

ENVIRONMENTAL IMPACT RESEARCH GUIDE

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**KEEPING ATHLETES
& COMMUNITIES SAFE**

We understand that converting to artificial turf from natural grass, or replacing an existing surface, is an important and involved project for your organization and community.

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With over 25 years of experience in artificial turf and sports construction, FieldTurf has one of the most knowledgeable and experienced teams in the industry. Our unwavering dedication to quality has guided our commitment to delivering surfaces that make a difference for athletes and their communities.

In this guide, you'll find answers to common environmental, health, and athlete-impact questions relating to artificial turf. As a company, we've always been committed to trusting the science. Along with information from our team of experts, the comprehensive collection of data and answers in this guide are supported by leading independent and third-party research.

Keeping your athletes & communities safe has been and will always be our first priority. Every day, we push the boundaries of research and innovation to engineer the most advanced artificial turf systems in the industry.

Eric Daliere



President – Tarkett North America & Tarkett Sports



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WHAT ARE THE BENEFITS OF ARTIFICIAL TURF OVER GRASS?

Synthetic turf offers a range of benefits over natural grass fields.

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One of the most valuable benefits of synthetic turf is that it saves water, making it an environmentally conscious choice for communities and organizations seeking to reduce water usage. The Salt Lake County Council in Murray City, Utah, estimated that converting to synthetic turf would save **2 million gallons of water per year per field**, which equates to over 16 million gallons of water over the field's expected lifetime.

With no need for pesticides, line painting, or chemicals for maintenance, synthetic turf helps protect the broader community's health by reducing the need for products containing harsh ingredients or volatile compounds, reducing the potential for spillover of these compounds into surrounding neighborhoods, ecosystems, or habitats. With no gas-powered mowers required to maintain them, synthetic turf fields reduce greenhouse gas emissions during their overall maintenance and use lifecycle.

Synthetic turf also provides increased availability of fields, meaning more hours of use are open to athletes and communities for sport and play.

Synthetic turf is made of recycled materials, helping divert waste from local landfills. One of the main components of a standard field is (SBR) styrene-butadiene rubber which is made from granulated post-consumer automotive tires.

With a wide range of benefits, synthetic turf is a smart choice for facilities and their communities.

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Source: <https://www.abc4.com/news/local-news/salt-lake-county-council-approves-converting-three-murray-sports-fields-to-artificial-turf/>



HOW CAN I MAKE MY FIELDTURF PROJECT MORE SUSTAINABLE?

Building for tomorrow: it's our sustainability commitment.

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That means our innovation isn't limited to product specs. Our promise to keep players safe on our turf has naturally evolved into an obsession — with a singular focus to completely eliminate its potential to harm not just people but the environment, too.

Now in everything we do, we strive for the lowest impact on people and the planet — from our zero turf-to-landfill commitment to circular design and the utmost care for those who play on and handle our products.

FieldTurf's industry-leading sustainability program, Sustain The Game, is proof of our commitment.

We understand that sustainability is a complex, multifaceted topic, so we've prepared a collection of answers to popular questions:

CAN FIELDTURF FIELDS BE RECYCLED?

Yes, FieldTurf surfaces can be 100% recyclable, and we have successfully recycled numerous fields across the country.

When AMB Sports and Entertainment embarked on replacing the surface at Mercedes-Benz Stadium in 2022, the organization trusted FieldTurf to ensure all components of the field avoided being sent to landfills in the replacement of the surface. The carpet material was successfully turned into composite wood products and other materials, and the infill was cleaned and separated for reuse.

HOW IS A FIELDTURF FIELD RECYCLED?

Artificial turf is made of common materials, including polyethylene, polypropylene, and nylon, while infill is made of either natural materials, sand, and (SBR) styrene-butadiene rubber. All of these are recyclable or compostable.



The first step to recycling an aged field is to remove the carpet and send the rolls to one of our Tarkett Sports recycling facilities to extract the infill, clean it, and separate it for reuse. The carpet is then sent to a specialized recycling partner to be cut, processed, and transformed into various products like composite nailer boards, planters, and park benches through the use of a proprietary process that upcycles the material into a high-grade polyurethane & polypropylene blend.

HOW DOES FIELDTURF MANAGE JOB SITE WASTE?

Under our Goal Zero commitment, FieldTurf will divert 100% of its manufacturing and job site waste in North America by the target date of 2025. This is an industry-first initiative. To achieve the goal, FieldTurf is working with suppliers, employees, and partners to ensure full alignment. FieldTurf is calling on everyone, including customers and other turf manufacturers, to join their mission to achieve Goal Zero and work toward eliminating waste to landfills.

HOW CAN I REDUCE THE CARBON IMPACT OF MY PROJECT?

With the FieldTurf Carbon Offset Program, you can now calculate the exact emissions from the manufacturing, transport, and installation of the surface and offset them so your project achieves carbon neutrality.

Offsets are provided through the Carbonfund Foundation's Carbonfree® Partner Program. This program funds third-party validated and verified renewable energy, forestry, and energy efficiency projects supporting a low-carbon transition for the planet.

WHAT BENEFITS DO FIELDTURF FIELDS DELIVER ANNUALLY?

FieldTurf fields are making a real difference every year.

- Over 16 billion gallons of water are saved annually.
- Over 17 million tires are recycled into raw materials to build new fields annually, diverting them from landfills.
- Over 7 million pounds of post-industrial material is recycled annually at our manufacturing facilities, diverting them from landfills.
- Over 4 million pounds of fertilizer is saved annually, eliminating potentially negative impacts on plant, animal, and human environments.

Data representing 2022 achievements.



ARE THERE POTENTIAL HEALTH RISKS FROM EXPOSURE TO (SBR) STYRENE-BUTADIENE RUBBER IN ARTIFICIAL TURF FIELDS?

The majority of FieldTurf systems are designed with styrene-butadiene rubber (SBR) infill, otherwise known as crumb rubber, made of reclaimed tires.

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Recycled crumb rubber, used in various everyday products and surfaces such as children's toys, surgical gloves, food packaging, playgrounds, and running tracks, has been scientifically proven to be a safe material.

More than 110 technical studies conducted by government bodies in the U.S. and Europe, along with several world health organizations, leading universities, and independent scientific bodies, have concluded that there is no health risk posed by using recycled SBR.

You can find the following recent studies and additional attachments that confirm the safety of crumb rubber for us in sports fields.

[U.S. Environmental Protection Agency \(EPA\) Report](#)

The report highlights what is commonly known about crumb rubber infill in synthetic turf fields: crumb rubber is made of the same components found in everyday consumer products and hospital and classroom floors. The report reconfirms that the mere presence of a substance does not equate to human exposure and recognizes substances are also present in grass fields and other types of surfaces. Furthermore, when the EPA tested for dozens of substances, it found low- and below-detection limits emissions, which is consistent with previous studies.

"The presence of a substance does not directly equate with human exposure. While there are many chemicals associated with recycled tire crumb rubber, our laboratory experiments suggest that the amount of chemicals available for exposure through release into the air and simulated biological fluids is relatively low. Air emissions tests were performed at both 25 °C (77 °F) and 60 °C (140 °F); temperatures were chosen to represent moderate and high-end field temperature conditions, respectively. For most VOC and SVOC target chemicals, air emissions



were low at 25 °C and in many cases, not measurable above the detection limit or above background levels. At 60 °C, higher emissions were measured for some, but not all, VOCs and SVOCs.”

“As expected, a range of chemicals was found in the recycled tire crumb rubber, including metals and organic chemicals. Where comparative data are available concentrations of most metal and organic chemicals found in tire crumb rubber were found to be similar when comparing this study to previous studies. Further, the emissions of many organic chemicals into air were typically found to be below detection limits or test chamber background, and releases of metals into simulated biological fluids were very low (mean bioaccessibility values averaged about 3% in gastric fluid and less than 1% in saliva and sweat plus sebum). **Together, these findings support the premise that while many chemicals are present in the recycled tire crumb rubber, exposure may be limited based on what is released into the air or biological fluids.**”

[Washington State Department of Health Study](#)

“We did not find the number of cancers among soccer players.”

— Washington State Department of Health Study

One of the most comprehensive human health studies came from the State of Washington Department of Health and researchers at the University of Washington School of Public Health, which formed a project team to investigate issues specifically related to soccer playing and cancer. Their findings were very reassuring.

“We know that crumb rubber is made from tires that contain chemicals that have been shown to cause cancer. However, what is critical to consider are the routes of exposure and the potential dose someone receives. The available research suggests exposures from crumb rubber are very low and will not cause cancer among soccer players. The Washington State Department of Health recommends that people who enjoy soccer continue to play regardless of the type of field surface.”

THEY CONCLUDED:

“We did not find the number of cancers among soccer players, select and premier players, or goalkeepers reported to the project team to be higher than expected based on Washington cancer rates for people of the same ages.”



[European risk assessment study on synthetic turf rubber infill – Part 3: Exposure and risk characterization](#)

“No health concerns were found for synthetic turf with ELT-derived infill materials”.

– European Risk Assessment Study on Synthetic Turf Rubber Infill (ERASSTRI)

The European Risk Assessment Study On Synthetic Turf Rubber Infill (ERASSTRI) is one of the most comprehensive multinational exposure studies to be conducted. The study involved researchers collecting various samples from indoor and outdoor synthetic turf fields and rubber recycling facilities across Europe, looked at different exposure possibilities, and concluded that “no health concerns were found for synthetic turf with ELT-derived infill materials.”

THE THREE-PART, PEER-REVIEWED, 20-MONTH STUDY:

- **Examined a Wide Variety of Sources:** The study analyzed 86 crumb rubber samples from synthetic turf fields and rubber recycling facilities in 14 European countries.
- **Included Comprehensive Bioaccessibility Analysis:** The study analyzed the migration of crumb rubber infill into artificial body fluids (sweat, saliva, and gastric fluid), as well as particles in the air above and around 17 synthetic turf fields in six European countries.
- **Conducted Complete Health Risk Analysis:** Calculated for oral, dermal, and inhalation routes using their extensive database obtained from infill sample collection, risk assessment analysis, and exposure measurements; carcinogenic and non-carcinogenic health risk characterizations indicated no health concerns.

“Calculated cancer risks for exposure to polycyclic aromatic hydrocarbons were below 1:1 million. Risk characterization ratios (RCRs) for non-carcinogenic substances were below 1, indicating no health concerns. For 2-hydroxybenzothiazole no toxicological data were found from which to derive a substance-specific reference value. A threshold-of-toxicological concern approach revealed maximum RCRs slightly above 1, which is acceptable, given the conservatism of the approach. ERASSTRI substantially improved the data available for assessing human health risks from using ELT-derived infill material. Overall, no health concerns could be identified for the use of synthetic turfs with ELT-derived infill material.”



[Comprehensive Multipathway Risk Assessment of Chemicals Associated With Recycled Crumb Rubber in Synthetic Turf Fields](#)

THE STUDY CONCLUDED:

- Estimated non-cancer hazards and cancer risks for all the evaluated scenarios were within US EPA guidelines. In addition, cancer risk levels for users of synthetic turf fields were comparable to or lower than those associated with natural soil fields.
- For most scenarios, cancer risks were higher for natural soil fields.
- The use of synthetic turf fields containing recycled rubber infill would not result in unacceptable risks or hazards to adults or children under US EPA's risk assessment guidelines.

“Methods: All available North American data on the chemical composition of recycled rubber, as well as air sampling data collected on or near synthetic turf fields, were identified via a literature search. Ingestion, dermal contact, and inhalation pathways were evaluated according to US Environmental Protection Agency (US EPA) guidance, and exposure scenarios for adults, adolescents, and children were considered.

Results: Estimated non-cancer hazards and cancer risks for all the evaluated scenarios were within US EPA guidelines. In addition, cancer risk levels for users of synthetic turf fields were comparable to or lower than those associated with natural soil fields.

Conclusions: This HHRA's results add to the growing body of literature that suggests recycled rubber infill in synthetic turf poses negligible risks to human health. This comprehensive assessment provides data that allow stakeholders to make informed decisions about installing and using these fields.”

[District of Columbia Study on the Safety of Synthetic Materials Currently Used in Construction and District Public Recreational Spaces](#)

This recently published study, which was undertaken to fulfill the requirements of the District of Columbia's Safe Fields and Playgrounds Act of 2018, identified and assessed the health and safety effects of all synthetic materials used in the construction of District recreational spaces. The study, conducted by the District of Columbia's Department of Energy and Environment (DOEE) and the Department of Health (DOH), compared laboratory test results from samples of natural grass and soils against samples of synthetic turf materials. The analysis revealed that comparable levels of carcinogenic chemicals such as arsenic and polycyclic aromatic hydrocarbons (PAHs) were present in both natural grass/soils samples and some of the artificial turf samples, while the majority of artificial turf samples contained few to no toxic chemicals at all.



In particular, FieldTurf's carpet and infill were found to contain the same levels of arsenic and PAHs as the natural grass and soil samples, while FieldTurf's grass carpet alone was found to contain no likely carcinogenic chemicals of potential concern.

OVERALL THE STUDY CONCLUDED THAT:

"Available broad-based evidence does not indicate that playing on synthetic/artificial turf will result in exposure to contaminants at levels that pose a significant risk to human health, provided such areas are properly installed and maintained, and users follow simple hygienic practices (e.g., washing hands, avoiding eating on the artificial field, and, to the extent practicable, removing as much dusty materials from shoes and clothing before going indoors)."



IS THERE A POTENTIAL HEALTH RISK OF AIR QUALITY WITH ARTIFICIAL TURF?

Researchers have refuted the false claim that exposure to styrene-butadiene rubber (SBR) can be carcinogenic,

from their study (Milone & MacBroom, engineering, landscape architecture, and environmental science firm based in Connecticut, December 2008, “Evaluation of the Environmental Effects of Synthetic Turf Athletic Fields”)

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“Under favorable conditions for vapor generation, no detectable concentrations of volatile nitrosamines or 4-(tert-octyl) phenol existed in the air column at a height of four feet above the tested synthetic playing surfaces or in the air either upwind or downwind of the fields.”

Other studies have affirmed these findings, including [a study across five fields in Connecticut](#) (Ginsberg G, Toal B, Simcox N, Bracker A, Golembiewski B, Kurland T, Hedman C. Human health risk assessment of synthetic turf fields based upon investigation of five fields in Connecticut. J Toxicol Environ Health), however, even though **outdoor and indoor synthetic turf fields are not associated with elevated adverse health risks**, proper installation of indoor fields should include guidance from an architect, designer, or HVAC expert regarding the adequacy of ventilation for your installation, best-practice oversight that is commonly required for all indoor construction investments:

“Cancer and noncancer risk levels were at or below de minimis levels of concern. The scenario with the highest exposure was children playing on the indoor field. The acute hazard index (HI) for this scenario approached unity, suggesting a potential concern, although there was great uncertainty with this estimate. The main contributor was benzothiazole, a rubber-related semivolatile organic chemical (SVOC) that was 14-fold higher indoors than outdoors. Based on these findings, outdoor and indoor synthetic turf fields are not associated with elevated adverse health risks. However, it would be prudent for building operators to provide adequate ventilation to prevent a buildup of rubber-related volatile organic chemicals (VOC) and SVOC on indoor fields. The current results are generally consistent with the findings from studies conducted by New York City, New York State, the U.S. Environmental Protection Agency (EPA), and Norway, which tested different kinds of fields and under a variety of weather conditions.”



IS THERE A POTENTIAL HEAT RISK ASSOCIATED WITH ARTIFICIAL TURF VERSUS GRASS FIELDS?

First, it's important to note that when it comes to surface temperature, artificial turf and natural grass fields vary.

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Like all plants, grass, through the process of photosynthesis, makes oxygen that produces a cooling effect at the surface level.

However, [research](#) by industry-leading expert civil engineering and landscape architecture firm Milone and Macbroom found that beyond the surface, ambient heat between artificial turf and grass largely trends to the same median temperature. At the height of 5ft, the temperature of the two surfaces is virtually the same.

This highlights the importance of looking beyond surface-level temperature to gain a more comprehensive understanding of the conditions of a field.

TIME OF DAY (HRS))	AMBIENT TEMPERATURE	NATURAL GRASS		SYNTHETIC TURF	
		AIR TEMPERATURE 2' ABOVE SURFACE	AIR TEMPERATURE 5' ABOVE SURFACE	AIR TEMPERATURE 2' ABOVE SURFACE	AIR TEMPERATURE 5' ABOVE SURFACE
	°F	°F	°F	°F	°F
12:00	101	99	101	103	101
12:30	101	99.7	101	104	101
13:00	103	100	103	104	101
13:30	102	101	102	103	101
14:00	101	100	101	103	101
14:30	99	97	99	104	101
15:00	99	100	99	104	101

Chart data sourced from TABLE 1 and TABLE 2 of research.



ARE THERE POTENTIAL RISKS OF HEAT ISLANDS WITH ARTIFICIAL TURF?

“Heat islands” often happen in urbanized areas that experience higher temperatures than rural and suburban settings.

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The temperature differences can be caused by a combination of built environments and our urban activities, such as transportation, energy consumption, and building construction.

It is possible for heat islands to negatively impact human health by causing discomfort and even heat-related illnesses. But it's not just parking lots. Any built environment can make a heat island. And that could include both built-and-designed artificial turf and natural grass fields.

The temperature of the field and the risk of heat islands can be influenced by a variety of factors, such as the amount of shade in the area, the presence of nearby buildings or water features, and the prevailing winds. These factors can create microclimates that affect the temperature of the surface.

The results of the temperature measurements obtained from the fields studied in Connecticut (Milone and Macbroom) indicate that solar heating of the materials used in the construction of artificial turf playing surfaces does happen and is most pronounced in the polyethylene and polypropylene fibers used to replicate natural grass (the carpet), rather than the crumb rubber particles (the infill).

Most FieldTurf systems are designed with more infill and a lower face weight (amount of fiber per square foot) than competitive synthetic turf systems, which could help mitigate the risk of heat islands.

Rapid cooling of the fibers was noted if the sunlight was interrupted or filtered by clouds. Even more significant cooling was noted if water was applied to the synthetic fibers as a cooling tactic in quantities as low as one ounce per square foot. The elevated temperatures noted for the fibers generally resulted in an air temperature increase of fewer than five degrees, even during periods of calm to low climate-and-weather-related temperature.



So even though we've established that artificial turf can be hotter at the surface than natural grass—artificial turf also cools down quickly and retains limited heat, so none of the negative impacts attributed to heat islands, such as driving up energy demand for air conditioning or creating conditions that can lead to heat stroke should be attributed to artificial turf.

That being said, it is important to note that the heat island effect is a complex phenomenon that is influenced by many factors, including land use patterns, building materials, and weather conditions. There are many other strategies that can be employed to mitigate this effect, such as using cool roofing materials and promoting the use of public transportation.



DOES ARTIFICIAL TURF POSE A RISK OF PROMOTING MRSA/STAPH INFECTIONS?

MRSA stands for methicillin-resistant *Staphylococcus aureus*, a type of bacteria that is resistant to several antibiotics.

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In the community (where you live, work, shop, and go to school), MRSA most often causes skin infections. It sometimes causes pneumonia (lung infection) and other infections. If left untreated, MRSA infections can become severe and cause sepsis—the body’s extreme response to an infection.

Anyone can get MRSA. The risk increases with activities or places that involve crowding, skin-to-skin contact, and shared equipment or supplies. Some people who carry MRSA can go on to get an MRSA infection. Non-intact skin, such as when there are abrasions or incisions, is often the site of an MRSA infection. Athletes, daycare and school students, military personnel in barracks, and those who receive inpatient medical care or have surgery or medical devices inserted in their bodies are at higher risk of MRSA infection.

Research has proven that **synthetic turf does not play a role in promoting MRSA/staph.**

Researchers at Penn State (study: [Human health issues on synthetic turf in the USA](#)) confirmed that staph is not an issue on artificial turf, and in fact, natural grass harbors more bacteria.

*“In conclusion, there are generally lower numbers of total microbes present in the infill or fibers of the synthetic turf systems tested compared to natural turfgrass rootzones and *Staphylococcus aureus* bacterium were not found on any of the playing surfaces. *Staphylococcus aureus* bacterium was found on towels and other devices used by athletes.*

*Under non-extreme temperatures and very limited light conditions present during the indoor portion of this study, *S. aureus* survived on both synthetic and natural turfgrass for multiple days. However, the bacteria do not appear to thrive under these conditions as the numbers of surviving bacteria decrease significantly with time.”*

*Based on the findings of the *S. aureus* survey, concern that infilled synthetic turf harbours and provides a breeding ground for *S. aureus* bacteria is unwarranted within the context of this study. *S. aureus* bacteria were found on a number of surfaces that athletes commonly come into contact with, such as towels and blocking pads; however, the tested synthetic turf did not contain any *S. aureus*.”*



DOES ARTIFICIAL TURF POSE A RISK OF WATER CONTAMINATION DUE TO WATER RUN-OFF?

Water run-off refers to the movement of water across any surface and into surrounding areas.

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Run-off is always a concern because water can carry a range of contaminants, such as heavy metals, chemicals, and fertilizers which can impact the environment and public health by potentially contaminating surface water and groundwater sources. This contaminated water also has the potential to enter rivers, lakes, or other bodies of water and ultimately find its way into drinking water sources. This can have serious consequences for both the environment and human health, making it important to carefully manage and monitor the water run-off.

Any surface can pose an issue—even pesticide-treated or fertilized natural grass produces run-off that could be concerning:

[Environmental Implications of Excess Fertilizer and Manure on Water Quality](#)

“When nutrients and other pollutants associated with animal manures and commercial fertilizers are not managed properly, they can affect plant and animal life (including humans) negatively. Some of these impacts include algae blooms causing the depletion of oxygen in surface waters, pathogens and nitrates in drinking water, and the emission of odors and gases into the air.”

For artificial turf, water run-off does not typically contain heavy metals, organics, or zinc, and crumb rubber (infill) also does not have a significant impact on groundwater quality.

[A 2014 study was conducted by CDM Smith](#) and the Massachusetts Department of Environmental Protection to evaluate the potential impacts of water run-off from artificial turf fields on water quality.

As part of this study, a sample of turf was collected from an active section of the field in June 2013. The sample was then tested using the synthetic precipitation leaching procedure (SPLP), a standardized method for determining the release of contaminants from solid materials into the water.



By using this method, the researchers were able to assess the potential for contaminants to leach out of the artificial turf and impact the surrounding environment:

“Water samples were collected from the field and water samples were tested for arsenic, cadmium, lead, mercury and zinc and were compared to criteria from the U.S. Environmental Protection Agency (EPA) for freshwater aquatic life and drinking water. Based on the results of the sampling effort, the athletic field is not a source of metal concentrations”.

Another [study from the New York State Department of Health](#) in May 2009 (An Assessment Of Chemical Leaching, Releases To Air And Temperature At Crumb-Rubber-Infilled Synthetic Turf Fields) collected thirty-two samples of groundwater in relation to artificial turf run-off, and no organics or zinc were detected.

“The dilution-attenuation factor (DAF) from the NYSDEC’s soil cleanup guidance for hazardous remediation sites was applied and demonstrated that crumb rubber may be used as an infill without significant impact on groundwater quality.”

In another study, the Town of Wilton, CT, Found Very Low Levels of PFAS From Turf

“The sampling test results showed:

- No PFAS chemicals detected in the stormwater discharge points from the artificial turf fields.*
- Some very low level PFAS chemical compounds in the surface water bodies tested.*



WHAT ARE PFAS, AND DO FIELDTURF SYSTEMS CONTAIN THEM?

PFAS, or per- and polyfluoroalkyl substances, have become a concern in many industries.

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PFAS are a group of man-made chemicals that have been widely used in various industrial and consumer products due to their unique properties, such as resistance to heat, water, and oil. The problem is that PFAS are persistent, meaning they do not break down easily and can accumulate in the environment and living organisms. PFAS exposure has been associated with various health effects, including developmental, reproductive, and immune system problems, as well as increased risk of some types of cancer, so there is growing concern about potential risks of PFAS exposure and efforts to restrict their use and promote safer alternatives.

The PFAS types highlighted as part of this issue are often categorized as “PFAS of concern.”

FieldTurf has tested the standard sports fibers it manufactures for those specific PFAS, and no PFAS of concern have been found in FieldTurf fibers.

Via U.S. Environmental Protection Agency (EPA) - <https://www.epa.gov/pfas/pfas-explained>

“EPA is committed to providing meaningful, understandable, and actionable information on per- and polyfluoroalkyl substances – known as PFAS – to the American public. PFAS are widely used, long-lasting chemicals, components of which break down very slowly over time.

Because of their widespread use and their persistence in the environment, many PFAS are found in the blood of people and animals all over the world and are present at low levels in a variety of food products and in the environment.

PFAS are found in water, air, fish, and soil at locations across the nation and the globe. Scientific studies have shown that exposure to some PFAS in the environment may be linked to harmful health effects in humans and animals.

There are thousands of PFAS chemicals, and they are found in many different consumer, commercial, and industrial products. This makes it challenging to study and assess the potential human health and environmental risks.”



[Here you will find the PFAS test results of 30 compounds](#) in accordance with U.S. Environmental Protection Agency (EPA) Method 537 Modified (537M)—the test done to determine the presence of PFAS in drinking water.

The report concluded: “As shown in Table 1, PFAS were not detected above the laboratory reporting limit in any of the tested synthetic turf carpets.

In addition to the “PFAS of concern,” some clients have asked for a more comprehensive test protocol of additional PFAS—including those deemed safe and used in everyday household items. Keep in mind that there are over 4,700 known PFAS that are used in a multitude of industries and in products such as fast-food containers/wrappers, microwave popcorn bags, pizza boxes, candy wrappers, water-resistant clothing, cleaning products as well as personal care products (shampoo, dental floss) and cosmetics (nail polish, eye makeup).

There were no detectable concentrations of PFAS in the FieldTurf, synthetic turf carpet pre-treatment sample. The following eight individual PFAS were detected at very low concentrations in the TOP Assay after extreme oxidizing conditions:

- 6:2 Fluorotelomer sulfonic acid—It should be noted that 6:2 Fluorotelomer sulfonic acid was also detected in a blank sample and therefore is not considered an actual detection in this sample.
- Perfluorooctanesulfonic Acid (PFOS)
- HFPODA (Gen-X)
- Perfluoropentanoic Acid (PFPeA)
- Perfluorobutanoic Acid (PFBA)
- PPF Acid (Pentafluoropentanoic Acid)
- Perfluorohexanoic Acid (PFHxA)
- R-EVE

THE REPORT CONCLUDED:

“Based on this evaluation, the detection of very low levels of a limited number of PFAS in the synthetic turf components does not represent a human health risk to those using the synthetic turf...”



WHAT HAS A HIGHER CARBON FOOTPRINT: ARTIFICIAL TURF OR NATURAL GRASS?

When it comes to comparing greenhouse gas emissions, it's important to consider the total lifetime of artificial turf vs natural grass.

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On the overall balance of things, artificial turf is assumed to produce a higher carbon footprint than natural grass due to manufacturing and disposal over the total course of its lifetime, even though there are many more emissions from the maintenance of natural grass.

Because the manufacturing and disposal of artificial turf can generate high emissions, FieldTurf is working to reduce the footprint of its manufacturing facilities and innovate to provide end-of-life options that divert used fields away from landfills by recycling them back into useful materials.

Carbon intensity also plays a role in comparing both field solutions.

[A study by the Zurich University of Applied Sciences](#) conducted a lifecycle analysis for different types of fields ranging from natural turf with and without drainage, hybrid turf, and artificial turf unfilled and filled.

They measured the carbon intensity of greenhouse gases for each option per hour of use, noting that the hours of use vary significantly between the natural turf and artificial turf (with more play time on artificial turf).

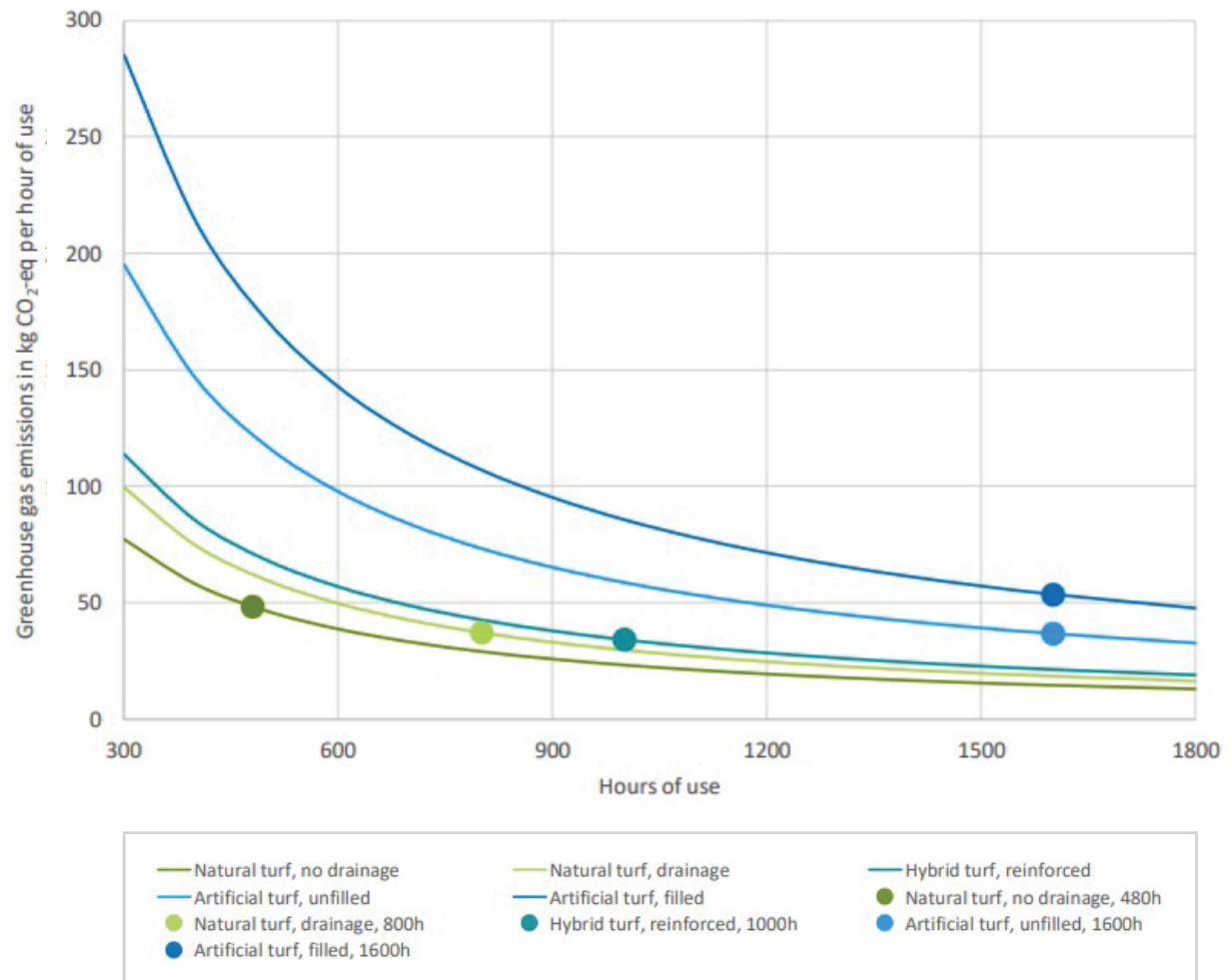
The results show that kgCO₂e per hour of use begins to converge as hours of use increase.

For example, you may only be able to get 500 hours of use from the natural turf without drainage (lowest footprint option), while you may be able to get 1600 hours of use from the artificial turf filled (highest footprint option)—**yet the greenhouse gas footprint per hour of use for both field types would be the same.**



The annual usage time not only depends on the turf type, but also on other factors like the existing infrastructure for lighting that allows for longer daily usage of the sports fields.

Greenhouse gas emissions in kg CO₂-eq according to IPCC (2013) per hour of use, depending on the total hours of use per year visualized for the natural, hybrid, and artificial turf sports fields under study; data points indicate the theoretical hours of use.



DOES PLAYING ON ARTIFICIAL TURF INCREASE THE RISK OF PLAYER INJURIES?

Keeping your athletes safe has been and will always be FieldTurf's first priority.

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When reviewing artificial turf and player safety, it's crucial to remember that not all turf is created equal.

THE FIELDTURF DIFFERENCE:

- FieldTurf's heavyweight infill systems were proven to deliver a lower incidence of total injuries.
- FieldTurf's unique wide-gauge design delivers leading cleat release times

FieldTurf is the only artificial turf company with systems reviewed by published peer-reviewed research.

STUDY HIGHLIGHTS:

COLLEGE FOOTBALL

FIELDTURF VS NATURAL GRASS

3-year study

FieldTurf systems led to:

- 13% Fewer Muscle Strains / Tears
- 11% Fewer Concussions
- 31% Fewer Ligament Tears
- 24% Fewer High Ankle Sprains
- 21% Fewer Severe Injuries
- 23% Fewer Injuries on 4-8+ Year Old Surface

HIGH SCHOOL FOOTBALL

FIELDTURF VS NATURAL GRASS

5-year study

FieldTurf systems led to:

- 44% Fewer Concussion Injuries Combined
- 43 % Fewer ACL Injuries Combined
- 25% Less Time Lost to Long-Term Injuries (22+ Days)
- 16% Less Time Lost to Short-Term Injuries (1-2 Days)



HIGH SCHOOL FOOTBALL

HEAVYWEIGHT INFILL VS OTHER INFILL WEIGHT SURFACES

7-year study

RECIPIENT OF THE 2016 AMERICAN ORTHOPAEDIC SOCIETY FOR SPORTS MEDICINE SPORTS TRAUMA AND OVERUSE PREVENTION (STOP) SPORTS INJURIES AWARD FOR TOP RESEARCH ON YOUTH SPORTS INJURY PREVENTION

Systems with >9 lbs per square foot of infill compared to all other infill weight surfaces led to:

- 19%-29% lower incidence of total injuries
- 35%-55% lower incidence of substantial injuries
- 19%-26% lower incidence of severe injuries
- 32%-47% lower incidence of player-to-turf injuries
- 17%-22% lower incidence of Ligament Sprains and Tears
- 58%-63% lower incidence of injuries on surfaces aged 8+ years, vs systems with 0-5.9 lbs per square foot

FIELDTURF RESEARCH SPOTLIGHT

Independent and third-party multi-year research is validating our effort to provide athletes with the safest field possible.

FieldTurf has been actively collaborating with University of Calgary researchers for many years on advanced traction research projects, as well as working with Penn State University's Center for Sports Surface Research on a variety of research studies.

Our latest venture, the [Smart Team Project](#). The FieldTurf Innovation & Performance Center (FIPC) has sourced the latest and most advanced technology in athlete-monitoring, analytics, and sports surfacing to connect its partner school.

With the help of advanced biometrics and real-time analytics, the SmartTeam Project will collect millions of data points obtained through athlete monitoring wearables, video analytics, and surface testing. The project's mission is to translate the findings into tangible learnings that could result in meaningful change for athletes.



The technology will record in-depth athlete biometrics (heart rate, speed, distance, player load), head impacts in real-time, and monitor recovery, strain, and sleep. The SmartTeam Project will leverage an advanced video analysis tool and connect to the world's only smart field technology to monitor field activity and maintenance. This technology will enable the recording of live events and overlay them with precise field surface conditions obtained through a battery of industry testing.

Every day, FieldTurf pushes the boundaries of research and innovation to engineer the most advanced artificial turf system in the industry.



WHICH OFFERS THE GREATEST VALUE: ARTIFICIAL TURF OR NATURAL GRASS?

A high-quality natural grass field can only be utilized for a fraction of the time an artificial turf field can be utilized.

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Artificial turf can be played on for 3,000 hours/year, whereas a natural grass field can be utilized for 300 – 600 hours to maintain its best playable condition.

FOR EXAMPLE, THE MONTGOMERY COUNTY WORK GROUP CONCLUDED:

“Despite the higher up-front and future replacement costs, an artificial turf MCPS Stadium field provides a substantially lower net cost per hour of use than any of the natural grass options because of the substantially increased hours of use and additional revenue generated from that increased use.”

20 YEAR COST SUMMARY						
20 YEAR NET COSTS		Artificial Turf	Bermuda (Sand Base)	Kentucky BG (Sand Base)	Bermuda (Native Soil)	Cool Season (Native Soil)
	Initial Capital Cost	1,125,000	530,000	580,000	150,000	75,000
	20 Year Replacement Cost*	1,280,000	150,000	175,000	100,000	60,000
	20 Year Maintenance / Other Costs	206,000	1,000,000	1,000,000	900,000	500,000
	20 Year Total Costs	2,611,000	1,680,000	1,755,000	1,150,000	635,000
	20 Year Revenue - MCPS**	1,600,000	-	-	-	-
	20 Year Net Cost - MCPS	1,011,000	1,680,000	1,755,000	1,150,000	635,000

COST PER HOUR OF USE	ANNUAL HOURS OF USE	2,300	600	500	400	300
	20 YEAR NET COST PER HOUR OF USE - MCPS	21.98	140.00	175.50	143.75	105.83

*Assumes two artificial turf carpet replacements (after years 8 and 16) and one major natural grass rehab after year 12.

**No revenue assumed for natural grass fields since MCPS would reserve these fields only for MCPS team games and practices.



In 2020, a report prepared by Atlanta-based planning, engineering, and landscape architecture firm Eberly & Associates for Woodward Academy in East Point, GA, sheds significant light on the topic.

The firm combined initial installation and annual maintenance costs for a new baseball field at a college-preparatory school with an estimated annual hour of usage to perform a 10-year lifecycle and hourly cost analysis of both artificial turf and natural grass.

The report concluded that over 10 years, the cost per hour of a synthetic turf was less expensive than natural grass.

	SYNTHETIC TURF	NATURAL GRASS
TOTAL COST	\$895,041	\$550,102
ASSUMPTION OF AVAILABLE USE	48 WEEKS/YEAR - 42 HRS/WEEK	40 WEEKS/YEAR - 20 HRS/WEEK
TOTAL AVAILABLE HOURS	2,016 HOURS	800 HOURS
COST PER HOUR	\$44.40	\$68.76

Maintenance costs for grass were estimated at \$23,000 per year, while annual maintenance costs for synthetic turf were estimated at \$5,000.

“The availability-of-use calculation varies among researchers and manufacturers, but generally it is thought that with weather issues (i.e. drainage from large rain events) and maintenance requirements — which include actual field maintenance and resting a natural field from use — a synthetic field would have anywhere from two to three times greater availability of use,” the report concludes.

The results of the firm’s analysis indicate that even though upfront costs for a synthetic turf baseball field might be higher than grass, turf will pay long-term dividends in the form of less maintenance and extended use over a 10-year period. Cost isn’t the only factor to consider when examining artificial turf vs natural grass for baseball.



HOW ARTIFICIAL TURF IS MAKING A DIFFERENCE FOR ATHLETES, SCHOOLS, AND COMMUNITIES

Synthetic Turf Increases Access To Play In Wet And Chilly Washington.

“Those teams who had access to turf fields played, while those that didn’t had to reschedule.”

(Tim Martinez, “[Martinez: Turf fields benefit most, but not all](#),” The Columbian, 4/18/23)

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John Boynton, Carlisle-MA Community Member, Renovates Surfaces With Artificial Turf, After Due Diligence.

“All four of my kids do play on these fields. It’s a tremendous opportunity for them to get outside, be active—I’m convinced that they are safe. We found that there is actually twenty years of research that has been undertaken into this specific question and we determined that the science really has spoken clearly.”

(Safe Fields Alliance, “[The Truth About Crumb Rubber and Artificial Turf](#),” Youtube, 2/1/16)

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Jim Dorsey, GA High School Athletic Director, Synthetic Turf Does Not Cause A Health Concern And Works Great.

“We presently have three artificial turf fields. Our first fields went in about thirteen or fourteen years ago. My course of action, primarily, was just to research studies that I could find on the internet dealing with this issue and based on their findings, there was just no correlation whatsoever that I could find on any of the things that I read that pointed to the fact that crumb rubber could be an issue. You know, my children went to school here, played on these surfaces while they were here. We have thousands of kids that come through, not only just our students here at McEachern High School but our youth leagues, our middle school programs utilize our fields day in – we literally have thousands of kids that have played on our fields over this twelve, thirteen year span and I’ve absolutely had no issues whatsoever.”

(Recycled Rubber Facts, “[The Many Benefits Of Recycled Rubber](#),” Recycled Rubber Facts, 2019)



Artificial Turf Fields Allowed Football Teams In Vicksburg, MS To Play Extended Seasons Without Worrying About Field Weather Damage.

"It's hard to deny, however, the functional appeal of turf, especially after Week 1 of the high school football season. In the days leading up to the 2019 Red Carpet Bowl, it allowed Warren Central's Viking Stadium to serve as a central practice facility for both its primary tenants and Vicksburg High's team. Construction crews are still installing the turf at VHS' Memorial Stadium, and doing work on the adjacent practice field. The Gators have been bussing to the nearby City Park softball fields and Vicksburg Junior High for practices."

(Ernest Bowker, "[Artificial Turf Brings Plenty Of Peace To Mind](#)," Vicksburg Post, 8/29/19)

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Turf Is A Safe Cost-Effective Option For Kids Of All Ages.

"Kids stand a higher risk for these injuries in football due to the conditions of the fields. The maintenance cost to upkeep these fields and repair them as grass fields is enormous even with volunteers doing most of the work. Turf is a much safer and cost-effective option when considering that it can bring in revenue with more than just football."

(Jackson, Blake, "[Letter: Artificial Turf Is Safer, Cheaper Than Grass](#)," State Journal, 12/9/19)

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Scott Stueber, NY School District Athletic Director, Claims Turf Repairs Have Attracted More Students To Athletics.

"'The grass fields on all three schools were in disrepair,' Scott Stueber, the district's athletic director, said. 'I think the new turf fields have helped all the teams, not just football, and now the field looks cleaner and the kids can take pride in their facilities.' Coaches for the district's varsity football teams said the turf fields offered players better footing, and with it, more speed and agility, in games and practices. The fields have also reportedly increased the number of students wanting to play football, and made more frequent practices possible."

(Nicole Alcindor, "[Turf Fields Earn High Marks](#)," LIHerald, 1/2/20)

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Chris Wagner, NY High School Coach, Says Turf Is Safer And Provides A More Consistent, Better Quality Surface.

"'I think the turf field is safer — there's less injury because there are no rocks or stones — it's a more consistent surface and, rain or shine, we can play,' North High School head coach Chris Wagner said. 'The sidelines, numbers and yard lines are perfect on turf fields, which makes



the game more organized.’ Although this was Wagner’s first year of coaching at North, he has coached football at other schools for 40 years. He said he noticed a difference when he played with teams on grass fields. Artificial turf, he said, has a number of advantages over grass fields, including built-in drainage systems, which prevent puddles and mud – conditions, Wagner said, that negatively affect traction and the quality of play on natural grass.”

(Nicole Alcindor, “[Turf Fields Earn High Marks.](#)” LIHerald, 1/2/20)

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Joe Guastafeste, NY High School Coach, Claims Turf Fields Can Properly Accommodate Multiple Sports Safely.

“At South, head varsity coach Joe Guastafeste said that prior to the installation of the artificial turf, the football field was also used as a baseball field. The dual configuration, he said, led to the mixing of clay from the baseball diamond and mud from the football field, which resulted in exceptionally slippery conditions. ‘Our [grass] field was known as the most dangerous field throughout Nassau County because grass would mix with clay, [there would be] constant puddles and there was always dangerous and uneven terrain,’ Guastafeste explained. The turf field, he added, solved those problems.”

(Nicole Alcindor, “[Turf Fields Earn High Marks.](#)” LIHerald, 1/2/20)

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Michael Rubino, NY High School Football Coach, Claims Turf Lengthens Sports Season.

“Central’s varsity football coach and athletic director, Michael Rubino, said his team likes artificial turf because it allowed for more practices. ‘We always had to hope for a dry and sunny day,’ Rubino said, recalling the seasons on natural grass. ‘Now, if it rains or snows the night before, with turf, guys can train more effectively and efficiently because turf fields remain the same in December as it is in the summer.’”

(Nicole Alcindor, “[Turf Fields Earn High Marks.](#)” LIHerald, 1/2/20)

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John Germano, NJ High School Athletic Director, Supports Turf Fields Extended Use.

“Over the years, Egg Harbor Township, Ocean City and St. Augustine Prep have installed turf fields. Schools are making the move because they find value in the investment, district officials said. The districts are able to save on maintenance, play during inclement weather and use the fields as much as they want, which also benefits local recreation programs. ‘It’s nonstop use for both our high school and our rec programs. It’s great,’ Germano said.”

(Zac Spencer, “[Barnegat Joins Schools Moving Toward Artificial Turf Fields.](#)” Atlantic City Press, 2/21/20)



Mike Pellegrino, NJ Athletic Director, Claims Athletic Programs Compete To Get Playing Time On Turf Fields.

"The only problem with a field that can take that much abuse is scheduling all the teams that want to play on it, said Mike Pellegrino, Egg Harbor Township athletic director. 'Sometimes we're trying to fit 11 games on the field in a six-day span,' he said. 'They all want to showcase and play under the lights. As an athletic director, it makes your days much longer.'"

(Zac Spencer, "[Barnegat Joins Schools Moving Toward Artificial Turf Fields](#)," Atlantic City Press, 2/21/20)

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PA Superintendent Prefers Turf Because Lower Maintenance Costs Create Long-Term Cost Savings.

"The recommendations for the artificial surface and other renovations would total about \$1.8 million, according to Superintendent Shannon Wagner. A combination of hearing from parents, students, and the community along with more research led to the administration to go with the artificial turf, Wagner said. While preliminary estimates showed artificial turf cost substantially more than natural sod to install, that isn't the case over a decade when considering maintenance costs. In the long run artificial turf costs less than grass, Wagner said."

(Mary Ann Thomas, "[Burrell Administration Recommends Artificial Turf For Buccaneers Stadium](#)," TRIB Live, 3/11/20)

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American Legion Field at Bartlett High School in Anchorage, AK, hasn't let a little snow get in the way of its [#baseball](#) and [#softball](#) schedules.

"While weather conditions have led to cancellations at several of the area's non-FieldTurf fields, our turf system, combined with the tremendous efforts of snow removal crews, have helped Bartlett High maintain its status as a reliable game day host." (4/22/23)

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Michael Bass (Alvin ISD Athletic Director) loves their FieldTurf at Freedom Field

"The great thing about a turf field is that it eliminates having the cost of having to do fertilizer, mowing to maintain, and insecticide, so you save yourself every year approximately \$100,000 - \$150,000, probably even more nowadays. "

(@SportsDissected on YouTube, Video, 10/01/22)



Bobby Cruz, Director – United Independent School District Loves FieldTurf’s Exceptional Drainage

“We had some unusually heavy rains hit us here in Laredo and our kids were able to practice immediately after the storms. In fact, they wanted to practice in the afternoon on the same day after getting 9 inches of rain in one day. We could have easily done it but the streets were flooded and we didn’t want to risk putting kids on the roads, so we waited until the next day. ALL of our outdoor programs utilized the field.”

(LinkedIn, post, 08/01/22).

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Antonio Arserio the Mayor of the City of Margate discusses the Reopening of Vinson Park after major renovations.

“It’s probably the biggest game changer out of all our parks in our city”

(@cityofmargatefla on YouTube, [Link](#), 04/23/22)

