

November 25, 2020

Martha's Vineyard Commission
C/O Alex Elvin, General Planner
The Olde Stone Building
Oak Bluffs, MA 02557

**Re: DRAFT Sampling Protocol and Recommended Approach
Synthetic Turf Laboratory Testing and Analysis
Martha's Vineyard Regional High School Athletic Fields Project (DRI 352-M4)**

Dear Mr. Elvin:

Tetra Tech has completed our review of identified literature, regulations, guidance and information from industry experts in relation to the assessment of potential hazardous materials associated with the originally specified synthetic turf components. We have prepared this letter for the Martha's Vineyard Commission (MVC) per Task 1 of our Scope of Services dated October 29, 2020. The following summarizes the preliminary findings of our assessment and our proposed approach for sampling, laboratory analysis and human health risk characterization of the proposed synthetic turf components which was developed based on the *Proposed Scope of Work for Laboratory Testing and Analysis* dated October 14, 2020.

Available Information About Selected Turf Products. Tetra Tech researched available information for the manufactures of the three products that were specified by MVC and their designer¹. The following summarizes the relevant information on the proposed synthetic turf components.

Greenfields USA Iron Turf Ultra Green Woven Synthetic Turf Carpet

- There was no specific manufacturer data on the Greenfields USA Iron Turf Ultra Green woven synthetic turf carpet. However, per Greenfields USA the turf grass blades are primarily comprised of polyethylene, polypropylene and polyester.²
 - The Synthetic Turf Council (STC), a non-profit trade association for the synthetic turf industry, compiled several studies on the environmental impact of various components including the turf carpets.³ The findings of these studies generally do not suggest that the turf carpets are a significant risk to human health from chemical exposures. However, there is some potential for metals (particularly lead) and certain semi-volatile organic compounds (SVOCs) to be present in some turf carpet materials.
 - The Massachusetts Toxics Use Reduction Institute (TURI) produced a fact sheet describing their research on PFAS⁴ in artificial turf carpet. Per TURI, PFAS compounds were found in artificial turf

¹ MVC Scope of Work, October 14, 2020.

² Greenfields USA, TenCate Grass Division, <https://greenfieldsusa.com/greenfields/part-of-tencate/>

³ Synthetic Turf Council, research info, <https://www.syntheticurfCouncil.org/page/Research#cri>

⁴ Per- and Poly-fluoroalkyl Substances (PFAS)

carpet that was tested by two nonprofit organizations.⁵ Available information from the STC website does not include studies specifically assessing potential risks associated with PFAS in artificial turf carpet, and no information on PFAS was identified on the Greenfields USA website.

BrockUSA BrockFill Wood Infill

- The BrockUSA BrockFill infill material is an engineered wood particle infill with reportedly no coatings or plastic additives. This material is not a tire crumb rubber product, and the wood is from softwood trees. According to BrockUSA website, testing information is available for a variety of parameters including pesticides and metals.⁶ The STC presents several studies of synthetic turf carpet systems; however, when products with infill are presented, the focus is on tire crumb rubber based infills, not wood infill systems such as the BrockFill product.

BrockUSA YSR Shockpad

- There was no information on the composition of the BrockUSA YSR shockpad available on the manufacturer's website. However, BrockUSA indicates that polypropylene is the core raw material.⁷ The STC presents several studies of synthetic turf carpet systems; however, the shockpads are not the primary focus of these studies, and the shockpads are not identified as a significant source of potential contaminants. The TURI fact sheet also does not separately address the shockpads as a potential source of PFAS.

Previously Unspecified Adhesives

- Two adhesive products were received from the designer on November 22, 2020 with different purposes associated with the turf field construction:
 - Mapei Ultrabond is identified by the manufacturer as a fast-set urethane adhesive designed for the high-performance seaming and direct bonding of artificial turf used in athletic and landscape applications including seaming.
 - Reynold 775 is a pellet glue product for logos. Limited information was identified about this product.

Sampling and Analysis Recommendations. The following summarizes the findings of our initial research into the state of the art in sampling and analysis methods and procedures, as they relate to this study of the proposed synthetic turf components:

- Samples of the three specified products as well as the two adhesive products (Reynold 775 Glue and Mapei Ultrabond) were obtained from the manufacturer via the MVC's designer. Tetra Tech took custody directly of the sampled directly from the designer on November 22, 2020 with an accompanying transmittal document.

⁵ TURI, Fact Sheet: PFAS in Artificial Turf Carpet, https://www.turi.org/TURI_Publications/TURI_Chemical_Fact_Sheets/PFAS_in_Artificial_Turf_Carpet. February 25, 2020.

⁶ BrockUSA, BrockFILL, <https://www.brockusa.com/brockfill/>

⁷ BrockUSA, Sustainability, <https://www.brockusa.com/sustainability/>

- The MVC Scope of Work requested laboratory analysis for total and leachable metals, polycyclic aromatic hydrocarbons (PAHs), and PFAS.⁸
 - Based on our review of available information, and as presented in our proposal, we recommend including the full list of SVOCs via EPA Method 8270D-SIM analysis in addition to the requested PAHs analysis. The plastics in the synthetic turf components may contain certain SVOCs either as components of the turf or as additives in the manufacturing process. The analysis of the full list of SVOCs via EPA Method 8270D-SIM does not require a budget modification and was included in our proposal.
 - Laboratory analysis for leachable constituents could be performed via the Toxicity Characteristic Leaching Procedure (TCLP) or the Synthetic Precipitation Leaching Procedure (SPLP). The SPLP analysis represents conditions that mimic the material being exposed to acidic precipitation while the TCLP analysis mimics conditions that could occur if the material were a waste in a landfill. We recommend that analysis for leachability be performed per the SPLP method to represent potential future conditions at the Site due to exposure to rainfall or turf irrigation over time. Analysis via the TCLP method would represent conditions that are more extreme than anticipated at the Site and is intended for hazardous waste characterization. The analysis of the in-scope parameters via SPLP method rather than TCLP does not require a budget modification.
- Tetra Tech consulted with Alpha Analytical (Alpha), of Westborough, Massachusetts, an environmental testing laboratory with extensive qualifications in the analysis of various media for environmental assessment purposes.⁹ Based on our discussions with Alpha, the total oxidizable precursors assay (TOP) Assay and Total Organofluorine (TOF) analysis are typically performed on aqueous samples, and there are currently no standard laboratory methods (e.g. no EPA Method or ASTM standards) for these parameters. Alpha can perform or coordinate these analyses, if requested; however, proprietary laboratory methods will be employed to process and analyze the samples. The TOP Assay subjects the sample to aggressive chemical oxidation to determine if PFAS precursors would degrade into regulated PFAS over time.¹⁰ This aggressive oxidation in the TOP Assay is intended to degrade PFAS to their end products but may not accurately represent likely conditions that the installed synthetic turf would be subject to, and instead would likely represent worst-case oxidation conditions. TOF would be performed to assess fluorine content by oxygen flask combustion where fluorine would be converted to fluoride, and fluoride content would be determined via an ion-selective electrode. The results of TOF analysis may not yield usable data for the quantitation of human health risk at the Site. As discussed in the proposal, the recommendation of analysis for TOP Assay or TOF will be discussed with MVC following the results of initial analysis, and budget for these analyses were not included in our original proposal.

⁸ MVC Scope of Work requested analysis using EPA Methods 6010D, 7471B, 7196A, 1311, 1312, 8270D-SIM, and PFAS via isotope dilution

⁹ Alpha Analytical, <https://alphalab.com/>.

¹⁰ Eurofins, PFAS Total Oxidizable Precursor Assay, <https://www.eurofins.de/food-analysis/food-news/food-testing-news/pfas-top-assay/>.

- In addition to the above considerations, the following analysis may provide additional useful data for consideration in the risk characterization:
 - Volatile organic compounds (VOCs) and/or SVOCs may off-gas from the synthetic turf product over time. Laboratory analysis of total VOCs could be performed via EPA Method 8260 directly from the samples that were collected. Alternatively, after installation, testing of the synthetic turf for organic emissions could be performed to assess actual volatile concentrations in the air above the turf surface.¹¹ The U.S. Environmental Protection Agency (EPA) crumb rubber study included such an assessment of volatile emissions from the product in a small chamber at different temperatures to mimic field conditions.¹²
 - Analysis of total VOCs via EPA Method 8260. This would require a budget adjustment of \$109/sample.
 - The manufacturer does not indicate that the BrockUSA BrockFill infill material is treated with chemicals such as flame retardants or pesticides. It is possible to test the BrockFill for these parameters. However, based on information from the manufacturer, the presence of these materials is unlikely, and pesticide data may be obtained from the manufacturer, as described below. Therefore, we do not recommend additional analysis of the BrockFill for these additional parameters at this time.
- Greenfields USA indicates that they are part of TenCate with reference to the EMEA Synthetic Turf Council (ESTC) who maintains a knowledge center with information on various turf systems and products.¹³ The ESTC published a Quality Guide for Landscaping Turfs in 2019 which references toxicology quality testing requirements including compliance with Table 2, Category III of EN 71-3 and Entry 50 of Annex XVII of the REACH regulations.¹⁴ This information should be available from the manufacturer of the selected products, upon request. Tetra Tech will request this information through the designer.
- The BrockUSA manufacturer reference that they are part of the STC. The STC presents guidelines for sampling and analysis of synthetic turf infill per EN 71-3, Category III in their 2015 guidelines.¹⁵ Like the recommendations from ESTC, the results of this testing should be available from the manufacturer of the selected products, upon request. Tetra Tech will request this information through the designer.

¹¹ Sampling methods including ASTM D5116, D7706, and/or ISO 16000-25 with laboratory analysis for VOCs via EPA Method TO-15 and/or SVOCs via EPA Method TO-13A

¹² U.S. Environmental Protection Agency, Office of Research and Development, Centers for Disease Control and Prevention, Agency for Toxic Substances and Disease Registry, *Synthetic Turf Field Recycled Tire Crumb Rubber Research Under the Federal Research Action Plan, Final Report*. July 25, 2019.

¹³ EMEA Synthetic Turf Council, Knowledge Centre, <https://www.estc.info/knowledge-centre/>

¹⁴ ESTC, Quality Guide for Landscaping Turfs, <https://www.estc.info/wp-content/uploads/2019/09/ESTC-Quality-Guide-for-Landscaping-Turfs.pdf>

¹⁵ Synthetic Turf Council, Suggested Environmental Guidelines for Infill, August 25, 2015.

https://cdn.ymaws.com/staging-stc.site-ym.com/resource/resmgr/guidelines/STC_Environmental_Guidelines.pdf
TETRA TECH

Proposed Risk Characterization Approach. The following describes our risk characterization considerations and proposed risk characterization approach based on the current MVC Scope of Work and our recommended analysis, as presented above.

- Using the results of laboratory analysis of the selected samples, an exposure point concentration (EPC) will be developed based on the relative mass-based proportions (weighted average) of the synthetic turf components and their respective corresponding chemical concentrations reported by the laboratory. We will request additional installation of the turf field from the designer to support this effort.
- Massachusetts has identified inhalation, incidental ingestion (swallowing) and direct contact as the potential exposure pathways for people exposed to synthetic turf.¹⁶ The analysis of selected chemicals for their total concentrations would be sufficient to evaluate these potential exposure pathways.
- The potential human receptors to be considered include adult and/or child recreational users of the synthetic turf area and adult maintenance workers working at the Site who may be exposed via inhalation, incidental ingestion and/or direct contact. Also, it is possible that nearby residents may be exposed to drinking water impacted by chemicals leaching from the synthetic turf surface into groundwater.
- Humans may be exposed to chemicals from the synthetic turf that may leach from the Site into groundwater and impact drinking water sources. The analysis of the selected chemicals for SPLP analysis will yield the concentrations of these constituents in leachate that may impact groundwater. These data will then be used to create a simple model to estimate the potential mass loading of leachable constituents into the groundwater at the Site.
- The EPA tire crumb rubber study concluded that the bioaccessibility for body fluids is low and that a default of 100% bioaccessibility should not be assumed to assess exposures.¹¹ The selected synthetic turf product does not include tire crumb rubber; however, this consideration is useful and the assumption of a similarly low bioaccessibility for the selected synthetic turf product is reasonable. This finding suggests that the comparison of total concentrations of the selected chemical parameters could over-estimate potential risks. However, the use of total concentrations of selected parameters is considered a suitable starting point for an initial evaluation of potential risks associated with the synthetic turf at the Site. Further considerations on this topic will be presented in our final report.
- The testing of virgin materials will likely represent the “worst case” for potential exposures associated with VOCs, SVOCs, and to a lesser extent metals. If PFAS are present, it is possible that weathering process may oxidize precursors over time and result in the formation of potentially more toxic PFAS compounds. Therefore, initial results will be compared to existing standards and/or guideline values without regard to the potential for decreases in concentrations over time. Also, pending the results of the initial PFAS analysis and/or TOF analysis, TOP Assay analysis may be recommended to further support this assessment.
- There are government published screening or guideline values/standards that can be considered in the assessment of potential risks of harm to human health. These guideline values are based on exposure to environmental media such as soil, air and groundwater. Although the synthetic turf is not soil, the use and

¹⁶ Massachusetts Department of Public Health, Bureau of Environmental Health, Artificial Turf Fields. June 2020. <https://www.mass.gov/service-details/artificial-turf-fields>

nature of this product is similar to soil, and it is our opinion that comparison to soil guideline values is appropriate. With modeling the evaluation of leachable chemicals from the synthetic turf into groundwater can be compared to applicable groundwater standards. The following summarizes the selected guideline values that will be reviewed in the context of our risk characterization:

- The EPA publishes Regional Screening Levels (RSLs) for several types of human receptors including residents and workers as well as various media including soil, air and tap water.¹⁷ The total concentrations of the selected chemical parameters can be compared to their respective RSLs for the target receptor and media. The EPA's RSLs are based on a target cancer risk of one-in-one million (1E-06) and a target hazard quotient (THQ) of 1.0 or 0.1 for non-cancer health effects.
- The Massachusetts Department of Environmental Protection (MassDEP) promulgates regulations related to the cleanup of spills of oil and/or hazardous materials and identified as the Massachusetts Contingency Plan (MCP).¹⁸ The MCP Method 1 Standards have been established for several chemical constituents in soil and groundwater. It would be reasonable to compare the MCP Method 1 Standards for category S-1/GW-3 to potential direct contact, inhalation and incidental ingestion related exposures to adult and child receptors. The MCP establishes an Excess Lifetime Cancer Risk threshold of one-in-one hundred thousand (1E-05) and a Cumulative Non-cancer Risk Limit which is a Hazard Index equal to one; however, the MCP Method 1 Standards are regulatory standards and may vary somewhat from these risk-based thresholds.
- The STC suggests guideline values for infill materials for certain potentially toxic metals that are analyzed according to the EN 71-3 protocol, Category III.¹⁵ The STC Guideline values are based on the soluble portion of the metals after being ingested by a child; however, STC does not elaborate on the parameters used in the development of their guideline values or the risk-based thresholds used. These guidelines could be compared to the results of sampling and analysis per EN 71-3, Category III, as provided by the manufacturer. Although the units of the guideline values (mg/kg) are the same units used for the EPA RSLs and the MCP Method 1 standards for soil, the STC guideline values should not be compared to the total concentrations of the selected parameters as analyzed per Task 2A of our proposal.

We appreciate the opportunity to provide these analysis and risk characterization services to the Martha's Vineyard Commission. If you have any questions about the proposed sampling plan or risk characterization approach, please contact us.

Very truly yours,

DRAFT

Ian S. Cannan, CHMM
Project Manager

DRAFT

Ronald E. Myrick, Jr., CHMM, P.E., L.S.P.
Director of Environmental

P:\319629\143-319629-21001\DOCS\REPORTS\2020-11-25 (MVC_TURFANALYSIS_PROPOSEDAPPROACH).DOCX

¹⁷ U.S. Environmental Protection Agency, Regional Screening Levels. <https://www.epa.gov/risk/regional-screening-levels-rsls-generic-tables>

¹⁸ Massachusetts Department of Environmental Protection, Massachusetts Contingency Plan. <https://www.mass.gov/regulations/310-CMR-4000-massachusetts-contingency-plan>