Human Health Risk Assessment - Asbestos Air Sampling Clear Creek Management Area, California September 15th, 2004

The purpose of this memorandum is to evaluate the potential human health risks for asbestos inhalation exposures during motorcycling recreational activities, based on the data obtained during the asbestos air sampling pilot study conducted at the Clear Creek Management Area (CCMA) on September 15, 2004. Potential excess Lifetime Cancer Risks (ELCR) were estimated for the Lead Motorcyclist, First Trailing Motorcyclist, and Second Trailing Motorcyclist receptors (Table 1).

The estimated ELCR was calculated for three exposure scenarios: a One-day per Year Exposure, a Reasonable Maximum Exposure (RME) of 5 days per year, and a High Estimate Exposure of 12 days per year (Table 2). The estimated ELCR values were compared to the risk management range of 1E-06 to 1E-04 that is generally used by EPA. Estimated ELCR values within or exceeding this range may require a risk management decision that includes evaluating site-specific characteristics and exposure scenarios to assess if remedial action is warranted.

For all three exposure scenarios, the estimated ELCR values were within or exceeded the risk management range:

- One-day per Year Exposure**.** ELCR for the lead, first trailing, and second trailing motorcyclist were, 3E-06, 4E-05, and 6E-05, respectively.
- RME Exposure. ELCR for the lead, first trailing, and second trailing motorcyclist were, 1E-05, 2E-04, and 3E-04, respectively.
- High Estimate Exposure. ELCR for the lead, first trailing, and second trailing motorcyclist were, 4E-05, 6E-04, and 9E-04, respectively.

The results of this study suggests that further sampling is needed to confirm the results of this one-time sampling event and to determine if risk management-based mitigation measures are needed to reduce the exposures of recreational motorcycle riders to naturally occurring asbestos at the CCMA.

Background:

The CCMA is located in San Benito County, California and is within a 48-square-mile area that contains large amounts of naturally occurring asbestos. The CCMA is one of the four geographically distinct areas of the Atlas Asbestos Mine Superfund Site. It is managed by the U.S. Department of the Interior, Bureau of Land Management (BLM), Hollister, California. The naturally barren slopes, bald ridges, network of bulldozed mining trails,

and isolated location makes the CCMA a popular location for recreational use by off-road motorcyclists, including many families with children, who camp in the area (Popendorf and Wenk, 1983).

Since the late 1970's the BLM has conducted studies to identify and quantify the dust exposures of recreational users and rangers within the CCMA. The "Human Health Risk Assessment for the Clear Creek Management Area" was developed for the BLM by PTI Environmental Services (1992) to assess the potential hazards and risks posed to public health associated with the inhalation of airborne asbestos generated during off-road vehicle use, as well as other site uses that generate less dust. This current work is part of the task to update the 1992 Human Health Risk Assessment (HHRA).

Introduction:

The asbestos air sampling pilot study was conducted at the CCMA on September 15, 2004. The asbestos air sampling and analysis approach, and methodology followed for the asbestos sampling pilot study are presented in the "Sampling and Analysis Plan for Asbestos Air Sampling, Clear Creek Management Area" (CH2M HILL, 2004). The purpose and objective of the pilot sampling and analysis effort was to reality test the asbestos air sampling and laboratory analysis methods presented in the SAP. In this way, field experience at the CCMA could be gained and adjustments made, as needed, to the SAP to optimize field sampling procedures and laboratory analysis before large-scale field sampling was conducted in November 2004.

Breathing zone air samples were collected from study participants during motorcycling riding, SUV driving, and other activities conducted at the CCMA on September 15, 2004. Using standard asbestos sampling techniques, air samples containing asbestos fibers were collected from personal breathing space air. This was done using a calibrated air pump attached to a plastic cassette, which contained an asbestos fiber-sampling filter.

The collected samples were sent to an analytical laboratory (Lab/Cor Inc.) and analyzed for asbestos type and concentrations in air by Transmission Electron Microscopy (TEM) using ISO 101312 methodology (Lab/Cor, Inc., 2004).

EPA requested that the potential health risks be estimated from exposures to airborne asbestos during motorcycle riding. The results and conclusions of this risk assessment will give EPA an initial estimate of potential risks to recreational motorcycle riders at the CCMA and will be used to further refine the SAP before the larger scale field sampling is conducted. The results and CCMA-specific experience gained from this risk assessment will also be used to assist in the development of the CCMA Risk Assessment Update Work Plan, which will be developed at a later date.

The three samples selected for evaluation were collected by motorcyclists while traveling over a 23-25 mile route of unpaved roads and trails. The results of the TEM laboratory analysis of theses samples (Lab/Cor, Inc., 2004) were reported as PCM (Phase Contrast Microscope) equivalent fibers (Table 3):

- Lead Motorcyclist: 0.0443 fibers/ml
- First Trailing Motorcyclist: 0.659 fibers/ml
- Second Trailing Motorcyclist: 0.955 fibers/ml.

For this human health risk assessment, exposures and risks were calculated using EPA based approaches and methodology as presented in the PTI Environmental Services HRA (1992) as described in the following sections.

Asbestos Dose-Response:

The EPA weight of evidence classification for asbestos is "A"; human carcinogen (Table 4). The basis of the classification, the observation of increased mortality and incidence of lung cancer, mesotheliomas, and gastrointestinal cancer in occupationally exposed workers, are consistent across investigators and study populations (U.S. EPA, 2004).

The unit risk for asbestos is 2.3E-01 $(f/ml)^{-1}$ [fibers/milliliter] $^{-1}$. The unit risk should not be used if the air concentration exceeds 4E-02 fibers/ml, since above this concentration the slope factor may differ from that stated (U.S. EPA 2004). In this risk assessment the calculated chronic exposure concentrations are compared to 4E-02 fibers/ml. The unit risk is based on fiber counts made by phase contrast microscopy (PCM), which detects only fibers longer than 5um and >0.4 um in diameter.

The quantitative unit risk estimate is limited by uncertainty in the exposure estimates, which results from a lack of data on early exposure in occupational studies and the uncertainty of conversions between various analytical measurements for asbestos.

Exposure Estimate:

The following airborne asbestos inhalation exposure algorithm is based on the 1992 PTI HRA:

$$EC = \frac{C_a \times ET \times EF \times ED}{AT}$$

Where,

EC = Chronic Exposure Concentration (averaged over a 70-year lifetime) [f/ml]
C_a = Asbestos Concentration in fibers per cubic centimeter (f/ml) (95% UCL)
ET = Exposure Time in hours/day
EF = Exposure Frequency in days/year
ED = Exposure Duration in years
AT = Averaging Time of 24 hours/day x 365 days/year x 70 years (lifetime).

All Chronic Exposure Concentrations estimated in this study (Tables 5, 6 and 7) were less than 4E-02 fibers/ml.

Risk Calculation:

The upper-bound excess lifetime cancer risks were calculated using the following equation described in EPA risk assessment guidance documents (EPA 1989) and is based on that presented in the 1992 PTI HRA:

ELCR = EC x URF

Where,

ELCR = Excess Lifetime Cancer Risk
EC = Chronic Daily Exposure Concentration (averaged over a 70-year lifetime) [f/ml]
URF = Unit Risk Factor for inhalation of asbestos [0.23 $(f/ml)^{-1}$].

Estimated potential cancer risks are presented in Tables 5, 6 and 7.

Results:

For purposes of this evaluation, the potential for unacceptable risk, was identified using the following criteria. ELCR values were compared to the risk management range of 1E-06 to 1E-04 that is generally used by EPA. ELCR values within or exceeding this range may require a risk management decision that includes evaluating site-specific characteristics and exposure scenarios to assess if remedial action is warranted.

For all three exposure scenarios, the estimated ELCR were within or exceeded the risk management range:

- One-day per Year Exposure**.** ELCR for the lead, first trailing, and second trailing motorcyclist were, 3E-06, 4E-05, and 6E-05, respectively (Table 5).
- RME Exposure. ELCR for the lead, first trailing, and second trailing motorcyclist were, 1E-05, 2E-04, and 3E-04, respectively (Table 6).
- High Estimate Exposure. ELCR for the lead, first trailing, and second trailing motorcyclist were, 4E-05, 6E-04, and 9E-04, respectively (Table 7).

The ELCRs for all three exposure scenarios are summarized in Table 8.

Uncertainty Analysis:

This risk assessment presents quantitative estimates of current and future potential cancer risks. However, it is important to note that these numbers do not predict actual health outcomes. The one-day per year, RME, and high-end scenario risk estimates are calculated in a conservative, health protective manner that tends to overestimate risks. Thus any actual health impacts are likely to be lower than these estimates. Specific uncertainties that should be considered when interpreting the results for this risk assessment include:

- Single Event, Single Rider, Single Sample for Each Riding Position. The asbestos samples were collected during a single sampling event, during the dry-season at the CCMA, with a single motorcycle rider for each riding position, and a single sample analyzed for each rider. Therefore the representativeness of the collected samples has a great degree of uncertainty. For example, the other riders may have different styles of riding (for instance, speed) that influence the amount of dust generated.
- Single 23 to 25-mile Motorcycle Route. The CCMA is a 48 square mile wilderness area. Exposures were monitored over a single 23 - 25 mile motorcycle route, which contributes uncertainties to the estimated exposures. Other parts and routes of the CCMA may have higher or lower levels of asbestos in the soil
- Dry Season - September 15th, 2004. Asbestos air monitoring samples were collected on one day, September 15th, 2004, during the dry season. Therefore the representativeness of the collected samples has a great degree of uncertainty. The dry season is assumed to contribute more asbestos fiber-containing dust to the air, while the wet season is assumed to have comparably less asbestos containing dust in the air. On the other hand more motorcycle riders use the CCMA during the cooler weather wet season.
- Exposure Parameters. The exposure parameters used were based on both EPA and site-specific exposure estimates reported by recreational motorcyclists at a CCMA public meeting (PTI, 1992). EPA default exposure parameters are selected to be protective of public health. The estimates by the recreational riders at the CCMA public meeting included the high-end estimates of long-term on-site motorcycle use by attendees present. Variations in exposure parameters will exist but this range probably covers most cases
- TEM Methodology for Asbestos Analysis. The use of TEM for asbestos fiber analysis adds more reliability to the enumeration and identification of asbestos fibers compared to historical phase contrast microscopy (PCM). However uncertainties arise from the current practice of expressing TEM analysis results in terms of PCM equivalent values. These uncertainties are minimized by applying standardized counting rules to the PCM equivalent analysis.
- EPA Cancer Slope Factor for Asbestos Fibers. The cancer slope factor used in the risk assessment was the value presented in current EPA guidance. The EPA Integrated Risk Information System (IRIS) was the source of the asbestos cancer slope factor used in the risk calculations. As noted in OSWER Directive 9285.7-53 (dated December 5, 2003), the EPA hierarchy of human health toxicity values recommended for use in risk assessments lists EPA's IRIS as the sole Tier 1 source. The hierarchy recognizes the EPA should use the best science available on which to base risk assessments. In general, if health assessment information is available in the IRIS for the contaminant under evaluation, risk assessors normally need not search further for additional sources of information. Since EPA's development and use of peer review in toxicity assessments, IRIS assessments have undergone external peer review in accordance with Agency peer review guidance. IRIS health assessments contain Agency consensus toxicity values.

  Since IRIS toxicity values are routinely re-evaluated and updated, there is some uncertainty as to when a specific toxicity value will be updated. Recently, IRIS has posted the IRIS Chemical Assessment Tracking System, a compilation of status reports

on EPA's IRIS assessments currently in progress, on the IRIS website. The chemical assessment for asbestos (noncancer effects) is in progress with a First Draft expected December 31, 2004 and a Second Draft expected March 31, 2005; Internal Peer Consultation is expected October 31, 2005; Agency Review is expected August 31, 2006; External Peer Review and Public Availability is expected March 31, 2007; Final ORD/NCEA Approval is expected October 31, 2007; and web posting of the asbestos risk assessment toxicity values for noncancer effects is expected January 31, 2008. Thus the results of the IRIS process to develop a new, final toxicity value for noncancer effects for asbestos are expected in 2008.

It should be noted that an assessment of the cancer toxicity value for asbestos is not currently posted on the IRIS Chemical Assessment Tracking System. Therefore, a projected date for review and updates to the asbestos cancer toxicity value is not currently available.

Conclusions:

For all three exposure scenarios, the estimated Excess Lifetime Cancer Risks were within or exceeded the risk management range generally used by EPA. The results of this study suggest that further sampling is needed to confirm the results of this one-time sampling event and to determine if risk management based, mitigation measures are needed to reduce the exposures of recreational motorcycle riders to naturally occurring asbestos at the CCMA. Additionally, air monitoring of asbestos exposures of recreational users of the CCMA should be considered for the wet season as well at the dry season. With lower temperatures, the wet season is a popular time for motorcycling and motorcycle racing events at the CCMA.

References:

CH2M HILL. 2004. Sampling and Analysis Plan for Asbestos Air Sampling, Clear Creek Management Area, San Benito County, California. October.

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