulemaking we were asked -- we asked questions relating to each of these five issues. We're particularly interested in responsive information related to these questions.

Now, I'd like to give you some background which has led us to be here today. In 1980, we requested that the National Institute for Occupational Safety and Health -- NIOSH -- investigate health problems at vermiculite operations around the country because our sampling data at that

time showed higher than average asbestos exposures among the miners. The results of the NIOSH study were published in 1986, and verified our sampling results that indicated high occupational exposure prior to 1974 at a vermiculite operation in Libby, Montana. The highest exposures were in the mill. The NIOSH report showed that in 1974 the mine began to use a wet process to concentrate vermiculite in the mill, and occupational exposures dropped markedly. The asbestos-exposed miners employed at the vermiculite mine in Libby, however, inadvertently carried the asbestos fibers home on their clothes and in their personal vehicles, thereby continuing to expose themselves and family members. At that time we encouraged the operators to change from dry to wet processing material, and also to reduce take-home contamination by installing showers, and requiring the miners to change clothing before leaving the site.

In November of 1999, a Seattle newspaper published a series of articles about the unusually high incidence rate of

asbestos-related illnesses and fatalities among individuals who had lived in Libby, Montana. Because MSHA had jurisdiction over the mine, the Department of Labor's Office of the Inspector General began an evaluation of MSHA's role at the Libby mine.

The findings and recommendations of the Office of the Inspector General were published in March 2001. Three of the recommendations would require additional rulemaking by MSHA. And those issues are the subject of this public meeting today. The Office of Inspector General recommendations were: (1) that MSHA lower the existing permissible exposure limit to a more protective level; (2) that MSHA use a more sensitive method, transmission electron microscopy, to quantify and identify fibers in our samples, rather than the phase contrast microscopy method currently used; and (3) that MSHA address take-home contamination from asbestos. As you know, our current asbestos standards for coal mining and for metal and non-metal mining is two fibers per cubic centimeters of air. And

these standards have been in place from the mid 1970s. Recently, MSHA adopted new asbestos sampling techniques, and we have increased the scope of sampling for airborne asbestos fibers at mines in an attempt to better determine miners' exposure levels to asbestos. Our efforts have included taking samples at all existing vermiculite, taconite, talc, and other mines to determine whether asbestos is present, and at what levels. Since the spring of 2000, we have taken almost 900 samples at more than 40 operations employing more than 4,000 miners. Our preliminary review and analysis of these samples show very few exposures occurred during the sampling period which were above the OSHA eight-hour time-weighted average of point 1 fiber per cubic centimeter of air. Our sampling results are now available to the public on our web site at www.msha.gov. Also, the sampling results will be made part of the rulemaking record if we move forward with rulemaking.

The issues surrounding asbestos exposure are important to MSHA, and we will

use the information provided to us at these public meetings to help us decide how to best proceed with these five issues. So we want to hear public view. These public meetings will give mine operators, miners and their representatives and other interested parties an opportunity to present their views on these five issues that we are considering for potential rulemaking action.

The format of this public meeting will be as follows: Formal rules of evidence will not apply, and this meeting will be conducted in an informal manner. Those of you who have notified us in advance of your intent to speak, or have signed up today will make your presentations first, unless there is an arrangement to the contrary. After all scheduled speakers have finished, others are free to speak. When the last speaker has finished, then we will conclude this public meeting. If you wish to present any written statements or information today, please clearly identify your material. When you give it to me, I will identify the material for the record by the title as you have

submitted it. You may also submit comments following this meeting, but please submit them by June 27th, which is the close of the comment period. Comments may be submitted to us by electronic mail, fax, or regular mail. But please note that the MSHA headquarters office has moved. The address is different than the "Federal Register" notice you picked up in the back. But in the back of the room there is a document that shows our new address, fax, electronic address, et cetera.

A verbatim transcript of this meeting will be available upon request. If you want a personal copy of this transcript, please make arrangements with the court reporter, or you may view it on our web site. It will be there and available within five days from today.

The procedures have been the same for each of these seven public meetings. We will begin with persons who have requested to speak. To ensure that we get an accurate record when you speak, please give your name, spell your name and the organization.

Our first speaker this morning is

Mr. Stephen Lucas. Good morning, Mr. Lucas.

MR. LUCAS: Good morning. Thank you, Mrs. Smith. Thank you, ladies and gentlemen. My name is Stephen Lucas, S-T-E-P-H-E-N, Lucas, L-U-C-A-S.

I'm a farmer. And I'm a fairly -- almost a neighbor of the Virginia Vermiculite plant in Louisa County not too far east of here. And I come here -- I kind of hoped to give a personal -- a different kind of view from the -- I know it's a lot of agency folks and a lot of commercial folks. And I hope to give a little personal information. I'm also a member of Historic Green Springs, an organization of owners of land adjacent to the mining area. My wife's farm has been -- my wife has farmed the land near the mine since 1959. So it's been awhile.

And when the information came out about Libby -- and, you know, there's volumes of information from the "New York Times," from all these places I'm sure you're aware of -- it scared her to death. Her parents both died -- both her parents and her grandmother all died of lung cancer within about three

years of each other -- not because of vermiculite, but because of smoking. But just the thought of lung cancer and the things that are in those reports scared her to death. And it scares me some, too. And it scares me because of my neighbors and friends who work at the plant, or near the plant -- have worked at or near the plant. Folks come through town in their pickup trucks, dusty clothes. I see them on the street, at soccer games, baseball games, Little League games. We see them. They bring the vermiculite dust with them.

And so, you know, I look -- to address the issues of the five that you listed, I say I want to know where the question is. If we're really trying to save the public from what happened in Libby, if we're really trying to do the right thing, these issues that you bring forth don't seem all that difficult. Lowering asbestos limits, why not? We have the technology to do it. Why is there a question if should do it. The fiber analysis method, shouldn't we be using the best available scientific -- there is the

sound science argument that comes up so much in politics today. What better thing of sound science is there than to use the best available information? I talked about the take home. I talked about some of these other things.

I just want to briefly say that folks, I thank you for coming out here and hearing what we have to say. All I ask for you to do is do the right thing. Help prevent Louisa County and these other places from becoming the next Libby. Like I said, it scares us to death of the potential it could happen. I just want to thank you so much for hearing us, and just ask you to do the right thing. Thank you so much.

MS. SMITH: Thank you, Mr. Lucas. We appreciate your comments.

Do the panel members have any question of Mr. Lucas? Thank you very much for coming.

MR. LUCAS: Thank you very much.

MS. SMITH: Our second speaker is Donald Gazaille. I probably didn't do that right.

MR. GAZAILLE: You came closer than most. My name is Donald Gazaille, G-A-Z-A-I-L-L-E. And I'm from Trevilians, Virginia. And I'm on the immediate side of the Virginia Vermiculite mine directly across the street. And I appreciate the opportunity to present my views on asbestos exposure related to mining operations.

I am particularly concerned about a statement contained in MSHA's March 29, 2002 "Federal Register" notice on page 15137. It says, MSHA's recent field data show that none of the samples collected exceeded OSHA's eight-hour time-weighted average of 0.15 per centimeter of air when analyzed using the TEM method. Considering the low fiber levels observed, what would be an appropriate agency action?

First, I think it is important to acknowledge that MSHA only conducts inspections once or twice per year at a mine.

Secondly, when the inspector is doing inspection work, working conditions are probably not the same as a typical day at the mine. I suspect when the inspector is

present, the mine is in good condition. Therefore, I don't think it's appropriate for MSHA to draw conclusions based on a limited number of unrepresentative samples.

MSHA says none of the samples collected exceeded OSHA's standard. I'm suggesting that these samples are not a good indicator of fiber levels at the mine. MSHA should not draw conclusions from the results of a handful of samples when a mine operates 300 to 600 shifts each year.

If MSHA really wants to know what the typical conditions are at a mine or group of mines, it should target these mines the full scale propaganda for several weeks at a time every couple of months.

We live on the off-site. Contamination is a concern of ours from MSHA, not only from its employees leaving the mine with contaminated areas, but the transportation of materials off the mine, and the loading of the materials -- the raw materials -- at the site. If you were to ever to go up and down Route 22 and across right along our driveway and across from our house is where the trucks

haul this material out of there, and see the gray trees on both sides of the road, and the gray all over the grass, you'll know where the contamination is going.

We're very concerned. It's totally inadequate. It doesn't take a lot of fibers to kill someone. The standard should be extremely high, and make us feel at least a little more comfortable that we can still live in the area. Thank you for your consideration. And we hope you'll keep the immediate public in mind. Thank you.

MS. SMITH: Thank you, Mr. Gazaille. Panel members? Thank you very much for coming.

Our next speaker is John Stamberg. Mr. Stamberg has admitted for the record a document entitled, "Testimony pursuant to Mine Safety and Health Administration on Advance Notice of Proposed Rulemaking for Measuring and Controlling Asbestos Exposure, June 20, 2002."

MR. STAMBERG: My name is John Stamberg. You have the report that I am submitting to the record.

Basically, a little bit about my background: I'm a civil engineer for the University of Maryland with a master's degree from Stamford. I've been in the asbestos business -- in the vermiculite business -- for over 40 years. I've taken courses in asbestos, asbestos abatement management and identification at Drexel, Tufts, Georgia Tech, Medical College of Virginia, Virginia Commonwealth University, and others. My relevant experience is heavily in the commercial retail inspection and abatement of asbestos under EPA and OSHA regulations. I've worked in 35 states, Canada. And I'm also familiar with the vermiculite industry as far as mines, expander operations, soil mixtures, that type of facilities. I've been active in 21 states with respect to vermiculite. I've also examined ores from five different states, evaluated the different vermiculites from them, as well as several different foreign countries.

I'm here on behalf of Virginia Vermiculite, and I've got a number of points I want to make.

The first point -- and I'll be brief -- is the three points that you choose to regulate to lower the permissible exposure level to .1 fiber per cc, the use of TEM versus PCM, and the control of take home are just three elements of what should be a full program similar to EPA and OSHA.

What defines a lot of the elements? Some of the things that are not clear from these: One is you've got to be properly ready to identify what really is asbestos. This isn't a problem when you have commercially-made asbestos products like you encounter in OSHA and EPA. They usually mix good grade commercial asbestos with granular or non-asbestos material. And the assumption that any fiber is asbestos is reasonable in that kind of context -- that kind of mixture -- in natural soils that breaks down. So the level that they're interested in is a much different level than we're talking here. So MSHA should fully address in their regulations specific methodologies geared to mining, earth products, rock products that can clearly identify asbestos-containing

materials. And in their tests they should have procedures and nomenclatures that clearly identify what the tests mean -- not just 3:1 and then assume it's asbestos, as you do with commericial products that only have tar and asbestos, or vinyl asbestos, or ingredients that are clearly identified in concentrations that are easy to identify.

Air sampling, it's the same issue there where in the air testing the assumption is that these particles in commericial building products are asbestos. Reasonable for that industry; not reasonable for this. So that assumption that the air test anything 3:1 is asbestos is not correct. I'll go into that a little bit later.

Then the other thing, the program should have some focus or targeting of where you should do the analysis. OSHA has procedures for negative exposures, use of objective data in other ways to aid or help target the extent, type and place for air monitoring; in other words, in places where there is no asbestos, you don't have to do elaborate monitoring.

So this is what I suggest for an overall program.

Going to the second point: One is that Virginia Vermiculite has been under the scrutiny and under the concern of asbestos since 1976 before they were mining in the public hearings and zoning. This has continually been a source of discussion. And it really stems from the Libby situation. And right now I'd like to just take a few minutes to do a one-on-one on geology.

EPA Region 10 with their studies from the Montana Bureau of Mines and Geology classified vermiculite. And vermiculite is not a single thing; it's a group of things with different origins, different chemistries. They classify vermiculite by three types. Type one is the type in Libby. Type two is often found in North Carolina and some other places. And the Louisa deposit is one of the ones that is type three.

If you look at my Figure 1, I've got the EPA report references, as well as the source rocks, the rock that mixed with it to form a primary sheet silicate that weathers

under moisture and then becomes either vermiculite, hydrobiotite or hydrophologopite. These are different subvarieties of vermiculite with different origins, different chemistries.

Then not only is the origin of the rock, chemical makeup, and the way it was metamorphized or altered are different, the temperature and pressure of formation makes a difference. My Figure 2 addresses that. These changed silicates, depending on the temperature and pressure can be diopside, quartz, or one of the many varieties of crystalline tremolite. Crystalline formation can be any of a number of things. It can be anywhere from massive, isolith or fibers tremolite. So there's a number of things. Also, the same deposit you can get quartz, diopside and these type of minerals. And it depends on the temperature and pressure.

What exists at Virginia Vermiculite is recently they've got into a situation not with the main deposit, but where the two rocks were twisting, turning and folding on each other. They have slip sheets. In those

slip sheets, which are about a 16th of an inch to maybe a little bit over an inch, the temperature and pressure in that slip sheet has created veinlets that have every one of these chemistries in there. There are some small areas where there is true asbestos, as well as bysolite, massive tremolites and quartz. And this stuff you can get right off the edge of it, and that veinlet doesn't exist. You get in the veinlet, and the chemistry can vary by the foot. It just depends on the local temperature and formation.

So what Virginia Vermiculite has done is tested -- what they do is there's the MSHA's bulletin P00-3 where it says how to isolate and not over mine this stuff. Virginia Vermiculite follows that. Then the material that they take and mine and send to the process, and their final product they test -- the United Kingdom has banned asbestos. They have developed a test that's 100 to 1,000 times more accurate than the U.S. tests for bulk material because of their ban. This material -- we send these

materials that are mined and sent to the process plant as well as the product on a routine basis to this more accurate test, which is good to about 10 parts per million. We have those results in Appendix 1. And we have been doing that ever since the third quarter of 2000 to make sure we get the accurate, most up-to-date test on that.

So what we find is that the test for country that has banned asbestos finds no detectable asbestos. And those are attached in there, and support a lot of the other tests that have been done.

In doing this program, Virginia Vermiculite has done several things. One is OSHA has a concept called a competent person that is trained to identify, locate and understand asbestos. They brought an international expert in, in both vermiculite an asbestos, and trained the miners, engineers, supervisors to identify this or anything that is suspect to that. So they developed competent people. These competent people then flagged the material. And it's either not mined or isolated per P00-3, the

MSHA criteria.

Recently, the MSHA people came in and inspected. They took three samples of this flag isolated material. And one of the three samples tested positive for asbestos, two were not. So it's an indication that people at VVL who are competent or were trained this way are well trained and err to the cautious side.

Okay. Another thing that Virginia Vermiculite has adopted from OSHA is the negative exposure assessment. So when they were doing the mining and isolating of the veinlets that were suspect material, they had an EPA OSHA licensed certified testing firm come in and see if there was any exposure over the .1 during the movement of that material. There was not.

Then, also during that procedure, the same consultant measured upwind, downwind and across the property to see if anything was going across property lines. And they found nothing but background levels of dirt and material.

The EPA came down and tested seven

homes for asbestos; in other words, the consultants was a snapshot during an activity that had concern. And EPA going to the homes and collecting dust in and around the homes is more a result of long-term accumulations. They found no asbestos in those seven homes that they tested.

VVL has also done a couple of things that are not required of it, even if they were under OSHA. They sent all their employees -- except one refused -- to the University of Virginia Division of Pulmonary and Critical Care Medicine for the OSHA-style respiratory x-ray series of medicals. And the conclusion was that there were no Virginia Vermiculite-related occupational issues. The whole details of the medical exam and other details are not privy to us, but we do get this -- or, you know, Virginia Vermiculite did get the letter that there was no occupational-related health effects.

They've also purchased a HEPA vacuum cleaning system that can vacuum the clothes. And that's a high efficiency particulate air systems that filters out 99.9 plus percent of

asbestos fibers used in the asbestos abatement industry. They have this to be available for cleaning clothes if the people want to do that. They find it's also useful for cleaning up the labs and some dusty areas around the office. It's just a cleaning tool.

So they have those things whether they need it or not. They've gone ahead and pursued those.

Next, I'd like to take a couple of minutes to talk about the bulk testing. I've touched on that. The accuracy of the U.S. test 600/R-93/116 is 1 percent. It's accurate, and it can detect things down to .1 percent. This is 10,000 parts per million, or 1,000 parts per million is its stated accuracy for ability to notice. The U.K. system, which is MDHS77, is accurate to .001 percent, or 10 parts per million. And that's the test that's in Appendix 1 that they have been doing.

Air tests: The PLM test is schizophrenic. Or PCM test is very different in results, because under the OSHA procedure

you can do differential counting. So if you see a spider's leg, an obvious fiberglass particle, vegetable particle, the microscopist at its discretion or its lab procedures can eliminate those from the count. This procedure is really inaccurate when you have soil and rock particles that -- many of which are 3:1 in the visible range, and are not asbestos.

So this differential counting of 3:1 and reporting it asbestos may be good for OSHA when you're abating fireproofing in a building when that's the only particle of that size, shape or configuration. That definition includes many, many different types and chemistries of particles. So that's using PCM as a screening tool.

And going to something more accurate, TEM can eliminate some of the particles because it has higher resolution. You can see cleavage fragments, arrowheads, non-parallel things, platelets that are on their side, and the whole variety of things. In using private labs using just TEM, VVL has found that 93 -- or 83 to 95 percent of the

particles are eliminated. So that 83 to 95 percent of the particles just with TEM can be eliminated. Some of the MSHA count sheets that we see eliminate only 30 to 70 percent. Again, this is the accuracy difference, or inaccuracy problems with differential counting.

NIOSH 7402, which is the TEM procedure that's most appropriate, states that the presence of substance may warrant the use of more powerful diffraction pattern, morphology analysis before positive identification could be made. So even with TEM you've still got to go to other techniques to identify it because these particles can have the same chemistry.

To illustrate the mistakes that could be made in this area, Dr. Chatfield of Ontario Research reviewed the samples and tests done by EPA in their garden products containing vermiculite material. He found that all but Libby were free from asbestos. They had identified diopside, hornblende, and clearly non-asbestos forming minerals as asbestos incorrectly. They also, in that

counting procedure, ignored EPA's definition of asbestos fibers. And 99.9 percent of the fibers fell outside the clear EPA definition without more powerful diffraction or morphology kind of identifications.

So there's tons of mistakes that could be made. And one of the things MSHA should consider is narrowing the size range that really fit asbestos in its definition of fibers so these cleavage fragments, blades, Acular arrowhead type of material is eliminated. And it should develop nomenclature that clearly identifies what the test means, what does it represent. So any time you see soils with a 3:1 aspect ratio, it doesn't automatically get reported as asbestos. So they need a lot of improvement in that. In OSHA EPA, they didn't need that.

Okay. So I'll go off of that point to another point about take-home asbestos. Again, my familiarity with OSHA, they have an elaborate protective clothing clause, 29 CFR 1926.1101(i). It's in the report. When there is a PEL or excursion exceedence, then

you fall under that, or if you do work of a certain nature, their definition of asbestos over 25 feet or 10 square feet for which you haven't done this negative exposure assessment, then they've got elaborate procedures on launderer notification, transport labeling inspection, and many procedures in that. It's a good law. It's a good regulation. And MSHA should consider that as a pattern that evolved over the years.

Going to another point on TEM versus PCM, the 900 data points when we went to the web site, only 178 of the 900 were reported. Of that, only 24 were side-by-side phase contrast versus TEM. Of that, 0 of the 24 side-by-side tests showed TEMs that were -- none of them were higher than the PCM. So the PCM seems to be picking up everything that has been presented. None of them -- there was no TEM, whether there was violations or not, were higher. So by circumstantial evidence, even though it's very thin, there was no indication that TEM's additional magnification is necessary.

In my chart -- or Figure Number 4, there's an understanding why. The chrysotile fibrils are suboptical, okay? But the fibers are not because it's like a frayed rope or a bundle of glass rods. To disseminate all these fibers into individual fibrils is very exacting, very difficult, and almost never done. So the optical microscope, particularly the amphiboles, can pick up and see the problem. And so that was the case. I mean, even at Libby the PCM test was exacting for that.

So my comments are that the scientific or circumstantial evidence to switch from PCM to TEM is not there.

Also, MSHA -- and I've got the exact quote in Figure 5 -- the long-term historical epidemiology as a disease correlation has not been with the small fibers. Potts, Stanton, Lippman and those people indicate that the particles have to be at least as a wavelength of light to be health-oriented. So you would have to establish that these smaller particles, submicroscopic -- or sub wavelength in diameter -- are a health

disease, which that has not been established. And again, the only fibers that are going to fall basically in that range is ultra-fine amphiboles and the individual chrysotile fibrils, which is extremely rare in situations.

So again, PCM may be a screening tool or a primary thing, and then you go to differential counting. TEM is maybe just one of the things that can be used. And there could be many others.

With respect to health -- that's my point six -- there is several things I want to mention on that. There is a fairly recent document put out by the Department of Health and Human Services, "Toxicology Profile for Asbestos Update." And that was in September 2001. They use a different concept than the EPA OSHA linear model where the -- they go directly proportionate to that.

The concepts here are no observable adverse effect levels, less serious lowest observable adverse health effects -- which means significant dysfunction. Asbestosis would be an example of that. Then it got

serious lowest observable adverse health levels -- and those are the ones that attack our biological system, cancer and things like that.

So with those concepts, if you go to Figure 6, I've taken the highest and lowest value presented in that report, as well as the median and the average. For the less serious impact -- you know, significant dysfunction -- at the .1 it would be 586 years to 380 years at the .1 exposure level before you would get the less serious impact. And then for the serious impact at the .1 you would be in the 700 to 1,800 years.

So even though the .1 seems to be achievable, it may not be based in health, in which case the rationale for the .1 is achievability as opposed to health. So I think this study is something very worthwhile to look at. And these are respiratory illnesses.

As far as gastrointestinal, they couldn't find animal studies to support that. And Gamal and some of these other people have not found the connection to gastrointestinal

or proved that. In fact, McDonald, in his Exhibit 410.6 of the OSHA regulations discussion, found that there was no excess number of deaths from cancers of non-respiratory sites at Libby. So if Libby is one of the things that is creating anxiety, the gastrointestinal side is not there.

Then point seven: The reporting accuracy of description testing procedures, methods and what they mean, MSHA needs a lot of improvement in that so things aren't taken out of context.

And then the report you have. If there's any questions, I'd be glad to respond to them.

MS. AINSWORTH: Yeah, I have one question, if you could clarify. Initially, I thought you were saying that you thought PCM wasn't the best analysis method because differential kinds by different laboratories produced different results. Then you said the TEM was good, but you needed an additional besides TEM diffraction work.

MR. STAMBERG: Yeah. Normally what's

done in EPA and OSHA is you do the total 3:1 count.

MS. AINSWORTH: Right.

MR. STAMBERG: If you assume that it's all asbestos and you're fine, within standards or clearance standards -- or standards set by the hospital, school or whatever -- then even with that assumption they don't do further analysis. Oftentimes, their first way of differential counting is to go to TEM, which still does not differentiate true asbestos from other similar amphiboles with different crystalline structures.

In the asbestos industry where you're dealing with pure asbestos in products, you really have to go beyond that. In mining, you have a plethora of products and chemicals and material that's in that 3:1 range that you have to go to additional techniques by infringement, extinction kind of things, morphology, Addison in his things has morphology characteristics of asbestos. He's got five of those. If you meet three of those, you can assume it's asbestos. So

those type of things are rarely used in EPA, HERA, or OSHA work because of the nature of the business.

Those type of differential countings with probably very necessary in mining and mining products -- rock, horn, and that type of thing -- to truly get at the true asbestos fibers.

MS. AINSWORTH: So you're suggesting that, and not TEM?

MR. STAMBERG: But with PCM as a primary tool. If need be, start differential counting by TEM, more exacting methods by fringement -- you know, additional optical, chemical, x-ray diffraction techniques to narrow down the particles to see whether they're true asbestos or not.

True asbestos almost never occurs in single individual fibers. It's created in bundles. And when you have it, you have the bundles, and you may have some chafe or things that crack off the bundles, but you have the bundles which are usually large enough to look at. The difficulty is when you get to particles below the diameter of

the wavelength of light, some of the light optical conditions when you can't identify some of these submicron particles with some of the light optical techniques. So you have to go look at the bundles or masses to see what those might be.

MS. AINSWORTH: Didn't you make a statement that you said the additional magnification of TEM was not necessary?

MR. STAMBERG: No. That's helpful because you can see non-parallel fibers, and you can see the morphology of the particles that are smaller than a wavelength of light -- generally two microns or finer. You can see a more definite image and decide whether it's a cleavage fragment or not. So TEM can be one of the mechanisms to differential count from a PCM test.

DR. JONES: Good morning. I just want to clarify one thing you said. When you use the TEM and see the things -- the fibers of a much lower diameter, was it your evaluation of the literature you found there was no information saying they had elevated hazard from those?

MR. STAMBERG: The studies by Potts, some of the information in the Lippman studies, show that the submicron particles are not the ones that are associated with health risks. I referred back in my file stuff that I can provide for you and show that the Potts demographic and particle size versus health risk.

DR. JONES: Were you also saying -- this is just for clarity -- when you have the fiber bundles, the things you see by PCM, does it require milling or some major action on those to generate the fibers?

MR. STAMBERG: No. Once you are -- once the bundles are in the optical range, the polarized slides, the curvature and other morphological visible signs are there so that the bundle can be fairly readily identified.

DR. JONES: But does that break up --

MR. STAMBERG: What?

DR. JONES: Do the bundles break into fibers readily when you view that?

MR. STAMBERG: No. No, they don't.

MS. SMITH: Mr. Stamberg, can you elaborate somewhat on -- you mentioned the

HEPA vacuum cleaner you use. Could you elaborate on that in terms of how it's used, the section of that to be used by miners, and the costs associated with that system?

MR. STAMBERG: Yes. The high efficiency particulate air systems come in a number of configurations. When they're doing asbestos abatement in a school, commericial, or even a home situation, it's a three-stage filter, each one getting finer and finer that will take out virtually all the asbestos-size fibers. So when they do negative air abatement -- say they seal this room -- they put it on negative air, which means they suck the air out so there is leakage in, not out. Standard technique. Then they use these filters. Then these filters also come as vacuum cleaners -- large vacuum cleaners or systems where they use that same thing, where the exhaust is virtually clean. And then you can use that to clean the clothes, clean the laboratory, and that type of thing, and then dispose of the filters as required.

In the asbestos industry for miner work, a lot of the companies have these HEPA

vacuum cleaners for cleaning not only whatever spilled, but they clean their clothes with that. So those systems are available. Virginia Vermiculite has one of those, even though they haven't detected asbestos in their ore or their product.

MS. JANES: Good morning. I was just wondering, could you submit your various references to the record as -- like Mr. Lippman's study, the Potts study?

MR. STAMBERG: Yes. I'll xerox those and send them by tomorrow, or by Monday.

MS. JANES: You're very close to our new location.

MS. SMITH: We have a question from another MSHA member who is sitting in the audience.

MSHA MEMBER: Yeah. Mr. Stamberg, could you clarify for me also along the same lines as Sharon Ainsworth, that 3:1 ratio, did you say it was not appropriate in the OSHA differential method? Since OSHA uses a differential method as part of --

MR. STAMBERG: No. The OSHA EPA method starts with 3:1 on PCM. Then you start

differential counting and say, What is this chunk, okay? And then there's a whole series of things which are in my Figure 5 of how you start sorting that out. A cellulose or vegetable fiber looks like a swirled piece of grass, and usually is easily identifiable. Cellulose fibers, insect material, fiberglass is very translucent under the green light. It can be eliminated.

Every microscopist and their expertise vary. When you're paying $6 for these tests you haven't got the Addisons, the Chatfields and the Krons doing this.

In England where they have banned asbestos, they have had to develop a method and microscopists with the skills that are consistent and detailed enough to do that differential counting at a higher and more sophisticated level.

MSHA MEMBER: Okay. And on the comment you made about the results being on the web site, 178 of those shift-weighted average results represent probably four or five samples taken in consecutive series that led up to that shift-weighted average compliance

of --

MR. STAMBERG: Okay. So you didn't do 900 shift-weighted averages. You did 178 shift-weighted averages which may comprise 258 separate subtests.

MSHA MEMBER: Right.

MR. STAMBERG: Oh, okay. So that wasn't apparent from --

MSHA MEMBER: We did do a lot more than 178, but a lot of those were excluded for quality control purposes. We betted a lot of those samples out because of some concern because they are compliant sample results.

MR. STAMBERG: Yes.

MSHA MEMBER: So they got a lot of scrutiny.

MR. STAMBERG: Mining, because it has a lot of other material other than just the asbestos, can be blinded, or the samples get fogged up and you get a lot of, say, particulate debris from diesel engines and stuff like that. So that's part of the concerns that you need to have good, detailed procedures that reflect mining and mining operations.

MS. SMITH: Thank you, Mr. Stamberg. We appreciate you coming.

Our next speaker is Robert Glenn.

MR. GLENN: Thank you very much, Ms. Smith. I'm Robert Glenn. I'm president of the Industrial Minerals Association of North America. For the record, Glenn is G-L-E-N-N. My training is the field of industrial hygiene. With me today is Mr. John Kelse, K-E-L-S-E. John is the Director of Risk Management for the R.T.T Vanderbilt Company, and a member of our Safety and Health Committee.

The Industrial Minerals Association of North America -- and I'll shorten it to IMANA -- appreciates this opportunity to appear at this public meeting to provide comments to MSHA on measuring and controlling asbestos in the mining industry. IMANA is a recently-established trade association serving the interest of six industrial minerals; ball clay, feldspar, industrial sand, mica, soda ash and talc. Thirty-seven founding producer member companies are presently members of IMANA operating more

than 200 mining facilities, and employing another 5,000 workers. Although no IMANA company is engaged in the production or distribution of asbestos or asbestos-containing products, IMANA recognizes the critical importance of sound policy and science in regard to the development and application of any standard involving asbestos.

Our comments today draw from the experience of our member companies. We will be brief in our comments today, and confine our remarks to some of the questions asked by the agency in its announced notice of proposed rulemaking. We will submit more comprehensive written comments and materials to the rulemaking record.

Regarding the asbestos permissible exposure limit, IMANA believes MSHA should lower its eight-hour time-weighted average permissible exposure limit for asbestos to 0.1 fibers per cubic centimeter, and its short-term exposure limit to 1.0 fibers per cubic centimeter over a sampling period of 30 minutes. This, of course, would be

consistent with the OSHA standard.

The 1994 revised OSHA asbestos standard noted that reducing the exposure limit to 0.1 fibers per cc would further reduce but not eliminate significant risk of asbestos-related disease. The excess lifetime cancer risk at that level was estimated to be 3.4 deaths per thousand workers exposed for a working lifetime. With the exception of the one asbestos mine surveyed by MSHA, MSHA's recent field sampling data showed that none of the samples collected exceeded OSHA's eight-hour time-weighted average of 0.1 fibers per cc when analyzed by transmission electron microscopy.

While preliminary, these results indicate that exposure to asbestos in mining are low, and that the cancer risk in miners should be less than the OSHA risk estimates, since cumulative working lifetime fiber per cc years in non-asbestos mining will be lower than the cumulative exposures in the OSHA risk estimate.

We wish to make it very clear that we

make this recommendation to adopt the OSHA PEL because of the need to be prudent in the face of uncertainty in the interest of regulatory consistency, not because of any agreement on our part with the risk estimate adopted by OSHA.

A voluminous body of scientific evidence establishes that asbestos exposure increases the risk for asbestosis, for lung cancer, and for mesothelioma. And while asbestos is perhaps the most studied occupational agent, there remains a great deal of uncertainty and controversy regarding its effect and acceptable levels of exposure.

While in our opinion it is not in the interest of any of the affected parties involved in this rulemaking to debate the adequacy of the OSHA asbestos PEL, MSHA should be aware and should keep in mind that uncertainties and controversies do exist. Some of the complexities in designing exposure response relationships and risk for asbestos-related disease include uncertainties and exposure estimates in studied workers both quantitatively and

qualitatively, extrapolation to low levels from epidemiological data with high levels of exposure, variability among estimates of risk from various studies, inconsistent or inappropriate adjustment for the possible confounding effects of cigarette smoking, possibility of differences in potency among different types of asbestos, and inadequate description and definitions of asbestos exposure in terms of asbestos mineral type, and characteristics of fibers that may lead to both the inclusion and exclusion of inappropriate fibers leading to aerogenic exposure method.

Regarding the analytical method, the IMANA believes that phase contrast microscopy should be continued to be used as a screening tool at the lower PEL of 0.1 fiber per cc, but only if fiber characteristics more specific to asbestos are applied, such as screening approaches that ensure actual or probable asbestos fiber exposures observable by light microscopy are recognized and then confirmed by more discriminating analytical methodology such as electron microscopy. We

believe this can be done, and that it will control the unnecessary expenditure of time and money for the TEM work.

In the ANPR, MSHA asked for comments regarding the advantage and disadvantage of exclusive use of TEM over the agency's current use of phase contrast microscopy as a screening tool for samples that may contain asbestos. Of course, the major difference of the two methods is the magnification or resolution limits associated with each method. TEM commonly uses magnification of 20,000 times for asbestos fibers, while PCM methods use 400 to 450 times magnification. Based on magnification alone, it would seem TEM is the preferable method; however, the agency seems to be aware of limitations and problems surrounding the sole use of TEM for identification and of PEL compliance determination for asbestos by the questions posed affected parties in your "Federal Register" announcement.

A specific question for MSHA -- from MSHA -- asks for information on the availability and costs for commericial TEM

analytical services. We have not attempted to survey commericial laboratories regarding capabilities for TEM services, but we are certain that we would find that there are far more laboratories equipped with light microscopes able to analyze fibers of 450 magnification using phase contrast elimination than there are laboratories with TEM scopes capable of asbestos identification at 20,000 times. Likewise, it stands to reason that there would be many more trained analysts at commericial laboratories capable of asbestos quantification using PCM than there are electron microscopists at commercial labs providing analytical asbestos services.

As for the cost of these analytical services, there are no doubt persons who can provide more precise information, but for illustrative purposes we have made some cost projections using the MSHA asbestos sampling data set as an example.

In the asbestos PEL section of the ANPR, MSHA noted that recent field sampling data showed none of the samples collected

exceeded OSHA's eight-hour time-weighted average of 0.15 fiber per cc when analyzed using the TEM method. Assuming that the personal asbestos fiber compliance air sampling results -- those that are posted on your web site -- is a basis for this statement, we would make some cost estimates of various strategies for analyzing asbestos by TEM and PCM. And I must say I did not understand all of the complexities in that data until the remark that was made previously by one of the MSHA staff that these numbers would even differ from what I would present.

The example we present includes 12 samples in the data set from the one asbestos mine, but we understand -- and our example assumes -- that analysis by TEM ranges between $150 to $250 per sample, while analysis by PCM for asbestos will range from $12 to $15 per sample. Assuming these analytical costs are in the ballpark, if TEM were required for all asbestos samples, analysis of the 273 samples in our count in the MSHA database by TEM would have cost on

the low end $40,950, and on the high end $68,250.

Suppose MSHA were to use a strategy of PCM for screening samples and establish an action level of one half the OSHA PEL of 0.05 fibers per cc, and use TEM to confirm the identification of asbestos on samples exceeding the action level. If our understanding of the MSHA data is correct -- and again, I think it is quite correct -- 44 samples would have exceeded that action limit, and would have been subjected to TEM analysis. Using the current fiber definition for PCM counting, the cost of PCM analysis for all of the 273 samples and confirmatory TEM for the 44 samples would have ranged from $9,876 to $15,095. Going one step further, if the screening level was set at the OSHA PEL of 0.1 fiber per cc, 12 samples would have been subjected to TEM, and the cost range would have been $5,286 to $8,345.

The end result of these scenarios using the MSHA database would have been that no overexposures to asbestos at the OSHA standard would have been detected in mines

not engaged in asbestos mining, and miners would not be subjected to unacceptable risk. So if TEM had been used to analyze all of the samples, the cost of doing so would have been wasted. Using PCM as a screen reduced unnecessary cost with no negative impact on risk detection, PCM analysis could be made an even more reliable screening tool by adopting fiber counting criteria more specific to asbestos, resulting in further unnecessary cost containment.

Be assured that in a for-profit business a greater than ten-fold cost difference of $5,286 on the low end of our example and $68,250 on the high end for any service -- whether it's analytical laboratory or other -- without receiving added value or benefit is not viewed as a sound business expense. Perhaps for any later rule to be proposed by MSHA you will have time to independently survey accredited asbestos laboratories to determine the capability of commericial laboratories for analytical services, and to provide cost projections that will be placed on the industry to comply

with the various sampling schemes.

This idea or concept of a phase contrast microscopy screening, especially if it's involves asbestos specific fiber counting criteria, is so important we do want to make a little more comment on that. And for that I would ask John Kelse to continue with the remarks on the subject.

MR. KELSE: I thank you, Bob. I guess I'll continue by saying that we realize there is concern that asbestos fibers below the resolution limit of a light microscope are not counted under PCM; and, when present, constitute a false negative PCM finding. And there is understandable concern, then, that an undetected health risk exists. And this, in turn, might argue for TEM analysis for every sample -- financial impact aside.

In addressing this concern, we found that MSHA's own 285 mine samples -- and again, it's I guess in the PDF file -- results provided, as Bob indicated, a valuable insight regarding the practicality of PCM screening from a risk perspective. We noted, for example, that the PCM total fiber

counts significantly outnumbered the corresponding TEM counts for actual asbestos in the MSHA database.

Comparison was available for 50 samples, I believe, for mines not engaged in the mining of asbestos. TEM asbestos counts turned out to be approximately 5 to 20 times lower than the PCM count. Even in the two asbestos mine samples analyzed by both PCM and TEM, the TEM asbestos fiber count was one-half that of the PCM count.

We believe this difference demonstrates the significant role non-asbestos elongated particulate false positive PCM results, if you will, play in the mining environment because none of the non-asbestos mine TEM data shows an asbestos concentration in excess of the proposed PEL of 0.1 fibers per cc. Most were not even close. Concern that actual asbestos not observed by PCM may be at risk of significance isn't supported by the agency's own data.

We think this, in turn, lends support for PCM as an adequately sensitive approach -- especially in the mining

environment -- one that could be made even more useful, as Bob mentioned, with the adoption of more asbestos-specific fiber counting criteria.

We believe in non-mining environments where processed asbestos-containing materials are more often encountered, asbestos fiber counts, as MSHA I believe has pointed out, have been shown to be much higher than PCM counts with the same exposure, or the same filter; the exact inverse of what you see in the MSHA mine data. In fact, in the mining environment, it might be argued that the greatest risk of PCM use is false positives. The counting of elongated particulate that is not asbestos.

It would be interesting to know how much difference the mining PCM counts would have been from the TEM counts had more discriminating fiber counting criteria been applied in the PCM counts. If you still have those filters, in fact, I suspect MSHA could do that comparison. It would be our guess that the difference between the PCM count and the TEM count would have been much less. And

if we're right, the need for TEM work would have been avoided altogether in this sampling effort. And the time and money involved could have been saved or directed to more important safety and health problems.

We believe far more could be gained in the mining environment by a more effective PCM screening approach than it could from exclusive use of TEM, since it does not appear a reasonable PCM screening approach would jeopardize the health of miners.

Given today's improved understanding of what asbestos is, we believe MSHA should be able to design a more discriminating, more asbestos-specific PCM fiber counting procedure for screening purposes with electron microscopy used to confirm that suspect PCM fibers are a regulated asbestos mineral. Asbestos fiber characteristics that can be observed under PCM will be discussed more fully in our written submission.

Further, in regard to the proper asbestos identification, we feel very strongly that MSHA should use this rulemaking opportunity to provide specific guidance to

the regulated community on the difference between asbestiform and non-asbestiform varieties of minerals. Doing this would reduce confusion and support an improved PCM screening approach. This clarity is particularly important in the mining environment because there is an even greater potential than in general industry to mistakenly include cleavage fragments in the counting of asbestos fibers, as I believe the PCM/TEM comparison I just discussed shows.

The characteristics of what constitutes and distinguishes asbestiform and non-asbestiform minerals was the topic of an OSHA asbestos hearing in 1990 with a final rule promulgated in 1992. MSHA is encouraged to review the testimony and docket submissions to this rule, and provide guidance to the regulated community and analysts on the characteristics that distinguish asbestiform from non-asbestiform varieties of the serpentine and amphibole mineral groups.

A consensus definition from the 1990 rulemaking supported by 16 mineral

scientists, many of whom have published extensively in this area -- and put forward by the American Mining Congress, now the National Mining Association; and the National Stone Association, that's now the National Stone, Sand and Gravel Association -- defined asbestos and ascribed characteristics of asbestos fibers. We feel that MSHA should adopt this consensus definition as a means further reducing ambiguity in this area. I should note that this consensus definition does not contradict the agency's current definition, but does build upon it. This additional clarity can only improve analytical specificity. A copy of this definition will be provided in our written submission.

In regard to what is regulated as asbestos, we would like to simply say at this time that asbestos aside, any material -- chemical or mineral, fibers or non-fibers, acicular or elongated, asbestiform or non-asbestiform -- should be regulated only on the basis of demonstrated risk, and always, always called by its proper name.

In the Advanced Notice of Proposed Rulemaking, MSHA also asked if PEL compliance should be measured using TEM, and if disease end points in epidemiology studies of asbestos have been related to TEM measurements. We believe the simple answer to both questions is no. We're not aware of any reported TEM asbestos fiber concentrations that have been adequately correlated to disease end points of asbestos exposure or to risk. In contrast, PCM asbestos fiber counts have been related to asbestos-related disease, and do form the basis for exposure limit decisions. Moreover, we are not aware of any reliable correlation or correction factor that can be applied within TEM asbestos fiber counts to PCM fiber counts. TEM to PCM asbestos fiber counting correlation schemes have been proposed, but the uncertainties and limitations of these schemes are well recognized. Some of those will be discussed in the submissions that we'll make later.

Variables such as the mode of fiber generation impacting size and number of fiber

bundles, and asbestos mineral type -- some present in shorter, thicker fibers than others -- must be taken into consideration. In summary, TEM asbestos fiber counts should not be compared to PELs that were developed using PCM fiber counts, since they do not relate occupational exposures to disease outcomes.

For the above reasons, it will still be necessary to conduct PCM analysis of all samples used for the determination of PEL compliance. Further, we are not aware of any adverse human exposure to any asbestos material in which the airborne exposure could not readily be observed by light microscopy.

Switching gears in regard to questions MSHA has asked about take-home contamination, we simply have at this stage a simple comment that we believe that when asbestos take-home exposure exists in a mine from any source, MSHA should require appropriate control measures. The Industrial Mineral Association plans to comment further in this area after MSHA has more fully defined what controls are desirable, and how implementation in this

area is envisioned.

In regard to asbestos sampling, we believe the most used, established asbestos monitoring protocols -- such as NIOSH 7400 -- in terms of filter media, flow rates, and sampling strategies should not be changed. We believe MSHA's emphasis on full-shift personal sampling is appropriate for PEL comparison purposes, as well.

IMA North America is obviously most concerned with consistency and proper asbestos identification. Changes in sampling variables such as collection flow rates are likely to further confound the usefulness of asbestos -- further confuse the usefulness of asbestos fiber counts.

Comparison of asbestos fiber concentrations obtained in ways different than those used to establish the risk linked PEL reduces the reliability of the sample to predict risk. Obtaining higher fiber counts by adjusting collection and analytical practices is not very meaningful if you aren't able to make apples to apples comparison between exposure and the risk of

disease.

Certainly any change in asbestos monitoring or analysis that would improve risk recognition is desirable. Such changes, however, should be confirmed before they are implemented. IMA North America is not aware of any monitoring adjustments at this time that would improve upon the current asbestos monitoring system.

To wrap up our testimony today, the Industrial Minerals Association believes significant asbestos exposure in U.S. mines, outside the mining and milling of asbestos, is very rare. MSHA's recent assessment of asbestos exposure in mines supports this. Further, despite ongoing controversy regarding risks associated with asbestos exposures and imprecision regarding the identification of asbestos, enough understanding does exist to properly identify and control hazardous exposure. However, to make the best use of this understanding, lessons of the past must not be overlooked. And theories and concepts no longer supported must be abandoned.

Considering the error-ridden history of asbestos regulation in the United States as it relates to a host of non-asbestos minerals, it might be argued that the greatest risk to the mining community is when asbestos is improperly identified, and emotionalism is allowed to trump science and reason. The IMA North America looks forward to further participation in this rulemaking as MSHA further refines and clarifies its intentions. Thank you very much.

If you have any questions, I'll see if I can dance around.

DR. JONES: You had called for a clear definition of asbestiform minerals versus non-asbestiform. What --

MR. KELSE: A clear definition of asbestos, what asbestos is. In defining asbestos, you have to also define what the term asbestiform means, and describe it. It will appear in our submissions.

DR. JONES: Okay. Thank you.

MS. SMITH: Thank you very much.

Do we have other individuals in the audience at this time who would like to speak

who have not signed up, who have just recently come in?

(Pause)

Has everyone else who signed up spoken?

MS. ELY: Thank you very much. It's a very good thing that you folks have elected to come to Charlottesville today. We appreciate that. My name is Rae Ely, R-A-E, E-L-Y. I'm an attorney from Louisa County.

I have been monitoring the production, distribution and problems associated with the vermiculite industry in America for approximately 30 years now. And I may be one of the few people in the room here today who was involved in the Federal government's levels of concern and interest in the 1970s in what was going on in Libby, Montana. Was it Yogi Bear who said, "It's deja vu all over again?" That's how I feel today.

The industry, as you know, took a very vigorous stand in the 1970s defending itself in the work that was being done in Libby, Montana. The people of Libby knew that they were being subjected to dangerous materials. And we -- as far away as Louisa County,

Virginia -- knew about what was going on in Libby. But the agencies were so concerned about the pressure from the industries that very little was done.

I was concerned by your opening statement here today where you indicated that MSHA, even though it had jurisdiction over Libby, learned about the extent of the problem in Libby from reading the Seattle newspapers. This is -- this is a real concern, I think, to people who are concerned about public health.

The problems that we have in Louisa County are now being debated as to whether or not there is any health problem. This is the same debate that took place in Libby in the '70s. There are not the death totals that we have in Libby now in Louisa County because that mine is 25 years younger. But I would submit to you that just as the W.R. Grace problem in Libby was a case study in the '70s, where we now know what the bottom line turned out to be, so is the problem in Louisa County a case study that you have the opportunity of addressing today.

If you look through your own files and records on the history of the inspections of this mine, you will see a great contradiction in the results that have been developed through the years. A number of reports from the inspections -- the MSHA inspections -- show no detection at all. And then when there was greater scrutiny following in the wake of Libby, there was extensive testing which found substantial samples of contamination; some of the contamination being as high as samples that showed 99 percent tremolite asbestos.

Now, one of the things that's in my possession that's quite interesting, I have -- because of extensive litigation with the W.R. Grace company, I have thousands and thousands of documents from the W.R. Grace company files, which show as early as 1949 when the Grace company was doing the original drilling -- the test drilling in Louisa -- of almost every test drilling hole, probably 75 percent at least showed high levels of actinolite and tremolite asbestos being pulled out of the ground in these samples.

And then, of course, Grace began to be very defensive as the problems in Libby developed. And Grace began to take the same position in regard to the vermiculite deposits in Louisa as it was in Libby, in every instance denying that there was a problem. Also, of course, at Libby they argued that the economics of controls were just so great for them that they could not afford to offer additional protection to the workers and the community. It's ironic, isn't it, that today -- 25 years later -- hundreds of people of the community and the workers are dead. And, of course, the company is bankrupt.

Now, one of the questions that was asked here today was about the breakdown of the bundles of fibers during the processing. And I certainly am not an engineer. I'm not a chemist. But I do have a little bit of common sense. And as I say, I've watched this process for a long time. I will say that based on the information that I have available, there is a tremendous risk of the massive asbestos samples -- or the bundles of fibers -- being broken down fairly readily.

This product is submitted to grinding and processing as it's being made ready for its downstream market. It is also subject to contact with heavy equipment in the workplace, large pieces of machinery running over this material. And one of the things that Mr. Stamberg did not mention to you is that when the asbestos veins are dug up, much of that is dumped into a pond on the property. And the water for the dust control at the plant is withdrawn from this asbestos-containing pond. And that water is sprayed over the roads and over the workers' area.

Right now we are in the middle of a drought, and, of course, tremendous heat. And we've had a fair amount of wind. I would invite any one of you to drive past that plant today and see the clouds of dust -- not only visible on the mine site itself, but out on the road. I drive past it twice every day. I hold my breath, literally, as I drive past that mine site, getting behind trucks that are giving off clouds of dust. All of these minerals -- much of this is stored in

an open location in the center of the Town of Louisa where it is being readied for shipment by rail. No protection whatsoever.

I am wondering whether any of you who are here today were present at the senatorial hearing that was held by Senator Paddy Murray last fall? One person. I will recommend to you that you review the transcript -- or perhaps the videotape -- which is available that exists from that hearing, and include that information as part of your record today.

In any event, we cannot afford to make anymore mistakes like this agency and EPA and other agencies made through the years with Libby. What more do we need than what we already have from the record that is available as far as this product in the United States?

Let's err on the side of caution. The most stringent tests should be employed. The workers must be protected. HEPA filters do not control the workplace outdoors. They do not control the dust that is laced with this product that is being spread around this

property and around the community. That is not sufficient. And we would request, on behalf of the community and the public at large, that this agency step up to the plate, assume the responsibility that it has, and exercise it to the best of its capability. Thank you very much.

MS. SMITH: Thank you very much. If you do have information available to us that you could submit for the record, could you do that?

MS. ELY: I'll be happy to supplement my remarks with documents.

MS. SMITH: Thank you very much.

Are there any other speakers in the audience who have not signed up, but would like to speak at this time?

(Pause)

We do have a request for speakers for 1:00 this afternoon. Since we have no other speakers at this time, we will go off the record. The panel will remain in this room until 11:00. If we do have other speakers come and request to speak, we will go back on the record to accept their remarks. If not,

then we will come back on the record in this room at 1:00. We have, I believe, eight speakers this afternoon beginning at 1:00. Thank you very much.

(Off the record, 10:40 a.m.)

MS. SMITH: Ladies and gentlemen, it is 11:00. We had no further requests for speakers this morning. Therefore, we will adjourn until 1:00. We do have speakers scheduled for this afternoon beginning at 1:00. Thank you.

(Recess, 11:00 a.m. to 1:07 p.m.)

MS. SMITH: I've had a request to start. We're going to start with Mr. William Ford.

MR. FORD: Thank you very much, distinguished members of the MSHA Asbestos Hearing Panel. My name is William Ford. I'm senior vice president of the National Stone, Sand and Gravel Association. I'm a registered professional engineer, and have been with the association for the past 12 years. I have more than 36 years experience in the field of environmental engineering, a significant portion of which has been as an

environmental and public health regulation.

The National Stone, Sand and Gravel Association, NSSGA, is pleased to offer comments and evidence in response to a request for comments from the Mine Safety and Health Administration regarding asbestos. We appreciate that the agency has reached out to stakeholders in an Advanced Notice of Proposed Rulemaking to obtain their views on this important matter. NSSGA has assembled speakers with expertise on the various facets of asbestos from geology, mineralogy, analytical chemistry, safety and health, and industrial hygiene to offer the best possible advice to the agency during its deliberation.

NSSGA is the world's largest mining association in terms of annual production and locations represented with more than 900 member companies -- many of which are small businesses -- operating over 3,500 locations across America. Our membership represents about 90 percent of the crushed stone, 70 percent of the sand and gravel produced annually in the United States. During 2000, 2.78 billion metric tons of crushed stone,

sand and gravel, valued at $14.5 billion, were produced and sold from the 10,000 locations nationwide -- more than double the tonnage of the next largest mining sector, which is sole. We represent operations in all 50 states.

NSSGA is completely and unreservedly committed to assuring a mining workplace that is free of recognized safety and health risks. NSSGA's "Safety and Health Guiding Principles," a written statement of policy, advocates that NSSGA members advocate a strong and unwavering commitment to safety and health, and pledges the association's work toward the prevention of all occupational illnesses and injuries.

Over the years, NSSGA has backed up this lofty rhetoric with programs designed to meet the objectives the organization espouses. For instance, in a landmark, award-winning seminar series, we have partnered with MSHA to bring real-life instruction on sampling for noise and respirable dust to aggregates industry safety and health professionals. Some 320

individuals have successfully completed this program, including eight who just completed the intensive three-day workshop this past week.

We have produced videos on new miner training, haul truck safety, and basic safety and health principles. We have teamed with MSHA to produce PowerPoint presentations on high wall safety, and we're currently working with the agency on a high wall video safety series. And we have joined hands with the agency to dissect the job of haul truck operators as a first step in preparing an interactive CD-ROM, which we believe will lead to a sharp reduction in the number of accidents of powered haulage accidents.

We have also collaborated with the agency, other industry stakeholders, and labor representatives to fashion a new safety training rule that meets the unique needs of safety aggregates miners. NSSGA co-founded, co-led and provided volunteer staff for the Coalition for Effective Miner Training, an industry/labor coalitions that MSHA used as the basis for its Part 46 training

regulation.

NSSGA's Board of Directors has approved development of an occupational health program for the aggregates industry. The OHP, as we call it, will set a benchmark for occupational health in the aggregates industry that should ensure an even healthier aggregates mining population than now exists, and may serve as a beacon for other industry segments to follow. The Association is a co-founder and active participant of the Silica Coalition. The aim of this organization is to bring sound science to regulatory deliberations on crystalline silica. NSSGA is also funding an epidemiological study of crushed stone workers to determine what, if any, adverse health effects they may have experienced due to potential exposure to crystalline silica.

The six commericial varieties of asbestos are widely known to present a serious health risk under specific circumstances of exposure. These substances are among the most highly regulated of any in the country today. We appreciate that the

agency is taking steps to tighten its asbestos regulations in the wake of the tragedy in Libby, Montana. We offer our heartfelt condolences to those who have suffered there, and to those who continue to suffer.

It's crucial to identify the hazard, and then to develop thoughtful regulations that will minimize or eliminate that hazard. We see a risk that MSHA might encompass, by regulation, non-asbestiform materials for which no health effects have been observed. As the panel knows, an attempt to regulate non-asbestiform minerals occurred in 1986 when the Occupational Safety and Health Administration announced a final rule aimed at regulating the non-asbestiform mineral habit of actinolite, tremolite, and anthophyllite.

Fortunately, this so-called ATA regulation was subsequently withdrawn in 1992 after NSSGA -- operating then as two separate entities, the National Stone Association and the National Aggregates Association -- along with others, persuaded an attentive agency

that it was off course; and that there was, in fact, no health justification for the regulation. The exhausting effort stretched out over six long years, and consumed countless hours of personnel time, and involved an expenditure to the industry alone of over $5 million in direct costs. A decade has since past, and there still is no evidence to support a regulation of non-asbestiform minerals.

Why did we put so much effort into turning back a regulation issued by an agency that didn't even have jurisdiction over our mining operations? We viewed it as critical to the very survival of our industry because, while OSHA does not regulate aggregates mines, it does regulate our customers. This issue is even more critical today because it is under consideration by an agency, MSHA, that does regulate our industry.

NSSGA viewed the 1992 decision as a victory for sound science, reason, and just plain common sense. In considering changes to its own asbestos standard, MSHA has a more challenging mission than OSHA had 15 years

ago. Because OSHA is primarily concerned with the handling of commercial asbestos in abatement projects, where the presence of asbestos is known, the need for more specific mineralogical descriptions of asbestos and more specific methods of analyzing asbestos are not necessary. But the environment MSHA looks after is much more difficult and complex when sampling and analyzing for asbestos, because in this setting the agency deals primarily with non-commericial, naturally-occurring asbestos, or no asbestos at all.

Where the federal fiber definition of a particle that is five microns and longer with an aspect ratio of at least 3:1 is not too troublesome in OSHA's regulatory environment, it is very troublesome and inappropriate in MSHA's regulatory environment. The only reason it hasn't been a problem in the past is that the current exposure limit of 2 fibers per cubic centimeter is high. Not many samples reach this concentration, and need mineralogical determination.

In the quarry environment there are

many types of harmless rock fragments that fit the federal fiber definition. In fact, the non-asbestiform habits of the six commercial varieties of asbestos fall under this category. As MSHA considers reducing its PEL from two fibers per cubic centimeter to a tenth of a fiber per cubic centimeter, the number of samples requiring additional electron microscopic analysis for mineralogical characterization will increase dramatically unless the discriminate counting procedure used by MSHA is more inclusive of asbestos and exclusive of non-asbestos.

We fully recognize the need for many MSHA to respond to the recommendations contained in the Department of Labor Inspector General's 2001 report. We have prepared testimony to assist the agency in responding responsibly to those recommendations.

As noted, we have assembled a panel of experts from across North America to offer their expertise in this matter in their professional field. Resumés of this group will be submitted with their formal

testimony, so I'll dispense with reciting the extensive array of skills, experience and training that they bring to their work. Nonetheless, I will provide a short introductory remark on each of them now.

Our first speaker will be Dr. Malcolm Ross, a retired geologist with the U.S. Geological Survey, who now is in private practice in mineral consulting. Dr. Ross will stress the importance for MSHA to properly define, sample and analyze asbestos in the mining industry to avoid significant adverse economic impacts. Dr. Ross's entire career has been devoted to geology and mineralogy.

The next three speakers following Dr. Ross will describe the specific impact improper asbestos definitions and analytical methods have had on their operations. Speaking from personal, firsthand experience will be Doug Palmore from Luck Stone Corporation here in Virginia, Rick Cole from the Lafarge Corporation in Maryland, and Alan Bowen of Southdown in New Jersey. Southdown is a division of the Cemex Corporation.

Our fifth speaker, Dr. Ann Wylie from the University of Maryland, will review the scientific literature that addresses how asbestiform fibers and non-asbestiform particles differ in the real world. Dr. Wylie will explain how asbestos is defined neurologically, and how the federal fiber definition fails to differentiate between asbestiform and non-asbestiform minerals. She will stress the need to incorporate these real world differences in a proper set of counting criteria that can be used in air and bulk analyses. Dr. Wylie has more than 35 years of experience in the field.

Dr. Richard Lee of the R.J. Lee Group in Monroeville, Pennsylvania will talk about the -- who has been active in the area of asbestos analytical research since the 1970s -- will demonstrate that many samples collected in quarries will exceed .1 fibers per cubic centimeter under microscopic analysis by phase contrast microscopy.

This will lead to a discussion about the need to change the simplistic federal

fiber counting criteria, since failing to do so could lead to excessive electron microscopy analysis. He will discuss the technical difficulties of characterizing samples using electron microscopy with a lack of qualified laboratories. He will address the impracticality of using OSHA's current fiber definition in an unknown mineral environment. His talk will conclude with a description of an analytical approach to air samples that contain federal fiber count for historical purposes, but incorporates the discriminate counting process that isolates only fibers of health concern; that is, long, thin fibers.

Dr. Eric Chatfield of Toronto-based Chatfield Technical Consulting, who will precede Dr. Lee, will describe how EPA is using the discriminate counting process to focus on asbestiform particles that are less lest than .5 microns in width, and 10 microns and longer. He will emphasize the inappropriateness of the PCM federal fiber method for the ambient environment typical of quarries. And he will identify other

entities that have departed from the federal fiber PCM counting method.

Kelly Bailey will conclude our presentation. Kelly is a certified industrial hygienist with Vulcan Materials Company, the nation's largest producer of aggregate products. He will describe how inappropriate fiber definitions have warped the dose/response curves for asbestos miners, and how continued use of the federal fiber analytical approach will prolong poor science. Kelly will also summarize the main points made by each of the panelists. And he will outline a proposed standard regarding fiber definitions and analytical processes.

In the interest of time and efficiency, we suggest that members of the panel hold any questions or comments until all of the speakers have concluded their presentations. It's possible that the questions that you may have for one speaker will be answered by a subsequent speaker.

Thank you again for offering stakeholders such as NSSGA the opportunity to offer expert witnesses on this vital issue.

Copies of the testimony of each of our speakers, plus an extensive array of supporting documents, will be submitted to the docket before the close of the comment period. This concludes my presentation, and Dr. Ross will be our first speaker.

DR. ROSS: Thank you for allowing me to address the panel, the MSHA panel.

The crushing of any rock produces some mineral particles that may be within the size range of specified federal regulations. If correct definitions of the truly hazardous material; that is, asbestos, are not made, it presents a formidable problem to those analyzing for the asbestos minerals in the multitude of different mineral particles that may be found in rock dusts, for not only must the size and shape of the mineral particles be determined, but also an exact mineral identification must be made. Many different types of non-fibrous amphiboles are found in many types of common rocks. And many of these amphiboles might be considered asbestos, depending on the professional training of the analyst, on the equipment

used for analysis. Drs. Wylie, Lee and Chatfield, in the testimony to be given later, ably discuss the methods to distinguish asbestos particles to non-asbestos particles, as I have nothing further to contribute to this subject other than to support their conclusions.

If the suspect fibers include non-fibrous, amphibole minerals, then we must recognize asbestos presents -- is present in significant amounts in many types of rocks covering perhaps 30 percent of the United States.

This is a slide that was produced by the Environmental Protection Agency some years ago. And on the right you see the cross-hatch region. That's essentially the Appalachian Mountains where you have many types of rocks that can contain asbestos, as well as in the West Coast in the Sierras and Rocky Mountains and so forth.

Rocks within the serpentenite belts, greenschist rocks, amphibolites, gneissic rocks, diabases, basalts, trap rocks and granites would be considered asbestos

bearing. Asbestos regulations would thus pertain to many of our country's mining operations and quarrying operations for concrete aggregate, dimension stone, road material, railroad ballast, and riprap. Also affected would be the construction industry -- road and housing construction, for example.

I now want to mention the Libby asbestos problem. The Libby vermiculite deposit located near the town of Libby, Montana is owned by the W.R. Grace Company, and was operated by that company from 1963 until it closed in 1990. The vermiculite found in a geologically complex magnesium iron-rich rock composed of alkaline rocks, syenites, trachytes, phonolites and granites. Anything amphibole-bearing, asbestos-bearing veins are disseminated throughout the vermiculite body. The asbestos has been identified as amphibole winchite. Colloquially, you can refer to this as a sodic tremolite.

Apparently, the newly-proposed MSHA regulations were promulgated because of the

concern over the asbestos dust and resulting health effects from the Libby mine. The problem at Libby, as I see it, is not because there was a lack of a .1 fiber standard, because neither the mine operator nor the state or federal authorities recognized that asbestos was pervasively disseminated through the ore body, and that airborne dust levels were far higher than existing regulations permitted, even after wet processing began in 1974. It was well known asbestos was present in the ore body long before the mine was taken over by Grace Chemical Company.

If a mineralogist/petrologist had been engaged to inspect this mine for asbestos, warnings could be given, and mining procedures altered, if possible, to keep the dust levels low. I believe it is imperative that mines of any type be inspected by qualified mineralogists and petrologists in order to protect the potential dust risks, an activity that I and my colleagues have been engaged in for several years.

Next, the crystal growth of asbestos fibers. All asbestos occurrences that I have

seen, and are noted in the scientific literature, show that asbestos crystallizes under very special conditions -- conditions that occur within rock formations that are undergoing intense deformation. Rock deformations are often accompanied by the intrusion of magnetic fluids forming dikes and sills. Fibers crystallize in high strain environments such as within folds, shear planes, faults, dilation cavities, and at intrusion boundaries.

For example, we observed fiber formation in a shear zone within a metamorphosed iron formation. Here non-fibrous ferroactinolite amphibole came into contact with low temperature acidic solutions which were moving through an active shear zone, causing the amphibole to re-crystallize in a fibrous form.

In another mine, I studied felsic dikes had intruded the host rock; the dikes composing perhaps 2 or 3 percent of the total rock volume. Asbestos was not found within the ore-bearing portion of the ore body, but rather as thin coatings of asbestos on the

contact surfaces between the felsic dikes and the host rock. I estimate that the fibrous mineral associated with the felsic dikes composed much less than .01 percent of the total volume of the rock.

In another mine, I noted thin coatings of asbestos on the shear surfaces of large blocks of marble, this shearing probably occurring over tens of millions of years. Rock deformations are common and found in many different geologic localities, hosting a variety of mineral deposits. But even though a deposit may be exploited for something other than asbestos, asbestos may form in extremely small quantities within the deformed rock.

Even though asbestos was present in the examples I presented, it was little or none that would be expected to show up in air sampling, particularly when the asbestos-bearing rock is not crushed and processed, but rather discarded with other overburden. I bring this point out, for even though the fiber may not be detected in air samples, organizations or individuals who,

for one reason or another are against mining, might collect samples of sheared rock and show that asbestos is indeed present in the ore, and thus there is a potential health danger to the miners and those living nearby. The mere fact that asbestos exists in a mine is often enough to stop production -- the one-fiber-can-cause-cancer scenario.

I present some case histories of where I think there has been a misdirected effort at the regulation. A large number of actions over the last 30 years, perpetuated in a misguided effort to protect human health, have greatly affected the vitality of U.S. Mining and metals industries and the U.S. economy. A few examples are given here.

A flood barrier surrounding part of the City of San Jose, California is composed of serpentinite rock containing small amounts of chrysotile asbestos. The EPA considers that rock toxic, and placed a barrier on the Superfund list for remedial action. In this same city, the extension of a mass transit rail line was held up indefinitely because the right-of-way required a cut through a

hill composed of serpentinite rock.

Serpentinite is a very common type of rock exposed in many areas in the United States, and is commonly used in construction zones and aggregates. Indeed, if serpentinite rock is considered dangerous, thousands of square miles of land might be placed off limits for any kind of development.

In one area of California, the New Idria Mountains, 50 square miles of soft rock is naturally exposed at the surface containing 15 to 60 percent chrysotile asbestos. Large amounts of asbestos from this area have entered the environment, both air and water and stream, for millions of years with no discernible health effects to the residents in those areas.

The U.S. District Court in Minnesota in 1975 declared the taconite mined by Reserve Mining Company contained amosite asbestos. The company was ordered to build a special landfill costing $300 million to dispose of the waste rock. Soon after spending this money for site preparation, the company

declared bankruptcy. The taconite mined by Reserve contains magnetite, carbonates, quartz, and various other silicates; including non-asbestiform cummingtonite and actinolite amphibole. After carefully sampling 11-miles just recently, I found only one small area, a shear zone, that contained asbestos.

In 1987, actinolite asbestos was discovered at a construction site in Fairfax County, Virginia, causing concern over possible health risks to workers, as well as county residents. The asbestos was confined to the shear zone and anticlinal folds within the actinolite schist, a prominent rock type within the Piney Branch formation, which outcrops over three and-a-half square mile area of Fairfax County.

As a result of this discovery, the Fairfax County Health Department initiated dust control procedures. The advisory requires contractors to use proper dust control practices, air monitoring, safe waste rock disposal, and existing asbestos standards. It further states in the county

advisory that construction not be banned. As a result of this well-reasoned regulatory initiative, the county continued to build housing and commericial buildings on some of the most valuable land in the United States, while at the same time protecting the workers and the public from an avoidable risk of asbestos-related disease.

Lastly, during the 1990s, many new housing projects were started in the fast-developing foothills area of El Dorado County, California, a county located in the Great Valley serpentenite belt. During excavation for housing sites within the serpentenite rock, fragments of tremolite were found, thus alarming the homeowners. The local newspapers published a series of articles that suggested that the county residents' exposure to tremolite asbestos was endangering their health. A large number of air samples were collected in numerous sites all over the county by the California Air Resources Board. The fiber concentrations, non-tremolite, averaged less than .001 fibers per cubic centimeter. El Dorado County still

appears to remain in turmoil over the asbestos. In contrast, Fairfax County, in which the asbestos controversy -- if indeed there was one -- died out 10 years ago.

Cleavage fragments described as amphibole, as well as fragments from many other natural occurring minerals, are abundant in our environment. Anywhere that mines or quarries are operated, where building road and tunnel construction occurs, in many agricultural regions, and where mineral or rock aggregate is processed or utilized, mineral fragments will usually be encountered both in air and water.

It is now common for people living near mines and quarries to believe that any amount of asbestos, or minerals said to be asbestos-like present unacceptable health risks. Others at this meeting will tell their problems facing quarry operations.

Many prescribe to the theory that there is no known exposure threshold for the induction of cancer. It's stated repeatedly in the press and in many health reviews that, because no one knows the minimum amount of a

carcinogen required to initiate the growth of a tumor, it must be assumed that any amount of a carcinogen is unsafe. Such statements lead the public to believe that just one fiber of asbestos can cause cancer, and has led many communities to ban the mining and quarrying of rock.

Hopefully, the state and federal regulatory agencies will help to counter such perceptions with promulgation of guidelines giving the true risks to the miners, as well as those living in the vicinity of the mine or quarry, of the various exposure scenarios.

With regard to the proposed MSHA standard of .1 asbestos fibers per cc, I believe most stone quarries could operate at this standard rock, provided only true asbestos is counted. However, if amphibole cleavage fragments are counted, many quarries could not meet the standard. Thank you.

MR. PALMORE: Good afternoon. My name is Doug Palmore. I am the Environment, Health and Safety Manager for Luck Stone Corporation. Luck Stone is a family-owned and operated aggregate company headquartered

in Richmond, Virginia with 800 associates and 19 operations in Virginia and North Carolina.

In addition to my role at Luck Stone, I'm also speaking today on behalf of the Virginia Aggregates Association, and in support of the testimony prepared by the National Stone, Sand and Gravel Association. The groups I am representing today support MSHA in its efforts to protect miners from hazards associated with asbestos.

Today I'm going to deliver a factual account about the economic impact caused by the misidentification of asbestos in crushed stone at one of our quarry operations. This misidentification was due to improper analytical methodology, and an improper fiber definition which apparently led to cleavage fragments being mistaken for asbestos.

A little over two years ago, our materials testing lab received a call from the Virginia Department of Transportation and Materials Division notifying us that they were investigating the possibility of asbestiform minerals in materials from our Rockville, Virginia -- not Rockville

Maryland -- crushed stone plant. This notification was very informal, and VDOT representative implied this was no big deal, they were not concerned, and they were simply addressing a citizen's complaint.

A week earlier, VDOT had received a letter from a concerned citizen notifying the Department that he had collected a sample from an unpaved road in front of his home. He had read an article about naturally occurring asbestos, and thought his respiratory ailments and those of his family may be due to asbestos in the dust from the unpaved road. He apparently had been working for some time to get the road paved with no success.

The results of his sampling showed 2.8 percent chrysotile asbestos as identified by EPA Method 600/R-93/116 using TEM. Armed with this data, he sent a letter to his local health department and copied the VDOT Secretary of Transportation, the State Attorney General, the Director of the Virginia Department of Environmental Quality, and the director of EPA Region III, to name a

few. It was not long before VDOT's position was very formal, very serious, and directed squarely at Luck Stone.

Even though stone had been placed on that road from several different quarries over the years, our Rockville plant had current orders to supply the VDOT maintenance shed that served the road in question. Within a couple of days of the initial notification, we received a call from the VDOT district administrator notifying us that VDOT was discontinuing the use of our stone in one of their residencies until the asbestos issue was resolved. And they requested access to our Rockville plant for testing.

We immediately collected a random sample of base material from Rockville, and shipped it overnight to R.J. Lee Group in Monroeville, Pennsylvania for asbestos analysis. We had not conducted any asbestos sampling previously because the geology at Rockville does not lend itself to the formation of asbestiform mineralogy.

Within 24 hours, we received the

results from R.J. Lee confirming what we thought: There was no asbestos in our Rockville material. We communicated that information to VDOT, but they would not lift the ban on our material until they received the results of sampling that they had done at our plant and on the road in question.

During this process, we were very concerned that VDOT may be using labs that were accustomed to analyzing building materials, and may not have experiencing analyzing natural occurring minerals for asbestos. Our fears were realized when one of VDOT's initial samples from the roadway showed a trace of chrysotile asbestos.

Concurrently with the sampling activity, and despite Luke Stone's data showing the Rockville material to be asbestos free, VDOT began circulating an e-mail banning Rockville's products from the entire Fredericksburg district and Richmond district. VDOT began to shut down our customers -- asphalt and concrete producers -- working on state jobs. Contract truckers were bringing the VDOT e-mail to

other Luck Stone sites, and asking if this ban applied to all of Luck Stone, or just material coming from our Rockville plant. The volatility of this situation expanded very quickly because of the general public's concern that asbestos equals cancer. Fortunately for us and for VDOT, VDOT did not used the word "asbestos" in their e-mails, only the word "contaminated" to describe our product.

A group from Luck Stone requested and received an emergency meeting with VDOT's Assistant Commissioner for Environment, Transportation, and Regulatory Affairs to express our concern over VDOT's response to this situation, and to request that the ban be lifted from our Rockville plant. We received an assurance that he would do everything he could to expedite VDOT's response, but he was not prepared to lift the ban until he had conferred with VDOT's project team.

Two days later, we finally convinced VDOT to participate in a conference call with the labs they were using and the R.J. Lee

Group. The conference call occurred eight days after we were initially notified of the problem, and three days after the ban on our material began to circulate. The outcome of that conference call was to split a series of samples between VDOT's lab and R.J. Lee. Only after VDOT received the results of the split sampling showing no asbestos present did they finally lift the ban on our product. VDOT impacted Rockville plant sales for seven days as a result of the misidentification of asbestos from an unpaved road.

The direct cost to Luck Stone in the form of lost sales and analytical fees numbered in the thousands of dollars, but pales in comparison to the cost of the man-hours we spent responding to this unfortunate situation.

In addition to the cost to Luck Stone, VDOT had a team of four to five people working on this project, along with representatives from the Virginia Health Department. Between VDOT and Luck Stone, we collected well over 60 samples from our plant, VDOT's stockpiles, and the unpaved

roadways -- all at a significant cost to the taxpayer. All because a lab with an excellent reputation for analyzing asbestos in building materials did not distinguish between a rock fragment and an asbestos fiber.

Beyond the measurable financial loss, the what-ifs associated with this story are even more daunting. If the press had picked up on the word "asbestos" associated with our Rockville plant, it is difficult to predict the amount of damage that would have occurred to Luck Stone's reputation and viability in the Richmond, Virginia market.

The cost to our industry and to MSHA resulting from a regulation that allows the misidentification of asbestos in naturally occurring minerals would be catastrophic. I'm not a chemist or a geologist, so I will not begin to speak to the technical details of what analytical methods are appropriate, or what the fiber definition should be. We have assembled an incredible wealth of knowledge and experience on the proper identification of asbestos in this room

today, and they will provide the scientific justification for our position. My concern is that we properly identify and regulate true asbestos for the health of our miners, for the well-being of the public, and for the good of our industry.

Thank you very much for the opportunity to speak today. I would like to introduce Rick Cole of Lafarge North America, who will be our next speaker.

MS. SMITH: Thank you.

MR. COLE: Good afternoon. My name is Rick Cole. I'm the manager of Environmental Control in Lafarge North America, Eastern U.S. Region. I would like to thank the MSHA Office of Standards, Regulations and Variances for the opportunity to comment on measuring and controlling asbestos exposure.

We have had a problem with the definition of asbestos as a 3:1 aspect ratio, and equal or greater to five microns in length for phase contrast microscopy, analysis which would then require transmission electron microscopy. This definition would include cleavage fragments

which would not be true asbestos, but would require us to proceed with TEM, which takes more time, and is more expensive.

You are also investigating reducing the PEL from two fibers per cc to .1 fiber per cc. This will cause the industry to test many more samples by TEM, which would be a waste of time and money since 3:1 greater than five microns would not necessarily be asbestos. Please don't make the same mistake that OSHA made during the hearings on asbestos back in the early '90s.

To illustrate our concerns, I would like to relate two episodes which our company encountered in 1986 due to the June 1986 OSHA proposal. We feel that both of these situations could reoccur with the current 3:1 aspect ratio greater than five microns in length definition if the agency fails to include an adequate definition of asbestos, and an adequate analytical procedure.

The first episode I'd like to relate is the New England play sand issue. It engulfed our company around 1986. And it began with a publication in the "New England Journal of

Medicine" on October 2nd, 1986. The article resulted in a panic situation in which we removed all our product from retailer shelves. This issue surfaced in the states of Massachusetts and New York, and was due to the lack of an adequate definition of the material allegedly found in play sand.

Numerous laboratories and renowned specialists were called upon to analyze these materials which were found to contain non-asbestiform tremolite rather than tremolite asbestos. Since they met the 3:1 aspect ratio, and were greater than five microns, they were initially reported as asbestos. Our firm was required to engage lawyers, as well as specialists, to monitor the issue -- all at great expense. We believe all this was caused by an inadequate definition of asbestos.

The second issue is Prince Georges County, Maryland, basically as a local jurisdiction's attempt to regulate asbestos. Literally, it dealt with a law that would have required an aggregate firm to certify that its material did not contain asbestos in

an amount greater than .01 percent by volume. The local law defined asbestos as actinolite, amosite, anthophyllite, chrysotile, crocidolite and tremolite -- the six.

Several Maryland quarrying operations filed a complaint asking for declaratory and injunctive relief against Prince Georges County. The Prince Georges County Executive formed a task group to study the issue and report back on the feasibility of the law. The task group met 12 times over a 14-month period to no avail. There was a labor viewpoint and an industry viewpoint. The task group had reached a stalemate, and it wasn't going anyplace.

One interesting activity undertaken by the task group was to submit a questionnaire to 20 different laboratories soliciting their ability to analyze aggregates in a manner to certify compliance with the law. 13 firms responded. None of them would certify that a quarry could be warranted asbestos-free from a sampling program, due to the heterogeneous nature of a stone deposit. It was also obvious that large errors were associated

with the measurements; and the smaller the concentration, the greater the error.

It was agreed that the resolution of this situation would be in the Circuit Court of Prince Georges County. Three years of debate, discussion and court hearings ensued between the introduction of the initial county bill and the final court action which declared the law invalid. Legal fees alone were more than $75,000.

In June 1992, OSHA resolved the actinolite, tremolite, anthophyllite issue -- after years of debate -- by finally admitting there were two forms of these minerals. In that admittance, I guess, they failed to address the 3:1 aspect ratio for particles greater than five microns.

I believe that these issues demonstrate that OSHA and MSHA do not operate in a vacuum, and local jurisdictions and municipalities look to these agencies for guidance in formulating safety and health programs. The asbestos issues in 1986 and subsequent laws subjected my firm to an enormous amounts of unnecessary effort to

convince our customers, employees, and even ourselves that our quarry products did not contain carcinogenic asbestos. We were required to become knowledgeable in explaining the difference between true asbestos and cleavage fragments, as well as non-asbestiform AT&A.

Both of these extremely volatile situations could have been avoided if the agencies had properly defined asbestos. I implore you to include in your new proposal a proper mineralogical definition of asbestos, and an adequate analytical procedure capable of distinguishing more realistically between cleavage fragments and asbestos. To do less would lead to continued confusion.

Again, I want to thank you for the opportunity to speak. And the next speaker will be Mr. Alan Bowen, Director of Operations of the Mineral Division of Cemex.

MS. SMITH: Thank you, Mr. Cole.

MR. BOWEN: Thank you. I also appreciate the opportunity to participate in this presentation as a member company of the National Stone, Sand and Gravel Association.

For the record, my name is Alan Bowen. I serve as Director of Operations for the Minerals Group of Cemex, Incorporated. We operate five plants in the Northeastern United States that are involved in a mining environment. All of these plants are subject to regulation and inspection by the Mine Safety and Health Administration.

It is important that I echo the sentiment expressed here today that preserving the safety of the personnel we employ is paramount to our success as a company. In fact, the four main responsibilities I give all of our operations to meet are to ensure the safety of the workforce, maintain environmental compliance of the facilities, adhere to the quality standards we have set for our products, and, of course, obtain the financial goals we have established. I see these four legs as equally important to our success. We are pleased to be able to work with outside organizations as resources to help us improve in any of these four areas. For that reason, we support MSHA's effort to establish new

standards as regards the exposure of any of our people to real asbestos.

However, our recent experience at our Sparta, New Jersey facility prompts me to present these remarks as to how important proper asbestos definition and analytical methods are to determining whether or not our employees are exposed to real asbestos hazards. The mineral deposit available to us in Sparta, New Jersey is a mixture of a granite overburden and a limestone ore body. The limestone is classified as part of the Franklin limestone deposit. It has the characteristic of a high purity calcium carbonate limestone, but has been blessed with a variety of other mineral inclusions during its millions of years of formation. These mineral inclusions actually detract from the purity of the limestone, but part of almost all naturally formed deposits. These inclusions compose such a small percentage of the total ore deposit that they do not interfere with the normal operations of the quarry, and do not have a measurable effect on the end product quality. Consequently,

these included minerals are generally processed as part of the limestone ore body. This has been the case in this quarry since it was opened by Thomas Edison in the early 1900s.

One of the known mineral inclusions is the non-asbestiform habit of tremolite. This mineral composes less than 1 percent of the ore body. It is important to understand that there is both an asbestos and a non-asbestos form of this same mineral. The potential harmful effects of the non-asbestos variety of this mineral has been studied many times. And the conclusion is that the non-asbestos variety does not pose a health threat. The almost hundred years of operation of the Sparta plant support this conclusion, as we have no history of plant personnel ever experiencing health problems of the type associated with known asbestos diseases. In fact, we have several third generation workers of the same family working in our Sparta quarry. They would not be there if they had had health problems in the previous generations of their families.

So why was our quarry the subject of such a public outcry a year ago, with claims of posing a health threat to our community? Why were we forced to spend millions of dollars -- and I mean literally millions of dollars -- to defend ourselves when we posed no health threat to our employees, let alone our community? Why are we still spending six figure amounts to continue to prove we are not posing a health threat to anyone? It was really the result of improper interpretation of what constitutes asbestos or asbestos form minerals and improper analytical testing methods.

Our tale of woe started as many urban sprawl stories do, with the development of very exclusive homes being built and purchased near our quarry site. Then when our neighbors occupied these homes, they were made to discover they had just bought their dream home next to a quarry that had been in operation almost a hundred years. This led to the typical complaints about blasting, noise, and dust generation. Even though we were not in violation of codes or

regulations, as good corporate citizens we attempted to address those complaints with modifications to our operations. We changed our blasting patterns. We installed noise suppression devices. We took steps to decrease any fugitive emissions through improved dust collection, road watering, even curtailing operations in times of high wind events.

Our level of public and regulatory scrutiny greatly increased when our neighbors, fueled by misguided emotion and improper asbestos definition, claimed the quarry posed a health threat to the community because of tremolite in the ore deposit. Continuing our role as a responsible corporate citizen, we voluntarily conducted stack testing to prove that there was no threat the our workers, let alone our community.

Unfortunately, we were not well enough educated ourselves to understand the problems that come from this improper interpretation of what constitutes asbestos or asbestiform minerals, and improper analytical testing

methods. The state agency's interpretation of the stack test alleged that asbestos type minerals were being emitted; however, after careful review and analysis by our outside expert, it was found that numerous errors occurred in the collection, preparation and analysis of the samples. In fact, asbestos type minerals could not be confirmed.

Of course, by that time we were trying to defend ourselves in the face of public outcry and a state agency reacting to public pressure. We had to employ the best experts available, as well as conduct extensive research, and go through multiple legal battles that could all have been avoided had we known ahead of time the pitfalls associated with improper interpretation of what constitutes asbestos or asbestiform minerals and improper analytical testing methods.

This is another real life example of what can happen across the entire mining industry if we do not set the proper standards for asbestos definition and analytical testing methods as we go forward.

We want our people to work safely, and we are committed to providing safe work environments. We appreciate outside agencies and resources such as MSHA working with us to help us achieve safe workplaces. But we must take advantage of the best science available to us to accomplish this goal, and avoid spending money chasing problems that are not real.

I'm supporting the recommendation of the NSSGA in regards to MSHA's proposed rule regarding asbestos. Our experience confirms we cannot simply rely on the federal fiber definition as a hazardous material. It is critical to both the mining industry and the efforts of MSHA that we use valid asbestos definitions and proper analytical methods in the new standard. Thank you very much.

It is my pleasure to introduce Dr. Ann Wylie, Professor of Geology at the University of Maryland.

MS. SMITH: Thank you, Mr. Bowen.

DR. WYLIE: Thank you very much. It is a pleasure to be here and to talk to you today. I've spent many years studying the

relationships between mineral fibers and disease. I think you face a complex task by changing the asbestos regulations because of the interferences of the system in the mining industry. So I'm hoping today that some of the comments that I make will assist you in the decisions that are ahead of you.

Could I have the first slide? The membrane filter method is the method used to monitor asbestos in the air. It was developed in Great Britain in an asbestos textile factory. The five micron minimum length was based on reproducibility of exposure estimates. That's where it came from. They did studies on how they could get the data from one analyst to another to be consistent. It was determined if they encountered asbestos fibers anything shorter than five microns, they lacked reproducibility.

MS. SMITH: Excuse me, Dr. Wylie. Could you move your microphone just slightly in front of you so it's not cutting out on you?

DR. WYLIE: Okay. Sure. The 3:1

aspect was just arbitrary in this environment just to allow ordinary dust. And I think it's very important, when you think about these regulations, to keep in mind that the longer than five and the 3:1 are not definitions. They never have been definitions. They were counting criteria. That's all they ever were. And that's all they ever are today. They are not definitions for asbestos.

Also, I think it's also important for you to keep in mind that what was counted then in Great Britain, and in monitoring asbestos ever since, is an index of exposure. It was never intended to be a comprehensive assessment of the total fiber in the air. It's an index of exposure. And it is not specific for asbestos, because things like cellulose and all kind of things satisfy these criteria.

In the 1979 publication where the membrane filter method was published by NIOSH, the method says very specifically that these should be counted in absence of evidence to the contrary. So even in 1979,

there was a clear recognition that there were things that could indeed be confused based on these arbitrary dimensional characteristics. And the NIOSH 7400 method says asbestos and other -- I think they say fiber, but what they really mean is what's loosely referred to as federal fiber, five microns, 3:1 aspect ratio particles. Mineralogically, these were not fibers.

These data came from a paper by Virta, et al. And they are length and width data that come from air monitoring studies that were done in the 1980s. The first one is from the Homestake goal line. The second one is from Peter Mitchell Pit. Dr. Ross referred to that particular location. And the third one was from one of the quarries here in Charlottesville. And in these three environments there is no asbestos; or if it is present, it's in trace amounts. The material that was collected on those filters were not asbestos. They were cleavage fragments of amphibole. These are three environments in which amphibole is a very abundant part of the rock, and not in the

asbestiform variety. Shipyard and electrical refers to air monitoring studies that were done in two industrial sites that were using amosite asbestos.

And the mean length on those -- the particles that were counted in this case were based only on aspect ratio criterion, so 3:1 particles. All 3:1 particles were counted in these studies. The mean length, you can see that in the first place, the particles in the shipyard and electrical are longer in their average length than you would find in these three quarries, but the ones in the quarries are pretty long. I mean, they approach the mean lengths. Now, this is the middle. So they approach the five micron limit. And the mean width in the quarries of these amphibole particles is about one micron; whereas in the shipyard and electrical it's less than half a micron. And we model these populations. It's possible to draw mathematical models that show you the relationship between length and width for any population of mineral particles. The model with the 10 microns in the cleavage fragments is greater than one

micron; whereas the model with the 10 microns for shipyard and electrical remains at about the mean width for the population. If you look at the model with the two microns for cleavage fragments it goes up to beyond two microns -- almost three microns at that length; whereas, again, in the shipyard and electrical environment the mean length remains approximately constant.

So there's a couple of points that I want to make from this slide. I summarized them in the next slide. Cleavage fragments get wider as they get longer. And that's a characteristic of them. Rock fragment, amphibole particulate as they get longer they get wider; whereas for asbestos, width is essentially independent of length. That's because of the nature of the way asbestos forms. It forms as unit fibrils. They are sort of a basic building block of asbestos. All that happens with asbestos is they just aggregate. But there are long particles with narrow widths, and there are short particles with narrow widths. But the widths are pretty much constant and independent. And

again, that five micron length of 3:1 ratio is not specific for asbestos. It is inclusive of asbestos, but it's not specific for it.

I've provided, to accompany my testimony, a copy of an article that was published some time ago entitled, "The Importance of Width in Asbestos Fiber, Carcinogenicity and its Implication for Public Policy." Myself, Kelly Bailey, Rich Lee and John Kelse were all in on that. Basically, what we did was take all the dimensional data that was published in the literature anywhere we could find it, and put it in kind of tabular form so that you could see what we know about the dimensions of asbestos, and what we know about the dimensions of cleavage fragments. So everything I knew about at that time is in that paper. And I ask you to look at it because you will see over and over and over again the characteristics of asbestos, and how constant they are -- whether they're in bulk samples or airborne, whether they're asbestos from South Africa or Australia, or

wherever. It's all very, very similar.

There is one other point that I want to make, and that is that asbestos fibers that are counted that are wider than one micron are bundles of particles. It's the nature of asbestos. These fibers of asbestos are smaller than a micron in diameter. So when they get to be the size of at least one micron -- even smaller than that in many cases -- but when they're at one micron you can see that these are composite particles. It's an important distinction to be made in the analysis of asbestos. It's not part of most of the population definitions because they just don't record that kind of information. But it is an important part.

Now, these are some of the data that are in that paper I referred to. I'm going to go through them fairly quickly just so that you'll get an idea, again, of the kind of things that I'm talking about. In column A, the percentage of the population that were actually longer than five microns. And again, I want to show you there's a lot of variability here. In some asbestos

populations only a small percentage are longer than five microns; and in other populations a lot is longer than five microns. So this is a variable in populations. And it will vary in the location, in the use, in different parts of an asbestos textile factory, different applications of asbestos. The portion that's longer than five and less than five is variable, but it is certainly not inclusive. You can see that here. These are bulk samples of the main commericial types of asbestos at the top, crocidolite and amosite, chrysotile, and then a couple of samples that are not mine commericial, but represent the actinolite variety.

And the other characteristic is how significant the width is. This material is less than a half a micron in width. Of course, it has high aspect ratio. I'm not going to spend a lot of time emphasizing aspect ratio today because we're going to present to you a proposal to consider width and length. So I want to concentrate on those fundamentals.

This is bulk samples; again, SEM characterization. And these are cleavage fragments. And again, you'll see that there is a proportion that's longer than five microns. There is a proportion that has a width less than one micron, less than half a micron here, but it's not very much. It is there, but it's not a characteristic of the population. Some of these also have aspect ratios that are greater than 20:1, but again, not anywhere near the abundance.

So populations of cleavage fragments and populations of fiber have distinctive characteristics that enable them to be distinguished.

Next slide. These are airborne data. Again, look at the very small proportion that is longer than five microns, and the variability of this characteristic. This particular dataset didn't have the width at less than .5. It had less than .375. But you can see, again, these are very, very narrow materials, high aspect ratio.

Airborne cleavage fragments. Same thing that you see in bulk. Actually, when

you look at airborne particles in bulk population you see the same characteristics. It's not as though you have something totally different airborne than you would have in bulk. You can tell a lot about what the airborne population is like by looking at a bulk population.

So if I were to summarize what I would say about population characteristics, most of them -- these are populations of longer than five micron particles to start with, because if you include the short ones that first statement doesn't hold. But if you only look at the ones that are longer than five, you find that they are also longer than 10. That's very characteristic. There's a lot of long fibers. And they have very narrow widths, less than half a micron or more. And these are commericial asbestos, by the way. They have high aspect ratio. Those fibers that are wider than one micron are bundles. About 50 percent are either fiber bundles, or are both longer than 10 and have widths less than one. The individual statistics here are not as important as the fact that the

populations have very distinctive characteristics that enable you to design methods that can tell them apart.

Okay. The next one. The things that I've been talking about have been recognized by those who have looked at the false positive dimensions of insoluble fiber -- durable fiber, it's called. There's a lot of data and animal experimentation, inhalation and implantation studies, cell studies, human exposure that have led people who make this their business to analyze these types of things to come up with what dimensions are actually likely to produce disease. And what you see here, the only thing I know about in the literature where people have taken a stab at this sort of thing, you can see that the lengths are longer than five microns, and the widths are less than a half a micron in general. Lippman has a .1, and he also has a .2 to .8. He makes a distinction between those and lung cancer. These are the characteristics of asbestos populations, as you might well imagine. But they are borne out by all types of inorganic fiber studies

we see.

What about Libby? It seems to me that everything that I've talked about so far has been known for a long time. There's nothing new that has been presented up there. But in the background of these hearings there's a spectra of what happened at Libby. Why does Libby, Montana exist? What's going on there? Has there been some failure, some lack of understanding about the material at Libby? Is there an issue there that we need to understand in order to move forward?

And I want you to understand really that at Libby the only -- one distinction is that the type of asbestos there is mineralogically properly called winchite, not tremolite by winchite. But it is an amphibole, and it's a very close cousin to tremolite. So we know that. We know the nomenclature of the specific mineral is distinctive there from what we had known, and was listed in the regulatory policy elsewhere. Airborne populations -- but it is asbestos. And it is common in the gangue there. It is very abundant material. It is

not some small amount. There's a lot of real amphibole asbestos present at Libby. Airborne populations contain both asbestos and some cleavage fragments. Dr. Lee is going to present some data from there that's going to make his point very clearly. And.

I'm going to present some data now from Libby. I have two studies that were done at Libby. One was done -- actually, Dr. Chatfield recorded some of the original data in 1980 under an EPA contract. It was not air data. It was data that -- cephalin techniques were used from the vermiculite, both raw ore and from exfoliated material to mimic what one would find in the air. And the second set of data that I'm going to show you is from EPA's air monitoring that's gone on for the last couple of years up there. So I'm going to look at the dimensions of the populations that are airborne there so that you get a feeling for it. And then the other population that I'm going to show you -- the other one, the one that's in the middle here says lung tissue. These are the raw data of Dr. Martha Warnock, who was a professor at

the University of California at San Francisco. And she studied the dimensions of material that was found in asbestos workers who suffered either from mesothelioma, asbestosis, or lung cancer. And the lung cancer were from people who had high lung burden of asbestos. So I want you to look at the actual fiber dimensions of asbestos. Her data, by the way, have all different types, but it's dominated by amosite. In the lung, how they compare with what's in the air or lung -- modeled in the air from Libby so you get a sense of how similar these things are.

So I've put a bunch of different criteria up there just to try to give you sort of a handle on this. Particles in -- in the first slide, I'm going to look at all widths. In the second slide -- don't change it yet -- I'm going to look at widths that are .125 microns in diameter. In the third slide, I'm going to look at widths that are .22 microns in diameter. And I'm making this distinction because of what will you see on phase contrast microscopy during air monitoring? And there are two things that

are used to take dimensional data that are gathered by TEM and try to understand what would you see if you were looking at this with an optical microscope. And the minimum width is the thing that is usually used. But there is visibility, and there's resolution by optimal microscopy. And there's two very different things. Visibility is about .125 microns for amphibole asbestos by the presently used air monitoring technique. It will vary. It depends on index of refraction contrast. So it varies, but it's about .125. Resolution is about .22.

So the thing to look for as I go through these three slides is that the data don't change at all, number one. There's really very little difference in what you take. You get the same sorts of characteristics. I just need to be sure you get why I've got the same thing over and over again up here. We take all widths. You see that Libby doesn't look exactly like amosite asbestos in the lungs of asbestos workers. It's a little fatter. It's a little shorter. It isn't a real good commericial asbestos,

actually, that stuff at Libby. But it does have the dimensional characteristics that are asbestos in their character. So they have widths less than a half. Most of the particles have widths less than one. A significant proportion are longer than 10, and the width is less than a half. Variety of different comparative data there, just so that you can see.

Now, let's look at the visibility width so we limit these to widths that are greater than .125 microns. And all the other data I've taken out. Oh, and by the way, there are -- in terms of numbers here, there's -- from Martha Warnock's data there's 541 particles. From the Libby mine there's 484 particles. And there's over 1,800 particles from the population in the Libby region. So these are fairly large datasets that I think represent fairly accurately what you're looking at.

Next slide. And again, not much changes here. They're less than one. They have half a micron. Very abundant, and so forth. So the stuff at Libby is asbestos.

It has the characteristics of asbestos. And it doesn't need a new way of thinking about it at all.

Next slide. This is just another looking only at the longer than 10 micron populations. Again, you see them.

So the lesson from Libby is that asbestos is a major component. The dimensions are similar to amphibole asbestos. The amphibole at Libby can cause asbestos-related diseases. One thing that I haven't presented the data to support -- Dr. Lee will support it -- is that really all the fiber at Libby is visible by phase contrast microscopy because it's fairly wide.

The data that I've presented, and all the data that we know about asbestos, say that there are discriminate characteristics that you could apply to an optical count that would tell you whether you have the likelihood of asbestos or not. And these are some of the discriminating characteristics that all populations of asbestos will share in common, one or the other. Either half the population is longer than 10, or they're less

than a half, or they have high aspect ratios, they're longer than one, they're bundles, and so forth. These populations have characteristics that you could use phase contrast microscopy to discriminate.

Next slide. I've already talked about this. Next slide. I'm going to end with just a little bit of discussion about bulk analysis, why polarized light could be used, because you specifically asked about that.

The bulk populations of asbestos have distinctive characteristics that easily enable you to tell whether they're asbestos or not. This is an easy thing to do. All mineralogists agree -- everyone who look at bulk samples using polarized light microscopy, whether they're asbestos or whether they're not. And they have population characteristics.

You asked specifically about methods. The ASTM method was listed. The ASTM method was adopted in gray sheets only. And I know about this because I wrote it, the original draft. It was then worked on by the committee. But ASTM never finished it. I

provided you a copy of the last go-round so you can have that for your records, but it was never officially adopted by ASTM.

You asked about an EPA method. Perkins and Harvey in 1993 developed a method that is widely referred to by the EPA method, but it was not formally adopted by the EPA, either. I'm not sure what you had in mind, but this is a very good method for asbestos-containing building materials. Provides a good approach.

NIOSH 9002, I would not recommend you using it. It has some identification information that is incorrect. But one thing that you really need to be aware of is that all these methods were designed for the asbestos-containing materials -- not the mining environment -- and that no method is adequate to measure quantitatively amounts of asbestos in low abundance. And all methods need attention to the literature, and a well-trained mineralogist familiar with the mining environment to apply them correctly. It's different from building materials, the mining environment. And I think that's the

last slide that I had.

And Eric Chatfield is sitting next to me. I have in my written testimony some comments on TEM. I'm not going to make them today. They're there for you to read. Dr. Chatfield's comments overlap everything I have written.

MS. SMITH: Thank you, Dr. Wylie.

DR. CHATFIELD: My name is Eric Chatfield. I'm president of Chatfield Technical Consulting, Limited just outside of Toronto, Canada. I've been working in the asbestos field for a considerable number of years -- probably more years than I really want to remember -- dating back to the Reserve mining, dumping of material into Lake Superior. And I believe I did the very first airborne asbestos measurement in Canada, which was taken at a school playground outside of a Johns Manville operation. And that was way back in around 1971.

Since then, we have been involved in writing analytical methods. I'm chairman of one of the international standards organization committees which does develop

analytical methods for asbestos. We've already published now three methods in the national standards level.

Well, enough about me. I want to address a number of issues that you have raised in your proposed rulemaking. The first comment I want to make is related to Libby, and why we don't -- I'll start with it first. In establishing any future regulatory action, I think it's important to discriminate between the Libby situation and pretty well everything else. In looking at vermiculite over the years, I've examined vermiculite from Brazil -- two different mining operations in Brazil -- Russia vermiculite. I've looked at Russian vermiculites, all the U.S. sources, and also sources in South Africa. And I have never seen anything even comparable. This Libby situation -- the amount and nature of the amphibole in Libby is, in my experience, totally unique. So I think it's important to recognize, though, that the conditions that prevail in currently operated mines and quarries are not really relevant to the Libby

situation, although I do recognize it was Libby that precipitated MSHA's regulatory action and proposals. And I believe that that statement I just made, I believe it is confirmed, to a large extent, by MSHA's recent findings in which no measurements by TEM were found to be .15 per cc, shows that currently operated mining operations really are different from what must have happened at Libby.

In the selection of analytical methods, I believe that a geological survey should be done to determine whether asbestos is even present. There's no point in sampling for asbestos if there isn't any there. And I believe a combination of TEM should be used in the initial investigation to characterize the airborne dust cloud in the mining operation. I also believe -- even though I'm a TEM microscopist, and I've made my above living at it for the last 30 odd years -- the last 50 years, actually -- I do not believe that TEM is a method for routine monitoring. And my basis for saying that is I believe that regardless of its deficiencies, phase

contrast microscopy still offers the most timely means to detect whether worker exposures have exceeded the permissible exposure limit. And I believe, therefore, the health interest of workers are best served by the continued use of PCM.

PCM analysis is widely available. And you can even carry it out on site, if you want to. It's easy to set up, easy microscope. Preparation of sample filters for PCM examination takes about 15 minutes. An examination takes about another 15. So after you -- if you analyze something on site, the results of those analyses can be available within about an hour of finishing the sampling.

Now, by comparison, if you do TEM analysis, they have to be transported to a TEM lab. Preparation -- and I will emphasize a valid TEM evaluation of one sample I believe cannot be completed in less than three to four hours. Moreover, many TEM labs are operating with one instrument where it's a simple matter -- and a relatively inexpensive thing -- to establish more than

one PCM microscope.

Now, having done an initial site-specific study which asbestos -- at a place where asbestos is known to be present, then I believe the parallel analyses by the same filters by TEM and PCM could develop a database which allows you to look at the size fraction of fibers that you're dealing with, the nature of the dust cloud. If those allowances are conducted correctly, it's my experience there's no reason to expect that the results would be different from the two methods, if the same size fraction fibers are measured; in other words, you go to TEM. You measure the same size fraction of fibers as are detected by PCM. The results should agree. And those places where I've done that kind of work, they do agree. I mean, there's some scatter, of course, but not significant.

The TEM analysis permits you to discriminate on the basis of a composition and crystallographic structure between different types of crystalline fibers that may be present. After you've characterized the nature of the airborne dust cloud in an

operation, I believe you should then carry out monitoring using PCM. And the only circumstance that would warrant using TEM after that would be to determine the proportionate asbestos fibers in a PCM count when the PEL is exceeded. And that, to me, is basically the fundamental approach taken by NIOSH in the publication of NIOSH 7402, which is basically a proportion measurement.

Now, with regard to the feasibility, availability cost of commericial TEM analysis, that is one of the questions that you have in -- I have a particular interest in that kind of thing because I do operate a TEM lab. I operate a TEM lab, but I also operate with polarized light microscopy and phase contrast microscopy. I do not believe, as a practical proposition, to specify TEM analysis of all occupational -- there is an exception that TEM analysis now is quite inexpensive and widely available. But in reality, very few commericial TEM labs are competent to perform valid analyses of the complicated mineralogical mixtures that you find in mining and quarrying operations.

Many TEM and PLM labs were established in response to activities related to asbestos in building products. The accreditation programs operated solely is to control quality of analyses related to asbestos in manufactured building materials in U.S. school buildings. These analyses are very straightforward, and involve only the six regulated asbestos types. The majority of the analyses, in fact, involve only the three most common asbestos types -- chrysotile, amosite and crocidolite.

Now, the low prices for PLM and TEM quoted by many labs reflect the simplicity of the analysis being performed. The low prices are based on the use of the AHERA analytical method for determination of airborne asbestos in U.S. school buildings. The vast majority of these samples are comparable with blank samples, with very few asbestos fibers present to report or measure or identify. And there's usually very little particulate on the filter at all. Therefore, they're not difficult to count.

The other thing is if a sample

obviously contains a large amount of particles or fibers to be identified, the sample is actually rejected automatically at first sight. No amount of analysis -- where there's a lot of fibers to count and measure because the area is obviously dirty -- the information is passed directly to the contractor that you better go and ahead, or I'm going to take more samples. So the analysis of a heavy sample is never done. So a lab can therefore handle these very simple and very clean samples at this reduced price.

The other point about accreditation I wish to make, the accreditation of status of a TEM or a PLM lab is unrelated to the ability of the TEM or PLM lab -- analysts, I beg your pardon -- to perform analyses of these complex -- such as these that exist in mines and quarries. And I mean to illustrate this comment with three examples which are my own power stories.

I've recently examined samples from a new vermiculite composite where the owners were looking for funding to pay for the mill, and to get the operation moving. They were

looking for investment. These vermiculite samples which were taken were reported by two accredited commercial TEM labs to contain chrysotile asbestos. One of the labs reported chrysotile concentration of 0.4 percent. The detailed electron diffraction analysis of the material showed that the fibers reported as chrysotile were all, in fact, a variety of lizardite -- which is another serpentine mineral -- which exhibited a peculiar scrolling arrangement. I did, in fact, get Dr. Fredwicks involved in this, who is -- he's the head of Earth Science at the Royal Ontario Museum in Toronto. He is one of the world experts in minerals. And I got him to help. And eventually between taking the diffraction patterns and analyzing them, we show that there was no evidence of chrysotile in this vermiculite at all. The erroneous analyses originally by the two TEM labs could have resulted in abandonment of this mine. And it was necessary for the company to make significant expenditures to resolve this problem. I believe it probably cost them

close to $50,000 to get this simple analysis dealt with.

The second example you already heard About from Alan Bowen regarding the marble quarry in New Jersey, contains very low concentrations of non-asbestiform tremolite. Following complaints from the State of New Jersey from recently arrived residents who built homes adjacent to the quarry, stack tests were performed to measure if there were any emissions of tremolite in the stack emissions. That was from the crushing and drying operations that were going on. Test samples were analyzed by an accredited TEM lab. The results of the analyses include the tremolite fibers up to 200:1 aspect ratio, which were interpreted as indicating the presence of asbestos. It was only after the state requested a listing of the fiber aspect ratios that I noticed a discrepancy between the lab records and the data submitted to the state. The data discovered during the lab visit that the measurement of fiber dimensions was such an unusual activity in that regard that the TEM operated was

required to calculate the fiber dimensions using a hand calculator while sitting at the microscope. Calculation errors were being made, and many fiber aspect ratios were actually a factor of 10 lower than they were actually recorded. The day following this discovery a court hearing was held in which the state was requesting that the quarry be closed. It was only by presenting a certification containing the corrected data, and a valid interpretation of it, that closure of that quarry was averted.

In another example illustrating the unreliability of TEM analysis by commericial labs when dealing with these complex mineralogical mixtures, an NVLAP accredited commercial TEM lab reported that a sample of talc contained 8 percent anthophyllite. A combination of PLM and TEM showed anthophyllite was certainly present, but only trace levels well below 1 percent.

So there we've got examples -- the fundamental problem is that the individual -- it isn't a question of the individual lab; it's a question of the individual analyst,

and the level of training and knowledge that exists in the individual analyst. And unfortunately, that training is simply not there.

Moving on to PCM methods, interference and method modifications. Among the modern published methods for PCM analysis, two PCM methods published by governmental agents of the U.S. are NIOSH 7400 and OSHA Method ID 160. Now, the International Organization for Standardization, ISO, has also published a PCM method known as ISO 8672. Now, for some time, ASTM also published a PCM method which was ASTM D4240, but this has lapsed, and is currently being rewritten. I've said that it will be produced in due course as soon as I have time to do it.

Unlike the NIOSH method 7400, or OSHA ID 160, 8672 requires that a fiber thicker than three microns is not counted. You throw those out because they're not respirable. That's the rationale for that. And the TEM method -- the direct transfer TEM method -- ISO 10312 applies the same criteria in counting the so-called PCM equivalent fibers.

The same criteria throw out the fibers thicker than three microns, or throw out the fibers which are in contact with particles thicker than three microns on the basis that the entire assembly is not respirable. The rationale basically is that fibers too large to be respirable should not contribute to an exposure measurement.

The PCM method as mentioned earlier was originally intended for the routine monitoring of worker exposure in the asbestos textile industry where asbestos is known to be present. Any fibers you find could be assumed to be asbestos. The fiber criteria was selected rather arbitrarily to provide discrimination between obvious fibers and fragments of other minerals which are mostly random or equant in shape. The airborne dust in other types of mining and quarrying operations can be very different, in that the numerical concentration in asbestos fibers, if asbestos is present at all, is low compared with that of the other types of particle. And unfortunately, crushing of these non-asbestiform minerals, and even

things such as -- if you crush them up you get large numbers of particles which qualify as fibers under the 3:1 aspect ratio rule. They constitute an interference in the current PCM methods when applied to monitor airborne dust in non-asbestos mining and quarrying. Using the current PCM fiber counting criteria, cleavage fragments are reported as fibers, even when there's no asbestos present at all.

In any revision to this PCM method, there are two actions that MSHA could take which would result in a fiber counting method directed toward monitoring worker exposure in mining and quarrying operations. One would be to bring the PCM fiber counting method into light with current national standards by incorporating the criteria to reject fibers thicker than three, and fibers in contact with particles larger than three microns in diameter. The second thing would be to modify the fiber counting criteria to make them more specific to asbestos, which would have the effect of reducing the interference by cleavage fragments.

Fibers of non-respirable dimensions clearly should not be included in the measurement of exposure. And the first criterion, the rejection criterion, would specify that such fibers would not be counted.

Fiber counting criteria could be made more specific for asbestos by taking into account the length to diameter relationship exhibited by asbestos fibers, particularly airborne asbestos fibers. The diameters of airborne asbestos fibers and asbestos fiber bundles generally increase only very slowly with increasing length; whereas the wet cleavage fragments of non-asbestiform minerals show a proportionate increase in width as they get longer. Airborne asbestos fibers collected and examined by PCM methods are generally thin. When they are thicker, they are fiber bundles which usually exhibit asbestiform morphology.

To make the measurement more specific to asbestos, the fiber counting criteria should be modified (1) to include all fibers that exhibit obvious asbestiform morphology;

i.e., fiber bundles, curvature, splayed ends, clusters; (2) to include any fibers for which the asbestiform or non-asbestiform nature is ambiguous and cannot readily be determined; and (3) to exclude all mineral fragments of discernible width that exhibit cleavage characteristics.

These changes would result in rejection of many other types of non-asbestiform mineral particles, and provide a more meaningful measure of the asbestos concentration in the special environments that MSHA regulates. In adopting fiber -- modified fiber counting criteria for the special situation in mining and quarrying, MSHA would not be the first agency to apply selective fiber counting in measurements of asbestos concentrations. In fact, all current PCM methods, or any selective fiber counting, in fibers shorter than or equal to five micrometers are disregarded. OSHA also recognizes the concept of selective fiber counting.

The alternate differential counting techniques are available, and they may

include primary discrimination based on morphology, polarized light analysis of fibers, or modification of PCM data by SEM or TEM. That language is actually in the OSHA ID 160 Method. But it does say that a great deal of experience is needed -- is required to routinely and correctly perform differential counting.

Another agency, EPA, is using also modified procedures. Just to illustrate the differential counting, that's a PCM slide containing mineral walls. And you see that the mineral wall could be recognized because generally they're rather thick, and generally they are a cylindrical section which you actually see quite well when you move the focus up and down on these slides.

Gypsum tends to be recognized because you see the bottom particle there has a fiber which is more than 3:1 aspect ratio, but you see the ends are out at an angle. And that's very characteristic of gypsum. So with a bit of mineralogical knowledge, you can do discrimination of these.

Going on to TEM, we have measurements

of the Libby site being made. The EPA is currently making environmental measurements using -- counting fibers longer than five and thinner than 0.5 microns. Those are the only size fractions being counted. And in these analyses special consideration is also being given to fibers longer than 10 and thinner than .5.

Now, the decision to include only the size range of fibers is based on experimental work that shows that graphs -- the incidence of lung tumors was related to long, thin fibers. And the actual lab data from the rat study came out as longer than 40 microns and thinner than 0.3. In determining a suitable risk protocol, EPA elected to relax that -- and somewhat arbitrarily, I might say -- to longer than 5 and thinner than .5.

Now, moving on to bulk sample analysis, you did address your question of bulk samples in the "Federal Register." A few comments I wanted to make about doing bulk samples. The four analytical methods -- EPA, ASTM, OSHA and NIOSH -- they're fundamentally based on the same principle. And they're almost

identical. And we did hear this morning about the British method -- which, again, is polarized light microscopy as the basis. In fact, the EPA method is currently the most versatile of these published analytical methods in that it includes some but not all, perhaps, of the procedures of gravimetric matrix reduction. If you're dealing with asbestos concentrations in the vicinity of below 1 or 2 percent, it's, in my opinion, absolutely essential to use matrix reduction to get accurate results. It's an indispensable component. Depending on the nature of the skill of the analyst, without gravimetric matrix reduction, it can fail to detect gross concentrations in asbestos. The reason for that is even if you consider the Libby situation, what you will find with the vermiculite with the Libby -- what we used to call tremolite, but we now call it winchite, in it the bulk of the weight is represented by some very large fiber bundles, which are widely spread in the vermiculite. So if you detect -- grind it up and put it under a microscope slide, you will either see or you

will not see one of these big ones. So the only way of dealing with this situation is to take the large sample, get rid of most of the vermiculite, and then have a look at what's left. Then you're in a much better situation, because you're perhaps only looking at 10 percent of the original weight. You've got rid of stuff which identifies vermiculite. That particular situation is very easy because you can exfoliate and make it float on the top of the water. It's very straightforward.

But nevertheless, there are a number of gravimetric procedures that are ambiguous. The mining and quarry samples you can accurately quantity the concentration only by using the gravimetric matrix reduction method.

I've already dealt with the fact that the ASTM method really was only a suggestion, and never really got forward and published. But in general, one comment I want to make on this topic is that TEM is not a suitable method for determining the concentration of asbestos in bulk samples. Asbestos is

present in the products of mines and quarries, is often presents as sporadic large fiber bundles widely disbursed in the material. They're often too large to appear on the specimen grid. The TEM specimen grid is 3-millimeters in diameter. If you have a fiber bundle in every hundred grams of product which -- and that fiber bundle is half an inch long, you're never going to see it on a TEM sample. You just never will get to it.

So PLM is by far the best approach -- in fact, I believe the only approach to bulk analysis. The way you do that is start with a large sample, and remove as much of the non-asbestos material as possible before you go to the microscopy. Once you get there, then the amount of asbestos remaining in that residue, which may be 10 percent or less than the original sample weight, is readily quantified if you use size selective points. TEM is useful in bulk analysis to identify fibers where you have some doubts, as opposed to the optical work. Certainly it's very simple to identify fibers on the TEM if

you're having some problems optically. But the other place where it's useful is to demonstrate the absence of asbestos because if you go through your gravimetric matrix reduction and you've got residue, you can -- it's a homogenized residue from a large sample, and you can them make up a TEM grid from that very simply. If you don't see any asbestos on that grid, it's a very good way of confirming the absence.

In fact, one of the things that I should say here in conclusion to that is that I believe TEM analysis of untreated samples are generally misleading. And because of the small sample size that you have to use, and it's an inappropriate method for the majority of these types of samples.

One of the other questions you did address, or did ask questions on, was selective removal of mineral dust from air samples. Now, in general if an air sample contains a large proportion of minute particles, little can be done to remove the non-asbestos particles, but there are some exceptions.

In samples which I collected -- air samples I collected roughly a week after the World Trade Center disaster, I had air filters which were very, very heavily loaded. They were collected in some apartment buildings. The loading was gypsum. And I did find that one of the techniques that can be used is to extract the gypsum with water. So you could put it onto a Jaffe washer with water for a period of a day. And at the end of the day you've got no gypsum there. The rest of the sample then could be analyzed very easily. And the same with marble and calcium carbonate; you can remove it with hydrochloric acid without any major -- that's the key thing. I didn't want to do any analysis on any of these things.

So with those two kinds of exceptions, you can do something. But in general, I don't believe there's anything that can be done other than taking -- doing it that way.

The other thing you could do in that case is if you have to drop the air volume, then your analytical sensitivity is going to be worse. You're going to run into the

situation where one fiber equals one fiber per cc, which is not very good. So what you can do, then, is to extend the fiber count and do a little more area on the PCM filter. Again, there's a limit as to how much of that you want to do because it gets to be a very long fiber count. So I think that's summarized on the slide, really. There's not much you can do unless you've got soluble fibers to remove.

I hope these comments are going to be useful to you. And I wish you the best of luck in your deliberations.

Now I'll pass the microphone down to Dr. Richard Lee, who will continue. He's president of the R.J. Lee Group.

MS. SMITH: Thank you, Dr. Chatfield.

DR. LEE: Might I suggest about a five-minute stretch?

MS. SMITH: Yes, you certainly may. Let's come back in about 10.

(Off the record, 2:53 p.m. to 3:04 p.m.)

MS. SMITH: We're back on the record, Dr. Lee.

DR. LEE: Thank you. And thanks for

the break.

MS. SMITH: Thank you.

DR. LEE: As you probably all know by now, my name is Richard Lee. And I'm very pleased to have the opportunity to address your panel in its consideration of the issues and ramifications of any change in the PEL.

I'm here on behalf of the Association from the Sand and Gravel and Aggregate producers. I'll be testifying today on the basis of my knowledge of the literature, my personal research which spans about two decades, and my personal experience and knowledge of the issues involved in fiber counting.

You've heard -- in fact, both Eric and I probably got our start -- a large part of our start in this business at the time of the Reserve mining case. I was a brand new Ph.D. at United States Guild Research when Mount Sinai researchers announced their finding of amphibole asbestos in Lake Superior water. We rapidly found out two things: We didn't know anything about it, and neither did anybody else. A whole set of issues have

developed because of the application of historical definitions into the electron microscope, and the use of the terminology, and the aspect ratios and sizes created a set of problems that persist today. They're responsible for the errors and mistakes that have caused various companies and individuals substantial money, shut down organizations like Reserve because of these definitional issues. They will surely create -- pop up more frequently with any reduction of the PEL to a point where the dose you're trying to measure is not substantially different than the background concentration of the interference. That is one of the critical issues facing a very -- bringing the PEL down to a very low level.

I've provided -- I will provide the slides I use today. I will also provide copies of the testimony I gave at the OSHA hearings in '92, because not much has changed, in reality, as Dr. Wylie and Dr. Chatfield pointed out. Unfortunately, the topics that were addressed there are coming up again, and will come up repeatedly

because the cutbacks in RND in both corporate and agencies have sort of diminished the corporate -- collective corporate memory. So we keep rediscovering and reinventing issues. So I think any change you make, you need to be sure to formalize what materials you're going to characterize, and the operational definitions of their characterization in the laboratory in a manner that hasn't been done previously. This is probably the most important thing of the action of the regulator in creating an ongoing corporate memory. How do we do this? We know how. It's we keep -- people get old, go away. And the next generation has to reinvent it.

I do not intend to comment on the merits of changing the PEL. I would like to point out that the PEL, as Dr. Wylie and others have pointed out -- and the use of PCM data is that of an index. It's not an absolute measure of concentration. It's an index which has been related to the characteristics of a disease population, and characterizes dose responses. We know full well that there are particles that are in

that exposure that aren't being characterized by that measurement. But as long as we have a qualitative and quantitative index relating that to dose response, we really don't care. But as the PEL is lowered, these factors, these interferences from cellulose fibers, other minerals, from cleavage fragments, become more important.

If you go back to the Libby situation, today the average PCM, airborne concentration is .003 fibers per cc. That is reduced by merely two orders of magnitude if you take out the interferences. So the interferences constitute a very large part of that concentration.

I will also not speak in any detail to the OIG's recommendation that TEM be used as a primary screening technique. Dr. Chatfield's comments I just support and endorse. You can find lots of references in the literature to the problems. But I would make these points, some of which echo Dr. Chatfield's comments: Number one, the average TEM laboratory is only equipped to measure chrysotile concentration, and then

only in specialized situations; number two, properly done, PCM and TEM will provide equivalent measures of the index of concentration. They are both microscopes. You see -- you look in them, and you see things. It's a matter of what Dr. Wylie talked about, the -- what did you say, Ann?

DR. WYLIE: Visibility and resolution.

DR. LEE: Visibility and resolution. That's it. Other than that, they both form images generated by a source. And you don't look -- you look at those images with your eye. So the fundamentals don't change between those two. And that's a very widely-hold misconception.

Number three: The properties of asbestos that make it biologically relevant. Mainly it forms in long, thin fibrils. And its typical characteristics in the atmosphere are long, thin particles; and therefore you can handle them. Also permits you to use a discriminate counting technique that could be employed on a very reliable rugged basis by people with limited skill sets. And in the industry we need to consider that. In the

agency, you need to consider that.

Number four: The cost of TEM analysis properly done is going to be at least 10 to 20 times the cost of PCM discriminate analysis properly done. As we lower the PEL that we're attempting to measure, it becomes more important that we increase the frequency of monitoring. Because the concentrations that we're trying to measure are being reduced, the natural variability in those concentrations increase. So in an attempt to get a reproducible index of the dose a person is receiving, we need more, not fewer measurement. Cost becomes an issue.

So for that reason, the consideration of the use of a simple discriminate counting technique, which will then enable more sophisticated analysis to determine whether or not you're getting an asbestos exposure, is significant. And that's why we, the technical expert on behalf of the Sand and Gravel and Stone Association -- I never remember what order -- on behalf of those guys -- are really recommending cleaning up, modernizing the definitions of PEL, and

instituting a reliable screening procedure that lets the concerned industrial hygiene professional, self-help health and safety professional or regulator determine the likelihood that there is an exposure going on.

I'll now turn to the topics covered in the slides. And if the panel would permit, I'd like to stand up. And I'll hold the microphone so the court reporter gets it.

I want to -- because I think organizations have short corporate memories, my suspicion is some members of the panel and certainly some members of the audience have not been introduced to the mineralogy and chemistry -- other than the four or five times today that you've heard about. I'd like to just briefly address the past OSHA rulings, the '92 ruling that ultimately eliminated ATNA cleavage fragments from consideration. And I've been extensively involved in the Libby, Montana situation. So I'd like to make some comments on that.

In the last extension notice that came out, the Stone Association sponsored some

sampling in various quarries to which we applied some discriminate counting techniques. So I'd like to report on those results. And finally, present the discriminate counting technique that we're proposing for your consideration.

Asbestos is forms of a mineral. This is chrysotile. It's what everybody in the country in TEM -- and for the most part optical labs -- count because that's what's used in ceiling materials and insulation jobs. It has a wide market. It's characterized by a very specific chemistry of magnesium and silica. The techniques we have available to determine whether this includes -- energy x-ray spectroscopy, which tells us what elements are present; pictures, which tell us the morphology or shape characteristics of it; electron diffraction, which tells us, if we interpret it correctly, what the crystal structure is. And this was a point Eric was making earlier about failure in some situations to properly interpret electron diffraction patterns leads to misinterpretation and misidentification.

Finally, the one -- the optical image which is polarized light microscopy. Of these, in one sense the most reliable is the one requiring the most sophistication, the polarized light microscope, because you learn how to recognize things by what you see, not what you can measure.

Just briefly, here is the six regulated minerals, tremolite, similar things. I'm not trying to train you on what these are. They're there. If you ever want to become a TEM analyst, you can use these for your reference. Anthophyllite, amosite. Each one of these, the pattern -- diffraction patterns, the crystal can be tilted up to give you a very specific diffraction pattern. It will exhibit, under certain conditions, very specific optical colors and properties. And they have specific chemistries. Crocidolite, which is not much of a factor except in the cement type industry.

Related to these is -- if you're chrysotile, it's identified as a mineral. So we really in general don't have a debate between cleavage fragments and amphiboles

because its cousins are -- cleavage rock forming cousins are minerals, and they have uniquely different structures in general. When you get to the amphiboles, they are not unlike chrysotile and amphibole, but they're not recognized as separate minerals. But therefore what happens is people see tremolite or actinolite. And if it's three times longer than wide, and they don't know what they're doing, they've got to question whether or not it's asbestos. And you'll get that debate.

The difference between them -- I was trying to think about it this morning -- this may not be a good analogy, but if you visualize a map of the United States -- the different states -- and at the time you're forming the country you're trying to decide whether we're going to be a union in which we have to physically break those boundaries, because they're growing together, they were an integral part of each other, or whether those were going to be loosely connected, each state was going to be its own thing. In an asbestos body, each fibril that makes up

an asbestos fiber is its own thing. You separate it. You don't have to break it. In the cleavage, those boundaries that you can see between the different grains are, in fact, boundaries. So they are -- they have to be broken that will produce long, thin particles. Nature is not always perfect, or at least our view of it isn't. You can get mixed asbestos and non-asbestos actinolite and tremolite -- any of these minerals. In the extreme case, it's simply obvious: Long and thin versus short and fat are never going to make an asbestos fiber. Just isn't going to happen. But that -- as you reduce the size and get smaller and smaller, that difference you see in the optical microscope gets harder and harder to resolve.

In the TEM, you still do -- this is a TEM picture -- you still do get that characteristic. And if you use the same scale like in the next slide, the difference is still obvious. You see the cleavage fragment is irregular, has that tapered end that Dr. Chatfield mentioned in the gypsum, and the way it was broken. If you flip back,

you see none of those characteristics in the TEM of the asbestos fibril. It's bent, its curvature. It's actually the same set of properties that Dr. Wylie put up as the definition of asbestos.

Finally, we can separate one advantage in electron microscopy is that we can actually separate -- use our chemical differentiation application to separate minerals out and discriminate, say, talc from tremolite where or other asbestos where the morphology in the PL, or whatever, may confuse you.

Now, I want to take a look at what OSHA concluded -- at least my understanding of what OSHA concluded in 1992. They examined the whole question of tremolite, anthophyllite and actinolite. You heard about the lengthy debate and discussion. Based on the testimony presented to OSHA, they cited -- and therefore I say determined. I don't know if that's technically a legal word or not -- conclude or didn't disagree with -- which I assume they would have had they not been determined -- first of all,

that the scientific literature -- and they cite Dr. Wylie's findings in there extensively -- that high aspect ratio thin particles were biologically relevant; that you can, in fact, discriminate asbestos and non-asbestos particles; and that they should be defined separately for regulatory purposes. I believe that if MSHA moves the PEL, it's important that they adopt this as a minimum. They use Dr. Wylie's slide to define what are the characteristics of the population. This is also a slide the ASTM uses in their definition, and the EPA method that Dr. Chatfield cited -- used.

They also further evaluated an optical discriminating counting that we had provided. They did not endorse it. They recognized that it existed. I just believe they didn't go far enough. What was done with that in order to enable that counting -- and this is important, because it's the difference between just counting everything that's three times longer than it is wide, and counting to make some discrimination. If you listen carefully to Dr. Chatfield, he was really

saying that below some number -- and he didn't particularly cite it -- but below about a half a micron -- optical fibers, optical images start to lose their distinctive shape characteristics, and start to become lines. That's about a half a micron.

So if -- and as Dr. Wylie pointed out, individual fibrils is thinner than one micron. So there's a graticule -- which has a half micron wide line, one micron wide lines, five microns in length, five micron circles, one micron dot -- various characteristics that enable the analyst to be trained to recognize and discriminate different features. We then count -- and anybody, any of these rock counter or ore investigators would say we do a green count. We count all particles that are greater than 3:1 under one button. We use another button to count those particles that which are longer than 10 microns, Dr. Wylie suggested. Another button to count those particles which are less than a half a micron, and another button to count those particles which are

bundles, or to display the obvious asbestiform characteristics. But instead of a manual grain counting device that's been used for 200 years, we use -- next slide. Go to the end. Back up. We'll come back.

We used a computerized version where the buttons are on a little computer device. You can do this on a sheet of paper. You can do this with a computer-aided device. It doesn't even matter. It's not hard. It's simple. And you can train people to do it, just like you train them to do phase contrast counting.

Okay. Now you can flip back. Let's take a look at this Libby data. Now, I'd like to focus a little bit on Libby. In terms of the historical, Dr. Ross mentioned that the Libby mine was shut down 10 years ago. So in term of a real problem, it's 10 years old, and beyond. The PCM could have, and should have, and did demonstrate high fiber counts at Libby. If you look at Amandis's data and the papers by EPA -- or I forget who, but Amandis was the author -- they showed that the fiber counts weren't

slightly above .1; they were much. They showed fiber counts slightly larger than one. They the were much larger. They were larger than 10 fibers.

So the PCM did not fail when used in the mine. There's been a large number of SEM and TEM analyses performed on samples recently. What you find is cleavage fragments. These are going to be images. Each one of these images has a relatively high magnification in each of the fibers, a low magnification, and a chemistry. And I'm really just going to focus your attention to the upper right-hand corner, because the first three I'm going to show you are cleavage. And the next three are asbestos. And you need to see them relative to one another in fairly close context in order to understand.

So go ahead. If you just flip -- another one tapered. Another one very course. Two microns thick, kind of plate. Another one now we turn to the asbestiform. High aspect ratio, thin width. .5 microns. Thinner and longer. Next. Thinner and

even -- even thinner and longer. If you back up, all of a sudden, boom, you see that even in the electron microscope when you're looking at these things, then you realize that the individual fibril -- which Dr. Wylie and Dr. Chatfield talked about -- then with length fiber diameter does not get courser for asbestos. That's the real key. You get to the long, thin guys, and you can dramatically see the difference -- at least I can, and you'll have to believe me if you don't.

Our data indicates 98 percent of the fibers were large enough to be detected by PCM. In the recent data sets, 72 percent of those -- in conjunction with Dr. Wylie's testimony -- were either less than half a micron in diameter, or longer than 10 microns in diameter. 55 percent of the particles by our analysis are, in fact, asbestiform.

So Libby has a characteristic that is the first time -- even though the concentrations that are there today are very, very low, .304 fibers per cc, they have characteristics we haven't seen in any other

population -- at least in the U.S. -- long, thin, substantial abundance. We just haven't seen that in any of the quarries.

If you go to TEM, you see the same situation. Next slide. Tapered -- tapered ends. These are characteristics of cleavage. Back up one. Again, tapered. Irregular. No evidence of fibril bundles. Next. Same thing. Next. I mean, you get some close calls. Sometimes you just can't tell on a single fiber. This is where Dr. Wylie mentioned you have to do populations. Next. Now you get into asbestiform. Very long, thin. Different population. Next. Same characteristics that distinguish on a macroscopic basis also distinguish it microscopically. It's actually quite nice that nature didn't somehow make things indistinguishable at the cell level that were distinguishable at the macroscopic level. Next. There are two populations: Asbestiform and non-asbestiform. Most of the fibers are non-asbestiform. Airborne fibers are probably 10 to 20 percent asbestiform. The mean fibril diameter is between .2 and.3

micrometers.

Now I'm going to show you some slides which illustrate the population. This, as Dr. Wylie mentioned earlier, is out of EPA data. It's AHERA fiber population. So it includes all fibers. Horizontal axis is width; vertical axis is length. It's a true dimensional crosscut of the contour map of the population.

So out here there's less than 10 fibers. The purple is 10 to 20, or whatever. The blue is the highest concentration. What's interesting about this, because of this large dataset they've collected, is that you can see there are two populations; one which is virtually independent, and one which is -- gets wider as it gets longer. It's the best data I've seen because it's the largest dataset. It was collected essentially by one lab. And we really can't argue with it, because the industry didn't pay for it; the EPA did. So it's not like there's suggestions that maybe this guy biased the analysis, or whatever. This is a lab collecting this data.

Now, let's look at the five micron diffraction. You see the interesting thing about Libby is you never see -- there's still a significant population above five microns. Next slide. So 57 percent are greater than five and greater than two. Next slide. Now let's look at the stuff wider than a half micron. You can see the line come in, and the left of it will shade off that which is greater than a half. So you see our population increasing. There's still nearly 25 percent. Next slide. 52 percent of the population greater than five is less than a half. So again, this is Dr. Wylie's characteristics of an asbestiform population. Take it up to 10, the risk population that Dr. Chatfield and Dr. Wylie talked about, we're still seeing a substantial portion. Next slide. So when we get done, Libby is unique, even though the current concentrations are extremely low. It's unique in anything that I've seen. And the data clearly illustrates that there's an asbestiform and a cleavage population in that airborne population.

Now, let's take a look at some recent datasets. Let's just go to the next slide. Historically, there is data that more than 20 percent of rock quarries samples would be above .1. MSHA recently provided a dataset which said about 7 percent by PCM -- not by TEM, but 7 percent by PCM. In the data analysis that we've done where people send a sample, it's not all that different. It's about 12 percent -- substantial, though, if you're going to start counting all these samples with TEM, number one; and substantial if you're going to have to go back on 12 or 14 percent and verify that you're not looking at asbestos by TEM. So it can still be a very significant cost.

In the historical dataset, selected samples have been examined by either SEM or TEM. All asbestos fibers were fine out of that percent.

When you look at the NSSGA data or the Libby data, the solution is do a discriminate optical count and analyze, based on the trigger mechanism, portions of the samples by SEM or TEM. This screening can help you

distinguish those samples which have characteristics of asbestiform in populations. And they let you analyze enough samples and enough particles because you're doing it using an inexpensive method to get some meaningful data.

Next slide. So we proposed to count all particles having greater than 3:1 aspect ratio. This is important because it relates back to the historical data. From that population, count using a separate button -- a separate tally -- a percentage of those being longer than 10 microns or less than a half micron. Say the sample is potentially asbestiform is now only 50 percent of the fibers and bundles are either less than a half micron in diameter, or longer than 10. That's a very inclusive rule. The proper rule properly is longer than 10 and less than a half. But if you do the ore, it's a little more inclusive, and will cost a little bit more, but will be sure to get anything potentially asbestos.

So if you do your PCM count if you're below .1, or whatever your PEL is, forget it.

Just go home. If it's above that, check your discriminate counts which you do on the same sample at the same time, the same ticks. You count the number. But you're also counting this. You're also counting this. And you're also counting lengths greater than 10 and widths greater than -- less than .5. And you're taking in bundles or obvious asbestiform particles. If more than 50 percent of the particles are -- meet those criteria, the asbestiform characteristics -- not that they're asbestos -- you say we better check this. At that point the operator either has the choice to treat that count as asbestos, or get a validation. That is the same as your OSHA rule right now.

Next slide. Then you move -- if you say the sample is potentially asbestos, you go in with SEM or TEM to confirm the identity, confirm it's asbestiform amphibole. If not, you say the sample is not asbestos. When you get done, you use the OSHA rule -- which basically says take your PCM count, take your percentage that was asbestos, and divided it by the total fibers. Multiply

that by your count. So I get a PCM count which is all fibers. I take my asbestos over my total -- that's my fraction -- and multiply those two together. And then I get my determination of what my asbestos concentration is. This is the way we do it I mentioned now. So we'll just go by that.

Now, I think for the purposes of late in the day and letting Dr. -- Mr. Bailey go -- I think the rest of this is a repeat of what we've seen earlier.

Oh, I forgot one thing. Let's go one more. Here is the chrysotile and asbestos in commericial building products. You see they're quite visible. This is chrysotile: Long, hairy. Now let's go to a real world. This slide is actually much better in black and white than the printed version. It's very hard, lots of background stuff in a real world dust sample that you don't get in a building sample. And that's the reason these labs go bad.

Next slide. When we apply the discriminate counting to recent samples, 73 samples, we're counting using either 10

microns or less than five. Nine of the samples were above .1, and had more than 50 percent of their population in that discriminate count category. Those samples are the ones that would go to TEM or SEM for a review.

There's another way that people have looked at it; and that's to say suppose I exceed my simple count .05 -- which is, for all practical purposes, the same thing -- I screen my sample out for asbestos as much as I can. If that counting is .05, then I go to my backup counting. Of those 73 samples, 12 samples were found to have 50 percent of the fiber population longer than 10 microns. None of those had 10 factors.

So the discriminate count I believe can be very effective, very powerful, and very simple, and not add anything to routine costs. So on the basis of that, that's what we recommend. I thank you for your time and patience. And we'll let Mr. Bailey wrap it up.

MS. SMITH: Thank you, Dr. Lee.

MR. BAILEY: I want to again thank MSHA

for the time it has given us to provide this testimony on its proposed asbestos standard.

I'm the manager of Occupational Health for Vulcan Materials Company. I have over 27 years as a professional industrial hygienist. I serve as the NSSGA's chairman on its IH Subcommittee, Occupational Health Program Task Force; and, of course, the Asbestos Task Force.

Now, before I conclude the Association's testimony, and I put forth the Association's recommendations to MSHA, I wish to address one additional, very important point concerning asbestos in miners.

The OSHA PEL was designed for protecting workers exposed to commercialized asbestos. For purposes of demonstration, here is a diagram of a sample collected in commericial asbestos environment, and counted through the light microscope. This is the kind of sample that many asbestos labs see. I have indicated here, for purposes of discussion and demonstration, a concentration of 0.5 fibers per cc.

The entire quantitative risk assessment

or QRA used by OSHA for asbestos PEL is based on a dose/response relationship of commericial asbestos and health outcome of the workers handling it. The OSHA asbestos QRA purposely did not include studies of asbestos miners, even though there were a number of valid studies available for the agency.

Why was that? The primary reason was that the various asbestos health risks -- asbestosis, lung cancer, mesothelioma -- were shown to be significantly lower in miners than those studies of non-miners. Was the asbestos found in mines significantly safer than that found in building, insulation and textiles? I believe the answer lies in the way the exposure dose was determined. And it pertains directly to what has been testified to this afternoon.

Properly sampling and analyzing ambient samples for asbestos in mining environments is critically important to MSHA and to those it regulates. In the chrysotile mine -- which we don't have anymore -- typically 95 percent of the ore being handled is the

host rock or gangue material, while 5 percent or less was the product being sought; asbestos. When chrysotile miner dust samples were collected in the early '70s and before, the liquid impinger sampling method and the million particles per cubic foot analytical measurement were used and recorded respectively.

The counting criteria, using a light microscope, were particles longer than five microns, and with length to width aspect ratios of 3:1 or greater. In the studies of asbestos miners, researchers attempted to convert the million particles per cubic foot results to fibers per cc so the fiber dose could be determined for risk assessment purposes. In later years, the phase contrast light microscope method was adopted and applied to the mining environment, along with the simplistic fiber definition.

What was the result? The asbestos fiber exposure results not only included chrysotile asbestos fibers, but also antigorite, lizardite, and other host rock fragments that fit the fiber definition,

designated here as A, L and O. And C is the chrysotile. In fact, the rock fragment proportion of an asbestos exposure would have accounted for most of the exposure seen under light microscopy.

Now, these are all particles -- this is -- I'm going to make it real simple. We're going to delete the non-fibril fibers here just for demonstration purposes here.

The antigorite and lizardite are not asbestiform minerals, and have never been shown to cause asbestos-like disease. The result is that asbestos exposure to miners was diluted or inflated with non-asbestos, non-harmful rock fragments. And consequently the dose of asbestos in mines did not cause the same effect as an equivalent dose of asbestos in other work cohorts exposed to asbestos. Of course, as show on the first slide, these other work cohorts were handling commercial asbestos. And almost all the particles fitting the fiber definition were, indeed, asbestos and harmful.

Had a more appropriate asbestiform fiber screening criteria been applied to the

mine samples, the results would have been very, very different, and would have been more consistent with the other non-mining asbestos cohorts. If the PCM counting criterion was such that the rock fragment portion of the dust sample was excluded from the count while still including the chrysotile asbestos, the real dose to asbestos miners, in this case being reduced now to .05 fibers per cc, would have been apparent and lower. And the resulting health outcome would have matched the exposure.

Here, an inappropriate analytical method led to an inappropriate conclusion regarding miner health. The analytical tools must account for the environment from which the samples are collected. It is clear that the mining environment is so different from what OSHA regulates, that more appropriate screening methodologies are necessary and essential.

Now, I briefly want to summarize the testimony and submit the recommendations for your consideration as a final part of my testimony, and then open up the forum to

questions and discussion.

From Bill Ford, senior vice president of the NSSGA, you heard how this issue is near and dear to our hearts. There is no question that this one issue of what is and what is not asbestos is linked directly to our survival as an industry. We were constantly present during the OSHA deliberations. And we will be vigilant again as you progress through your rulemaking.

Dr. Malcolm Ross, retired from the USGS -- and a prolific author of numerous papers and chapters on this very subject of asbestos and non-asbestos -- told you that true asbestos risk needs to be based on factual information, and risks need to be put into perspective. He told you about the distribution of the two mineral habits in the United States, and what could and did happen to the mining industry when improper and ambiguous asbestos measuring techniques were used.

To bring that point home, three companies shared their separate but related story of how poor definitions, poor

analytical procedures, and poor understanding of the properties of asbestos and non-asbestos minerals resulted in significant adverse economic impact and unwarranted panic of customers, neighbors and employees.

Dr. Wylie, recognized worldwide for her expertise on naturally occurring asbestos, told you how the asbestiform mineral habit of minerals is different from the non-asbestiform habit. She told you where the federal fiber counting rules for the PCM originated, and why they cannot be used to distinguish between the two mineral habits. Finally, she reported on the numerous scientific papers in the asbestos literature demonstrating how populations of asbestiform minerals can be easily recognized using morphological properties that are more appropriate for that mineral habit.

Dr. Eric Chatfield, consulting electron microscopist to EPA and others, recognized worldwide for his expertise, as well as the author of asbestos analytical methods, told you that TEM analysis for routine exposure monitoring is a poor choice because of cost,

time for analysis, quality of labs due to the lack of experience with mine samples, and too small a sample size being analyzed. He did say that electron microscopy needs to be used to confirm the mineralogy of the particles of interest. And, very importantly, Dr. Chatfield provided examples of where discriminate fiber analysis has already been established in the very environments MSHA is regulating. The precedent for change for the betterment of science has been established, and MSHA should follow this trend.

Finally, Dr. Lee, who is also recognized internationally as an asbestos expert and as a past consultant to MSHA, told you how to apply the morphological differences in a more appropriate discriminate PCM counting procedure that captures true asbestiform minerals while excluding the majority of harmless cleavage fragments. This procedure allows a logical tiered analytical approach for mine samples going from the least expensive, time consuming and technique sensitive to the most sophisticated where needed. Like

Dr. Chatfield, Dr. Lee also spoke to the point that the many electron microscopic laboratories doing asbestos work are dealing with commercial asbestos samples and samples for mine ores would be very difficult for them to accurately analyze. Samples from mines and from commercial asbestos abatement sources are completely different with respect to complexity, where the samples from mine require experienced mineralogists.

All of these experts addressed the Libby, Montana vermiculite issue. And none of the recommendations made would minimize or miss what occurred at Libby.

Based on this testimony from these individuals, NSSGA offers the following recommendations: NSSGA recommends that MSHA reduce the PEL to 0.1 fiber per cuber centimeter of air for the currently regulated asbestos minerals -- chrysotile, amosite, crocidolite, actinolite-asbestos, tremolite-asbestos and anthophyllite-asbestos -- and other amphiboles in their asbestiform habit -- for example, winchite-asbestos,

richterite-asbestos, et cetera -- and erionite-asbestos. The short-term limit for these same asbestiform minerals should be set at 1.0 fiber per cc for a 30 minute sampling duration to be consistent with OSHA.

The term "asbestiform habit" needs to be defined as follows -- this is consistent with all the testimony -- the mineral fiber populations have an asbestiform habit when the following characteristics are viewed under light microscopy: (1) many particles with aspect ratios ranging from 20:1 to 100:1 and higher for particles longer than five microns in length; (2) very thin fibrils, generally equal to or less than five microns in width; (3) in addition to the mandatory fibrillar crystal growth, two or more of the following attributes must be apparent: (a) parallel fibers occurring in bundles; (b) fibers displacing splayed ends; (c) matted masses of individuals fibers; (d) fibers showing curvature.

Now, this recommendation goes beyond the DOL Inspector General report -- which is lower the permissible exposure limit for

asbestos to a more protective level -- in that it specifically adds the amphibole asbestiform minerals and the specific minerals that have been shown to cause asbestos-like health effects. These minerals are not commercially mined, and need not be incorporated in the OSHA standards. They are relevant to the MSHA sphere of responsibility and enforcement.

NSSGA recommends in the strongest terms that MSHA adopt a more improved PCM discriminate counting procedure that specifically emphasizes the asbestiform properties of minerals. This counting procedure would supplement the current procedure -- not replace it -- with additional measurements of federal fibers that are .5 microns wide or less, unless existing as bundles, and 10 microns long or longer. If these measurements show that 50 percent or more of the federal fibers exist with either of those morphological characteristics, then electron microscopy -- either SEM or TEM -- with the necessary analytical peripheral devices, be used to

ascertain if the PCM-observable asbestiform fibers are composed of the minerals listed above. If so, then the PCM count would be adjusted to reflect the mineralogy as determined by electron microscopic analysis to determine compliance with the exposure limits. Only respirable particles -- a maximum of three microns in width unless a bundle -- should be counted to be consistent with recent international standards.

This approach is consistent with the DLO Inspector General report recommendation number two: Use transmission electron microscopy to analyze fiber samples that may -- and I emphasize that on my own -- contain asbestos. The use of TEM in the NSSGA recommendation is for mineralogical verification, not fiber quantification. SEM, in many samples, will be adequate to distinguish the minerals of interest from others. Where it cannot, TEM must be used.

Finally, the International Mineralogical or Mineral Association's definitions of amphiboles need to be incorporated for reference for guidance in

electron microscopic identification of these minerals. The reference for this source is provided here.

Finally, NSSGA recommends that MSHA adopt appropriate provisions in the OSHA asbestos standard for construction regarding hygiene facilities for asbestos abatement workers who handle asbestos-containing materials, or whose exposure exceeds the PEL. The definition of asbestos-containing material -- 1 percent or more -- must be consistent with OSHA's.

With that, I'd like to recognize one other person that belongs to this panel and did a lot of work is Mr. Jim Sharpe. If he's still here, he can join our panel -- perhaps also answer questions that may come. Thank you for the time and the attention. We leave it open to you.

MS. SMITH: Thank you to the representatives of NSSGA. I'd like to ask the panel members if they have any questions.

DR. JONES: I'd like to ask Dr. Lee -- Dr. Chatfield also contributed to this -- about the use of relatively low skill

analysts to do discriminate analysis. Is that widespread in the business now? Are there people who can do that?

DR. LEE: I think it would take additional training.

DR. JONES: How extensive?

DR. LEE: I think a PCM certification today is a 40-hour course, I believe, if I recall right. I don't think you would have to retrain your analyst, but I don't think they would take more time than that 40 hours. But I don't think -- I mean, we had to retrain ours to get them, and to run some trial samples in the office. OSHA at Salt Lake City participated in Reynolds Robin with MSHA's Denver lab a number of years ago participated. We also agreed that we would have to retrain the analysts to recertify them.

DR. JONES: Is the RME gradual in use now?

DR. LEE: It's in use in very limited form, but it's available and could be manufactured by the people that currently manufacture the Walton bucket, which is the

common --

DR. JONES: When NSSGA did their 12 to 14 percent of their PCM counts above .1 ; is that correct?

DR. LEE: That's --

DR. JONES: Was that done using differential counting?

DR. LEE: No. That was the straight federal fiber count. Dr. Clark might be the right guy, because he's got a better memory than I do. We counted the NSS -- we counted these guys as samples using the federal fiber count five microns and greater than 3:1. The -- of those samples, some 270, 11 percent or 12 percent -- 77 of those, 12 percent ended, up above .1 fibers. When the discriminate count was applied, which was kept simultaneously with separate tick marks, I believe 9 of those samples, which is -- go ahead.

DR. CLARK: If I may, it was reduced by approximately 25 percent. 75 percent of the samples were still -- 75 percent of the samples had 50 percent or greater -- 10 microns or greater fibers.

DR. JONES: I just have one last question: How was the 50 percent chosen, 50 percent of the microns?

DR. LEE: Well, it's really based on a couple of things. One is Dr. Wylie's asbestiform population; and second is my own experience in the laboratory over any number of years that if you're -- what we've done historically since I was at U.S. Steel is if a PCM sample exceeded .05, which was half of the threshold, we checked it by electron microscopy. What we found just by experience -- but also you can show this statistically -- that if it's below half that limit using normal collection parameters, it could be asbestos, and it will never go above .1. You'll never reach the .1 no matter what the fraction is. And above .05 given a .1 threshold, a recount could -- you have a significant probability that the recount would take you over .1. So it's those two factors.

DR. JONES: Also, I had some interest in what Dr. Chatfield was saying about the need of the gravimetric matrix reduction. I

can see where that would be a very essential thing, but is there -- do you know of any research that's going on to look at very matrixes to see how that could be reduced in other ways? It seems to me it's important in a lot of different situations. Is anybody looking at these situations that you're aware of -- various ores or different things that are mined?

DR. CHATFIELD: There's a number of techniques that can be used to concentrate any asbestos that's present. And the whole idea there is to -- is to get rid of as much non-asbestos material as you can. In some cases you can't do anything because if the --

DR. JONES: If it's truly insoluble, say?

DR. CHATFIELD: If it's truly insoluble, and there's no major density difference -- you can do density separation on some of these things as well. I mentioned with vermiculite you can exfoliate it and float off the vermiculite. If one of them is acid soluble, you can dissolve it out.

The other thing, of course, is you

could take account of these width characteristics in the sedimentation process -- not just with the vermiculite work and the Libby work -- you could have -- recognize that cleavage fragments are generally going to settle much faster than the asbestos fibers do. So if there's any asbestos present, you would find it. But on the other hand, in something like Libby there's been a lot of the asbestos fiber fragments settle as well.

DR. JONES: And it doesn't change the characteristics to suspend those?

DR. CHATFIELD: I don't believe so, no.

DR. JONES: Thank you.

DR. LEE: It's primarily for bulk sampling. Just to comment, for air sampling you virtually have to reduce the sampling time if you have substantial dusty conditions. Also, you have to collect multiple samples as recommended in OSHA 7400.

DR. JONES: That's what we've been doing.

MS. AINSWORTH: Dr. Lee, along with your computerized system, that was just for

recording the counts, right? The analysts would just record the counts on the computer rather than on paper?

DR. LEE: That's right.

MS. AINSWORTH: Do you have any attempt at letting the computer determine if the particles meet those size requirements and let it count if there's no objective decision by the analysts?

DR. LEE: Actually, in the right kind of samples we're actively working on that kind of effort. One of the problems with stone, with the quarry samples, is the vast majority of the dust is something else. And so that you really do have a lot of interferences. And your own eye is an incredibly quick image analyzer at recognizing long, thin particles. It's hard for a computer to keep up.

MS. AINSWORTH: One question is if the interference due to all these other mineral dust is a problem, is there any information about available -- to use some kind of size select sampler to eliminate them rather than get rid of them after you've collected them?

DR. LEE: That certainly is an option that could be considered. I think to define the standard around it you might -- it might -- I think that would be a good thing. There are cascading factors, various size selective devices, cycles -- small cycling samplers, and the like. That would certainly help your analysis. You would just have to get the acceptance in the mines, in the quarry, and make sure your calibrations are done. But yeah, that could help a lot. It would help very much with any of these proposals.

MS. AINSWORTH: And I have a question for you, Dr. Wylie: With your distributions and the sizes and the particles and the fibers, for the bulk samples, was there some preparation done on them to grind them or send them that might change that size?

DR. WYLIE: Well, actually, with a real asbestos it's extremely difficult to grind. It has remarkable tensile strength. A lot of this data came from a study that was done by NIEHS -- from a question by the NIEHS through the Bureau of Mines. We had a mill, and we

were trying to reduce the amosite. They wanted to use the animal feet studies, so they wanted to reduce the size so they could actually get them down. And they had a mill that they were using, an air jet mill. Instead of reducing the size, the amosite blew a hole in the side of this mill. It's steel and about that thick. It has remarkable tensile strength. It's very, very difficult to do. They were dispersed. They used a technique of a little bit of soap and water, and a little slight sonication just to try to aggregate it -- simple aggregation. But there was no real attempt to try to reduce it in any other way. We were really looking for the size distribution that you would get in this animal feet study. Some of those data are air data. Of course, the air itself has done this aggregation for us.

If I might add one more thing: You really can't reduce the width of the fibrils. It's a growth property.

MS. AINSWORTH: I was thinking of the cleavage fragments.

DR. WYLIE: Yeah. Well, we had to

cleave them. I mean, they're -- yes, we ground them. For the bulk material, it was actually received in a ground state. So we were characterizing the samples as we received them from the Bureau of Mines.

MS. SMITH: With no more questions from our panel, I'd like to express my appreciation to the speakers from NSSGA and the other speakers earlier this morning.

Do we have additional speakers that have come in later who would wish to present information at this time?

If not, I would like to encourage those of you who have indicated you're going to leave us with materials, if you'd like to do that today, if you would leave it with me before you do leave. And I thank you all for coming today. The information you have given us certainly will assist us in our deliberations as we move forward to deal with these difficult issues. And we very much appreciate the information you've provided so that we can do that in a timely and efficient way.

And with that, I believe we will close

the record on this public meeting. Thank you all very much for coming.

(Whereupon, at 4:07 p.m, the hearing in the above-entitled matter was concluded.)

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CERTIFICATE OF COURT REPORTER

I certify that the foregoing is a correct transcript from the record of proceedings in the above-entitled matter.

Lisa M. Blair, RPR, Notary Public
Commonwealth of Virginia at Large