

Real is Better than Fake: Concerning the Dangers and Risks of Synthetic Turf Fields

October 2015

By: Rockwood Turf



What data/studies are you relying on that synthetic turf fields are safe?

Posed to RSD; remains unanswered.

Yes, they did provide studies, but all were either limited, outdated or taken out of context.

When your foundation is faulty, how can you stand? How can you knowingly put children at risk?

We do know enough about synthetic turf to know it isn't safe.

Precautionary Principle says the proponent of an activity has the burden of proof of safety. Not the public.

Explore the truth in this paper.



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BACKGROUND

As a resident of Rockwood School District (RSD), in the St. Louis area, I represent a group of concerned parents/citizens. I care about the safety of our children and wish to share the following information with you concerning the risks associated with synthetic turf fields. Although RSD has recently chosen an “organic” infill, there are still many known dangers and risks associated with the fields themselves. The chosen infill, corkonut, also comes with its own risks.

Comprehensive School Improvement Plan (CSIP) District Finance Committee – “The goal of this committee is to ensure efficient operations and accountability for fiscally responsible use of district resources.” <http://www.rockwood.k12.mo.us/committees/CSIP/Pages/default.aspx>

I belong to RSD's CSIP Finance Committee, through which I was able to obtain line item costs for RSD's current grass maintenance expenditures and what they've been told they will spend on maintenance of synthetic turf fields. I recreated the line items in Excel, then compared it with a rough estimate from a professional landscaping company, who is not only cheaper, but better in the short- and long-run for our children. His professional opinion is that natural grass can withstand the wear and tear of the district's school sports and that it can be done without the cost, risks and other negative effects of synthetic turf.

*What you will find is that although crumb rubber is given the attention on health issues, it is but **scratching the surface of the problem of synthetic turf fields.***

This paper discusses the overall cost when considering installation and maintenance, which is not presented by those in favor of synthetic turf. In addition, it provides information about the other risks of synthetic turf, including extreme temperatures, lead exposure, possible cancer risk, synthetic turf's role in Staph/MRSA infections, and infills. Players' preferences, injury rates and inadequacies of current studies are also presented. Finally, the option for natural grass and organic lawn care are given, along with actual successes. What you will find is that although crumb rubber is given the attention on health issues, it is but scratching the surface of the problem of synthetic turf fields. Therefore, the focus of this paper is to give the public the truth about the all-encompassing health problem synthetic turf fields create.

REAL IS BETTER THAN FAKE, ESPECIALLY WHEN WE CAN AFFORD IT

Reality: It is scary to think that as a parent, you may have exposed your child to lead from a synthetic turf field, or put them at risk for heat-related illness, etc., but we cannot put our heads in the sand now that we have the information. We must do what is right for our children.

I know my own parents felt terrible that as children we ate food with pesticides, did not use enough sunscreen and did not wear seat belts enough, amongst other things. The research evolved. Now we know better so we do better. The same applies here.

Introduction: RSD and other school districts are considering installing synthetic turf fields. Natural grass has always been, and continues to prove to be, the best option for our children. As of 2014, RSD maintained their natural grass fields using trained in-house staff. RSD maintenance cost savings have been published, along with the cost of installation for synthetic turf fields at four high schools. However, no information has been presented on overall cost when considering installation and maintenance, the *true* cost to taxpayers.

In addition, no information on natural grass has been provided, including professional opinions of outside landscaping companies, features/benefits, and cost comparison of installation and maintenance.

When analyzing the data, it is obvious that we can afford natural grass. If a professional landscaping company is hired, the service they provide will allow for fields that can withstand wear and tear. Their years of experience and passion for grass (not to mention if they fail, they lose business!) produce successful results. The proof is in their clientele and the beating the fields withstand.

We cannot, however, afford to put our children at risk from extremely high temperatures, lead exposure, possible cancer risk and other known dangers via synthetic turf. The nation is calling for action on more studies to prove the safety of synthetic turf. Cancer can take years to reveal itself and we already know of the other health risks involved. Why risk anything else?

The choice is yours, but at least now you'll have all the facts.

Questions for RSD, Other Schools (*RSD has not been able to answer*)

Parents have a right to know to what their children are being exposed. The following are questions that need answering. Does anyone feel comfortable having children play on the fields when these questions remain unanswered, yet we know of the many dangers and risks they present already?

Parents have a right to know to what their children are being exposed. Questions need answering.

1. What data/studies are you relying on that synthetic turf fields are safe?
 2. How will RSD prevent children's exposure to lead?
 3. What information was presented to the school board about synthetic turf? Grass?
 4. Was new grass turf with a drainage system ever considered as an alternative to synthetic turf?
5. How will RSD make certain our children are not exposed to lead?
 6. How will RSD prevent heat-related illnesses?
 7. How will RSD make certain that our children do not inhale fine particles?

Additional Questions for RSD, Other Schools

8. Understanding that there can be varying amounts of lead in turf fibers depending on turf fiber colors, in addition to field components other than turf fibers can contain even more lead than turf fibers, when will RSD complete lead testing on each field?
 - a. How will RSD disinfect fields due to vomit, blood, sweat, spit, feces, etc.?
 - b. Are fields treated with Antimicrobials at factory or on site by maintenance crew?
 - c. If using, how often will chemicals be sprayed?
 - d. If using, what chemical disinfectants are used on the field?

- e. How will RSD ensure fields are truly disinfected?
 - f. If using UVC treatment, how will RSD ensure that fields are truly disinfected?
 - g. What is the effect of these disinfectants on children including, but not limited to, cancer risk, respiratory effects, skin irritants?
9. What chemicals are in the runoff from RSD's fields?
- a. What is the effect on drinking water?
 - b. Will RSD use any herbicides or chemicals to prevent weeds growing on synthetic turf?
10. Do fields contain; what are the short- and long-term effects of the following:
- a. Flame retardants?
 - b. BPA?
 - c. Phthalates?
 - d. Bromine?
 - e. Zinc?
 - f. PVC?
 - g. PAHs?
11. Since the field is made from polyethylene plastic, a petroleum-derived product, what is the effect of the plasticizers used on children?
12. Binding agent is needed to combine cork oak with coconut husk particles; what is it?
- a. What makes the compound?
 - b. What is the effect on children?
13. Does the school have an ethical responsibility to delay installation until unanimous results are found that synthetic turf is safe for children?
14. Is RSD willing to go on record, stand behind the decision to install synthetic turf fields, in light of all of the known dangers and risks, including, but not limited to, lead exposure, heat-related illnesses, cancer risk, Staph/MRSA increased risk via turf burns, those of corkonut infill?

Challenges for RSD, Other Schools

15. Due to known extreme temperatures on synthetic turf fields, notably its frequent rise to temperatures from 120-150 degrees, record the temperature of each of the School's synthetic football fields before watering, and both 5 and 20 minutes after watering every day of the year. Release to the public.
16. Release to the public actual maintenance costs of synthetic turf football fields each year. Compare to what School was told by the synthetic turf industry.
17. Release TestAmerica lead test results showing Eureka's turf fibers contain lead.
- a. Considering that there can be more lead in field components than in turf fibers alone, complete third party lead testing of all field components of all fields. Do not allow FieldTurf to pay for the test as before.
 - i. Calculate the total amount of lead (in grams) of each field. This is the total amount of lead to which children will be exposed.
 - ii. Consult pediatricians. Release results, pediatrician remarks to the public.
18. Have third party respiratory testing conducted on corkonut infill. Do not allow corkonut manufacturer to pay for the test. Consult pediatricians. Release results, pediatrician remarks to the public.

COST

(See Appendix A: RSD-Trf-Flds-Annl-Eff-on-Bdgt-20141124.xlsx.)

Because it is easy to say that one study favors grass as cheaper, and another favors synthetic turf as cheaper, RSD's actual costs are explored here. Note that what is usually missing from estimates of synthetic turf is the installation cost. It is a major piece, along with disposal costs.

*RSD's **actual costs** are explored here. Note that **what is usually missing** from estimates of synthetic turf **is the installation cost**. Combined **installation and maintenance**, **natural grass** always comes out **cheaper**.*

Below you'll see an analysis of actual costs for RSD's previous natural grass versus the actual (at this time) costs for synthetic turf.

RSD's synthetic turf fields were installed in 2015 and it is not yet known what a year's maintenance costs will be, but it is possible to estimate based on research. RSD provided only what FieldTurf told them maintenance costs would be in a spreadsheet given to the CSIP Finance Committee. The spreadsheet in Appendix A accounts for installation costs, additional maintenance costs based on research, and an estimate from a local professional landscaping company to provide services for natural grass. According to the spreadsheet, for the cheapest, safest option with the ability to withstand wear and tear, TruTurf Solutions (TruTurf) natural grass is the winner. **RSD has not been able to refute these findings.**

- RSD believed it would only spend \$3.3 million for installation and maintenance of four synthetic turf fields. As of October 2015, since 4/9/2015, there have been 6 change orders, with a current total of \$3.8 million. This does not include an equipment cost of \$66,716.52 for watering systems for corkonut infill.
- When considering maintenance, cost of relocating games only, with TruTurf, RSD saves \$132,000/yr compared to existing conditions. Only save \$82,000/yr with synthetic turf.
- Combined installation and maintenance, natural grass always comes out cheaper.
- RSD was told it will only cost \$8,000/year for synthetic turf maintenance, however factors unaccounted for include disinfection, carpet repair (rips, joints), water cooling, and weeding. These items are listed in studies by Fresenburg and others.
 - A more likely annual maintenance cost could run upwards of \$42,000.
- Bottom line: hiring TruTurf now to install brand new state-of-the-art sand-based field facility = \$2,000,000 total for 4 fields.
 - Useful life is 8 years.
 - Annual maintenance is \$66,100.
 - Every 8 years RSD would pay \$500,000 total for 4 fields' replacements.
- Synthetic turf installation = \$3.8 million total for 4 fields (actual cost as of October 2015)
 - Useful life is 10 years.
 - Annual maintenance is \$8,000, but with additional costs unaccounted for, it could more likely be \$42,000.
 - Every 10 years RSD would pay \$1.7 million for 4 fields' replacements, but did not account for an estimated \$130,000 in disposal costs for each field.

- 10-Year Total Cost (Install/Maintain)
 - TruTurf = \$3.2 million
 - Synthetic Turf = Range of \$3.9 million-\$4.2 million
- Every Subsequent 10-Year Total Cost (Replace/Maintain)
 - TruTurf = \$1.3 million
 - Synthetic Turf = Range of \$1.8 million-\$2.6 million

List of Costs Associated with RSD's Four Synthetic Turf Fields Installation, Infill
As of 10/29/2015, \$3,771,129 is the cost for installation and infill.

9/17 \$4,093,887.40 athletic fields, track resurfacing Byrne & Jones Construction
[http://www.boarddocs.com/mo/rsdpa/Board.nsf/files/A29US55D3170/\\$file/Consent-Change%20Order%206-Byrne%20%26%20Jones%20Construction%20091715.pdf](http://www.boarddocs.com/mo/rsdpa/Board.nsf/files/A29US55D3170/$file/Consent-Change%20Order%206-Byrne%20%26%20Jones%20Construction%20091715.pdf)

5/7 +\$483,341.60 Limonta (corkonut infill) <http://www.boarddocs.com/mo/rsdpa/Board.nsf/Public-806,100> track resurfacing

- 4/9/2015 \$4,265,500 athletic fields and track resurfacing
[http://www.boarddocs.com/mo/rsdpa/Board.nsf/files/9VEMTS5B4B48/\\$file/2015%20Bond%20Issue-Purchases%20and%20Related%20Contracts%20%247%2C500%20or%20Greater-Facilities-Byrne%20%26%20Jones%20Construction%20040915_Revised.pdf](http://www.boarddocs.com/mo/rsdpa/Board.nsf/files/9VEMTS5B4B48/$file/2015%20Bond%20Issue-Purchases%20and%20Related%20Contracts%20%247%2C500%20or%20Greater-Facilities-Byrne%20%26%20Jones%20Construction%20040915_Revised.pdf)
- 7/16/2015 C.O. 1 \$39,765 Eureka unsuitable soils
[http://www.boarddocs.com/mo/rsdpa/Board.nsf/files/9YGR8D5C5FA5/\\$file/Consent-Change%20Order%201-Byrne%20%26%20Jones%20Construction%20071615.pdf](http://www.boarddocs.com/mo/rsdpa/Board.nsf/files/9YGR8D5C5FA5/$file/Consent-Change%20Order%201-Byrne%20%26%20Jones%20Construction%20071615.pdf)
- 7/8/2015 C.O. 2 Policy 7211 Superintendent approved (under an amount of money less than 15,000) \$4,125 Marquette High unsuitable soils (call to
- 8/5/2015 C.O. 3 \$209,100 Lafayette unsuitable soils
[http://www.boarddocs.com/mo/rsdpa/Board.nsf/files/9ZDH3K4688E5/\\$file/Consent-Change%20Order%203-Byrne%20%26%20Jones%20Construction%20082015.pdf](http://www.boarddocs.com/mo/rsdpa/Board.nsf/files/9ZDH3K4688E5/$file/Consent-Change%20Order%203-Byrne%20%26%20Jones%20Construction%20082015.pdf)
- 5/7 C.O. 4 -\$483,341.60 tri party contract with Byrne and Limonta. RSD will pay Limonta directly, contract with Byrne & Jones reduced by the above amount.
<http://www.boarddocs.com/mo/rsdpa/Board.nsf/Public>
- 9/17 C.O. 5 \$26,355 Rockwood Summit unsuitable soils
[http://www.boarddocs.com/mo/rsdpa/Board.nsf/files/A29UR45D2591/\\$file/Consent-Change%20Order%205-Byrne%20%26%20Jones%20Construction%20091715.pdf](http://www.boarddocs.com/mo/rsdpa/Board.nsf/files/A29UR45D2591/$file/Consent-Change%20Order%205-Byrne%20%26%20Jones%20Construction%20091715.pdf)
- 9/17 C.O. 6 \$32,384 Lafayette, Rockwood Summit asphalt repairs
[http://www.boarddocs.com/mo/rsdpa/Board.nsf/files/A29US55D3170/\\$file/Consent-Change%20Order%206-Byrne%20%26%20Jones%20Construction%20091715.pdf](http://www.boarddocs.com/mo/rsdpa/Board.nsf/files/A29US55D3170/$file/Consent-Change%20Order%206-Byrne%20%26%20Jones%20Construction%20091715.pdf)
- Track resurfacing -\$806,100

Does not include equipment cost

7/16 +\$66,716.52 watering systems

[http://www.boarddocs.com/mo/rsdpa/Board.nsf/files/9YA3D56D3E6A/\\$file/2015%20Bond%20Issue-Purchases%20and%20Related%20Contracts%20%247%2C500%20to%20%24150%2C000%20071615.pdf](http://www.boarddocs.com/mo/rsdpa/Board.nsf/files/9YA3D56D3E6A/$file/2015%20Bond%20Issue-Purchases%20and%20Related%20Contracts%20%247%2C500%20to%20%24150%2C000%20071615.pdf)

Studies and Actual Scenarios Confirm Natural Grass is Cheaper

<http://turf.uark.edu/turfhelp/archives/021109.html>

- **“Maintenance**

- It is a myth that synthetic fields require less maintenance than natural turfgrass fields or to say that artificial turf fields are maintenance free. Synthetic fields require 1) additional infill, 2) irrigation because of unacceptably high temperatures on warm-sunny days, 3) chemical disinfectants, 4) sprays to reduce static cling and odors, 5) drainage repair and maintenance, 6) erasing and repainting temporary lines, and 7) removing organic matter accumulation. In a recent presentation by the Michigan State University, Certified Sports Turf Manager, she cited that the typical annual maintenance costs of her artificial turf fields ranged from \$13,720-\$39,220, while the typical annual maintenance costs of her natural turf fields had a similar range of \$8,133-\$48,960 (1).

- **Long-term costs**

- Long-term costs are less with natural turf fields compared to synthetic turf fields. Artificial fields need replacing every 8-10 years, whereas a natural turf field does not need as frequent renovation and can be renovated at a much reduced price compared to an artificial field. In a 16-year scenario, Fresenburg came up with an annual average cost for each field type as follows: the natural soil-based field, \$33,522; the sand-cap grass field, \$49,318; the basic synthetic field, \$65,846; and the premium synthetic field, \$109,013 (2).

- **Disposal costs**

- When artificial turf (in-fill systems) needs renovating every 8-10 years, there is a hidden cost of disposal. Because the field is filled and top-dressed with a crumb rubber material (typically made from ground automobile tires), the material may require special disposal. Disposal costs are estimated at \$130,000 plus transportation and landfill charges (3).”

- **Again, when comparing installation and maintenance, grass is cheaper.**

- “While the factors influencing costs vary from field to field, construction costs for an artificial turf field generally far outweigh construction costs for a natural field.
- Properly installed and maintained quality natural grass remains viable for at least twice as long, exponentially increasing the costs for a synthetic field based on the need to tear up, totally re move and reinstall new artificial turf every eight to ten years or even more often.” http://www.nsgao.com/images/Natural-Grass-and-Artificial-Turf_booklet.pdf
- **“...turfs cost more than grass fields.** Artificial turf fields cost between \$500,000-\$1,000,000. My school district has a quote for \$750,000 for one field...A premium organic renovation with real grass would cost approximately \$300,000.

EXTREME TEMPERATURES

Synthetic turf is 35-55 degrees hotter than natural grass. Temperatures above 122 degrees can injure/burn skin in less than 10 minutes. **Synthetic fields frequently reach 120-150 degrees.** "Children are less able to adapt to changes in temperature... **greater chances of discomfort, dehydration, heat stroke.**"

Synthetic turf fields are known to reach extreme temperatures frequently.

- **2015 FIFA Women's World Cup sampling of temperatures (Canada).**

Note: some temperatures converted from Celsius to Fahrenheit.

Sample Temperatures 2015 WWC

Air	Synthetic Turf
82 °F	150 °F
	From 86 °F to over 122 °F within 5 minutes.
77 °F	131 °F
64 °F	129 °F
77 °F	109 °F
78 °F	120 °F

Sources: https://en.m.wikipedia.org/wiki/2015_FIFA_Women%27s_World_Cup
<http://news.nationalpost.com/sports/soccer/womens-world-cup-offence-is-hot-and-the-fields-are-hotter-renewing-complaints-over-artificial-turf>
<http://t.thestar.com/#/article/sports/soccer/2015/06/08/womens-world-cup-heats-up-as-pitch-level-mercury-soars.html>

- **Kansas City, Missouri, Stanley-Durwood Soccer Stadium**
 - 95 °F air, 159 °F synthetic turf <http://www.sportingnews.com/soccer/story/2014-08-23/alex-morgan-nwsl-portland-thorns-hot-turf-field-uswnt>
- **On a 98 °F (37 °C) day, MU's Faurot Field had a surface temperature of 173 °F (78 °C).** The temperature of the nearby natural grass was only 105 °F (41 °C). Even at head-level, the temperature over the artificial turf was 138 °F (59 °C).¹³
 - Dr. Brad Fresenburg, turfgrass specialist from the University's Division of Plant Sciences, explains the danger of artificial turf is that the rubber and plastic materials used absorb more of sunlight's heat energy than natural grass, causing extraordinarily high temperatures.
<http://plasticfieldsforever.org/ArtificialTurfBooklet.pdf> "Synthetic Turf Playing Fields Present Unique Dangers," *Applied Turfgrass Science*, November 3, 2005.
- **Columbia, Missouri: Professor says "the fibers in a synthetic field control the heat."**
 - According to a news report in the *Columbia Missourian* (6 September 2013), the Faurot Field at the University of Missouri's Memorial Stadium registered a high of 151 degrees during the school's football season opener on Saturday 31 August. "A team of turf experts used an infrared thermometer to measure the heat coming off of the field in Memorial Stadium." "The National Weather Service in St. Louis [had] reported Saturday" high temperature in Columbia as 100

degrees, but that reading was on a natural grass surface about 6 feet above the ground.” The service’s hydrologist, Mark Fuchs, said “on an artificial-turf surface, the temperatures jump.” The Division of Plant Sciences professor Brad Fresenburg had this to say about the heating of the artificial turf fields: sunlight plays a vital role in turf temperature. “If we’ve got the sun in the air and there’s a clear blue sky, we’re easily going to be in the 150s. It could even be in the 160s.” “We know that the fibers in a synthetic field control the heat.” “Artificial fields are made of petroleum-based fibers that absorb heat as weather conditions change. Mid- to late afternoon, when direct sunlight has had its greatest effect on temperature, is usually when turf fields reach high temperatures. Much like vinyl in cars, the fibers capture and hold heat until the field has time to cool. Often, the fields get so hot that the heat can be felt through the soles of shoes.” “Temperature readings vary depending on the kind of surface, amount of cloud cover, humidity, wind speed and thermometer height during the time of the reading. A slight breeze, for instance, can change temperatures by 20 or 30 degrees.” “The clarity of the sky and the time of day — that makes a huge difference in what reflects off of that field as far as heat. The sky, if it’s more clear blue, that’s going to allow the field to absorb more heat.” Source: Beth Castle, “Artificial turf turns up the heat on Faurot Field,” in the *Columbia Missourian*, 5 September 2013, at <http://www.columbiamissourian.com/a/165243/artificial-turf-turns-up-the-heat-on-faurot-field/> . See pdf of the news report [here](#).

- **Children Highly Susceptible to Heat – Risk of Heat Stroke and Other Issues**

- "Children less able to adapt to changes in temperature...How does high surface temperature affect field users?...Greater chance of heat-related issues. Discomfort, dehydration, heat stroke." Some believe that the crumb rubber infill is to blame for high temperatures. However, no matter what type of infill is used, "Fibers are a major contributor to high surface temperatures."
<http://plantscience.psu.edu/research/centers/ssrc/documents/temperature.pdf>

- **Student suffers severe injuries during 'punishment'**

- See video: <http://www.kvia.com/news/Student-suffers-severe-injuries-during-punishment/16233940>

- **Why did this happen?**

- Synthetic turf is 35-55 degrees hotter than natural grass. Temperatures above 122 degrees can injure/burn skin in less than 10 minutes. Synthetic fields frequently reach 120-150 degrees, again, no matter what infill is used.

<http://plantscience.psu.edu/research/centers/ssrc/documents/temperature.pdf>



- Lowest temp in a test of synthetic fields on an average 76 degree air temp day...154! <http://plantscience.psu.edu/research/centers/ssrc/documents/heat-progress-report.pdf>, See pp. 12-14 for outdoor testing.
- "No product in this test substantially reduced surface temperature compared to the traditional system of green fibers filled with black rubber in both the indoor and outdoor test. Reductions of five or even ten degrees offer little advantage when temperatures still exceed 150 °F. Until temperatures can be reduced by at least twenty or thirty degrees for an extended period of time, surface temperature will remain a major issue on synthetic turf fields."
<http://plantscience.psu.edu/research/centers/ssrc/documents/heat-progress-report.pdf>
- "Artificial turf fields have multiplied over the past decade. Many questions remain as to how these fields may affect children's health. Where installation of turf fields is still under consideration, Dr. Landrigan recommends delaying the decision until the questions about the safety of artificial turf have been studied more thoroughly.
 - When the air temperature is in the 80's or 90's, temperatures above the turf can exceed 150 °F. Any temperature above 122 °F can injure or burn skin in less than 10 minutes. Also, heat stress and heat stroke are possible for children playing strenuously on the hot fields."
http://www.mountsinai.org/static_files/MSMC/Files/Patient%20Care/Children/Childrens%20Environmental%20Health%20Center/Fact%20Sheet%20-%20Back%20to%20School%20QA.pdf
- **Cooling the synthetic field only lasts 5 minutes**
 - Irrigation of the synthetic turf had a significant result cooling the surface from 174 °F to 85 °F but after five minutes the temperature rebounded to 120 °F. The temperature rebuilt to 164 °F after only twenty minutes.
<http://plasticfieldsforever.org/ArtificialTurfBooklet.pdf>

LEAD EXPOSURE

- **Parents expect that since children are already playing on the fields that they're safe, but health threats have already been found; should be tested for lead.**
<http://www.ceh.org/news-events/press-releases/content/legal-action-launched-on-lead-in-artificial-turf/>
- **The fibers of FieldTurf's current grass (as of 2015) are made from polyethylene.**
<http://www.fieldturf.com/de/artificial-turf/fag>
 - Other dangers of the turf fibers themselves:
<http://www.synturf.org/wrapuparticles.html>, No. 9

The CDC now says, that "no safe blood lead level in children has been identified. Even low levels of lead in blood have been shown to affect IQ, ability to pay attention, and academic achievement. And effects of lead exposure cannot be corrected."

- **Polyethylene contains lead.**

- Turf fibers exceeding the statutory limit **included polyethylene**, nylon, and polyethylene/nylon blends. Results indicate elevated lead concentrations predominantly in green nylon-based turf fibers and polyethylene-based turf fibers of various colors.
<http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2957910/#!po=32.3529>, p. 6

- **See video:** <http://www.ceh.org/lead-in-artificial-turf/>

- **Lead concern increases as fields age**

- Synthetic turf can deteriorate to form dust containing lead at levels that may pose a risk to children and
- All current fields *should be tested for lead content and then routinely tested for surface lead if lead over limit for children's toys is found in the blades.*
http://www.kickenson.info/ArtificialTurfFacts/MCCPTA_Health_and_Safety_files/Kathy_MCCPTA3-29-2011_Artificial_turf_MSSM_base2aja-kmm.ppt, Slide 10, including slide notes

- **Lead risks when considering today's synthetic turf grass contains lead**

- The CDC now says, that "**no safe blood lead level in children** has been identified. Even low levels of lead in blood have been shown to affect IQ, ability to pay attention, and academic achievement. And effects of lead exposure cannot be corrected."
http://www.cdc.gov/nceh/lead/acclpp/blood_lead_levels.htm

<http://www.usatoday.com/story/news/2015/03/15/artificial-turf-health-safety-studies/24727111/>

- "Because of the physical development of younger children, lead has a greater propensity to be absorbed," said Robert Laughton, the school district's environmental health and safety director. "They're the most at-risk population we have."

*"Synthetic turf can deteriorate to form dust containing **lead at levels that may pose a risk to children.**"*

*EPA states "**there is no definitive study that fully addresses** all of the questions regarding **safety considerations** associated with the use of synthetic turf and/or crumb rubber fields."*

- The turf study showed that two fibers would release potentially harmful amounts of lead into a child's bloodstream — 9.9 micrograms and 6.6 micrograms.

- There is no current consensus on the risk to children from playing

on artificial turf fields. The U.S. Environmental Protection Agency [states](#), "there is no definitive study that fully addresses all of the questions regarding safety considerations associated with the use of synthetic turf and/or crumb rubber fields." Municipalities are considering moratoriums on the installation of new fields until definitive safety studies are completed.

- "Fields that are old, that are **used frequently**, and that are exposed to the weather break down into dust as the turf fibers are worn or demonstrate progressive signs of weathering, including fibers that are abraded, faded or broken. <http://www.cdc.gov/nceh/lead/tips/artificialturf.htm>
- As the turf ages and weathers, lead is released in dust that could then be ingested or inhaled, and the risk for harmful exposure increases. If exposures do occur, CDC currently does not know how much lead the body will absorb; however, if enough lead is absorbed, it can cause neurological development symptoms (e.g., deficits in IQ). Additional tests are being performed by NJDHSS to help us better understand the absorption of lead from these products." <http://www.cdc.gov/nceh/lead/tips/artificialturf.htm>

- **There can be much more lead in other field components than turf fibers.**

"The high lead levels were found in a secondary layer of nylon fiber at the base of the fields called the root zone..."

"Our opinion is that AstroPlay could pose a human health risk', wrote Michael T. Abel project manager at the Lubbock lab that conducted the test."

"Elsewhere in the country, school officials have closed facilities that showed lead levels far lower than those measured at the two Texas stadiums"

<http://www.turfgrasssod.org/files/file/66243337-aa6f-447a-9cd1-c0d39867db69>

- **Lead from runoff of synthetic turf fields can be released into the environment.**

- "...testing at the Birdville stadium also found about twice the EPA limit for lead in drinking water in the runoff from the field, an indication that the lead is being released into the environment."

- **Synthetic turf should be considered a children's product**

- The lead limit for children's products is 100 ppm. CPSC notes that this does not make the products safe, as there is no safe level of lead per the CDC.

- **Additional quotes from Dr. David Brown, Sc.D.***

- Turf industry likes to compare other levels of acceptable lead, but this does not account for a TOTAL amount of lead.
- There is no threshold for lead poisoning in children or pregnant women.
- You will increase your lead exposure no matter what
- What is the total amount (in grams) of lead in the field? How much lead is there?
- Synthetic turf fields are the largest single lead source in the town
- Soccer field is larger than a baby rattle.
- New major source of lead in town is a public health concern.

*There can be much **more lead in other field components than turf fibers.***

*"Turf industry likes to compare other levels of acceptable lead, but this does not account for TOTAL amount of lead. **What is the total amount (in grams) of lead in the field?" Dr. Brown, Sc.D.***

- It should be considered a health nuisance at minimum because we encouraging children to play on it, this hazardous material.
- If lead testing is completed by RSD, it should be placed in a bag and archived so later when children get sick we'll know what we've exposed them to.
- Pediatricians can weigh on children's exposure to lead. You'd hear them say children should not be exposed at all because it's a neurotoxin; look at the total amount of lead in the field.

"Total amount of lead in grams matters, not ppm. Children will be exposed to total amount of lead,"
Dr. David Brown, Sc.D.

- **RSD partially completes lead testing**

- Although installed four synthetic turf football fields in the summer of 2015, RSD chose only to test the turf fibers of one of the fields. It did not test all of the field

components, nor did it test the other fields' turf fibers or components. Different color turf fibers contain different amounts of lead.

- In addition, other synthetic turf field components can contain even greater amounts of lead than turf fibers.
- **Notes on RSD Eureka High School Lead Test Report (turf fibers only)**

(See Appendix B for the partial lead test conducted by TestAmerica.)

- Mg/kg is the same as parts per million (ppm).
- Client is FieldTurf (not an independent test).
 - Call placed to TestAmerica confirmed FieldTurf paid for the test.
- "Total amount of lead in grams matters, not ppm. Children will be exposed to total amount of lead," Dr. Brown, Sc.D.*
- We don't know the total amount of lead in ANY field.
- Eureka's turf fibers tested positive for lead.
- Different colors of turf fibers contain different amounts of lead; other schools' lead content will be different due to differing colors used.
<https://www.cpssc.gov//PageFiles/104716/turfassessment.pdf>
- NO other schools' turf fibers or field components were tested.
- NO other field components tested although there can be much MORE LEAD in these than turf fibers.
<http://www.turfgrasssod.org/files/file/66243337-aa6f-447a-9cd1-c0d39867db69>

- According to the EPA Lead Specialist I spoke with, (1-800-424-LEAD), once bare soil is covered with grass, there is NO

EPA Lead Specialist I spoke with, (1-800-424-LEAD), "**once bare soil is covered with grass, there is NO RISK of lead exposure, even if the soil approached the lead limit of 400 ppm. According to Dr. Brown, Sc.D.*, "it is highly doubtful RSD's (grass) fields even come close to that amount of lead."**

RISK of lead exposure, even if the soil approached the lead limit of 400 ppm. According to Dr. Brown, Sc.D.*, it is highly doubtful RSD's (grass) fields even come close to that amount of lead.

- Recall that according to the CDC, there is no safe level of lead, especially for children.
- Even low levels of lead in blood have been shown to affect IQ, ability to pay attention, and academic achievement. And effects of lead exposure cannot be corrected. <http://www.cdc.gov/nceh/lead/tips.htm>

POSSIBLE CANCER RISK

Note: at the time of this article, Amy Griffin's list was only 38 players; it has now grown to 136 cases as of May 15, 2015 according to Dr. David Brown, Sc.D. So the text below is even more alarming.*

"Lymphomas...are heavily influenced by environmental factors.

"On the question of increased concern about cancer patterns in synthetic turf fields, Alderman and Brown believe that when one looks at the cancers that the soccer goalies who played on synthetic field are getting - most

of the cancers are lymphomas. Lymphomas are cancers that are heavily influenced by environmental factors. The infill of synthetic turf fields is made up of ground up rubber tires that contain many carcinogenic compounds. Scientists understand today, that when a population that is exposed in a particular setting comes down with one type of cancer it is often caused by an exposure to a specific group of chemical carcinogens that are in that particular environment. The presence of a single type of tumor, or cancer, rather than the normal distribution of cancers expected in the overall population of that age group, is in itself an indication that the affected population is being exposed to the same chemical carcinogens.

According to Alderman and Brown, the number of lymphomas in the population of athletes who played on synthetic turf collected by [soccer coach] Amy Griffin is much higher than would be normally expected. This suggests that the athletes who have come down with lymphomas and have played on synthetic turf for years, may have all been exposed to the same chemical carcinogens just like those found in rubber tire infill. Among the distribution of lymphomas in 15 to 19 year olds who are treated for cancer nationally, 13.5% for Hodgkin's lymphoma, 8.3% for non-Hodgkin's Lymphoma; and 1.1% for Burkitt's Lymphoma according to EPA's "America's Children and the Environment" http://www.epa.gov/ace/publications/ace_2003.pdf . The percentage of lymphomas in the population of athletes who played on synthetic turf collected by Amy Griffin [38 U.S. soccer players with blood cancers, including 34 goalkeepers] is much higher than this.

Being one of the first to call for a moratorium of creating more artificial turf fields around the country, EHHI believes that it may be time for a Congressional hearing on synthetic turf fields." <http://www.synturf.org/ehhibrief.html>, No. 6

"Amy Griffin's cases of soccer players with cancer - right now they're not sure what caused the cancer. A lot of folks have pointed to crumb rubber, but Dr. Brown, Sc.D. says it could have been the synthetic grass itself, but we don't know. It hasn't been studied yet. There are 136 reported cases so far; Dr. Brown, Sc.D. is in contact with Amy Griffin. Most are blood cancers, lymphoma that could have been caused by the breakdown of polyethylene, the current material used in FieldTurf," phone interview with Dr. Brown, Sc.D.*, May 15, 2015

*"Amy Griffin's cases of soccer players with cancer - right now they're **not sure what caused the cancer**. A lot of folks have pointed to crumb rubber, but Dr. Brown, Sc.D. says **"it could have been the synthetic grass itself, but we don't know. It hasn't been studied yet."***

BACTERIA/STAPH/MRSA/RISK OF INFECTION

Photo source: http://equalizersoccer.com/wp-content/uploads/2014/10/141001_2_Application-Sec-24-Schedule-A.pdf

Synthetic turf appears to play a role in Staph and MRSA infections due to unsanitary conditions on the field. Because of turf burns, the risk of infection increases for players due to more susceptibility.

- "Like playing on a giant used bandaid." http://www.synturf.org/images/CALBill-PressReIFOR_IMMEDIATE_RELEASE.doc
- "Studies have shown that **"Players who sustained turf burns had a risk of infection that**

Artificial Turf Abrasions

Sydney Leroux
United States



April 14, 2013
Twitter: [@sydneyleroux](https://twitter.com/sydneyleroux)

Samantha Kerr
Australia



May 12, 2013
Twitter: [@samkerr1](https://twitter.com/samkerr1)

Nadine Angerer
Germany



January 24, 2014
Twitter: [@NAngerer](https://twitter.com/NAngerer)

*MRSA infections: "Players who sustained turf burns had a **risk of infection that was 7 times higher than that for players without turf burns.**"*

was 7 times higher than that for players without turf burns." These open lesions are often the source of contracting and vehicle for spreading dangerous infections. In fact, a 2003 study of MRSA infections among St. Louis Rams football players found that all eight MRSA infections began at turf burn sites. <http://cid.oxfordjournals.org/content/39/10/1446.full>, <http://www.synturf.org/staphturbbrief.html>

- **“Medical experts have found that staphylococci and other bacteria can survive on polyethylene plastic, the compound used to make synthetic turf blades, for more than 90 days.** Blood, sweat, skin cells and other materials can remain on the synthetic turf because the fields are not washed or cleaned. In short, playing on these fields is like playing on a giant used band aid. I am glad to see that the Senate recognized the importance of further investigating the safety of these fields,” Maldonado concluded.” http://www.synturf.org/images/CALBill-PressReIFOR_IMMEDIATE_RELEASE.doc
- “Blood, sweat, skin cells and other materials can remain on the synthetic turf because the fields are not washed or cleaned. In short, playing on these fields is like playing on a giant used band aid.”*
- **Alarmed about germs and bacteria on synthetic turf fields.** [No. 38] Sacramento, Calif.: Maldonado says playing on turf is a like playing on “a giant used Band-Aid.” According to a news item in San Jose Mercury Post (January 12, 2009), State Senator Abel Maldonado, “who has three young sons, is alarmed about germs and bacteria. Once turf is installed, there’s no regulations about how to clean or disinfect it. Kids bleed, sweat and spit on turf fields during sports; dogs poop on them at night.” Maldonado said, “Blood, sweat, skin cells and other materials can remain on the turf because the fields are not washed or cleaned. It’s like playing on a giant used Band-Aid. I’m not against turf, but I want to make sure that it’s totally safe for kids. The parents at Trace have a right to raise concerns.” Maldonado introduced legislation last year, wanting the “state agencies must conduct a study about the health and environmental impacts of synthetic turf fields,” according to the Post. For more on this story, see Dana Hull, “Sen. Abel Maldonado says state must study health impacts of increasingly-popular turf fields, saying they are like playing on ‘a giant used Band-Aid’,” in San Jose Mercury News, January 12, 2009, available at http://www.sanluisobispo.com/news/local/breaking_news/story/585213.html. For background information about Maldonado and his efforts, see <http://www.synturf.org/moratoriums.html> (Item No. 7) and <http://www.synturf.org/wrapuparticles.html> (item No. 6) <http://www.synturf.org/warnings.html>
 - **Synthetic turf fields’ microbial populations accumulate over time, including Staph.** “There is growing concern regarding the contribution of infilled turf fields on increased athlete infections. Abrasions that occur on these fields create a port of entry for pathogens such as Staphylococcus aureus that are present on the athlete’s skin or possibly on the field’s surface. This study compares the occurrence of microbial populations on two infilled synthetic turf fields (year old turf vs. 6 year old turf) in three locations. Both fields were sampled once a week for at least 14 weeks (exact number varied on field and location) during the late summer and fall of a football season...**Much higher microbial populations were found on the older turf field with as much as a 104 increase over similar locations on the newer turf. This suggests microbial populations can accumulate in synthetic turf infill from year to year...These results indicate that infill material can serve as a source for the spread of pathogens among student athletes, and that these organisms seem to accumulate over time posing a greater risk if proper turf cleaning is not regularly performed.**” <http://skyline.bigskyconf.com/journal/vol1/iss1/1/>

- **The Life-Threatening Danger of MRSA:** In a 2005 issue of the New England Journal of Medicine, seven doctors reported on a research project related to Methicillin-resistant Staphylococcus aureus (MRSA) an emerging cause of infections outside of health care settings. The doctors focused on an outbreak of abscesses due to MRSA among members of a professional football team and examined the transmission and microbiologic characteristics of the outbreak strain. The report stated: "From our player survey and observational study of games and practices, we found that skin abrasions occurred frequently among players ... Players reported that abrasions were more frequent and severe when competition took place on artificial turf than when it took place on natural grass."

The report also stated: "Findings from our investigation underscore the importance of certain factors at the player level and at the team level that could have facilitated the spread of the clone in this setting. One important player-level factor was skin abrasions, or turf burns. MRSA skin abscesses developed at sites of the turf burns on areas of the skin not covered by a uniform (e.g., elbows and forearms) these abrasions were usually left uncovered, and when combined with frequent skin-to-skin contact throughout the football season, probably constituted both the source and the vehicle for transmission."²⁶

The report also makes several recommendations to control or prevent the spread of MRSA. The full report can be obtained at www.nejm.org (February 3, 2005). "Facts about Artificial Turf and Natural Grass":

<http://plasticfieldsforever.org/ArtificialTurfBooklet.pdf>

- **Diagnosis: MRSA:** During the 2003 football season, researchers from the CDC (Center for Disease Control) found eight cases of MRSA in five members of the St. Louis Rams. Skin scrapings proved that a turf burn from synthetic turf had provided the entry point. MRSA was then passed amongst the players in a variety of ways, such as sharing towels or using locker room facilities that were not completely disinfected. After a game with the San Francisco 49ers, some members of that team were also diagnosed with MRSA.²⁷

MRSA is not a condition limited to the professional sports teams. College and high school players have been diagnosed across the country, including confirmed cases in Connecticut, Texas, Illinois and Pennsylvania.

Following this news, one synthetic turf supplier has voluntarily started to offer free, lifetime decontamination services to existing customers based on the levels of bacteria found in its sand infill. The decision came after independent research commissioned by the company showed infill containing sand had 50,000 times the bacterial count as that of all-rubber infill.

Athletic Turf News reported that an officer of the company was "stunned" by the results of the study and committed to sanitation techniques which were expected to be needed monthly for each field containing the sand infill. He was also quoted as saying that the synthetic turf company would "strongly encourage others in the industry to do the right thing and follow our lead."²⁸

Because bacteria genes can become resistant, care must be taken to clean fields, equipment, uniforms, towels and locker rooms to kill MRSA. "Facts about Artificial Turf and Natural Grass": <http://plasticfieldsforever.org/ArtificialTurfBooklet.pdf>

Disinfecting Synthetic Turf

Choices to clean synthetic turf are antimicrobials or UVC machines. The sun is not enough. More chemicals for children to be exposed to, or using an expensive UVC machine.

- **CDC 5 C's: risk factors for Staph and MRSA infections**

- "MRSA skin infections can occur in any work setting. However, certain factors make it easier for MRSA to spread. These are the 5 Cs:
 - Crowding,
 - frequent skin-to-skin Contact,
 - Compromised skin (cut, scrape, or rash),
 - Contaminated items and surfaces,
 - lack of Cleanliness.
 - Workplaces where the 5 Cs are common include schools..."
 - <http://www.cdc.gov/niosh/docs/2013-112/pdfs/2013-112.pdf>

- **Prevention of Staph/MRSA Infections**

- CDC: "Cleaning procedures should focus on commonly touched surfaces and surfaces that come into direct contact with people's bare skin each day...
 - Is it safe for the surface? Some cleaners and disinfectants, including household chlorine bleach, might damage some surfaces (e.g., metals, some plastics)." <http://www.cdc.gov/mrsa/community/enviroment/athletic-facilities.html>
- Health Dept.: How do I prevent Staph and MRSA infections?
 - This health department notes CDC guidelines; also mentions "Surfaces that are contaminated with bodily fluids should be cleaned at least daily" <http://www.gchd.net/ReportsAndData/MRSA/MRSACommunityForum.pdf>
- Tufts Univ.: "Disinfect surfaces that are touched frequently."
 - "You may be at higher risk for MRSA if:..."
 - You participate in contact sports.
 - You spend time in crowded or unsanitary conditions..." http://www.tufts.edu/med/apua/consumers/personal_home_5_890113708.pdf

- **Killing Staph/MRSA**

Takes 140 degrees to kill MRSA. Only UVC light kills Staph/MRSA. Ozone blocks this band from sunlight, must use UVC machine to access. Turf industry claim is that sunlight can kill, but this is false.

- **Takes 140 degrees to kill MRSA.** Fields do frequently get this hot, but not every day of the year. Turf industry claim is that heat kills, but it's not enough. <http://www.sciencedaily.com/releases/2011/10/111003132351.htm>

- **Only UVC light kills Staph/MRSA.** Ozone blocks this band from sunlight, must use UVC machine to access. Turf industry claim is that sunlight can kill, but this is false. https://www.ucar.edu/learn/1_5_1.htm
- **Chemicals/bleach to kill.** "Irritants to humans. Bad for the environment. Expensive over the longer time period. Very corrosive to metal and artificial turf fields are full of metal. Not 100% effective." --Sports Turf NW <http://www.staph-infection-resources.com/prevention/infection-control/>
- **UVC machine cost,** typical school football field is "\$14,000." --Sports Turf NW
- <http://www.sportsturfNW.com/trust-the-center-for-disease-control-when-it-comes-to-facts-about-mrsa-and-staph/>

- **UVC Disinfection of Staph**

- UVC machine company provides proof, explains Staph/MRSA on synthetic turf. Mike Woelfel of Sports Turf NW is quoted below.

"Parents should be aware that their kids are rolling around in other people's bodily fluids and that the turf surface is one giant shared towel. The CDC in Atlanta is very clear about the needed 5 C's for a Staph infection to take place. You only need one of the five but turf shares all 5."

- **TRUTH:**
"Turf manufacturers avoid the topic that bodily fluids are on the turf, 5 C's (CDC) for transmission are present and that nothing is being done to disinfect the surface so they say turf does not harbor colonies of MRSA and that makes it sound safe."
 - Parents should be aware that their kids are rolling around in other people's bodily fluids and that the turf surface is one giant shared towel. The CDC in Atlanta is very clear about the needed 5 C's for a Staph infection to take place. You only need one of the five but turf shares all 5."
 - Be cautious of "how the turf manufacturers interpret the studies."
- **MYTH:** "Penn St said turf does not harbor colonies of MRSA. That is 100% correct but turf manufacturers use that to say turf has nothing to do with MRSA. Big difference in interpretation."
- **UVC machines like GreenZapr kill 99.99% of Staph on both artificial turf fibers and infill.**
 - The Penn State study showed with two passes of (UVC) GreenZapr on artificial turf, Staph was reduced to zero colonies, killing 99.99%.
- **Uses:** UVC is used in hospitals to disinfect. "Hospitals wouldn't be forking over \$125,000.00 per unit if UVC didn't work."
<http://www.ncbi.nlm.nih.gov/pubmed/2601458>
 - Also used by two NFL teams, sports facilities around the country.
<http://www.prweb.com/releases/sportsturfnorthwest/greenzapr/prweb10749335.htm>, <http://www.sportsturfNW.com/mrsa-and-the-nfl-greenzapr-and-minizapr-a-trainers-dream/>
- **History:** <http://www.sportsturfNW.com/uvc-technology-history-and-explanations>

- **Stories from Real Players**

- **Player suffers from MRSA recurrence via turf burn/Texas has 16x higher player MRSA infection rate than national avg**

- "Mom, I can't move my arms or legs."

Boone, 16, wide receiver, "was suffering from a recurrence of...MRSA, which his doctor said he got through an abrasion from playing on artificial turf, Baker said.

Texas has artificial turf at 18 percent of its high school football stadiums, according to Web site Texasbob.com. It also has an MRSA infection rate among players that is 16 times higher than the estimated national average, according to three studies by the Texas Department of State Health Services."

<http://www.bloomberg.com/apps/news?pid=newsarchive&sid=alxhrJDn.cdc>

- **Player sues school over Staph infection**

Player sues school over Staph infection. "McWilliams' elbow was injured during the game, and he was infected with..(MRSA) bacteria, according to his lawsuit. That August,... a rainstorm caused the field to flood with raw sewage...damage was so extensive, there are still signs posted warning people to stay away from it."

- If the synthetic turf field was "professionally cleaned," then had "routine maintenance" and it wasn't enough, this is a problem!

"McWilliams' elbow was injured during the game, and he was infected with methicillin-

resistant staphylococcus aureus (MRSA) bacteria, according to his lawsuit. That August, before the start of the football season, a rainstorm caused the field to flood with raw sewage.

"The field was cleaned professionally then," Brandon Voelker, the attorney for Newport Independent Schools, said. "Then once, after that happened, Newport did its routine maintenance on the field."

The damage was so extensive, there are still signs posted warning people to stay away from it." <http://www.wcpo.com/news/local-news/campbell-county/newport/somerset-high-school-football-player-sues-newport-catholic-over-staph-infection>

Grass Naturally Disinfects

- **Microorganism utopia.** Grass and the topsoil are home to zillions of beneficial organisms that break down and recycle organic and inorganic products that fall into the grass.
- **Clean surface.** Grass roots, thatch and leaves provide a good, clean surface to run and play on.

*Grass and the topsoil are home to zillions of **beneficial organisms that break down and recycle organic and inorganic products that fall into the grass.***

- **Recycles.** Because grass has microorganisms, it is an excellent recycling center. Tree leaves, sputum, gum, candy, vomit, urine, soda, spilled food, sports drinks, bird droppings, animal manure, and bits of paper do not have to be picked up off a natural grass field, unlike on artificial sports field, which saves on labor costs. Human diseases like MRSA that are transferred from a player to the grass are naturally disinfected. Grass fields do not need disinfecting. [www.kinnelonconserves.net, Turf_Report_2015.doc](http://www.kinnelonconserves.net/Turf_Report_2015.doc)
- **Good Bacteria, Bad Bacteria:** Different types of bacteria serve different purposes in the world of athletic fields. Soils in natural grass fields contain helpful bacteria which naturally sanitize the surface by decomposing human body fluids, algae and animal excrements. Artificial turf lacks significant populations of these natural cleansers, leaving the job of sanitation to man-made cleansers, which then must be flushed to leave the surface safe for athletic play. But other bacteria, such as that found in sand and rubber infill of artificial turf, can cause infection and even life-threatening health problems. Because sand and artificial turf has a lower microbiological activity than soil, harmful bacteria do not have to compete with beneficial microbes that grow in turfgrass root zones, allowing the harmful bacteria to multiply to dangerous levels, creating an increased opportunity for dangerous infection. Brad Fresenburg, turfgrass specialist from the University of Missouri's Division of Plant Sciences, describes how synthetic fields are virtual breeding grounds for harmful bacteria due to the combinations of warmth, moisture, sweat, spit and blood. 25 "Facts about Artificial Turf and Natural Grass": <http://plasticfieldsforever.org/ArtificialTurfBooklet.pdf>

INFILLS

Crumb Rubber Infill

Much is already known about the carcinogens contained in crumb rubber infill. A brief summary is included below.

- **October 2015, Bipartisan Committee Leaders Ask EPA about Crumb Rubber Safety in Synthetic Turf Fields.** Congress asks EPA to answer questions about crumb rubber safety. Due to recent news stories, studies and anecdotal evidence building, Congress demands answers to answer questions about children's safety. <https://democrats-energycommerce.house.gov/newsroom/press-releases/bipartisan-committee-leaders-ask-epa-about-crumb-rubber-safety-in-synthetic>
- **June 2015, Yale Study**

"Of the 96 chemicals detected – a little under a half...nothing is known about them.

20% are probable carcinogens.

Carbon Black makes up to 20% to 30% of every tire...listed as a carcinogen by IARC."

- "...the analysis found 96 chemicals in the rubber tire infill used in synthetic turf and rubber tire mulch used as surfacing in toddler playgrounds.
- Of the 96 chemicals detected – a little under a half have had NO toxicity assessments done on

them for their health effects - therefore nothing is known about them. The other half have had SOME toxicity testing done on them - but even many of those chemicals had incomplete toxicity testing and therefore all health effects are not fully known.

- Of the half that have had toxicity assessments, 20% are probable carcinogens.
- As well, 40% of the chemicals in that group were found to be irritants. 24% are respiratory irritants - some causing asthma symptoms; 37% are skin irritants; and 27% can cause eye irritants...
- “Chemicals are usually assessed for their toxicity one chemical at a time. **Synergistic affects of being exposed to numerous chemicals at the same time is not known.** From the data of this new study, it is reasonable to assume that persons playing on synthetic turf fields with rubber tire infill or toddler playgrounds surfaced with rubber tire mulch are being exposed concurrently to multiple chemicals...”

○ **RESULTS**

- There were 96 chemicals found in 14 samples analyzed. Half of those chemicals had no government testing on them - so we have no idea whether they are safe or harmful to health. Of those chemicals found that have had some government testing done on them these are the findings with their health effects.

- **12 CARCINOGENS**

Name	Effect
2-Mercaptobenzothiazole	Carcinogen, toxic to aquatic life
9,10-Dimethylanthracene	Carcinogen, respiratory irritant and can cause asthma
Bis(2-ethylhexyl) phthalate	Carcinogen, may cause damage to fetuses
Fluoranthene	Carcinogen, Fluoranthene is one of the US EPA's 16 priority pollutant, A PAH.
Heptadecane	Carcinogen
2-mercaptobenzothiazole	Carcinogen
Phenol, 4-(1,1,3,3-tetramethylbutyl)-	Carcinogen
Phenanthrene	Carcinogen - A PAH
Phthalimide	Carcinogen, skin, eye and lung irritan. A Fungicide
Pyrene, 1-methyl-	Carcinogen
Tetratriacontane	Carcinogen, eye and skin irritant. Can cause systemic damage to central nervous system.
Pyrene	Carcinogen, toxic to liver and Kidneys, a PAH
Carbon Black*	Carcinogen

**Carbon Black makes up to 20% to 30% of every tire. It is used as a reinforcing filler. Carbon Black is listed as a carcinogen by the International Agency for Research on Cancer (IARC).*

Carbon Black, as such, was not analyzed by the Yale Study because Carbon Black is made up of a number of chemicals – some of which were found in the Yale study. Carbon Black is not one chemical -- it is made up of many chemicals - often of petroleum products.

Furthermore, carbon black has no fixed composition, even of the many compounds it contains. Carbon black from different sources will have differing compositions. In our method, carbon black will register as a series of substances extracted from it. There is no carbon black molecule, it's a mixture.

▪ **20 IRRITANTS**

Name	Effect
1,4-Benzenediamine, N-(1,3-dimethylbutyl)-N'-phenyl-	Irritant - causes skin and eye irritation, toxic to aquatic life
1,4-Benzenediamine, N-(1-methylethyl)-N'-phenyl-	Irritant - causes skin and eye irritation, toxic to aquatic life
2(3H)-Benzothiazolone	Irritant - causes skin and lung irritantation
2-Dodecen-1-yl(-)succinic anhydride	Irritant - causes eyes, skin and lungs irritation
3,5-di-tert-Butyl-4-hydroxybenzaldehyde	Irritant - causes irritation to eyes, skin and lungs.
Anthracene	Irritant - causes skin, eye and respiratory irritation. Breathing it can irritate the nose, throat and lungs causing coughing and wheezing.
Benzenamine, 4-octyl-N-(4-octylphenyl)-	Irritant - causes eye and skin irritation
Benzenesulfonanilide	Considered hazardous, very little testing has been done on it.
Benzothiazole, 2-(methylthio)-	Irritant - causes Skin and eye irritation.
Dehydroabietic acid	Toxic to aquatic organisms
Docosane	Irritant - causes Skin irritation
Hexadecanoic acid, butyl ester	Irritant - causes eye, skin and lung irritant. Can cause reproductive effects.
Methyl stearate	Irritant - causes eye, skin and lung irritation.
Octadecane	Irritant - causes skin, eye and respiratory irritation
Octadecanoic acid also known as Stearic acid	Irritant - causes skin, eye and respiratory irritation
Oleic Acid	Irritant - causes skin and eye irritation
Phenol, 2,2'-methylenebis[6-(1,1-dimethylethyl)-4-ethyl-	Irritant - causes skin, eye and respiratory irritation
Tetradecanoic acid	Toxic to aquatic organisms. Skin and eye irritant.
Anthracene, 2-methyl-	Acute aquatic toxicity, Not much data available - what there is shows it to be an eye, skin and lung irritant
Anthracene, 9-methyl-	Acute aquatic toxicity, serious eye irritant

http://www.ehhi.org/turf/new_study_jun2015.shtml, <http://www.ehhi.org/turf/findings0815.shtml>

- **October 2014, NBC News report: How Safe is the Artificial Turf Your Child Plays On?** Coach Amy Griffin is featured, describing her experience collecting names of soccer players with cancer. All played on synthetic turf fields. Questions begin. <http://www.nbcnews.com/news/investigations/how-safe-artificial-turf-your-child-plays-n220166>

Corkonut Infill

Many believe that simply choosing an alternative infill like corkonut will solve all issues related to synthetic turf fields. It just is not true. Corkonut has its own risks.

Because corkonut may be safer than crumb rubber, but you still know there's a respiratory risk, are we still willing to put children up to that risk?

Again, there are plenty of other dangers to synthetic turf fields besides the infill.

- **Corkonut infill is hazardous dust, not magic dust**
 - Many schools believe that when they choose an alternative infill, that this somehow makes the synthetic field safe.
- **Corkonut infill is marketed as “organic” but it is not.**
 - Schools are told they have an option to choose "organic corkonut infill"; this infill is not certified by the USDA as organic, so FieldTurf's infills could have pesticides. Do we want our children exposed to pesticides?
 - Definition of USDA Organic:
<http://www.ams.usda.gov/AMSV1.0/getfile?dDocName=STELPRDC5101547>
- **According to FieldTurf, cork infill is made from cork oak tree.**
 - <http://www.fieldturf.com/media/W1siZiZlsljwMTUvMDEvMTQvMTcvMjEvMDgvMzc3L0ZpZWxkVHVyZl9QdXJlZmlsbF9Ccm9jaHVyZS5wZGYiXV0/FieldTurf%20Purfill%20-%20Brochure.pdf>
- **Cork oak tree can cause alveolitis, which could lead to fibrosis.**
 - "4. Some hardwoods can cause hypersensitivity pneumonia (alveolitis), and frequent attacks can cause permanent lung scarring (fibrosis). Examples of these highly toxic woods include giant sequoia, cork oak, some maple woods and redwood." http://www.uic.edu/sph/glakes/harts1/HARTS_library/woodhazards.txt
- **Children will be inhaling cork dust (amongst other particles from the breakdown of the field). Inhalation of fine particles is toxic.**
 - "Studies have indicated that low-solubility ultra fine particles are more toxic than larger particles on a mass for mass basis. Because of their tiny size, they can get deep into the lungs and, once in the bloodstream, may be able to cross the blood-brain barrier. Particles deposited in the nasal region may be able to enter the brain by translocation along the olfactory nerve. Particles, especially composites, may be able to penetrate the skin, and even some protective equipment. The smaller the particle, the more likely it is to be suspended in air, and hence, be available for inhalation/ingestions."
<http://www.ehs.gatech.edu/chemical/nanotechnology.doc>

*Corkonut is made from the cork oak tree. When it breaks down and is breathed in, it can cause “**hypersensitivity pneumonia (alveolitis)**, and frequent attacks can cause **permanent lung scarring (fibrosis)**.”*

“Testing for respiratory effects hasn’t been completed.

Just because it is a natural material doesn’t mean we should be breathing it in.”

- **Testing for respiratory effects hasn’t been completed** (comments from Dr. Brown, Sc.D.*)

- “The question is if an organic material creates

dust, what type of respiratory problems does it cause?

- RSD is adding another material to the field that has not been tested specifically for respiratory effects
- No respiratory physicians have stated exposing children to corkonut dust is safe.”
- **Additional comments from Dr. Brown, Sc.D.***
 - “Just because it is a natural material doesn’t mean we should be breathing it in.
 - Heat studies completed with heat lamp not same as the sun; heat lamp won't give you a sunburn, but sun will.
 - Not really a study, they are selling their product.
 - In addition to other tests on extreme temperatures of synthetic turf fields, a test we could do ourselves is on a sunny, clear day to stand on a local natural grass field for 20 minutes, measure body temperature. Stand on the synthetic field for 20 minutes, measure body temperature.”

THE PLAYERS SPEAK

- Beaver Stadium has beautiful grass for Penn State football! Wow! After first setting foot on it, linebacker Brad Bars didn't want to leave!
- “I really wanted to go lay down on it and go to sleep,” Bars said. “It was unbelievable. I really didn’t even think it was grass because it was that perfect of a playing surface. Those guys over there, they’re unbelievable. Same with our practice field. It’s the best surface that I’ve ever played on. The grass is perfect, everything about it is great and everything you’d want as a college football player.”
http://www.centredaily.com/2014/09/06/4340877_laying-the-groundwork-beaver-stadium.html?rh=1

*“It was unbelievable. I really didn't even think it was grass because **it was that perfect of a playing surface.** Those guys over there, they're unbelievable. Same with our practice field. It's the **best surface that I've ever played on.** The grass is perfect, **everything about it is great and everything you'd want as a college football player.**”*

- NFL

NFL Players say:

- Nearly **70% prefer grass**
- **82% artificial turf contributes more to injury**
- **90% artificial turf shortens career**
- **75% NFL Groundskeepers play Very Significant role in NFL grass playing surfaces.**

- Nearly 70% of NFL players surveyed year after year name real grass as their preferred playing field. Synthetic turf is **more likely to contribute to injury, soreness and fatigue, shortened career, and negatively impact quality of life after football.**

- 69.4% of players would rather play on a grass field than a turf field. Furthermore, 82.4% say artificial turf more likely to contribute to injury
- 89.1% expressed that playing on artificial turf causes more soreness and fatigue to play on.
- 89.7% attribute artificial turf to shortening their career
- 74.7% Very Significant: the role you believe NFL grounds keepers play in the performance of NFL grass playing surfaces?
- One of most reoccurring comments: "Artificial Turf is much harder on the body with joint soreness and makes for tougher work."
http://www.stma.org/sites/stma/files/pdfs/2010_NFL_Survey.pdf
- At a 95% confidence level, knee sprains were 22% higher on Field Turf than on natural grass. Increases of 67% and 31% for ACL sprains and eversion ankle sprains (overextending the inner part of the ankle), respectively, were noticed on Field Turf versus natural grass. The American Journal of Sports Medicine published a study titled "An Analysis of Specific Lower Extremity Injury Rates on Grass and Field Turf Playing Surfaces in NFL Games" in Sept. 2012
<http://www.synturf.org/images/sportsmed-036354651245888.pdf>
- 2007: "the Steelers lobbied hard and successfully to retain their grass field."
 - "I think everybody wants to keep the grass," wide receiver Hines Ward said.
 - "I need the grass. I like the mud. I like the sloppiness," cornerback Ike Taylor said. "I'm used to it, Mr. Rooney, can we please keep the grass? I don't want no FieldTurf. It's bad on your knees."
 - For us, there's a lot more injuries on turf." Hines Ward.
<http://www.nfl.com/news/story/09000d5d8049f968/article/steelers-players-lobby-against-artificial-turf>

"I think everybody wants to keep the grass," Hines Ward.

"I need the grass. I like the mud. I like the sloppiness," Ike Taylor. "...can we please keep the grass? I don't want no FieldTurf. It's bad on your knees."

"For us, there's a lot more injuries on [synthetic] turf." Hines Ward.

"Natural grass is so much better to play on." Ben Roethlisberger.

- “Natural grass is so much better to play on – players love playing on the natural grass compared to an artificial surface,” he said. “The NFL nowadays is doing so much to ‘protect players’ and players’ health and concussions and all these injuries – well, that artificial surface is a harder surface. I think guys when they slam their heads seem to get more concussions than on natural grass....I saw a study the other day that 88 percent of injuries occur on artificial surface – knee injuries – occur on artificial surfaces compared to grass,” Roethlisberger continued. “I don’t think people really realized that. I know I was shocked when I saw that number. So, I’m just thankful that the Rooneys are all about grass and that we’ll stay on it.” <http://bigben7.com/interview-with-kdka-this-evening/>, <http://profootballtalk.nbcsports.com/2012/08/28/ben-roethlisberger-real-grass-is-the-safest-surface-for-football/>

- **MLB**

- All ballparks use natural grass except two. These two ballparks plan to convert to grass by 2018. All future ballparks intend to use grass. https://en.wikipedia.org/wiki/List_of_Major_League_Baseball_stadiums
- It is now considered a competitive disadvantage to have synthetic turf. Grass is much safer. Synthetic turf causes lingering injuries. <http://sportsturfonline.com/2015/02/17/university-of-guelph-takes-lead-to-find-natural-grass-solution-for-blue-jays-and-rogers-centre/6803/>
- Quote: “Good riddance, personally, I just wish it would have been gone a long time ago.” – Andre Dawson <http://www.baseballessential.com/news/2014/12/21/why-astro-turf-no-longer-belongs-in-baseball/>
- "I would be shocked if, at the big league level, you could ever get guys to say they like a synthetic-turf field," he says. "If we went out and showed scientifically that everything was exactly the same, I still don't think we'd get approval." – Matthew Boggs, AstroTurf's director of research <http://articles.latimes.com/2013/sep/11/sports/la-sp-0912-baseball-astro-turf-20130912>

*It is now considered a **competitive disadvantage to have synthetic turf**. All ballparks except two are grass; those two plan to convert by 2018.*

*"I would be **shocked if...**you could **ever get guys to say they like a synthetic turf field.**" AstroTurf's director of research.*

- **MLS/FIFA**

FIFA vows **never to hold World Cups on synthetic turf again after 2015's Women's World Cup was played on synthetic turf. The conditions were unbearable.**

- Many soccer players refuse to play on synthetic turf due more damage to body than grass. U.S. Women's Soccer players name real grass as preferred playing field, file suit against FIFA for gender discrimination. The lawsuit was dropped, but FIFA vows never to

hold World Cups on synthetic turf again after

2015's Women's World Cup was played on synthetic turf. The conditions were unbearable.

[http://www.fifa.com/mm/Document/AF-](http://www.fifa.com/mm/Document/AF-Magazine/FIFAWeekly/02/29/68/83/weekly_LowRes_21_en_Neutral.PDF)

[Magazine/FIFAWeekly/02/29/68/83/weekly_LowRes_21_en_Neutral.PDF,](http://www.fifa.com/mm/Document/AF-Magazine/FIFAWeekly/02/29/68/83/weekly_LowRes_21_en_Neutral.PDF)

<http://www.msnbc.com/rachel-maddow-show/watch/us-womens-soccer-puts-end-to-fifa-turf-use-460951619836>

- "Turf wars: Pro soccer players link synthetic surfaces to higher risk of injury" appeared in the 25 March 2014 edition of *Postmedia News* at <http://www.canada.com/Turf+wars+soccer+players+link+synthetic+surfaces+higher+risk+injury/9659898/story.html>
- Abby Wambach broke news today that FIFA leaders assured her that the Women's World Cup would never again be played on turf. She said, "[Valcke] assured us that the Women's World Cup would never be played on turf again. He gave me his word, which for me, that's a win. For me, that's progress." <http://www.washingtonpost.com/news/early-lead/wp/2015/05/07/abby-wambach-says-fifas-stubbornness-led-it-to-turn-down-free-offers-to-install-grass-in-world-cup-stadiums/>
- U.S. Senators to FIFA : WWC 2015 artificial (synthetic) turf deemed "short-sighted" and "counterproductive." Notes "inferiority of turf to natural grass." <http://thehill.com/homenews/senate/223343-read-senators-letter-to-fifa>
- "It should be grass stains, not blood." - Abby Wambach, U.S. National Team Forward, FIFA Player <http://www.cbsnews.com/news/female-soccer-players-file-discrimination-suit-over-womens-world-cup/>
- "...an outrage, ...a disgrace," Wambach said. "The game changes...less fun as an athlete." <http://www.cbsnews.com/news/female-soccer-players-file-discrimination-suit-over-womens-world-cup/>

"It should be **grass stains, not blood,**" Abby Wambach.

"...**an outrage...a disgrace,**" Wambach said. "**The game changes...less fun** as an athlete."

"**The skin is all ripped off; it's pretty disgusting. It's like walking on hot coals with your skin ripping and slowly cracking, constantly,**"

Michelle Heyman.

- "The skin is all ripped off; it's pretty disgusting. It's like walking on hot coals with your skin ripping and slowly cracking, constantly." - Michelle Heyman, FIFA Player <http://sports.yahoo.com/news/there-s-nothing-fake-about-issues-with-artificial-turf-at-women-s-world-cup-200746963.html>
- "No matter how much some owners would like us to think fake-turf fields are OK, the clear view of the players is simple: They're not." U.S. Soccer Journalist Grant Wahl's noted views of American soccer players. http://www.fifa.com/mm/Document/AF-Magazine/FIFAWeekly/02/29/68/83/weekly_LowRes_21_en_Neutral.PDF

INJURY RATES: ACL, SPRAINS, CONCUSSIONS

<http://notoxturf.ca/wp-content/uploads/2014/07/SynTurf.orgsBrief.pdf>

- **ACL injuries higher rate on synthetic turf fields.** A 2012 study from Stanford University found that between 2004 and 2009, NCAA football players experienced a greater number of ACL injuries in games compared with practices, in scrimmages compared with regular practices, and when playing on artificial turf surfaces. <http://ajs.sagepub.com/content/40/5/990.abstract>
- At a 95% confidence level, **knee sprains were 22% higher on Field Turf** than on natural grass. **Increases of 67% and 31% for ACL sprains and eversion ankle sprains** (overextending the inner part of the ankle), respectively, were noticed on **Field Turf** versus natural grass. The American Journal of Sports Medicine published a study titled "An Analysis of Specific Lower Extremity Injury Rates on Grass and Field Turf Playing Surfaces in NFL Games" in Sept. 2012 <http://www.synturf.org/images/sportsmed-036354651245888.pdf>
- **Concussions more prevalent on synthetic turf fields.** Finally, a 2013 report from the "American Academy of Neurology suggests that concussions are more prevalent on synthetic turfs, in part because improved traction lets athletes accelerate and collide at higher speeds."...<http://www.thepostgame.com/blog/daily-take/201410/synthetic-turf-giving-athletes-cancer-soccer-crumb-rubber-goalie-fields> (24 October 2014). The logic is straightforward: greater the acceleration brought about by the superb traction qualities of artificial turf fields the more forceful collision/impact between players, thereby increasing the risk of concussion. According to the Report of the Guideline Development Subcommittee of the AAN, which focused on the factors that increase/decrease concussion risk, "[i]n football, playing on artificial turf is possibly a risk factor for **more severe concussions**,"... "Epidemiology of concussion in collegiate and high school football players," in American Journal of Sports Medicine 2000: 28:643-650 <http://www.ncbi.nlm.nih.gov/pubmed/11032218> . The AAN report stated that a **higher rate of concussions was reported in a study of injuries sustained on artificial turf (22%) relative to those sustained on natural grass (9%)**. The AAN report is available via http://www.synturf.org/images/concussion_guidelines.pdf
- **Studies confirm players' actual experiences and preferences.** See previous section, The Players Speak.

"67% increase in ACL sprains on FieldTurf versus natural grass."

"Concussions more prevalent on synthetic turfs."

OTHER

Children's Overall Exposure to Chemicals

*'we have **no information at all on about 80% of the chemicals [synthetic turf].**' ... every day, our children – and that includes **fetuses, infants, young children – are exposed to a whole suite of chemicals of simply unknown toxicity** which I consider to be an inherently **risky business,**' Dr. Joel Forman, Professor of Pediatric Medicine, Mt. Sinai School of Medicine.*

- **Unknown impact of chemicals on children**

- Dr. Joel Forman, Professor of Pediatric Medicine, Mt Sinai School of Medicine, puts it this way, "We've done a very poor job of testing these chemicals [found in

synthetic turf carpets] to ascertain whether or not they are toxic. ... And then when it comes to the more specific question 'What do we know about the impact of these chemicals might have on early childhood development?' - the answer is 'we have no information at all on about 80% of the chemicals.' Which is to say that every day, our children – and that includes fetuses, infants, young children – are exposed to a whole suite of chemicals of simply unknown toxicity which I consider to be an inherently risky business." Learn more in Children, Synthetic Turf, and San Francisco Public Health, Published Nov 17, 2012 (video link below).

- Video includes pediatricians, toxicologists and others discussing plastic turf grass in addition to other toxins: <http://youtu.be/c3sq2BNILfU>

- **Toxicologist speaks about dangers of synthetic turf fields**

- See video: <http://lebocitizens.blogspot.com/2014/02/artificial-turf-fields-troubling.html>
- On May 15, 2015, I spoke with Dr. Brown, Sc.D.*, the Public Health Toxicologist and Director of Public Health Toxicology for Environment and Human Health, Inc. (See additional credentials below.) Since synthetic turf fields are primarily using crumb rubber infill, I wanted to know his thoughts on the rest of the field materials and on the corkonut infill. Here are his comments:
 - "No tests have been done on the corkonut dust inhalation, how stable it is, or playing/getting particles on body, but we know that the dust is fine particles inhalation. Infill may not be safe for people with asthma. It can cause asthma attacks from inhalation of fine particles. (See other risks above of fine particles inhalation.)
 - Natural grass can clean itself. Synthetic fields can't. It must be sprayed with biocides to sanitize the fields. These have not been studied; what are we exposing our kids to from these chemicals?

- Amy Griffin's cases of soccer players with cancer - right now they're not sure what caused the cancer. A lot of folks have pointed to crumb rubber, but Dr. Brown, Sc.D. says it could have been the synthetic grass itself, but we don't know. It hasn't been studied yet. There are 136 reported cases so far; Dr. Brown, Sc.D. is in contact with Amy Griffin. Most are blood cancers, lymphoma that could have been caused by the breakdown of polyethylene, the current material used in FieldTurf.
- What data are we relying on that the fields are safe?
- Exposing kids to chemicals at a critical time in their lives when you don't have to, for what, to play a game?
- EPA, CPSC no longer support the fields as safe.
- A Westport Connecticut mom with a child in remission from cancer approached EHHI asking if the synthetic field her child played on was safe. At that time EHHI had not investigated, but after they began their research, they found the studies at the time were not sound enough to tell if it was safe. After EHHI conducted research, they informed the mom that known carcinogens were in the field, but fields are not tested.
- There's no feeling quite like facing moms who bring us their children with cancer and we know that it was from playing on the synthetic turf fields. Yes, we may pay a fine, have to pay for all of the disposal of the fields, but it will be revealed what kind of humans we are."

Inadequate Testing/Study Shortcomings

- "the list compiled by the coach of University of Washington's women's soccer program, Amy Griffin, had grown to more than 120 athletes afflicted with one variety of cancer or another. According to the count received from Griffin on 2 February 2015, the athletes include some 108 soccer players (81 of them goalies), 6 Lacrosse and/or Field Hockey players, and 10 football players (3 of them playing in the NFL). As types of cancer, there are some 51 players with lymphomas, 19 with leukemia, 9 with testicular cancer, 9 with sarcoma, 6 with thyroid cancer, 9 with brain cancer, and others. <http://www.synturf.org/health.html>
- Inadequate testing of products like this is a continual problem in the U.S. says Nancy Cowles, who heads watchdog group Kids In Danger. 'Unfortunately a lot in our product safety system is backward,' said Cowles. 'In Europe... you have to prove something is safe before you can use it. Often in the U.S., instead, you get to use it until it's proven unsafe.' <http://chicago.cbslocal.com/2015/02/11/2-investigators-crumb-rubber-turf-could-pose-cancer-risk/>

Inadequate testing of products like this is a continual problem in the U.S. says Nancy Cowles, who heads watchdog group Kids In Danger. 'Unfortunately a lot in our product safety system is backward,' said Cowles. 'In Europe... you have to prove something is safe before you can use it. Often in the U.S., instead, you get to use it until it's proven unsafe.'

"None of [the studies] are long term, they rarely involve very young children and they only look for concentrations of chemicals and compare it to some sort of standard for what's considered acceptable," said Dr. Forman. "That **doesn't really take into account subclinical effects, long-term effects, the developing brain and developing kids."**

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"That doesn't really take into account subclinical effects, long-term effects, the developing brain and developing kids."

<http://www.nbcnews.com/news/investigations/how-safe-artificial-turf-your-child-plays-n220166>

- The health threat is substantial enough that the federal Centers for Disease Control and Prevention lists artificial turf as one of seven sources of children's lead exposure along with well-known items such as paint, water and toys. <http://www.cdc.gov/nceh/lead/tips/sources.htm>
- Similarly, the EPA stepped back from its own 2009 safety assurances, and now notes on its website that the "very limited nature of this study" makes it impossible to "extend the results beyond the four study sites or to reach any more comprehensive conclusions without the consideration of additional data." Laura Allen, EPA deputy press secretary, said the federal study was intended to determine a testing method for a larger study – but more testing needs to be done. She declined to comment about whether the federal agency plans to carry out more research: "The decision to use tire crumb remains a state and local decision." http://www.huffingtonpost.com/2015/05/09/toxic-turf_n_7218728.html
- <http://www.usatoday.com/story/news/2015/03/15/artificial-turf-health-safety-studies/24727111/>
- May 19, 2015 Congressman Frank Pallone questioned Elliot Kaye (Chairman of the CPSC) if 2008 report truly reflects CPSC's current views on safety of synthetic fields. Chairman Kaye notes that it was a "political effort" and "does not reflect his views of the state of play" "did not reflect the technical staff's views" the report does not indicate that the product is safe, lead exposure that might exist from the blades of grass, didn't intend to convey and shouldn't have conveyed that synthetic turf is safe the CPSC is currently working with EPA, CDC, FDA and others to address these issues.
 - See video: <http://youtu.be/7crcxR8aYjo>
 - <http://pallone.house.gov/press-release/pallone-questions-cpsc-dangers-crumb-rubber-gets-commitment-federal-efforts>
 - CPSC has acknowledged shortcomings in its 2008 study, which spokesman Scott Wolfson says "was just a handful of fields and was not representative of the full scope of fields across the country."

EPA and CPSC no longer stand behind their own studies.

- Only a few studies have investigated the possible harm to young children from ingesting turf fibers or rubber crumbs, which can be as small as a pencil tip or as large as a wood chip. The studies analyzed a small number of turf materials. <http://www.nbcnews.com/news/investigations/how-safe-artificial-turf-your-child-plays-n220166>
- A widely cited study by California officials in 2007 did not consider health effects of children ingesting rubber crumbs or turf fibers. The study analyzed three playground surfaces made of crumbs fused into a solid rubberized surface and found negligible risk from children ingesting rubber dust that might get on their hands or from swallowing a rubber chunk once in their lifetimes. <http://www.nbcnews.com/news/investigations/how-safe-artificial-turf-your-child-plays-n220166>
- At least 10 studies since 2007 — including those by the safety commission and the EPA — have found potentially harmful lead levels in turf fibers and in rubber crumbs, USA TODAY found. <http://www.nbcnews.com/news/investigations/how-safe-artificial-turf-your-child-plays-n220166>
- **Typical studies quoted by the synthetic turf industry are taken out of context, limited or inadequate.**
- The EPA 400 ppm lead limit for bare soil means just that – bare soil. An EPA Lead Specialist confirms that once bare soil is covered with grass, there is no risk to lead exposure because the grass provides the barrier. Even if the soil were to exceed 400 ppm, the grass still protects. The Lead Specialist also notes that the 400 ppm lead limit applies only to soil, not synthetic turf. In addition, Dr. Brown, Sc.D.* notes that it is doubtful RSD's own football fields contain that much lead. Synthetic turf industry claims that the 400 ppm lead limit for bare soil in children's playing areas from EPA, synthetic turf's lead limit is closer to 5 ppm, lead is everywhere, so it is ok. Again, this is false.

Let this be clear: **this isn't a case of studies on both sides.**

What we have are **inadequate, limited and/or outdated studies.** "By conducting an inadequate study that does not find safety issues one can't conclude the studied product is safe. One can **only conclude the product is not properly tested via a very limited study.**"

that does not find safety issues one can't conclude the studied product is safe. One can only conclude the product is not properly tested via a very limited study."

<http://www.safehealthyplayingfields.org/#!/Synthetic-Turf-Council-Offensive-Industry-Offense/c1p75/555d398b0cf298b2d3d2101b>

- Let this be clear: this isn't a case of studies on both sides. We still cannot say synthetic fields are safe.
- What we have are inadequate, limited and/or outdated studies. "By conducting an inadequate study

- There are now reports of cancer linked to synthetic fields - 136 to be exact (phone interview with Dr. Brown, Sc.D.*, May 15, 2015). The reason why for 40 years (as of what year?) nothing has been reported is because synthetic fields have only existed at high schools for 10-15 years (earliest found was 1999, Piqua High School). Children are more susceptible to toxins than adults. They're the most at-risk population. It takes years for cancer to develop. Exposure to toxins like lead should be avoided especially in childhood. <http://www.usatoday.com/story/news/2015/03/15/artificial-turf-health-safety-studies/24727111/>
- What's wrong with the studies mentioned:
 - Air above fields was not tested for airborne metals. The previously reported finding of lead in dust sampled from some artificial turf fields indicates a potential for lead and other metals to become suspended in the air and possibly inhaled. Testing field air samples for metals is warranted.
 - The presence of a relatively large number of unidentified organic chemicals in the air over these fields is a potential health risk that cannot be evaluated at present.
 - No long-term studies
 - Limited sample sizes (usually between 4-6 fields, when there are more than 11,000 synthetic fields in the U.S. <http://www.usatoday.com/story/news/2015/03/15/artificial-turf-health-safety-studies/24727111/>)
 - Field age and field temperature are not considered
- Study: CPSC Staff¹ Analysis and Assessment of Synthetic Turf “Grass Blades”
 - Source: <https://www.cpsc.gov/PageFiles/104716/turfassessment.pdf>
 - **“Wipe testing” can be inaccurate.** “Wipe testing” provides a snap shot of an amount of lead that the wipe can pick up from the artificial carpet or the infill at any given time. “Wipe testing” right after a rain event or irrigation will not read the same level of lead than in an unwashed state. Testing in the earlier months of an installation would not result in the same reads as the time when the carpet becomes worn. “Wipe test” will say nothing about the total load of dislodgeable lead available or present in the product. <http://www.synturf.org/lawsuits.html>, No. 7
 - **The following CPSC statement is out of date**, due to the fact that CDC states there is no safe level of lead. http://www.cdc.gov/nceh/lead/acclpp/blood_lead_levels.htm
 - “CPSC staff recognizes a level of 10 micrograms of lead per deciliter of blood (10µg/dL) as a level of concern with respect to lead poisoning. To prevent children from exceeding this level, the staff suggests that chronic ingestion of lead from consumer products should not exceed 15 µg lead/day³. This value was determined from epidemiological studies of ingestion of lead through food and drink (as discussed above with respect to bioavailability). The results (Table 1) for this set of tested synthetic turf fields show no case in which the estimated exposure for children playing on the field would exceed 15 µg lead/day.

o Study Limitations

- This assessment is subject to a number of limitations including the accuracy of the wipe sampling method for estimating exposure to lead - containing residue from touching or other contact with the synthetic turf surface; the accuracy of the assumptions about the capacity of bare skin to collect surface residues during a typical play event at a field; and the accuracy of the assumptions related to hand - to - mouth transfer of lead - containing residues. Further, the staff did not make adjustments in its assessment to account for the non - uniformity of lead content of synthetic turf fields; i.e. , some fields had striped areas that contained lead that constitute only a small part of the total playing surface of the field that otherwise had no detectable lead levels. Children playing on such fields might have some contact with the lead - containing striped areas, but most of their contact with the surface would be expected to be with the other parts of the turf (not lead - containing). Finally, the bioavailability of lead from synthetic turf may not be the same as it is for the food and drink exposures that were the basis of the dose - response assessment used to determine the staff's recommended 15 μ g /day exposure limit for lead.

- Study: In October 2010, the California Office of Environmental Assessment completed its multi-year study of air quality above crumb rubber infilled synthetic turf, and bacteria in the turf, and reported that there were no public health concerns.

- o Source: <http://www.calrecycle.ca.gov/publications/Documents/Tires/2010009.pdf>

- o Sample size: four fields

- o It's important to note it's a contractor's study with a disclaimer that reads:

- "Disclaimer: This report was produced under contract by the Office of Environmental Health Hazard Assessment. The statements and conclusions contained in this report are those of the contractor and not necessarily those of the Department of Resources Recycling and Recovery (CalRecycle), its employees, or the State of California and should not be cited or quoted as official department policy or direction.

The state makes no warranty, expressed or implied, and assumes no liability for the information contained in the succeeding text. Any mention of commercial products or processes shall not be construed as an endorsement of such products or processes.

- o Uncertainties and Data Gaps Remaining

- 1) Inhalation hazard
- a. It is not known if the following variables influence PM2.5 and VOC release from artificial turf fields containing crumb rubber infill: field age...

- Study: In July 2010, the Connecticut Department of Public Health announced that a new study of the risks to children and adults playing on synthetic turf fields containing crumb rubber infill shows "no elevated health risks."
 - Source:
http://www.ct.gov/dph/lib/dph/environmental_health/eoha/pdf/artificial_turf_fs_2010.pdf
 - Sample size: four outdoor fields and one indoor field
 - "Limitations And Relationship To Other Studies"
 - Like all scientific studies, our evaluation of artificial turf fields has limitations. It did not specifically evaluate the risks from dermal exposure or ingestion of the crumb rubber"
- Study: A December 2009 U.S. Environmental Protection Agency scoping study of the health risks from inhalation, ingestion, and dermal contact with synthetic turf and crumb rubber found every test result to be "below levels of concern."
 - Current statement: "EPA stepped back from its own 2009 safety assurances, and now notes on its website that the "very limited nature of this study" makes it impossible to "extend the results beyond the four study sites or to reach any more comprehensive conclusions without the consideration of additional data." Laura Allen, EPA deputy press secretary, said the federal study was intended to determine a testing method for a larger study – but more testing needs to be done. She declined to comment about whether the federal agency plans to carry out more research: "The decision to use tire crumb remains a state and local decision." http://www.huffingtonpost.com/2015/05/09/toxic-turf_n_7218728.html
 - "Given the very limited nature of this study (i.e., limited number of components monitored, samples sites, and samples taken at each site) and the wide diversity of tire crumb material, it is not possible to extend the results beyond the four study sites or to reach any more comprehensive conclusions without the consideration of additional data."
http://www.epa.gov/nerl/features/tire_crumbs.html
- Study: The California EPA released a report dated July 2009 which indicated there is a negligible human health risk from inhaling the air above synthetic turf.
 - Source:
<http://www.calrecycle.ca.gov/tires/Products/Health/TurfStudy/LitReview.doc>
 - "Data Gaps"
 - Only two artificial turf fields were evaluated in the New York State (2009) study. The same two fields comprised the TRC (2009) study. Testing additional fields for the release of chemicals and particulate matter is warranted.
 - Testing fields of different ages and at different temperatures would help determine how those variables affect chemical and particulate release. In particular, fields near the end of their useful lifetime should be evaluated.
 - More air samples from upwind of the fields should be collected on the same days as field samples to determine if chemicals measured over the fields are also present at similar concentrations in the ambient air.

- The air above fields was not tested for airborne metals. The previously reported finding of lead in dust sampled from some artificial turf fields indicates a potential for lead and other metals to become suspended in the air and possibly inhaled. Testing field air samples for metals is warranted.
 - To estimate inhalation exposures it was assumed that athletes used the artificial turf fields continuously over their entire lifetimes. This overestimates the health risks. Data covering the time athletes spend on these fields would allow more accurate exposure and risk calculations and result in reduced risk estimates.
 - In the study by New York State (2009), the relatively large number of TICs with peak match qualities below 85 percent indicates that these fields release many unidentified VOCs and sVOCs (“unknowns”). Some of these were at $\mu\text{g}/\text{m}^3$ levels (Table 11). It is likely that the health risks posed by these chemicals, if any, will not be known for the foreseeable future. The presence of a relatively large number of unidentified organic chemicals in the air over these fields is a potential health risk that cannot be evaluated at present.
- Study: Independent tests conducted by the New York State Department of Environmental Conservation and New York State Department of Health, released in May 2009, proved there were no significant health concerns at synthetic turf fields.
 - Source: http://www.dec.ny.gov/docs/materials_minerals_pdf/crumbrubfr.pdf
 - Sample size: two fields
 - "This report addresses some aspects of the use of crumb rubber infill in synthetic turf fields and is not intended to broadly address all synthetic turf issues, including the potential public health implications associated with the presence of lead-based pigments in synthetic turf fibers."
 - Study: In July 2008, a U.S. Consumer Product Safety Commission staff report approved the use of synthetic turf by children and people of all ages.
 - From Washington, D.C. Latest confirmation that CPSC does not stand behind their 2008 study and there is continued concern, even at the national level, over the safety of synthetic fields, not just those that use crumb rubber infill. (See additional notes above in Inadequate Testing/Study Shortcomings.)
 - See video: <http://youtu.be/7crcxR8aYjo>
 - <http://pallone.house.gov/press-release/pallone-questions-cpsc-dangers-crumb-rubber-gets-commitment-federal-efforts>
 - Interesting notes in studies RSD provided:
 - In the Artificial Turf Football Fields Environmental.pdf provided, the last statement is the point:
 - "Further work will be necessary to assess the actual scenarios of exposure by inhalation and the corresponding risks."

- ...
- "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. It is important to note that synthetic turf is more abrasive than natural turf grass and, as a result, breaks in the skin are more common, creating a pathway for infection when in contact with an infected surface."
- The proof that synthetic turf fields harbor microbial populations, including Staph is here:
<http://skyline.bigskyconf.com/journal/vol1/iss1/1/>
- "There is growing concern regarding the contribution of infilled turf fields on increased athlete infections. Abrasions that occur on these fields create a port of entry for pathogens such as Staphylococcus aureus that are present on the athlete's skin or possibly on the field's surface. This study compares the occurrence of microbial populations on two infilled synthetic turf fields (year old turf vs. 6 year old turf) in three locations. Both fields were sampled once a week for at least 14 weeks (exact number varied on field and location) during the late summer and fall of a football season...**Much higher microbial populations were found on the older turf field** with as much as a **104 increase over similar locations on the newer turf**. This suggests **microbial populations can accumulate in synthetic turf infill from year to year**...These results indicate that **infill material can serve as a source for the spread of pathogens among student athletes, and that these organisms seem to accumulate over time posing a greater risk if proper turf cleaning is not regularly performed.**"
- MYTH: FieldTurf says (marketing material):
- http://www.fieldturf.com/media/W1siZiIsIjIwMTUvMjMvMTcvMjEvMDAvMTUvOTZlL0ZUX1NhZmV0eV9Qcm92ZW5fV2I0aF9TY2IibmNIXzIwMTUuUERGI1d/FT_Safety%20Proven%20With%20Science_2015.PDF
- "Outbreaks of antibiotic-resistant strains of staph last year gained significant media attention, resulting in the temporary closing of school buildings and athletic facilities. Our research found that infilled synthetic turf systems do not harbor significant populations of staph bacteria to warrant concern."
- Dr. Andrew McNitt, Associate Professor of Soil Science at Penn State University, June 2007, 'A Survey of Microbial Populations in Infilled Synthetic Turf Fields'

- **Risks known now should not be ignored**

[www.kinnelonconserves.net, Turf_Report_2015.doc](http://www.kinnelonconserves.net,Turf_Report_2015.doc)

- Children can develop cancer much sooner, however, “We are forgetting that it takes years for cancer to develop, and decades for people to start to realize where the cancer is coming from. Asbestos killed thousands before proper national attention was raised. Lead, too, was widely prevalent in paint before this country finally banned it in 1977. And it took 40 years for people to realize that Hexavalent Chromium, Brockovich's Grendel, was tainting water and causing cancer.
- **Children are more susceptible** than adults to a variety of **environmental hazards**, for several reasons. Children's organ systems are developing rapidly. **A toxic exposure during a critical window of development can have life-long consequences.** Children's detoxification mechanisms are also immature, so an exposure that might not have an important effect on an adult could have an important effect on a child. In addition, children have many years in which to develop disease.
- **Cancer**, in particular, is **a disease with long latency**: disease can develop many years after exposure. For this and other reasons, it is particularly important to avoid carcinogenic exposures during childhood.”

Asbestos killed thousands before proper national attention was raised.

Children are more susceptible than adults to a variety of environmental hazards...Children's organ systems are developing rapidly. A toxic exposure during a critical window of development can have life-long consequences.

SUCSESSES/FEATURES/BENEFITS OF NATURAL GRASS

- **Natural grass fields with drainage systems, managed properly** by outside professional landscaping companies **are successful and can withstand heavy traffic.**
- **Natural grass fields without a drainage system, managed by in-house school staff**, especially staff not specifically devoted to field maintenance are typical in public schools and **are also typically unsuccessful.**
- **Becoming educated about how natural grass can withstand much wear and tear if managed properly, appropriate plants, and equipment used, etc.**
 - Local professional landscaping companies, local Sports Turf Managers Association (STMA) members and others can educate about best sports field management practices and provide examples of how natural grass is an option. Their experience and knowledge in the business can give children the best option for a safe, non-toxic, cheaper, better surface for the optimal sports experience.

- **Local Examples of How Grass Works!**

- Local parks department – soccer/lacrosse field 1,000 hours of activity per year

- Rockwood previously (through 2014, grass fields) only used fields for 60 hours per year; both of the fields were built the same: native base field with no subsurface drainage.

Grass Works! Compare:

*Local parks department – soccer/lacrosse field
1,000 hours of activity per year*

Rockwood previously (through 2014, grass fields) only used fields for 60 hours per year; both of the fields were built the same: native base field with no subsurface drainage.

- Saint Louis Youth Soccer Association – 4,000 games/year, 17 fields, 235 games on one field – have had it for 3 years
- Whitfield School – gym class, homecoming, practices/games for lacrosse, field hockey, soccer, baseball
- Saint Joseph’s Academy – gym class, practices/games soccer, lacrosse, field hockey
- Saint Louis Priory School – practices/games rugby, soccer, football, lacrosse
- University of Missouri, Saint Louis – baseball, softball, soccer games and practices

- **Carbon Dioxide (CO₂) Grass Absorption, Synthetic Field Emissions over 10 Years**

http://www.athenasmi.org/wp-content/uploads/2012/01/UCC_project_ATHENA_technical_paper.pdf

- Grass absorbs 16.9 tons of CO₂
- Synthetic Fields EMIT 55.6 tons of CO₂
- Emissions consider project life cycle:
 - Production of the main components of the artificial turf system
 - Use and maintenance
 - Disposal phase (recycling)
 - Transportation
- Results have been scaled according to the reference unit 9,000-m² field and over a 10-year period.
- Total GHG emissions factor of the baseline and project are estimated respectively to (-16.9)¹ and (55.6) tonnes CO₂e. GHG emissions offset is estimated to be (-72.6) tonnes CO₂e.
- As per U.S. DOE, 1998, a medium growth coniferous tree, planted in an urban setting and allowed to grow for 10 years, sequesters 23.2 lbs of carbon, equivalent to 0.039 metric tonnes CO₂ [12]. The tree planting offset requirements to achieve a 10-year carbon neutral synthetic turf installation is estimated to be 1861 trees (±23%).

www.kinnelonconserves.net, Turf_Report_2015.doc

- **Environmentally friendly.** 2,500 square feet of living, growing grass plants release enough oxygen for a family of four for a year. Grass absorbs carbon dioxide, helping to reduce global warming.
- **Microorganism utopia.** Grass and the topsoil are home to zillions of beneficial organisms that break down and recycle organic and inorganic products that fall into the grass.
- **Aquifer recharger.** The area inside a typical high school football/track complex is about 2 acres. Over 2 million gallons of water from rain will fall on this area if it rains 40 inches a year. *Grass will filter the water as it flows into the groundwater.*
- **Cooler surface.** Grass provides a cooler place to play than bare dirt, cement, asphalt or artificial turf. This occurs because the photosynthetic process in the leaves intercepts sunlight, utilizing the sun's energy to make plant sugars instead of warming the dirt or other surface. Plants evaporate water, which also cools the air.
- **Clean surface** Grass roots, thatch and leaves provide a good, clean surface to run and play on.
- **Better appearance.** The visual appearance and smell of grass are pleasing to people.
- **Fewer health risks.** Years of study have shown no risks to playing on natural turf. No such proof exists from long-term exposure to elements in artificial turf, such as crumb rubber infill.
- **Recycles.** Because grass has microorganisms, it is an excellent recycling center. Tree leaves, sputum, gum, candy, vomit, urine, soda, spilled food, sports drinks, bird droppings, animal manure, and bits of paper do not have to be picked up off a natural grass field, unlike on a artificial sports field, which saves on labor costs. Human diseases like MRSA that are transferred from a player to the grass are naturally disinfected. Grass fields do not need disinfecting.
- **Self-repairs.** Natural grass fields repair themselves. All sports fields sustain wear and damage when used. Living natural grass fields have the ability to repair and regenerate themselves. Man-made surfaces do not repair themselves. Natural grass fields can last two to three times longer than artificial fields.
- **Provides traction.** Grass gives good traction, but not great traction. Good traction means when players collide, the turf gives way, not human joints. Great traction is bad, because joints can break before a player's foot slides on artificial turf.
- **Costs less to remove.** End-of-life disposal costs of natural grass are a small fraction of what it costs to remove and dispose of artificial turf.

- **Yale's Own Physicians Argue Against Installing Artificial Turf at Yale Bowl.**

Synthetic turf is being considered as an option for the Yale Bowl. However, its own physicians have studied synthetic turf and concluded it is not safe. They are dangerous not just because of the crumb rubber infill; but because of the numerous other risks. Will Yale go against its own physicians?," asked Nancy Alderman, who is a Yale alum and also the President of Environment & Human Health Inc. She said, "There is no safer surface for students and athletes than a grass field."

Yale's Own Physicians Argue Against Installing Artificial Turf at Yale Bowl

Synthetic turf fields are dangerous not just because of the crumb rubber infill, but because of the numerous other risks.

*"Will Yale go against its own physicians?"
Nancy Alderman, Yale alum, Pres. EHHI*

- <http://sportzedge.com/2015/09/28/yales-own-physicians-argue-against-installing-artificial-turf-at-yale-bowl/>

- Sprinturf's comments at end: every argument they make is either outdated, limited or just taken out of context! See previous section: Inadequate Testing/Study Shortcomings.
- EHHI: "The Laura Green that NBC interviewed in this segment who said crumb rubber from waste tires is safe -- got her Ph.D. from MIT -- not from Biology or Chemistry -- but from the former Department of Nutrition and Food Science. She has also been industries' spokesperson in the past. Hardly an independent voice on this issue."

ALTERNATIVE: ORGANIC LAWN CARE

Speak with local turf professionals, including professional landscaping companies and Sports Turf Managers Association (STMA) members to learn about current grass practices for sports fields, including organic lawn care.

*"...remarkable success in implementing an **organic land management** approach has resulted in **healthier turf and lower maintenance costs.**"*

- **Quick Facts:**

- "The town's Parks and Recreation Department's remarkable success in implementing an organic land management approach has resulted in healthier turf and lower maintenance costs."

<http://www.momsteam.com/health-safety/connecticut-town-a-model-for-managing-playing-fields-without-use-of-pesticides>

- "Over the past five years, Chip transformed 15 acres of playing fields to organic care, now at a cost of \$2400-\$3000 per 2 acre playing field, not including mowing costs."
<http://www.beyondpesticides.org/lawn/factsheets/PesticideandPlayingFieldsItrhead.pdf>
- "Total expenditures over five years show a cost savings of more than 7% using natural turf management, and once established, annual cost savings of greater than 25% can be realized."
<http://www.bernards.org/Environmental%20Commission/document/turfcomparisonreport.pdf>

- **What Is Organic Lawn Care?**

http://www.bernards.org/boards_commissions/environmental/ec_organic_lawn_care.aspx

- **Who Is Doing It? (Connecticut Pesticide Ban)**

http://www.ct.gov/dph/lib/dph/environmental_health/eoha/pdf/turf_mgt_without_pesticides.pdf

- **Read more about Connecticut towns that have organic turf fields at town parks and at schools:**

- Branford, Connecticut's 24 fields are all maintained without the use of chemical pesticides or fertilizers.
- Cheshire's McNamara Legion Field and the Maclary Complex football field transitioned to organic care in 2007.
- Greenwich Connecticut also banned the use of pesticides on all of its athletic fields in 2008.
- Woodbridge, CT banned the use of pesticides on all town football, soccer and baseball fields in 2012 <http://organiclandcare.net/organic-towns>

- **Comments on Organic Lawn Success**

- "One of the fields that we made the transition on was the high school varsity football field. That field has a tremendous amount of use throughout the year. It is used for the football team, it's used for the lacrosse team, boys and girls, soccer plays on it. They also have high school graduation and the Relay-For-Life, which entails the camping out of thousands of people on that field. And we just had that last weekend and there was rain and heavy usage and it really withstood that use very well."
<http://www.ct.gov/deep/cwp/view.asp?A=2708&Q=386618>

Organic Lawn Care

*"One of the fields that we made the transition on was the **high school varsity football field**...It is used for the football team, lacrosse team, boys and girls, soccer plays on it...Relay-For-Life...**thousands of people on that field**...there **was rain and heavy usage** and it really **withstood that use very well.**"*

PRECAUTIONARY PRINCIPLE

Precautionary Principle

*"When an **activity raises threats of harm to human health** or the environment, **precautionary measures should be taken even if some cause and effect relationships are not fully established scientifically...must also involve an examination of the full range of alternatives, including no action.**"*

- Public schools and others should be guided by the **Precautionary Principle (PP)**.
 - "When an activity raises threats of harm to human health or the environment, precautionary measures should be taken even if some cause and effect relationships are not fully established scientifically.

In this context the proponent of an activity, rather than the public, should bear the burden of proof. The process of applying the precautionary principle must be open, informed and democratic and must include potentially affected parties. It must also involve an examination of the full range of alternatives, including no action." - [Wingspread Statement](#) on the Precautionary Principle, Jan. 1998

- Doesn't the school have an ethical responsibility to delay until unanimous results are found that synthetic turf is safe for children?
- The United Nations Educational, Scientific and Cultural Organization, The Precautionary Principle World Commission on the Ethics of Scientific Knowledge and Technology:
 - "In summary, the Precautionary Principle applies when the following conditions are met:
 - There exist considerable scientific uncertainties;
 - There exist scenarios (or models) of possible harm that are scientifically reasonable (that is based on some scientifically plausible reasoning);
 - Uncertainties cannot be reduced in the short term without at the same time increasing ignorance of other relevant factors by higher levels of abstraction and idealization;
 - The potential harm is sufficiently serious or even irreversible for present or future generations or otherwise morally unacceptable;
 - There is a need to act now, since effective counteraction later will be made significantly more difficult or costly at any later time."

In the end, I've heard it said that the best predictor of future behavior is past behavior. Do we really trust the past record of the synthetic turf field industry, including FieldTurf, when it relates to harmful chemicals in their products, recalls, not replacing fields under warranty, etc.? We have to ask ourselves this question.

Can we look back 10 years from now and tell our children that we did THE BEST we could for them? We have to ask ourselves this question.

Consider these things.

Note: photo of grass field with football used on cover and background was taken and belongs to Author.

**Dr. David Brown, Sc.D. is the Public Health Toxicologist and Director of Public Health Toxicology for Environment and Human Health, Inc. He is the past Chief of Environmental Epidemiology and Occupational Health in Connecticut and was previously Associate Professor of Toxicology at Northeastern College of Pharmacy and Allied Health. He also served as Deputy Director of the Public Health Practice Group of Agency for Toxic Substances and Disease Registry (ATSDR) at the National Centers for Disease Control and Prevention in Atlanta, Georgia. Dr. Brown graduated from Cornell University in Biochemistry, received his MS from the University of California In Environmental Health, and his ScD from Harvard School of Public Health in Toxicology.*

ADDITIONAL SOURCES OF INFORMATION

Natural Grass and Artificial Turf: Separating Myths and Facts

http://www.nsgao.com/images/Natural-Grass-and-Artificial-Turf_booklet.pdf

Synthetic Turf Playing Fields Present Unique Dangers

http://agebb.missouri.edu/news/ext/showall.asp?story_num=3521&iln=8

Town of Greenwich Environmental Action Task Force, Artificial Turf Presentation to The Board of Selectmen

http://www.greenwichct.org/upload/medialibrary/c93/Artificial_Turf_Presentation_022609.pdf

Facts about Artificial Turf and Natural Grass

<http://plasticfieldsforever.org/ArtificialTurfBooklet.pdf>

EHHI brief, <http://www.turfgrassod.org/files/file/767404d0-e9ed-41e3-8d82-ffb0dad32c02>

The Truth about the Existence of Microbes in Synthetic Turf System

http://www.synturf.org/images/TRUTHS_20About_20Microbes.pdf

Synthetic Turf is the New Snake Oil

<http://www.texasmultichem.com/blog/synthetic-turf-snake-oil>

Eight Good Reasons Why Artificial Turf Is One Bad Idea

<http://notoixicturf.ca/wp-content/uploads/2014/07/SynTurf.orgsBrief.pdf>

Appendix A

RSD Costs of Installation and Maintenance: Grass and Synthetic Turf



Turf Fields Annual Effect on Budget

Source: Rockwood School District CSIP Finance Committee Meeting

11/24/2014

	RSD Staff Existing Fields	TruTurf Grass Fields	Turf Fields	Addl Costs Turf Fields
Mowing	\$6,720	\$10,240		
Seeding	\$2,800	\$10,600		
Irrigation Repairs	\$6,000	\$6,000		
Water Use	\$4,240	\$4,240		
Aerating	\$2,400	\$4,000	\$480	
Striping	\$17,200	\$15,900	\$2,800	
Fertilizing	\$8,960	\$6,320		
Pesticides	\$6,000	\$3,800	\$1,680	
Re-sprigging	\$16,800	\$0		
Other	\$2,200	\$5,000	\$400	
Brushing/Grooming	\$0	\$0	\$1,920	
Vacuuming/Sweeping	\$4,400	\$0	\$720	
Disinfecting*				\$8,000
Carpet Repair (rips, joints)**				\$4,000
Water Cooling**				\$20,000
Weeding**				\$2,000
Annual Costs	\$77,720	\$66,100	\$8,000	\$42,000
Replacement Cost	\$700,000	\$500,000	\$1,700,000	
Disposal***	\$0	\$0		\$520,000
Estimated Useful Life (years)	5	8	10	
Annual Cost	\$140,000	\$62,500	\$170,000	\$222,000
Total Annual Cost	\$217,720	\$128,600	\$178,000	\$264,000
Difference - Maintenance	\$39,720			

Annual Maintenance	Savings	Loss
Synthetic Turf vs Existing	\$39,720	
Adjusted Synthetic Turf vs Existing		\$46,280
TruTurf vs Existing	\$89,120	
TruTurf vs Synthetic Turf	\$49,400	
TruTurf vs Adjusted Synthetic Turf	\$135,400	

Cost of Relocating Games (FY14):

Field Rental	\$8,785	\$8,785
Travel to Alternate Site	\$3,786	\$3,786
Estimated Reduction of Gate	\$8,500	\$8,500
Estimate Reduction of Concessions	\$21,600	\$21,600
Total Cost of Relocating Games	\$42,671	\$42,671

Total Impact	\$82,391	\$131,791
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Installation + Maintenance Costs

First 10 Years

Cost to Install^*	\$1,400,000	\$2,500,000	\$3,771,129	\$3,771,129
Cost to Maintain per Year	\$77,720	\$66,100	\$8,000	\$42,000
10-Year Maintenance Costs	\$777,200	\$661,000	\$80,000	\$420,000
10-Year Total Costs	\$2,177,200	\$3,161,000	\$3,851,129	\$4,191,129
Average Cost per Year	\$217,720	\$316,100	\$385,113	\$419,113

Annual Installation + Maintenance Costs	Savings	Loss
---	---------	------

Synthetic Turf vs Existing	\$39,720
Adjusted Synthetic Turf vs Existing	\$201,393
TruTurf vs Existing	\$98,380
TruTurf vs Synthetic Turf	\$69,013
TruTurf vs Adjusted Synthetic Turf	\$103,013

Every Subsequent 10 Years

Cost to Replace^^	\$1,400,000	\$625,000	\$1,700,000	\$1,700,000
Disposal	\$0	\$0		\$520,000
Cost to Maintain per Year	\$77,720	\$66,100	\$8,000	\$42,000
10-Year Maintenance Costs	\$777,200	\$661,000	\$80,000	\$420,000
10-Year Total Costs	\$2,177,200	\$1,286,000	\$1,780,000	\$2,640,000
Average Cost per Year	\$217,720	\$128,600	\$178,000	\$264,000

Total	Savings	Loss
Synthetic Turf vs Existing	\$39,720	
Adjusted Synthetic Turf vs Existing		\$46,280
TruTurf vs Existing	\$89,120	
TruTurf vs Synthetic Turf	\$49,400	
TruTurf vs Adjusted Synthetic Turf	\$135,400	

Bottom Line: Hire TruTurf, spend \$2 million for installation, \$66,100/year for maintenance. **Total of \$2,066,100 for 2015.** In 2023, spend \$500,000 to replace fields, \$66,100/year for maintenance. **Total of \$566,100 in 2023.**

Alternative is hiring synthetic turf company, spend \$3.3 million for installation, \$8,000/year maintenance. **Total of \$3,779,129 for 2015.** In 2025, spend \$1.7 million to replace fields, \$8,000 for maintenance. **Total of \$1,708,000 in 2025.**

Conclusion: when installation and maintenance costs are combined, natural grass costs less.

"Artificial fields require a different type, but just as extensive maintenance protocol as natural grass, particularly if used regularly for a multitude of sports regularly."

Notes:

Data represents costs for 4 fields total.

Data in green and/or italics added by TruTurf Solutions and Jill Schilling

To compare all costs equally:

^Initial installation is \$2,000,000 total for 4 fields with a lifespan of 8 years. The 10-year cost is calculated by $\$2,000,000/8=\$250,000$ per year, x 10 years= $\$2,500,000$

*\$3,300,000 is the amount RSD believed it would cost for installation and infill of synthetic turf fields. As of 10/29/2015, \$3,771,129 has been spent on installation and infill of synthetic turf fields. This was calculated by using the contract amount to Byrne & Jones of \$4,093,887.40 (construction of athletic fields and track resurfacing)

^^Replacement is \$500,000 total for 4 fields with a lifespan of 8 years. The 10-year cost is calculated by $\$500,000/8=\$62,500$ per year, x 10 years = $\$625,000$

*Source: <http://www.enviroturfservices.com/>

**Source: <http://plasticfieldsforever.org/ArtificialTurfBooklet.pdf>

***Source: http://www.ccenterdispatch.com/opinion/article_f36e8394-379f-11e4-8d0f-0017a43b2370.html

Additional Resources:

<http://www.triturf sod.com/resources.html?p=artificial-turf-vs-natural-grass>

http://www.nsgao.com/images/Natural-Grass-and-Artificial-Turf_booklet.pdf

This 32-page booklet is based upon information from some of the industry's most highly respected research scientists, sports field managers, contractors and other professionals. Natural Grass and Artificial Turf: Separating Myths and Facts provides answers to questions that decision-makers, by their responsible position in society, must address. Their decisions will have significant short and long-term health and safety, fiscal and environmental impacts on their communities.

<http://cafnr.missouri.edu/research/turfgrass-costs.php>

"Synthetic Turf Costs Far Exceed Natural Grass"

Brad Fresenburg, Ph.D., an MU Extension turfgrass specialist, cost analysis installing and maintaining natural and synthetic fields. Results: Synthetic turfgrass costs a lot more.

http://www.stma.org/sites/stma/files/pdfs/stma_syntheticurfguidehipg1.pdf

"A Guide to Synthetic and Natural Turfgrass for Sports Fields"

Maintenance cost of synthetic field is included, by Dr. A. J. Powell, University of Kentucky.

Appendix B

TestAmerica Lead Test Results, Turf Fibers Only, Eureka High School



TestAmerica

THE LEADER IN ENVIRONMENTAL TESTING

ANALYTICAL REPORT

TestAmerica Laboratories, Inc.
TestAmerica St. Louis
13715 Rider Trail North
Earth City, MO 63045
Tel: (314)298-8566

TestAmerica Job ID: 160-12414-1
Client Project/Site: Metals Analysis

For:
FieldTurf, Inc.
2413 Powderham Lane
Cedar Park, Texas 78613

Attn: Ms. Lindsay Agattas

Elizabeth M. Hoerchler

Authorized for release by:
7/8/2015 5:34:12 PM

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This report has been electronically signed and authorized by the signatory. Electronic signature is intended to be the legally binding equivalent of a traditionally handwritten signature.

Results relate only to the items tested and the sample(s) as received by the laboratory.

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Case Narrative

Client: FieldTurf, Inc.
Project/Site: Metals Analysis

TestAmerica Job ID: 160-12414-1

Job ID: 160-12414-1

Laboratory: TestAmerica St. Louis

Narrative

CASE NARRATIVE

Client: FieldTurf, Inc.

Project: Metals Analysis

Report Number: 160-12414-1

With the exceptions noted as flags or footnotes, standard analytical protocols were followed in the analysis of the samples and no problems were encountered or anomalies observed. In addition all laboratory quality control samples were within established control limits, with any exceptions noted below. Each sample was analyzed to achieve the lowest possible reporting limit within the constraints of the method. In some cases, due to interference or analytes present at high concentrations, samples were diluted. For diluted samples, the reporting limits are adjusted relative to the dilution required.

TestAmerica St. Louis attests to the validity of the laboratory data generated by TestAmerica facilities reported herein. All analyses performed by TestAmerica facilities were done using established laboratory SOPs that incorporate QA/QC procedures described in the application methods. TestAmerica's operations groups have reviewed the data for compliance with the laboratory QA/QC plan, and data have been found to be compliant with laboratory protocols unless otherwise noted below.

The test results in this report meet all NELAP requirements for parameters for which accreditation is required or available. Any exceptions to NELAP requirements are noted in this report. Pursuant to NELAP, this report may not be reproduced, except in full, without the written approval of the laboratory.

Calculations are performed before rounding to avoid round-off errors in calculated results.

All holding times were met and proper preservation noted for the methods performed on these samples, unless otherwise detailed in the individual sections below.

All solid sample results for Chemistry analyses are reported on an "as received" basis unless otherwise indicated by the presence of a % solids value in the method header. All soil/sediment sample results for radiochemistry analyses are based upon sample as dried and disaggregated with the exception of tritium, carbon-14, and iodine-129 by gamma spectroscopy unless requested as wet weight by the client.

This laboratory report is confidential and is intended for the sole use of TestAmerica and its client.

RECEIPT

The samples were received on 06/19/2015; the samples arrived in good condition, properly preserved. The temperature of the coolers at receipt was 20.0° C.

TOTAL METALS (ICP)

Samples EUREKA 1 PURPLE (160-12414-1), EUREKA 2 GREEN/WHITE (160-12414-2), EUREKA 3 WHITE (160-12414-3) and EUREKA 4 GREEN (160-12414-4) were analyzed for total metals (ICP) in accordance with EPA SW-846 Method 6010C. The samples were prepared on 07/02/2015 and analyzed on 07/06/2015 and 07/07/2015.

Due to the high concentration of aluminum, barium, calcium, iron, and magnesium, the matrix spike / matrix spike duplicate (MS/MSD) for preparation batch 160-198432 and analytical batch 160-199123 could not be evaluated for accuracy and precision. The associated laboratory control sample (LCS) met acceptance criteria. (160-12414-A-1-G MS) and (160-12414-A-1-H MSD)

The matrix spike / matrix spike duplicate (MS/MSD) recoveries for preparation batch 160-198432 and analytical batch 160-199123 were outside control limits for sodium, manganese, and vanadium. Sample matrix interference and/or non-homogeneity are suspected

Case Narrative

Client: FieldTurf, Inc.
Project/Site: Metals Analysis

TestAmerica Job ID: 160-12414-1

Job ID: 160-12414-1 (Continued)

Laboratory: TestAmerica St. Louis (Continued)

because the associated laboratory control sample (LCS) recovery was within acceptance limits. (160-12414-A-1-G MS) and (160-12414-A-1-H MSD)

The following samples from preparation batch 160-198432 and analytical batch 160-198889 were diluted to bring the concentration of target analytes within the calibration range: EUREKA 2 GREEN/WHITE (160-12414-2), EUREKA 3 WHITE (160-12414-3) and EUREKA 4 GREEN (160-12414-4). Elevated reporting limits (RLs) are provided.

The following sample from preparation batch 160-198432 and analytical batch 160-199123 were diluted to bring the concentration of target analytes within the calibration range: EUREKA 1 PURPLE (160-12414-1), (160-12414-A-1-G MS), (160-12414-A-1-H MSD) and (160-12414-A-1-F SD). Elevated reporting limits (RLs) are provided.

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

MERCURY

Samples EUREKA 1 PURPLE (160-12414-1), EUREKA 2 GREEN/WHITE (160-12414-2), EUREKA 3 WHITE (160-12414-3) and EUREKA 4 GREEN (160-12414-4) were analyzed for mercury in accordance with EPA SW-846 Method 7471B. The samples were prepared on 06/22/2015 and analyzed on 06/23/2015.

Prep. Batch: 196597

The matrix spike / matrix spike duplicate (MS/MSD) recoveries for preparation batch 160-196597 and analytical batch 160-196901 were outside control limits. Sample matrix interference and/or non-homogeneity are suspected, because the associated laboratory control sample (LCS) recovery was within acceptance limits.

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

PERCENT SOLIDS

Samples EUREKA 1 PURPLE (160-12414-1), EUREKA 2 GREEN/WHITE (160-12414-2), EUREKA 3 WHITE (160-12414-3) and EUREKA 4 GREEN (160-12414-4) were analyzed for percent solids in accordance with EPA Method 160.3 MOD. The samples were analyzed on 06/23/2015.

No analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

TestAmerica

THE LEADER IN ENVIRONMENTAL TESTING


Temperature on Receipt _____

Drinking Water? Yes No

Chain of Custody Record

TAL-4124 (1007)

Client Lindsay Agathas		Project Manager Jason Cordes		Date		Chain of Custody Number 260520	
Address 15129 Kimberly Ct		Telephone Number (Area Code)/Fax Number 314-541-8167		Lab Number		Page _____ of _____	
City Houston		Site Contact		Lab Contact		Analysis (Attach list if more space is needed)	
Project Name and Location (State) Eureka High School MO		Carrier/Maybill Number		Lab Contact		Special Instructions/ Conditions of Receipt	
Contract/Purchase Order/Quote No.		Matrix		Containers & Preservatives			
Sample I.D. No. and Description (Containers for each sample may be combined on one line)		Date		Time		Air	
Eureka 1 Purple		6-19		9:17		Aqueous	
Eureka 2 Green/White		6-19		9:17		Soil	
Eureka 3 White		6-19		9:17		Sed.	
Eureka 4 Green		6-19		9:17		Unpres	
						H2SO4	
						HNO3	
						HCl	
						NaOH	
						ZnAc	
						NaOH	



160-12414 Chain of Custody

Possible Hazard Identification
 Non-Hazard Flammable Skin Irritant Poison B Unknown Return To Client Disposal By Lab Archive For _____ Months (A fee may be assessed if samples are retained longer than 1 month)

Turn Around Time Required
 24 Hours 48 Hours 7 Days 14 Days 21 Days Other _____

QC Requirements (Specify)
 1. Relinquished By _____ Date **6-19-15** Time **9:17**
 2. Relinquished By _____ Date _____ Time _____
 3. Relinquished By _____ Date _____ Time _____

Comments
 7/8/2015



Login Sample Receipt Checklist

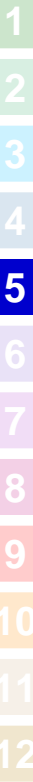
Client: FieldTurf, Inc.

Job Number: 160-12414-1

Login Number: 12414
List Number: 1
Creator: Daniels, Brian J

List Source: TestAmerica St. Louis

Question	Answer	Comment
Radioactivity wasn't checked or is \leq background as measured by a survey meter.	True	
The cooler's custody seal, if present, is intact.	N/A	
Sample custody seals, if present, are intact.	N/A	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	True	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	True	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time.	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	True	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <math><6\text{mm}</math> (1/4").	N/A	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	



Definitions/Glossary

Client: FieldTurf, Inc.
Project/Site: Metals Analysis

TestAmerica Job ID: 160-12414-1

Qualifiers

Metals

Qualifier	Qualifier Description
J	Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value.
B	Compound was found in the blank and sample.
F1	MS and/or MSD Recovery is outside acceptance limits.
4	MS, MSD: The analyte present in the original sample is greater than 4 times the matrix spike concentration; therefore, control limits are not applicable.

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
α	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CNF	Contains no Free Liquid
DER	Duplicate error ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision level concentration
MDA	Minimum detectable activity
EDL	Estimated Detection Limit
MDC	Minimum detectable concentration
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
NC	Not Calculated
ND	Not detected at the reporting limit (or MDL or EDL if shown)
PQL	Practical Quantitation Limit
QC	Quality Control
RER	Relative error ratio
RL	Reporting Limit or Requested Limit (Radiochemistry)
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)

Method Summary

Client: FieldTurf, Inc.
Project/Site: Metals Analysis

TestAmerica Job ID: 160-12414-1

Method	Method Description	Protocol	Laboratory
6010C	Metals (ICP)	SW846	TAL SL
7471B	Mercury in Solid or Semisolid Waste (Manual Cold Vapor Technique)	SW846	TAL SL
Moisture	Percent Moisture	EPA	TAL SL

Protocol References:

EPA = US Environmental Protection Agency

SW846 = "Test Methods For Evaluating Solid Waste, Physical/Chemical Methods", Third Edition, November 1986 And Its Updates.

Laboratory References:

TAL SL = TestAmerica St. Louis, 13715 Rider Trail North, Earth City, MO 63045, TEL (314)298-8566



Sample Summary

Client: FieldTurf, Inc.
Project/Site: Metals Analysis

TestAmerica Job ID: 160-12414-1

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
160-12414-1	EUREKA 1 PURPLE	Solid	06/19/15 09:17	06/19/15 09:17
160-12414-2	EUREKA 2 GREEN/WHITE	Solid	06/19/15 09:17	06/19/15 09:17
160-12414-3	EUREKA 3 WHITE	Solid	06/19/15 09:17	06/19/15 09:17
160-12414-4	EUREKA 4 GREEN	Solid	06/19/15 09:17	06/19/15 09:17

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Detection Summary

Client: FieldTurf, Inc.
Project/Site: Metals Analysis

TestAmerica Job ID: 160-12414-1

Client Sample ID: EUREKA 1 PURPLE

Lab Sample ID: 160-12414-1

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Aluminum	8300		90	19	mg/Kg	5	☼	6010C	Total/NA
Arsenic	4.3	J	4.5	1.1	mg/Kg	5	☼	6010C	Total/NA
Barium	4100		22	0.49	mg/Kg	5	☼	6010C	Total/NA
Beryllium	0.36	J	2.2	0.34	mg/Kg	5	☼	6010C	Total/NA
Cadmium	0.36	J	2.2	0.15	mg/Kg	5	☼	6010C	Total/NA
Calcium	21000		1100	30	mg/Kg	5	☼	6010C	Total/NA
Chromium	8.9	B	4.5	0.62	mg/Kg	5	☼	6010C	Total/NA
Cobalt	2.1	J	22	0.65	mg/Kg	5	☼	6010C	Total/NA
Copper	24		11	1.1	mg/Kg	5	☼	6010C	Total/NA
Iron	4100		45	8.9	mg/Kg	5	☼	6010C	Total/NA
Lead	11		4.5	0.58	mg/Kg	5	☼	6010C	Total/NA
Magnesium	3600	F1	450	14	mg/Kg	5	☼	6010C	Total/NA
Manganese	34	F1 B	4.5	0.36	mg/Kg	5	☼	6010C	Total/NA
Nickel	6.4	J	18	0.52	mg/Kg	5	☼	6010C	Total/NA
Selenium	2.4	J	6.7	0.93	mg/Kg	5	☼	6010C	Total/NA
Sodium	860	F1	450	34	mg/Kg	5	☼	6010C	Total/NA
Vanadium	22	F1	22	2.3	mg/Kg	5	☼	6010C	Total/NA
Zinc	41		22	2.5	mg/Kg	5	☼	6010C	Total/NA
Mercury	0.012	J	0.030	0.010	mg/Kg	1	☼	7471B	Total/NA

Client Sample ID: EUREKA 2 GREEN/WHITE

Lab Sample ID: 160-12414-2

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Aluminum	4200		90	19	mg/Kg	5	☼	6010C	Total/NA
Arsenic	2.4	J	4.5	1.1	mg/Kg	5	☼	6010C	Total/NA
Barium	3600		23	0.50	mg/Kg	5	☼	6010C	Total/NA
Calcium	11000		1100	30	mg/Kg	5	☼	6010C	Total/NA
Chromium	4.9	B	4.5	0.62	mg/Kg	5	☼	6010C	Total/NA
Cobalt	1.4	J	23	0.65	mg/Kg	5	☼	6010C	Total/NA
Copper	11		11	1.1	mg/Kg	5	☼	6010C	Total/NA
Iron	2100		45	9.0	mg/Kg	5	☼	6010C	Total/NA
Lead	4.6		4.5	0.58	mg/Kg	5	☼	6010C	Total/NA
Magnesium	1600		450	14	mg/Kg	5	☼	6010C	Total/NA
Manganese	14	B	4.5	0.36	mg/Kg	5	☼	6010C	Total/NA
Nickel	3.2	J	18	0.52	mg/Kg	5	☼	6010C	Total/NA
Sodium	420	J	450	34	mg/Kg	5	☼	6010C	Total/NA
Vanadium	9.4	J	23	2.3	mg/Kg	5	☼	6010C	Total/NA
Zinc	11	J	23	2.5	mg/Kg	5	☼	6010C	Total/NA
Mercury	0.041		0.031	0.010	mg/Kg	1	☼	7471B	Total/NA

Client Sample ID: EUREKA 3 WHITE

Lab Sample ID: 160-12414-3

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Aluminum	6100		100	21	mg/Kg	5	☼	6010C	Total/NA
Arsenic	2.7	J	5.0	1.2	mg/Kg	5	☼	6010C	Total/NA
Barium	4800		25	0.55	mg/Kg	5	☼	6010C	Total/NA
Calcium	14000		1300	34	mg/Kg	5	☼	6010C	Total/NA
Chromium	5.8	B	5.0	0.69	mg/Kg	5	☼	6010C	Total/NA
Cobalt	1.8	J	25	0.72	mg/Kg	5	☼	6010C	Total/NA
Copper	14		13	1.2	mg/Kg	5	☼	6010C	Total/NA

This Detection Summary does not include radiochemical test results.

TestAmerica St. Louis

Detection Summary

Client: FieldTurf, Inc.
Project/Site: Metals Analysis

TestAmerica Job ID: 160-12414-1

Client Sample ID: EUREKA 3 WHITE (Continued)

Lab Sample ID: 160-12414-3

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Iron	2800		50	10	mg/Kg	5	☼	6010C	Total/NA
Lead	7.5		5.0	0.65	mg/Kg	5	☼	6010C	Total/NA
Magnesium	2400		500	16	mg/Kg	5	☼	6010C	Total/NA
Manganese	19	B	5.0	0.40	mg/Kg	5	☼	6010C	Total/NA
Nickel	4.2	J	20	0.58	mg/Kg	5	☼	6010C	Total/NA
Sodium	640		500	38	mg/Kg	5	☼	6010C	Total/NA
Vanadium	16	J	25	2.5	mg/Kg	5	☼	6010C	Total/NA
Zinc	17	J	25	2.8	mg/Kg	5	☼	6010C	Total/NA
Mercury	0.030		0.030	0.0099	mg/Kg	1	☼	7471B	Total/NA

Client Sample ID: EUREKA 4 GREEN

Lab Sample ID: 160-12414-4

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Aluminum	5300		87	19	mg/Kg	5	☼	6010C	Total/NA
Arsenic	3.6	J	4.3	1.0	mg/Kg	5	☼	6010C	Total/NA
Barium	2400		22	0.48	mg/Kg	5	☼	6010C	Total/NA
Calcium	17000		1100	29	mg/Kg	5	☼	6010C	Total/NA
Chromium	5.1	B	4.3	0.60	mg/Kg	5	☼	6010C	Total/NA
Cobalt	2.5	J	22	0.63	mg/Kg	5	☼	6010C	Total/NA
Copper	19		11	1.1	mg/Kg	5	☼	6010C	Total/NA
Iron	2600		43	8.7	mg/Kg	5	☼	6010C	Total/NA
Lead	7.3		4.3	0.56	mg/Kg	5	☼	6010C	Total/NA
Magnesium	2200		430	14	mg/Kg	5	☼	6010C	Total/NA
Manganese	21	B	4.3	0.35	mg/Kg	5	☼	6010C	Total/NA
Nickel	5.1	J	17	0.50	mg/Kg	5	☼	6010C	Total/NA
Selenium	1.0	J	6.5	0.90	mg/Kg	5	☼	6010C	Total/NA
Sodium	550		430	33	mg/Kg	5	☼	6010C	Total/NA
Vanadium	17	J	22	2.2	mg/Kg	5	☼	6010C	Total/NA
Zinc	13	J	22	2.4	mg/Kg	5	☼	6010C	Total/NA
Mercury	0.020	J	0.029	0.0095	mg/Kg	1	☼	7471B	Total/NA

This Detection Summary does not include radiochemical test results.

TestAmerica St. Louis

Client Sample Results

Client: FieldTurf, Inc.
Project/Site: Metals Analysis

TestAmerica Job ID: 160-12414-1

Client Sample ID: EUREKA 1 PURPLE

Lab Sample ID: 160-12414-1

Date Collected: 06/19/15 09:17

Matrix: Solid

Date Received: 06/19/15 09:17

Percent Solids: 99.5

Method: 6010C - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Aluminum	8300		90	19	mg/Kg	☼	07/02/15 08:31	07/07/15 15:04	5
Antimony	ND		4.5	1.4	mg/Kg	☼	07/02/15 08:31	07/07/15 15:04	5
Arsenic	4.3	J	4.5	1.1	mg/Kg	☼	07/02/15 08:31	07/07/15 15:04	5
Barium	4100		22	0.49	mg/Kg	☼	07/02/15 08:31	07/07/15 15:04	5
Beryllium	0.36	J	2.2	0.34	mg/Kg	☼	07/02/15 08:31	07/07/15 15:04	5
Cadmium	0.36	J	2.2	0.15	mg/Kg	☼	07/02/15 08:31	07/07/15 15:04	5
Calcium	21000		1100	30	mg/Kg	☼	07/02/15 08:31	07/07/15 15:04	5
Chromium	8.9	B	4.5	0.62	mg/Kg	☼	07/02/15 08:31	07/07/15 15:04	5
Cobalt	2.1	J	22	0.65	mg/Kg	☼	07/02/15 08:31	07/07/15 15:04	5
Copper	24		11	1.1	mg/Kg	☼	07/02/15 08:31	07/07/15 15:04	5
Iron	4100		45	8.9	mg/Kg	☼	07/02/15 08:31	07/07/15 15:04	5
Lead	11		4.5	0.58	mg/Kg	☼	07/02/15 08:31	07/07/15 15:04	5
Magnesium	3600	F1	450	14	mg/Kg	☼	07/02/15 08:31	07/07/15 15:04	5
Manganese	34	F1 B	4.5	0.36	mg/Kg	☼	07/02/15 08:31	07/07/15 15:04	5
Nickel	6.4	J	18	0.52	mg/Kg	☼	07/02/15 08:31	07/07/15 15:04	5
Potassium	ND		2200	330	mg/Kg	☼	07/02/15 08:31	07/07/15 15:04	5
Selenium	2.4	J	6.7	0.93	mg/Kg	☼	07/02/15 08:31	07/07/15 15:04	5
Silver	ND		4.5	0.31	mg/Kg	☼	07/02/15 08:31	07/07/15 15:04	5
Sodium	860	F1	450	34	mg/Kg	☼	07/02/15 08:31	07/07/15 15:04	5
Thallium	ND		9.0	0.85	mg/Kg	☼	07/02/15 08:31	07/07/15 15:04	5
Vanadium	22	F1	22	2.3	mg/Kg	☼	07/02/15 08:31	07/07/15 15:04	5
Zinc	41		22	2.5	mg/Kg	☼	07/02/15 08:31	07/07/15 15:04	5

Method: 7471B - Mercury in Solid or Semisolid Waste (Manual Cold Vapor Technique)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	0.012	J	0.030	0.010	mg/Kg	☼	06/22/15 15:37	06/23/15 12:42	1

Client Sample ID: EUREKA 2 GREEN/WHITE

Lab Sample ID: 160-12414-2

Date Collected: 06/19/15 09:17

Matrix: Solid

Date Received: 06/19/15 09:17

Percent Solids: 99.4

Method: 6010C - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Aluminum	4200		90	19	mg/Kg	☼	07/02/15 08:31	07/06/15 15:22	5
Antimony	ND		4.5	1.4	mg/Kg	☼	07/02/15 08:31	07/06/15 15:22	5
Arsenic	2.4	J	4.5	1.1	mg/Kg	☼	07/02/15 08:31	07/06/15 15:22	5
Barium	3600		23	0.50	mg/Kg	☼	07/02/15 08:31	07/06/15 15:22	5
Beryllium	ND		2.3	0.34	mg/Kg	☼	07/02/15 08:31	07/06/15 15:22	5
Cadmium	ND		2.3	0.15	mg/Kg	☼	07/02/15 08:31	07/06/15 15:22	5
Calcium	11000		1100	30	mg/Kg	☼	07/02/15 08:31	07/06/15 15:22	5
Chromium	4.9	B	4.5	0.62	mg/Kg	☼	07/02/15 08:31	07/06/15 15:22	5
Cobalt	1.4	J	23	0.65	mg/Kg	☼	07/02/15 08:31	07/06/15 15:22	5
Copper	11		11	1.1	mg/Kg	☼	07/02/15 08:31	07/06/15 15:22	5
Iron	2100		45	9.0	mg/Kg	☼	07/02/15 08:31	07/06/15 15:22	5
Lead	4.6		4.5	0.58	mg/Kg	☼	07/02/15 08:31	07/06/15 15:22	5
Magnesium	1600		450	14	mg/Kg	☼	07/02/15 08:31	07/06/15 15:22	5
Manganese	14	B	4.5	0.36	mg/Kg	☼	07/02/15 08:31	07/06/15 15:22	5
Nickel	3.2	J	18	0.52	mg/Kg	☼	07/02/15 08:31	07/06/15 15:22	5
Potassium	ND		2300	330	mg/Kg	☼	07/02/15 08:31	07/06/15 15:22	5
Selenium	ND		6.8	0.93	mg/Kg	☼	07/02/15 08:31	07/06/15 15:22	5

TestAmerica St. Louis

Client Sample Results

Client: FieldTurf, Inc.
Project/Site: Metals Analysis

TestAmerica Job ID: 160-12414-1

Client Sample ID: EUREKA 2 GREEN/WHITE

Lab Sample ID: 160-12414-2

Date Collected: 06/19/15 09:17

Matrix: Solid

Date Received: 06/19/15 09:17

Percent Solids: 99.4

Method: 6010C - Metals (ICP) (Continued)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Silver	ND		4.5	0.32	mg/Kg	☼	07/02/15 08:31	07/06/15 15:22	5
Sodium	420	J	450	34	mg/Kg	☼	07/02/15 08:31	07/06/15 15:22	5
Thallium	ND		9.0	0.86	mg/Kg	☼	07/02/15 08:31	07/06/15 15:22	5
Vanadium	9.4	J	23	2.3	mg/Kg	☼	07/02/15 08:31	07/06/15 15:22	5
Zinc	11	J	23	2.5	mg/Kg	☼	07/02/15 08:31	07/06/15 15:22	5

Method: 7471B - Mercury in Solid or Semisolid Waste (Manual Cold Vapor Technique)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	0.041		0.031	0.010	mg/Kg	☼	06/22/15 15:37	06/23/15 12:44	1

Client Sample ID: EUREKA 3 WHITE

Lab Sample ID: 160-12414-3

Date Collected: 06/19/15 09:17

Matrix: Solid

Date Received: 06/19/15 09:17

Percent Solids: 99.5

Method: 6010C - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Aluminum	6100		100	21	mg/Kg	☼	07/02/15 08:31	07/06/15 15:27	5
Antimony	ND		5.0	1.5	mg/Kg	☼	07/02/15 08:31	07/06/15 15:27	5
Arsenic	2.7	J	5.0	1.2	mg/Kg	☼	07/02/15 08:31	07/06/15 15:27	5
Barium	4800		25	0.55	mg/Kg	☼	07/02/15 08:31	07/06/15 15:27	5
Beryllium	ND		2.5	0.38	mg/Kg	☼	07/02/15 08:31	07/06/15 15:27	5
Cadmium	ND		2.5	0.17	mg/Kg	☼	07/02/15 08:31	07/06/15 15:27	5
Calcium	14000		1300	34	mg/Kg	☼	07/02/15 08:31	07/06/15 15:27	5
Chromium	5.8	B	5.0	0.69	mg/Kg	☼	07/02/15 08:31	07/06/15 15:27	5
Cobalt	1.8	J	25	0.72	mg/Kg	☼	07/02/15 08:31	07/06/15 15:27	5
Copper	14		13	1.2	mg/Kg	☼	07/02/15 08:31	07/06/15 15:27	5
Iron	2800		50	10	mg/Kg	☼	07/02/15 08:31	07/06/15 15:27	5
Lead	7.5		5.0	0.65	mg/Kg	☼	07/02/15 08:31	07/06/15 15:27	5
Magnesium	2400		500	16	mg/Kg	☼	07/02/15 08:31	07/06/15 15:27	5
Manganese	19	B	5.0	0.40	mg/Kg	☼	07/02/15 08:31	07/06/15 15:27	5
Nickel	4.2	J	20	0.58	mg/Kg	☼	07/02/15 08:31	07/06/15 15:27	5
Potassium	ND		2500	360	mg/Kg	☼	07/02/15 08:31	07/06/15 15:27	5
Selenium	ND		7.5	1.0	mg/Kg	☼	07/02/15 08:31	07/06/15 15:27	5
Silver	ND		5.0	0.35	mg/Kg	☼	07/02/15 08:31	07/06/15 15:27	5
Sodium	640		500	38	mg/Kg	☼	07/02/15 08:31	07/06/15 15:27	5
Thallium	ND		10	0.95	mg/Kg	☼	07/02/15 08:31	07/06/15 15:27	5
Vanadium	16	J	25	2.5	mg/Kg	☼	07/02/15 08:31	07/06/15 15:27	5
Zinc	17	J	25	2.8	mg/Kg	☼	07/02/15 08:31	07/06/15 15:27	5

Method: 7471B - Mercury in Solid or Semisolid Waste (Manual Cold Vapor Technique)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	0.030		0.030	0.0099	mg/Kg	☼	06/22/15 15:37	06/23/15 12:46	1

Client Sample ID: EUREKA 4 GREEN

Lab Sample ID: 160-12414-4

Date Collected: 06/19/15 09:17

Matrix: Solid

Date Received: 06/19/15 09:17

Percent Solids: 99.8

Method: 6010C - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Aluminum	5300		87	19	mg/Kg	☼	07/02/15 08:31	07/06/15 15:31	5

TestAmerica St. Louis

Client Sample Results

Client: FieldTurf, Inc.
Project/Site: Metals Analysis

TestAmerica Job ID: 160-12414-1

Client Sample ID: EUREKA 4 GREEN

Lab Sample ID: 160-12414-4

Date Collected: 06/19/15 09:17

Matrix: Solid

Date Received: 06/19/15 09:17

Percent Solids: 99.8

Method: 6010C - Metals (ICP) (Continued)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Antimony	ND		4.3	1.3	mg/Kg	☼	07/02/15 08:31	07/06/15 15:31	5
Arsenic	3.6	J	4.3	1.0	mg/Kg	☼	07/02/15 08:31	07/06/15 15:31	5
Barium	2400		22	0.48	mg/Kg	☼	07/02/15 08:31	07/06/15 15:31	5
Beryllium	ND		2.2	0.33	mg/Kg	☼	07/02/15 08:31	07/06/15 15:31	5
Cadmium	ND		2.2	0.15	mg/Kg	☼	07/02/15 08:31	07/06/15 15:31	5
Calcium	17000		1100	29	mg/Kg	☼	07/02/15 08:31	07/06/15 15:31	5
Chromium	5.1	B	4.3	0.60	mg/Kg	☼	07/02/15 08:31	07/06/15 15:31	5
Cobalt	2.5	J	22	0.63	mg/Kg	☼	07/02/15 08:31	07/06/15 15:31	5
Copper	19		11	1.1	mg/Kg	☼	07/02/15 08:31	07/06/15 15:31	5
Iron	2600		43	8.7	mg/Kg	☼	07/02/15 08:31	07/06/15 15:31	5
Lead	7.3		4.3	0.56	mg/Kg	☼	07/02/15 08:31	07/06/15 15:31	5
Magnesium	2200		430	14	mg/Kg	☼	07/02/15 08:31	07/06/15 15:31	5
Manganese	21	B	4.3	0.35	mg/Kg	☼	07/02/15 08:31	07/06/15 15:31	5
Nickel	5.1	J	17	0.50	mg/Kg	☼	07/02/15 08:31	07/06/15 15:31	5
Potassium	ND		2200	310	mg/Kg	☼	07/02/15 08:31	07/06/15 15:31	5
Selenium	1.0	J	6.5	0.90	mg/Kg	☼	07/02/15 08:31	07/06/15 15:31	5
Silver	ND		4.3	0.30	mg/Kg	☼	07/02/15 08:31	07/06/15 15:31	5
Sodium	550		430	33	mg/Kg	☼	07/02/15 08:31	07/06/15 15:31	5
Thallium	ND		8.7	0.83	mg/Kg	☼	07/02/15 08:31	07/06/15 15:31	5
Vanadium	17	J	22	2.2	mg/Kg	☼	07/02/15 08:31	07/06/15 15:31	5
Zinc	13	J	22	2.4	mg/Kg	☼	07/02/15 08:31	07/06/15 15:31	5

Method: 7471B - Mercury in Solid or Semisolid Waste (Manual Cold Vapor Technique)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	0.020	J	0.029	0.0095	mg/Kg	☼	06/22/15 15:37	06/23/15 12:47	1

QC Sample Results

Client: FieldTurf, Inc.
Project/Site: Metals Analysis

TestAmerica Job ID: 160-12414-1

Method: 6010C - Metals (ICP)

Lab Sample ID: MB 160-198432/1-A
Matrix: Solid
Analysis Batch: 198889

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 198432

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Aluminum	ND		20	4.2	mg/Kg		07/02/15 08:31	07/06/15 14:59	1
Antimony	ND		0.98	0.30	mg/Kg		07/02/15 08:31	07/06/15 14:59	1
Arsenic	ND		0.98	0.23	mg/Kg		07/02/15 08:31	07/06/15 14:59	1
Barium	ND		4.9	0.11	mg/Kg		07/02/15 08:31	07/06/15 14:59	1
Beryllium	ND		0.49	0.073	mg/Kg		07/02/15 08:31	07/06/15 14:59	1
Cadmium	ND		0.49	0.033	mg/Kg		07/02/15 08:31	07/06/15 14:59	1
Calcium	ND		240	6.6	mg/Kg		07/02/15 08:31	07/06/15 14:59	1
Chromium	0.195	J	0.98	0.13	mg/Kg		07/02/15 08:31	07/06/15 14:59	1
Cobalt	ND		4.9	0.14	mg/Kg		07/02/15 08:31	07/06/15 14:59	1
Copper	ND		2.4	0.24	mg/Kg		07/02/15 08:31	07/06/15 14:59	1
Iron	ND		9.8	1.9	mg/Kg		07/02/15 08:31	07/06/15 14:59	1
Lead	ND		0.98	0.13	mg/Kg		07/02/15 08:31	07/06/15 14:59	1
Magnesium	ND		98	3.1	mg/Kg		07/02/15 08:31	07/06/15 14:59	1
Manganese	0.0781	J	0.98	0.078	mg/Kg		07/02/15 08:31	07/06/15 14:59	1
Nickel	ND		3.9	0.11	mg/Kg		07/02/15 08:31	07/06/15 14:59	1
Potassium	ND		490	71	mg/Kg		07/02/15 08:31	07/06/15 14:59	1
Selenium	ND		1.5	0.20	mg/Kg		07/02/15 08:31	07/06/15 14:59	1
Silver	ND		0.98	0.068	mg/Kg		07/02/15 08:31	07/06/15 14:59	1
Sodium	ND		98	7.4	mg/Kg		07/02/15 08:31	07/06/15 14:59	1
Thallium	ND		2.0	0.19	mg/Kg		07/02/15 08:31	07/06/15 14:59	1
Vanadium	ND		4.9	0.49	mg/Kg		07/02/15 08:31	07/06/15 14:59	1
Zinc	ND		4.9	0.55	mg/Kg		07/02/15 08:31	07/06/15 14:59	1

Lab Sample ID: LCSSRM 160-198432/2-A
Matrix: Solid
Analysis Batch: 198889

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 198432

Analyte	Spike Added	LCSSRM Result	LCSSRM Qualifier	Unit	D	%Rec	%Rec. Limits
Aluminum	8060	6090		mg/Kg		75.5	39.5 - 160.0
Antimony	94.0	57.7		mg/Kg		61.4	22.8 - 257.4
Arsenic	113	95.2		mg/Kg		84.3	69.7 - 142.5
Barium	155	135		mg/Kg		87.3	72.9 - 127.1
Beryllium	109	96.8		mg/Kg		88.9	74.7 - 124.8
Cadmium	67.5	62.1		mg/Kg		92.0	73.2 - 126.8
Calcium	5850	5220		mg/Kg		89.3	73.7 - 126.5
Chromium	164	151		mg/Kg		91.9	70.7 - 129.9
Cobalt	100	97.8		mg/Kg		97.8	74.4 - 126.0
Copper	128	117		mg/Kg		91.1	75.2 - 125.8
Iron	15200	12000		mg/Kg		78.6	37.4 - 162.5

TestAmerica St. Louis

QC Sample Results

Client: FieldTurf, Inc.
Project/Site: Metals Analysis

TestAmerica Job ID: 160-12414-1

Method: 6010C - Metals (ICP) (Continued)

Lab Sample ID: LCSSRM 160-198432/2-A
Matrix: Solid
Analysis Batch: 198889

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 198432

Analyte	Spike Added	LCSSRM Result	LCSSRM Qualifier	Unit	D	%Rec	%Rec. Limits
Lead	90.1	77.5		mg/Kg		86.0	70.1 - 129.9
Magnesium	2790	2280		mg/Kg		81.6	65.2 - 135.1
Manganese	363	316		mg/Kg		87.0	75.8 - 124.5
Nickel	89.3	88.8		mg/Kg		99.5	72.0 - 127.7
Potassium	2770	2270		mg/Kg		82.0	61.7 - 138.3
Selenium	156	135		mg/Kg		86.2	67.3 - 132.1
Silver	52.6	43.7		mg/Kg		83.2	66.7 - 133.5
Sodium	686	604		mg/Kg		88.0	55.8 - 144.2
Thallium	116	108		mg/Kg		93.1	67.4 - 131.9
Vanadium	73.0	63.5		mg/Kg		87.0	59.7 - 139.7
Zinc	168	150		mg/Kg		89.0	69.0 - 131.5

Lab Sample ID: 160-12414-1 MS
Matrix: Solid
Analysis Batch: 199123

Client Sample ID: EUREKA 1 PURPLE
Prep Type: Total/NA
Prep Batch: 198432

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
Aluminum	8300		959	7340	4	mg/Kg	☼	-103	75 - 125
Antimony	ND		48.0	38.4		mg/Kg	☼	80	75 - 125
Arsenic	4.3	J	95.9	86.3		mg/Kg	☼	85	75 - 125
Barium	4100		95.9	4000	4	mg/Kg	☼	-62	75 - 125
Beryllium	0.36	J	95.9	85.3		mg/Kg	☼	89	75 - 125
Cadmium	0.36	J	95.9	85.7		mg/Kg	☼	89	75 - 125
Calcium	21000		959	17200	4	mg/Kg	☼	-391	75 - 125
Chromium	8.9	B	95.9	91.1		mg/Kg	☼	86	75 - 125
Cobalt	2.1	J	95.9	91.5		mg/Kg	☼	93	75 - 125
Copper	24		95.9	107		mg/Kg	☼	86	75 - 125
Iron	4100		959	3990	4	mg/Kg	☼	-14	75 - 125
Lead	11		95.9	97.1		mg/Kg	☼	90	75 - 125
Magnesium	3600	F1	959	3530	F1	mg/Kg	☼	-7	75 - 125
Manganese	34	F1 B	95.9	109		mg/Kg	☼	78	75 - 125
Nickel	6.4	J	95.9	94.5		mg/Kg	☼	92	75 - 125
Potassium	ND		959	1060	J	mg/Kg	☼	110	75 - 125
Selenium	2.4	J	48.0	43.7		mg/Kg	☼	86	75 - 125
Silver	ND		19.2	16.8		mg/Kg	☼	87	75 - 125
Sodium	860	F1	959	1500	F1	mg/Kg	☼	67	75 - 125
Thallium	ND		19.2	16.8		mg/Kg	☼	87	75 - 125
Vanadium	22	F1	95.9	95.9		mg/Kg	☼	77	75 - 125
Zinc	41		95.9	131		mg/Kg	☼	93	75 - 125

TestAmerica St. Louis

QC Sample Results

Client: FieldTurf, Inc.
Project/Site: Metals Analysis

TestAmerica Job ID: 160-12414-1

Method: 6010C - Metals (ICP) (Continued)

Lab Sample ID: 160-12414-1 MSD
Matrix: Solid
Analysis Batch: 199123

Client Sample ID: EUREKA 1 PURPLE
Prep Type: Total/NA
Prep Batch: 198432

Analyte	Sample	Sample	Spike	MSD	MSD	Unit	D	%Rec	Limits	RPD	Limit
	Result	Qualifier	Added	Result	Qualifier						
Aluminum	8300		873	5660	4	mg/Kg	☼	-305	75 - 125	26	30
Antimony	ND		43.7	36.0		mg/Kg	☼	83	75 - 125	6	30
Arsenic	4.3	J	87.3	77.2		mg/Kg	☼	83	75 - 125	11	30
Barium	4100		87.3	3420	4	mg/Kg	☼	-728	75 - 125	16	30
Beryllium	0.36	J	87.3	76.6		mg/Kg	☼	87	75 - 125	11	30
Cadmium	0.36	J	87.3	77.0		mg/Kg	☼	88	75 - 125	11	30
Calcium	21000		873	13600	4	mg/Kg	☼	-842	75 - 125	23	30
Chromium	8.9	B	87.3	83.3		mg/Kg	☼	85	75 - 125	9	30
Cobalt	2.1	J	87.3	82.4		mg/Kg	☼	92	75 - 125	11	30
Copper	24		87.3	95.4		mg/Kg	☼	81	75 - 125	12	30
Iron	4100		873	3210	4	mg/Kg	☼	-105	75 - 125	22	30
Lead	11		87.3	86.6		mg/Kg	☼	86	75 - 125	11	30
Magnesium	3600	F1	873	2810	4	mg/Kg	☼	-90	75 - 125	23	30
Manganese	34	F1 B	87.3	96.1	F1	mg/Kg	☼	71	75 - 125	12	30
Nickel	6.4	J	87.3	84.8		mg/Kg	☼	90	75 - 125	11	30
Potassium	ND		873	926	J	mg/Kg	☼	106	75 - 125	13	30
Selenium	2.4	J	43.7	38.9		mg/Kg	☼	84	75 - 125	12	30
Silver	ND		17.5	15.1		mg/Kg	☼	86	75 - 125	11	30
Sodium	860	F1	873	1250	F1	mg/Kg	☼	44	75 - 125	18	30
Thallium	ND		17.5	15.8		mg/Kg	☼	90	75 - 125	6	30
Vanadium	22	F1	87.3	84.5	F1	mg/Kg	☼	71	75 - 125	13	30
Zinc	41		87.3	120		mg/Kg	☼	90	75 - 125	9	30

Method: 7471B - Mercury in Solid or Semisolid Waste (Manual Cold Vapor Technique)

Lab Sample ID: MB 160-196597/1-A
Matrix: Solid
Analysis Batch: 196901

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 196597

Analyte	MB	MB	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
	Result	Qualifier							
Mercury	ND		0.029	0.0095	mg/Kg		06/22/15 15:37	06/23/15 12:31	1

Lab Sample ID: LCSSRM 160-196597/2-A
Matrix: Solid
Analysis Batch: 196901

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 196597

Analyte	Spike Added	LCSSRM	LCSSRM	Unit	D	%Rec	Limits
		Result	Qualifier				
Mercury	8.37	7.51		mg/Kg		89.8	51.3 - 148. 1

QC Association Summary

Client: FieldTurf, Inc.
Project/Site: Metals Analysis

TestAmerica Job ID: 160-12414-1

Metals

Prep Batch: 196597

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-12414-1	EUREKA 1 PURPLE	Total/NA	Solid	7471B	
160-12414-2	EUREKA 2 GREEN/WHITE	Total/NA	Solid	7471B	
160-12414-3	EUREKA 3 WHITE	Total/NA	Solid	7471B	
160-12414-4	EUREKA 4 GREEN	Total/NA	Solid	7471B	
LCSSRM 160-196597/2-A	Lab Control Sample	Total/NA	Solid	7471B	
MB 160-196597/1-A	Method Blank	Total/NA	Solid	7471B	

Analysis Batch: 196901

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-12414-1	EUREKA 1 PURPLE	Total/NA	Solid	7471B	196597
160-12414-2	EUREKA 2 GREEN/WHITE	Total/NA	Solid	7471B	196597
160-12414-3	EUREKA 3 WHITE	Total/NA	Solid	7471B	196597
160-12414-4	EUREKA 4 GREEN	Total/NA	Solid	7471B	196597
LCSSRM 160-196597/2-A	Lab Control Sample	Total/NA	Solid	7471B	196597
MB 160-196597/1-A	Method Blank	Total/NA	Solid	7471B	196597

Prep Batch: 198432

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-12414-1	EUREKA 1 PURPLE	Total/NA	Solid	3050B	
160-12414-1 MS	EUREKA 1 PURPLE	Total/NA	Solid	3050B	
160-12414-1 MSD	EUREKA 1 PURPLE	Total/NA	Solid	3050B	
160-12414-2	EUREKA 2 GREEN/WHITE	Total/NA	Solid	3050B	
160-12414-3	EUREKA 3 WHITE	Total/NA	Solid	3050B	
160-12414-4	EUREKA 4 GREEN	Total/NA	Solid	3050B	
LCSSRM 160-198432/2-A	Lab Control Sample	Total/NA	Solid	3050B	
MB 160-198432/1-A	Method Blank	Total/NA	Solid	3050B	

Analysis Batch: 198889

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-12414-2	EUREKA 2 GREEN/WHITE	Total/NA	Solid	6010C	198432
160-12414-3	EUREKA 3 WHITE	Total/NA	Solid	6010C	198432
160-12414-4	EUREKA 4 GREEN	Total/NA	Solid	6010C	198432
LCSSRM 160-198432/2-A	Lab Control Sample	Total/NA	Solid	6010C	198432
MB 160-198432/1-A	Method Blank	Total/NA	Solid	6010C	198432

Analysis Batch: 199123

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-12414-1	EUREKA 1 PURPLE	Total/NA	Solid	6010C	198432
160-12414-1 MS	EUREKA 1 PURPLE	Total/NA	Solid	6010C	198432
160-12414-1 MSD	EUREKA 1 PURPLE	Total/NA	Solid	6010C	198432

General Chemistry

Analysis Batch: 196827

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-12414-1	EUREKA 1 PURPLE	Total/NA	Solid	Moisture	
160-12414-1 DU	EUREKA 1 PURPLE	Total/NA	Solid	Moisture	
160-12414-2	EUREKA 2 GREEN/WHITE	Total/NA	Solid	Moisture	
160-12414-3	EUREKA 3 WHITE	Total/NA	Solid	Moisture	
160-12414-4	EUREKA 4 GREEN	Total/NA	Solid	Moisture	

TestAmerica St. Louis



Last updated: 10/29/2015

