Erskine Environmental Consulting

Geologic Investigations Hazardous Materials Naturally Occurring Asbestos

TECHNICAL MEMORANDUM

January 22, 2020

Subject: Comments: Response by the EMSL Laboratories Regarding the Inquiry for an SOP Used for Differential Counting (Email from Benjamin Ellis to Gary Latsha, dated January 8, 2020).

The following is a response to the EMSL Laboratories (EMSL) email that "provided background information on what constitutes asbestiform structures and the decision making process used by EMSL during analysis on samples analyzed" for PA DEP.

Based on the information provided, it can be concluded that:

- EMSL does not have an SOP for differential counting, and therefore, the differential counting procedures are not incorporated into its SOP for asbestos testing as required by the NVLAP accreditation.

- EMSL offers differential counting only upon request, and therefore, is not conducted during routine testing that rely on standardized test methodologies and in accordance with protocols established through the NVLAP accreditation program. EMSL apparently has two independent procedures: one that conforms to test methods and protocols established under the NVLAP accreditation, and another, modified under request, that is applied in select cases.

- EMSL acknowledges that criteria used for differential counting is subjective, and not included within recognized test methods. As a result, its test results that used these methods cannot be verified as precise, accurate or reproducible, and therefore, cannot be validated.

The following is a brief summary of the email using specific passages to illustrate where EMSL is in agreement with conclusions in previous memoranda submitted by Erskine Environmental Consulting (EEC), and where EEC disagrees with EMSL's protocols.

EEC is in agreement with EMSL on the following topics:

EMSL Statement: *"Unfortunately, the distinction between asbestiform and non-asbestiform on a fiber by fiber basis is difficult at best and is often based on subjective morphological observations. Even the importance of the distinction between asbestiform and other fibers with similar dimensions is subjective and highly debated".*

EEC Response: This statement is true: the differentiation is difficult at best, highly subjective, and highly debated. Conformance with the standard procedures used to test asbestos using standardized test methods is neither difficult, subjective, nor debated.

EMSL Statement: *"…it should be recognized that the distinction can be subjective. It is important that the client and the laboratory have a discussion prior to analysis, about the specific criteria to be applied".*

EEC Response: Normally a client expects that a test method be followed correctly and the results are accurate, precise and reproducible. Otherwise, the test result cannot be relied upon. When deviating from a test method, or implementing a new testing protocol that is not standard, it is critically important that the laboratory discuss the pros and cons with the client, and explain in writing how the test methodology deviates from Standard of Practice. In this case, the client should be aware that the test methodology is not in conformance with standard test methods, and the result can deviate considerably from a result that would normally be produced by applying the test method correctly.

EMSL Statement*: "Since the asbestiform and non-asbestiform manifestations of a particular mineral can have identical chemistry and crystallography at the microscopic level, the primary distinctions are made by morphology (size and shape) of the elongate mineral particles (EMPs) in question. Because of this, it is extremely important to recognize that the preparation steps that the laboratory employs can have a profound impact on the size and shape of the fibers observed during analysis".*

EEC Response: Minerals that have crystallized within a rock are crushed and pulverized to a finely comminuted powder. Therefore, the morphology of the original fibers may be severely altered. This is only one reason why the shape of the fiber tips, for example, cannot be used as a method to positively identify asbestos. Many fibers will be omitted from reporting because of morphological alteration during the pulverization process.

EMSL Comment: *"The specific criteria outlined in the analytical methods significantly affect the final results that are reported. These criteria typically do not address distinguishing asbestiform from non-asbestiform EMPs".*

EEC Response: This is a correct statement. Test methods do not provide criteria for differential counting. It is not part of the test methods. Therefore, if differential counting protocols are used, the laboratory cannot claim to be following a specific method.

EMSL Statement: *"The asbestiform habit is best defined at the macro scale on hand samples and not the micro scale on individual fibers".*

EEC Response: The general definitions and descriptions of asbestos cited in regulations and by both RJLG and EMSL are derived from observations of commercial-grade asbestos deposits that can be observed without the aid of a hand lense. These descriptions and characteristics include: long curved fibers; high aspect ratios; matted masses, etc. However, the overwhelming majority of asbestos in rocks is too fine to observe macroscopically or with a hand lense. Asbestos is defined on the micro scale by the counting rules established in the test methods, and not by a general description of commercial grade asbestos. It is not acceptable to apply these descriptions during microscopic analysis and overturn the positive identification of asbestos.

EMSL Statement: *"None of the current asbestos methods can unambiguously classify a countable fiber as asbestiform vs. cleavage fragment in all cases. Furthermore, it cannot be unambiguously stated that non-asbestiform fibers can be dismissed as non-contributors to asbestos related diseases".*

EEC Response: This is precisely why the test methods do not include protocols for particle differentiation.

EMSL Statement: *"Cleavage fragments have the potential to be elongate, and if they have the same chemistry as the asbestiform variety of a specific mineral, they will be counted as a fiber during analysis".*

EEC Response: Correct- EPA and other test methods do not allow for particle differentiation. Any additional analysis involving differentiation is not in conformance with the test methods.

EMSL Statement: *"Below are some common definitions…"*

EEC Response: As stated above, these "definitions" rose from massive commercial-grade deposits, and are not incorporated into the test methodologies.

EEC is in disagreement with EMSL on the following topics:

EMSL Statement: *"TEM analysis involves more analysis and decisions on a fiber by fiber basis. The lab can characterize the fibers present in the sample with a particle size distribution that includes average length, width, aspect ratio etc. However, on a fiber by fiber basis subjective decisions need to be made on the basis of morphology as to whether the particle is to be included in the overall count".*

EEC Response: TEM analysis following the test methods do not involve "more analysis and decisions on a fiber by fiber basis". It involves an analysis that is specified in the test method itself. There are no procedures within test methods to conduct such an analysis, and no criteria to apply the results. EMSL states that subjective criteria are needed for the analysis of individual fibers, and acknowledged that the sample preparation procedure can seriously affect a sample. A subjective analysis produces a qualitative result at best, and perhaps this is one reason why the field sampling report is titled: "Qualitative Geologic Survey".

EMSL Statement: *"In a scientific approach to this technical challenge, EMSL has adopted the following criteria for differentiation of asbestos vs. non-asbestos elongate particles".*

- *Elongate mineral fibers of amphiboles with pointed terminations (acicular), Rounded or cleft sides or ends, or do not meet aspect ratio will be counted as non countable elongate mineral fibers (Non- Asbestiform)*

EEC Response: There is nothing scientific about using these protocols to eliminate fibers from reporting. The scientific approach is to test the use of the criteria against other test data, and conduct an analysis assuring that fibers that contribute to a cancer risk are not inadvertently removed. Quality assurance testing has not been conducted, and at least one major study has shown that the application of these untested and subjective protocols significantly under estimate risk (see EEC's response to RJLG, dated January 21, 2020).

These applications are subjective, and are not recognized in test methods. Asbestos fibers often have rounded and cleft ends, as well as sides that are cleft (indented) and not wholly parallel. See Figure 1 on the following page as an example.

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Figure 1: Scanning Electron Microscopy (SEM) photomicrograph of tremolite asbestos rock fragment collected within the Franciscan Complex in the San Francisco Bay Area region of California. Note the numerous fibers with rounded, pointed and cleft ends, non-parallel sides, and non-perpendicular ends, all of which would be eliminated using EMSL's and RJLG's differential counting criteria.

The comments and conclusions provided in this memorandum represents the opinion of the author, and is based on more than 33 years of experience in the fields of asbestos consulting and testing. It is suggested that the RJLG and others review this document, and offer their opinions or rebuttal to the material provided herein. EEC will be happy to review and comment on any submittals.

Please contact me if you have any questions.

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