Exposure Investigation Protocol

for

Emissions from Crumb Rubber Synthetic Turf Playing Fields

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1. INTRODUCTION

1a. Background

In recent months, the Environmental and Occupational Health Assessment Program (EOHA) within the Connecticut Department of Public Health has received inquiries from schools, towns and residents about health risks from synthetic fields made with a cushioning infill material that comes from recycled tires in the form of ground tire crumbs. Crumb rubber consists of recycled, chipped/pulverized, used automobile tires. The tire crumbs are roughly the size of grains of course sand and generally are spread two to three inches thick over the field surface and packed between ribbons of green plastic used to simulate grass. Crumb rubber granules contain a variety of chemicals typical in rubber, including polycyclic aromatic hydrocarbons (PAHs), volatile organic chemicals (VOCs), alkyl phenols, metals and phthalates [1]. In addition, crumb rubber includes some amount of dusts and small particles [2], which may be further increased by mechanical abrasion and wear that comes with use of the fields.

Crumb rubber fields have been installed or are being proposed in many towns throughout Connecticut, and elsewhere in the United States. However, health questions continue to arise as exposures and risks have not been fully characterized and several groups have questioned the safety of these fields [3, 4]. Cities and towns in Connecticut have sought clarification from EOHA amidst calls for a moratorium on new artificial turf fields from some groups and reassurances of safety from the synthetic turf industry. A bill raised in the New York State legislature in November 2007 would place a moratorium on new fields until the health questions are answered [5]. Risk evaluations of artificial turf have been conducted by several European governments (Sweden, France, Norway) but risk assessments in this country have been very limited [6, 2]. EOHA has reviewed the literature and risk evaluations available to date and we generally concur with their findings of no evidence for an imminent public health threat. However, we recognize that the exposure and toxicology information are incomplete, which precludes EOHA from developing a more definitive statement on risk. This status was communicated in a fact sheet developed by EOHA in October 2007 and distributed to local health departments across Connecticut [7].

Only a single study has measured ambient air under actual field conditions at crumb rubber fields [8]. This study has limited relevance to outdoor fields in Connecticut because it was conducted at indoor fields in Norway under controlled climactic conditions and likely did not capture worst case conditions. Other studies have measured chemicals which leach from the rubber crumbs under actual field conditions, and chemicals which can be extracted from the crumbs under laboratory conditions [3, 6]. While the main exposure pathway is expected to be inhalation of particles and VOCs, ingestion is also possible. Athletes may inadvertently ingest dust particles that cling to the hands and clothing. It is also possible for young children to swallow the crumb rubber granules directly. One study which evaluated the ingestion pathway found these risks to be not significant [6]. Lastly, there is the potential for ongoing exposures in the home, from tracking of dust and crumb rubber material on clothing and shoes.

Taken together, the available studies indicate that there are a variety of volatile and respirable sized, particle-borne chemicals that may be released from crumb rubber. This could present inhalation and, to a lesser extent, ingestion exposures to children and adult athletes and

spectators who use these fields. Some of these chemicals have carcinogenic potential and some are irritating to the respiratory system. Finally, there are chemicals (primarily metals), which can leach from the crumb rubber. However, this pathway is of greater interest for environmental quality than human health.

1b. Justification for Exposure Investigation

Based on the single published study (the Norwegian Study) which measured ambient air at crumb rubber fields under actual field conditions, we know that these fields can release numerous chemicals into the air, some as gases and other as particles [8]. VOCs measured in air in the Norwegian Study included benzothiozole and toluene. The Norwegian Study also found elevated levels of rubber-related PM_{10} during sports field use. This airborne dust contained PAHs and phthalates, among other compounds. While the authors of the Norwegian study did not find an elevated health risk, they did not necessarily measure worst case conditions. VOC offgasing is expected to be greatest in sunny hot weather when the surface of the field can reach temperatures in excess of 140^0F [9]. A variety of rubber constituents can offgas at these elevated temperatures as shown in a recent laboratory head space analysis of crumb rubber [10].

The release of VOCs and PM_{10} from crumb rubber during play activities may be an asthma trigger for exercising children. Asthma is an ongoing concern for children on sports teams because of the increased rate of asthma in children in general, and because physical exertion in hot weather may exacerbate asthma. The potential addition of irritating VOCs and PM_{10} to this scenario may be a cause for concern and needs investigation. While there are many chemicals that can be in the volatile or particulate state at these fields, benzothiazole in a particular target for study because of its known irritation potential [11] and because it is a hallmark of rubber. Other potential health effects are long-term cancer risk from exposure to PAHs in crumb rubber dust and the potential for latex antigens in tire dust [12]. A recent study also identified volatilized nitrosamines as a potential exposure concern [13].

An EI is needed because there is currently a lack of air data representing realistic worst case concentrations of benzothiazole, related irritant VOCs, and particulate matter in the breathing zone of athletes using artificial turf fields. In addition, there are data gaps regarding how variables such as weather conditions, including ambient temperature, age of field, nature of sporting activities and type of infill, affect chemical and PM_{10} concentrations.

In Connecticut, we know of at least 85 crumb rubber fields already in use, and another 30 that have been proposed or are being constructed [14]. This EI is needed to determine if adults and children who play on crumb rubber athletic fields in CT are exposed to benzothiazole, related irritant VOCs, and particulate matter at levels that may present a public health risk. Given the expanding number of fields, this may become a chronic exposure spanning many years, from youth to adult and even senior years. Air data collected at selected crumb rubber fields are needed to understand the breadth and scope of exposure and to identify chemicals which may be risk drivers or for which there are substantial data gaps. This exposure information will be fed into a risk analysis which will inform public health policy regarding these fields.

1c. Investigators/Collaborators

The Environmental and Occupational Health Assessment Program (EOHA) within the Connecticut Department of Public Health will conduct this exposure investigation. EOHA will contract with an environmental consultant for sampling and analytical components. EOHA personnel will evaluate the air sampling results and will interpret the associated potential public health impact. EOHA personnel will prepare a written report on the EI findings that includes the consultant field report as an appendix. ATSDR personnel will participate in reviewing the EI report. EOHA will coordinate with the local health department and town officials involved in maintaining sports fields in the town(s) where air testing occurs. EOHA will update its artificial turf fact sheet and provide recommendations to towns as appropriate, based upon the study's findings.

1d. Exposure Investigation Objectives

This EI has the following objectives.

1. Characterize the concentrations of VOCs, SVOCs, metals and particulate matter in air at selected crumb rubber fields in Connecticut under potential average case and worst case conditions. Measurements are needed at the field surface and in the normal breathing zone of athletes (3-6 feet above ground surface). There will be no direct measurement of concentrations where spectators normally sit or stand as these will likely be lower and can be extrapolated from the collected data for athletes. The collection of background samples is a key component as exposure to airborne rubber particles and component gases is not unique to sports fields.
2. Determine whether selected variables have an effect on chemical and PM_{10} concentrations in air (examples of variables are weather and temperature conditions, age of field, type of crumb rubber, indoor vs. outdoor field).
3. Identify chemicals of potential concern in air and evaluate the suitability of toxicology data to assess the risks within the context of background exposures.
4. Evaluate the level of risk for respiratory irritation/asthma, cancer and other potential health effects.

2. METHODS

2a. Exposure Investigation Design

This EI will consist of air sampling for a suite of VOCs, SVOCs, metals and PM_{10} at selected outdoor crumb rubber athletic fields in CT. The sampling will be designed to capture a range of exposures but because conditions at an outdoor field can be so variable, a special focus will be high end or worst case exposures. Samples will be collected during actual play conditions. An indoor field will also be sampled in an effort to reproduce and expand upon the findings from Norway and to characterize exposures at indoor fields in Connecticut. EOHA staff will conduct a survey to determine the most commonly used type of crumb rubber at fields in Connecticut. This information will be used to assist us in selecting appropriate fields to sample.

This EI will be conducted in two phases (initial and follow-up). The initial investigation will involve an extensive sampling effort under worst case (high offgasing) conditions at one outdoor field. Worst case conditions include: low wind, high temperature and recent field construction (new crushed rubber infill). Personal air samples will be collected at approximately 3-foot

height with sampling equipment (1 liter SUMMA canister for VOCs, personal sampling pump for volatile PAHs and side pak real-time monitor for PM_{10}) worn by players during active play on the field. The initial phase will also include collection of stationary samples on the field. An outdoor background sample will be collected near the field and will be analyzed for the same constituents as samples taken on the field.

The follow-up phase of the EI will involve more limited sampling at three additional fields (including an indoor field) under different conditions. This curtailed sampling design will achieve cost reductions while collecting data that can be used to estimate parameters not specifically measured during the follow-up phase. This will be achieved by extrapolating from data collected in the more extensive design, as described below in Section 2c.

2b. Target Population

The target population for this exposure investigation is adults and children who play on crumb rubber athletic fields in Connecticut. While the samples collected will be directly pertinent to those who are playing at the time of sampling, the total population affected by the sampling results is potentially much greater, given the number of crumb rubber fields already constructed or planned in Connecticut. Results will be highly relevant to other athletes using the particular field sampled who were not present at the time of sampling. Further, the results for different types of fields under different conditions will be broadly applicable to athletes using these fields. Spectators will receive lower exposures, which can be estimated to some extent by the samples taken for athletes and background locations.

For each field selected for air sampling, EOHA will obtain any necessary permissions from local authorities, for staging sampling equipment and conducting sampling. Paid volunteers will be used for the simulated soccer game and personal air measurements.

2c. Air Sampling Procedures

EOHA will contract with an environmental sampling consultant to collect all samples and securely ship sampling media to a laboratory for analysis. EOHA will separately contract with an analytical laboratory (to be determined), to perform all sample analyses. Two samples will be collected for each of the types of measurements during active play. Active play will consist of a staged, three-on-three player soccer match. Duration of play will be two hours. Evacuated one-liter summa canisters will be worn by two players at hip height to collect VOC samples. Side pak personal PM_{10} real time monitors will be worn by two other players also at hip height. Volatile PAHs will separately be sampled using two additional players equipped with personal sampling pumps and sorptive media to trap the volatile PAHs. For greater analytical sensitivity, a Hi Vol sampler will be placed in the middle of the field and surrounded by a cage to protect the device. The Hi Vol filter will be used for chemical speciation of the particulate matter. In addition, filters from the personal PM_{10} monitors and from the Hi Vol sampler will be analyzed by scanning electron microscopy (SEM) to determine the percentage of rubber particles on the filter. At each field, a sample of the crumb rubber infill will be collected for bulk analysis.

As stated previously, the EI will be conducted in two phases. The initial phase is the most extensive, characterizing worst case conditions and the largest number of parameters. Based upon results from this study, follow-up investigations at three additional fields will involve a

curtailed sampling protocol to save on costs. The data collected during follow-up investigations will be extended to parameters not measured by analogy with the results obtained under the extensive design. The following outlines the samples and chemical/particulate analyses to be conducted under the extensive and follow-up phases of the EI.

Phase One - Initial Investigation
Scenario: Outdoor field, high temperature, low wind, new infill
Activity monitored: staged 3 on 3 soccer match, 2-hour duration

Table 1 below provides a summary of the measurements, sampling equipment and sample analysis for the initial phase of the EI. The samples listed in Table 1 will be collected from one outdoor crumb rubber field in Connecticut. The specific field will be identified at a later date. Temperature and relative humidity data will be collected at the start and stop of the sampling event.

Phase Two – Follow-Up Investigation
Three additional fields will be sampled in an attempt to capture comparative data that are:

1) Representative of average rather than worst case conditions – i.e., same field as the initial investigation but under conditions of moderate temperatures and light wind.
2) Representative of an older field to determine if the rubber infill release properties change with long-term weathering and physical impact. EOHA will insure that the older field will be one where fresh rubber infill has not used to replenish what may have been lost over time. This scenario will be tested at high summertime temperatures and low wind.
3) Representative of an indoor field under cold weather conditions in which the building heating system is on and the fresh air incorporation is minimized to save energy.

The sampling design will include only active field sampling for VOCs, volatile rubber compounds and PM_{10}. There will be no stationary sampling (except for background samples). Table 2 summarizes the measurements, sampling equipment and analyses for the Phase Two portion of the EI. The sampling regime summarized in Table 2 will be conducted at three fields, to be identified at a later date.

Table 1. Summary of Measurements, Sampling Equipment and Sampling Analyses for Initial Investigation (Phase One).

Type of Testing	Sampling Equipment	Total Number of Samples	Analyses	Method
Active – Field (VOCs)	1-liter SUMMA canister worn at hip height by 2 players	2	VOCs plus rubber compounds*	TO-15^
Stationary – Field (VOCs)	1-liter SUMMA canister at ground level and 3 feet above ground in middle of field	2	VOCs plus rubber compounds*	TO-15^ and NIOSH Method N2522&
Stationary – Background (VOCs)	1-liter SUMMA canister placed upwind between field and road at 3 feet above ground level	1	VOCs plus rubber compounds*	TO-15^ and NIOSH Method N2522&
Active – Field (Volatile PAHs)	Personal sampling pump with sorptive media worn at hip height by 2 players	2	Volatile PAHs	NIOSH Method 5506$
Stationary – Background (Volatile PAHs)	Sampling pump with sorptive media placed upwind between field and road at 3 feet above ground level	1	Volatile PAHs	NIOSH Method 5506$
Active – Field (PM_{10})	Sidepak PM_{10} real-time monitor with filter worn at hip height by 2 players	2	PM_{10} and % rubber particles	SEM@
Stationary – Field (PM_{10} and chemicals)	Hi-vol sampler at 3 feet above ground level in middle of field.	1	PM_{10} and % rubber particles plus speciated semi-vols and metals	SEM@, VPH/EPH# and OSHA 125%
Stationary – Background (PM_{10} and chemicals)	Hi-vol sampler between field and road at 3 feet above ground level	1	PM_{10} and % rubber particles plus speciated semi-vols and metals	SEM@, VPH/EPH# and OSHA 125%
Bulk Sample of Infill	Not applicable	1	VOCs, Semi-vols, metals	VPH/EPH# and OSHA 125%

* Rubber Compounds = benzothiazole, hexadecane, octylphenol, volatile nitrosamines
^ TO-15 = EPA Analytical Method TO-15, available at http:/www.epa.gov/ttn/amtic/airtox.html
&NIOSH Method N2522 = National Institute for Occupational Safety and Health, Method 2522 for nitrosamines by GC/TEA, available at http://www.cleanerworld.com/nmam/pdfs/2522.pdf
@SEM = Scanning Electron Microscopy
#VPH/EPH = Massachusetts Department of Environmental Protection aliphatic/aromatic hydrocarbon evaluative technique, available at http://www.state.ma.us/dep/bwsc/vph_eph.htm.
$NIOSH Method 5506 = National Institute for Occupational Safety and Health, Method 5506 for PAHs by HPLC, available at http://www.cdc.gov/NIOSH/nmam/pdfs/5506.pdf.
OSHA 125% = Occupational Safety and Health Administration: Metals and Metalloid Particulates in Workplace Atmospheres (ICP Analysis), available at http://www.osha.gov/dts/sltc/methods/inorganic/id125g/id125g.html

Table 2. Summary of Measurements, Sampling Equipment and Sampling Analyses for Follow-Up Investigation (Phase Two).

Type of Testing	Sampling Equipment	Total Number of Samples	Analyses	Method
Active – Field (VOCs)	1-liter SUMMA canister worn at hip height by 2 players	2	VOCs plus rubber compounds*	TO-15^
Stationary – Background (VOCs)	1-liter SUMMA canister placed upwind between field and road at 3 feet above ground level	1	VOCs plus rubber compounds*	TO-15^
Active – Field (PM_{10})	Sidepak PM_{10} real-time monitor with filter worn at hip height by 2 players	2	PM_{10} and % rubber particles	SEM@
Stationary Background (PM_{10})	Hi-vol sampler upwind between field and road at 3 feet above ground level	1	PM_{10} and % rubber particles	SEM@
Bulk Sample of Infill	Not applicable	1	VOCs, Semi-vols, metals	VPH/EPH# and OSHA 125%

TO-15^ = EPA Analytical Method TO-15, available at http:/www.epa.gov/ttn/amtic/airtox.html
SEM@ = Scanning Electron Microscopy
VPH/EPH# = Massachusetts Department of Environmental Protection aliphatic/aromatic hydrocarbon evaluative technique, available at http://www.state.ma.us/dep/bwsc/vph_eph.htm
OSHA 125% = Occupational Safety and Health Administration: Metals and Metalloid Particulates in Workplace Atmospheres (ICP Analysis), available at http://www.osha.gov/dts/sltc/methods/inorganic/id125g/id125g.html

2d. Data Analysis and Interpretation

Data will be logged into Excel spreadsheets by uniquely coded sample number so that all measurements for a single sample appear on the same line. Data will be analyzed according to summary statistics for each parameter (number of detects, minimum, maximum, geometric mean, arithmetic average). Variables that may affect airborne concentrations (ambient air temperature, surface temperature, wind speed, height above surface where measurement taken) will be evaluated in correlational analyses with airborne concentrations of total VOCs and total PM_{10}.

Calculations and Extrapolation of Results from Phase One to Phase Two Sampling

Estimation of airborne concentrations in the breathing zone of active participants at artificial turf fields will be taken directly from the personal monitoring results for VOCs, volatile PAHs and PM_{10}. Additionally, the airborne concentrations of semi-volatile and metal analytes stemming from both background sources and the crumb rubber infill will be estimated as the concentrations derived from the Hi-vol PM_{10} sampler. However, some analytes may be at airborne concentrations that are below the limit of detection for the 2-hour Hi-vol sample. These concentrations will be estimated and the concentrations of detected analytes will be cross-checked using the following equations:

% Rubber in PM_{10} * PM_{10} Conc = Rubber PM_{10} Conc

Rubber PM_{10} Conc * Bulk Semi-Vol-Conc = PM_{10} Semi-Vol-Conc

The semi-volatile or metal airborne PM_{10} concentration calculated in this manner should be a close approximation of what is determined from the Hi-Vol filter. The possibility exists that the

weight of rubber particles will be different than the weight of other PM_{10} constituents so that the relationship between rubber PM_{10} analytes and total PM_{10} mass will not be a simple ratio based upon SEM results on the filter. This will become evident from initial comparisons between the calculated and actual (Hi-Vol) concentrations of semi-volatiles and metals. Any necessary adjustments to the calculations will be made to normalize the results and then to estimate analytes that may be below the detection limit of the Hi-Vol 2-hour sample.

Latex allergens will not be measured in this study. However, a published estimate of the level of latex protein allergen in tire rubber (27.7 ug allergen/g rubber) [12] will be used to extrapolate the level of airborne latex allergen using the rubber PM_{10} concentration derived as described above.

The initial, more extensive round of testing will define relationships between PM_{10} concentration, percent rubber particles on the filter, and ambient concentration of rubber-related analytes (e.g., metals and semi-volatiles such as PAHs and phthalates) under one set of conditions. We will also establish relationships between rubber related VOCs (e.g., benzothiazole) and volatile PAHs (e.g., naphthalene). To extrapolate these results to other fields and conditions, we will measure a subset of parameters (PM_{10}, percent rubber particles, bulk analysis, VOCs by TO-15) during Phase Two and then use the relationships established during Phase One to estimate airborne semi-volatiles, metals and volatile PAH concentrations at other fields. The PM_{10} equations shown above will be used to estimate airborne concentrations of semi-volatiles and metals at these additional fields, where there will be no Hi-vol samples.

As summarized in Table 1, during the Phase One investigation we will collect two stationary VOC samples from the middle of the field during active play. One sample will be at ground level and one will be at 3 feet above ground level. This will allow comparison of VOC concentrations at ground surface versus 3 feet above ground surface at high temperature and low wind. The purpose of this portion of the design is to assess how rapidly VOCs disperse from an expected peak at the field surface where players may be exposed only briefly (when they fall). Thus, these data will not be used to estimate dose but only to help understand how VOC exposure may change with breathing zone height.

Health Implications of Exposure

Airborne concentrations for all analytes will be compared across fields and conditions to evaluate the range and variability in exposure that is possible. Comparison with the site-specific background concentration will determine whether an elevated exposure is indicated as a result of field use. For those analytes where that is the case, health implications will be assessed by comparison to health benchmarks using standard risk procedures as contained in Table 3.

Table 3. Health Benchmarks and Risk Assessment Methods.

Analytes	Health Benchmarks	Risk Method
Non-carcinogenic VOCs, PAHs and Metals	Acute inhalation MRLs, Chronic inhalation MRLs, RfCs, CA OEHHA acute and chronic inhalation RELs; RfDs and oral MRLs if no inhalation values available; CTDPH derivation on as needed basis	Dose average over relevant time frame (acute, chronic) by percentage of time at field. Dose route extrapolation if needed, but only for systemic active agents. Hazard quotient and cumulative Hazard Index
Carcinogenic VOCs, PAHs and Metals	Unit Risk values from IRIS, CA OEHHA; CSFs if unit risk unavailable	Dose average for lifetime exposure. Estimation of cancer risk for individual chemicals and cumulative across chemicals. Oral CSFs and dose route extrapolation for systemic sites if unit risk unavailable.
Latex allergen	None available	Comparison to indoor and outdoor background

Those analytes which drive risk will be further assessed with respect to the relative contribution of background in relation to the crumb rubber infill. Background exposures and risks will be estimated from site-specific background samplers as well as other types of sources prevalent in the human environment (e.g., PAHs in air and soil, airborne rubber particles from tire dust, char-broiled foods, estimates of phthalate exposures from background sources based upon biomonitoring data).

2e. Data Limitations

The sampling campaigns are intended to capture a range of field and weather conditions but cannot cover the full spectrum of possible conditions. In addition, the simulated active field use will involve personal monitoring of players in a 3 on 3 soccer game. These players will be limited to a small field area to maximize the release of PM_{10} from repeated abrasion of the rubber into a small air zone above the field. How this design relates to PM_{10} generation under normal use of these fields is somewhat uncertain although the use of a design involving adults in a confined area should be reasonably conservative with respect to youth soccer (larger mass, more abrasion of rubber particles). VOC concentrations may theoretically be higher at the field surface than at normal breathing zone height. Our comparison of ground level and 3-foot height measurements done under worst case conditions will help understand the variability and uncertainty introduced by this factor in relation to brief periods where players have fallen on the ground.

This study may have limitations in terms of analytic sensitivity to detect all rubber-related semivolatile analytes given that the play period and Hi-Vol sampling duration of only 2 hours. The Norwegian study was able to detect ng/m^3 and even pg/m^3 levels of semivolatile contaminants on Hi-Vol filters in operation for 5-6 hours while there was active play [8]. Although the study does not specify, it appears that they set up their Hi-Vol sampler on the sideline as a general area sample rather than attempting to represent the higher particle concentrations possible in the midst of the play. Therefore, our 2-hour sampling interval should be sufficient to detect at least some if not most rubber-related analytes detected in the Norwegian

study. What cannot be detected can be extrapolated from the crumb rubber bulk analysis as described above.

This study will focus on inhaled chemicals and particles rather than ingested or dermally absorbed chemicals. These exposure pathways are also possible and to some extent have been analyzed by others [6]. Our analysis of health implications will include a discussion of these other pathways.

A major limitation of any risk assessment for a complex mixture such as rubber is the fact that there are insufficient data for MRL or RfC development for many constituents and the manner in which they interact once absorbed is not well understood. These uncertainties can only be dealt with qualitatively at the present time. We intend to address the uncertainties presented by data gaps in toxicology profiles by bringing forward whatever is known for key constituents (e.g., benzothiazole – no MRLs or RfC but some relevant data exist) [11] and using this information to describe the types of effects possible and range of exposures where risks may theoretically begin. An important aspect will also be comparison against background given that rubber-related particles and gases are common in outdoor air (and in some cases indoor air), and certain constituents are present in consumer products and food. Therefore, even if we cannot project how much risk is associated with a detected analyte or from the mixture stemming from rubber infill, we can describe the level of exposure relative to background sources.

2f. Data Quality Assurance

Before the sampling event begins, personnel from the environmental consulting firm will verify that the sampling equipment is operating properly. During sampling, they will periodically verify that equipment is operating properly. Data qualifiers will be examined by the environmental consultant to make sure that any data quality issues are resolved (or at least understood) when presented to EOHA for development of the risk assessment.

At least one blank sample will be used for each type of testing. These field blanks will show whether samples were contaminated during shipping or if the laboratory analysis is potentially flawed. Blank samples will be given a false sample ID and location, so the laboratory will be blinded to the sample's identity, as appropriate. Analytical accuracy will be evaluated using chemical recovery data and instrument calibration results. The environmental consultant will use standard chain-of-custody forms to document sample collection, storage, shipment, and the description of requested analyses. The original forms will be sent along with the samples to the laboratory and the environmental consultant will maintain copies of the forms.

3. RISK BENEFIT INFORMATION

We have identified no risks associated with this EI. The potential benefit is that adults and children who use crumb rubber athletic fields will learn whether they are exposed to levels of chemicals and dust that are high enough to pose a health threat. The EI will also help EOHA develop recommendations and policy statements regarding construction and use of crumb rubber fields in Connecticut.

Towns who participate in this EI by consenting to allow air sampling will receive no financial reimbursements or incentives.

4. INFORMED CONSENT PROCEDURES

Potential participating municipalities with crumb rubber fields will be informed of the purpose of this EI. It will be emphasized that participation is voluntary. If a municipality indicates a willingness to allow air sampling on a crumb rubber field on town-owned property, EOHA personnel will explain what the air sampling will entail and will obtain written, informed consent.

Volunteers who wear the sampling equipment for the staged 3-on-3 soccer match will also be informed of the purpose of this EI and will provide written, informed consent for their participation. The volunteers will be employees of the consulting firm hired to do the sampling.

5. COMMUNITY INVOLVEMENT

5a. Reporting Results to Participating Municipalities

EOHA will evaluate air sampling data to determine whether chemicals are present at levels that could pose a health threat. If chemical concentrations indicating a health threat are exceeded, EOHA will immediately notify the municipality(s) in which the field is located and will provide the results of the study to other municipalities across the state. EOHA will consider updating its artificial turf fact sheet [7] based upon the findings of this EI.

5b. Final Report

At the conclusion of the investigation, EOHA will prepare a written report summarizing the investigation, results, public health interpretation and recommendations. A draft of this report will be sent to ATSDR for comment. EOHA will make the report available to all interested parties, including community members, municipalities, environmental groups, other Connecticut state agencies and other states.

6. CONFIDENTIALITY

The name and location of the crumb rubber field(s) sampled in this exposure investigation will not be identified in the final report and will not be made available to the public. Confidentiality will be protected according to state laws (CGS19a-25).

7. TIMELINE

Upon project initiation, formal sampling protocols will be developed and equipment obtained. We anticipate initiating Phase 1 field work in July 2008 and completion of Phase 2 by November 2008. Laboratory results will be obtained on an ongoing basis and data analyzed as they are received. We anticipate completing a draft report by February 2009 and a final report by May 2009.

8. PROJECTED BUDGET AND FUNDING SOURCES

EOHA requests a total budget of **$21,139** from ATSDR to provide an extensive investigation of one field and follow-up investigations of three additional fields. As described in detail below, costs for the Phase 1 investigation total $8,764. The Phase 2 follow-up investigation is $4,125 for each field. EOHA will use the sampling and analytical contractor reports to develop one integrated report that includes results, data analysis and health implications for all four fields. All funds will be passed through to the contractor for sampling, analytical costs, and development of the field report. EOHA will not retain any funds and offers to contribute matching labor in the form of project oversight, data analysis, report writing, risk assessment and risk communication.

Detailed Projected Budget

a. *Phase One - Extensive Investigation*

Analytical Costs:
VOCs by method TO-15 plus rubber-related compounds (benzothiazole, hexadecane, octylphenol, volatile nitrosamines)
$275 per sample * 5 samples = $1,375
Volatile PAHs by method NIOSH 5506
$275 per sample * 3 samples = $825
PM_{10} – particulate matter in ug/m^3 and SEM for % rubber
$400 * 4 samples = $1,600
PM_{10} – full semi-vol and metals analysis from Hi Vol sampler – background and on-field
$400 * 2 samples = $800
Bulk analysis for semi-volatiles and metals: $500

Total analytical costs = $5,100

Labor Costs:
Field technicians – 3 person-days = $1,500
CIH - 8 hrs = $850
Soccer players = $58/hr * 2 hr * 4 players = $464
(includes 2 sampling technicians doubling as players)

Total Labor Costs = $2,814

Equipment Costs:
Rental of 2 side pak PM_{10} and 2 Hi-vol samplers = $850

Total Equipment Costs = $850

Total Cost for Phase 1 - Extensive Investigation: $8,764

b. Phase 2 - Follow-up Investigation

The costs detailed below are costs per field. EOHA is requesting funds to cover sampling at three fields during the follow-up phase of this EI.

Analytical Costs
VOCs for TO-15 plus rubber compounds (benzothiazole, hexadecane, octylphenol, nitrosamines)
$275 per sample * 3 = $825
PM_{10} – particulate matter and SEM for % rubber
$400 * 3 samples = $1,200
Bulk analysis for semi-volatiles and metals: $500

Total analytical costs = $2,525

Labor Costs
Field technicians/soccer players = $1000

Equipment Costs
Equipment rental of 3 dust monitors = $600

Total Cost per Field = $4,125 * 3 fields = $12,375

Total Cost for Phase 2 – Follow-up Investigation: $12,375

Project total = $21,139

9. REFERENCES

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