Wayland Recreation Department
Minutes
October 19, 2010
Recreation/ BoPW Joint Forum Meeting

Present: Virzi, Wright, Meliones, Gayshan, McShea, Ouellette and member of BoPW

Virzi called meeting to order at 7:00 pm.

Virzi gave overview of the purpose of the forum, discussion and ideas on the Field Use Master Plan Study that we recently completed.

Nathan Collins from Gale Associates presented the Field Use Master Plan Study to those in attendance. Talked about how he developed the data, recommendations, overuse of fields, maintenance and suggestions for future field development or redevelopment.

Mark Santangelo wanted to know if we had eliminated Greenways altogether? Collins commented on the extensive grading that would need to happen, it's near inaccessibility and the high cost to construct that field as reasons why we felt it was too high to pursue field development in that area.

Tom Sciacca – gave three handouts 1. Turf field injures kids. 2. Thermal issues on field. 3. Carcinogens on the fields. Plus environmental issues. Felt that if town followed optimum management practices that we would be producing better fields. High School tennis is within a zone 1 of the wells. Should not repair tennis courts there. Expressed concerns over Gale Associates and turf fields.

Mike Pattison – Questions about the turf field usage…are we making revenue, how much does this use take from our other fields. McShea tried to quantify usage and talked about the turf field replacement fund that we currently have set up.

Gerry Levin – works with DPW and Parks and Recreation for many years as a user of Cochituate Fields 9-12 during the week from April 1 – December. Is a member of EMASS softball a 501c3 that has 350 members, 10-15% from Wayland. Looking to offer financial assistance if Loker is available for fields need 275' outfields for softball. Could potentially assist substantially in the cost of the field development. Have 4-5 leagues and growing at a rate of 15% per year.

Joe Nolan – tools to make own analysis. With such a substantial grade change needed at Loker how did you come to the $975,000 figure? Collins based on GIS schematic grading levels, can balance with fill on site.

Linda Segal – feels this plan at Loker fits in better with the overall residential neighborhood.

McShea mentioned that there will be a Public Forum on Loker and the potential development of that site on Tuesday December 7th at 7pm.

Rick Maglian – Do we have an overview of Loker site showing the recreation parcel versus the conservation parcel?

Sherry Cohen – Lives near Loker site – walking trails bicycle trails and nature area to be included in site. Wants these items included in the plan.

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Alice Folter – press boxes, lights, is this the standard practice? Collins – lights at Alpine Field would be new, at the high school it would replace what is already existing.

Debbie Portyrata – Would there still be a wood buffer near the middle school? What about skate parks?

Mike Lindeman – DPW why two fields at the middle school grass and not synthetic? Collins, synthetic have a larger impact and a higher cost associated with the construction.

More general discussion.

Joe Nolan – Perhaps we need to revisit the Greenways municipal site and look at what might be able to be done there.

Don Ouellette – DPW Director – doing 95% of what is in the study relative to the field maintenance. If adding fields will need to add manpower. Budget is coming up soon, how to determine what to put in for this cycle. Advised to put in place holder article at this time, can always withdraw after deadline if need be.

Meeting adjourned about 8:30pm

Tom Sciacca

From WVN March 21, 2010
http://groups.yahoo.com/group/waylandvotersnetwork/message/415

Dear Wayland Voter,

The kind of artificial surface used on Wayland's high school playing field has been implicated in excess National Football League injuries.

TURF INJURIES

On March 12 the Associated Press reported an NFL study showing higher rates of leg injuries on FieldTurf, the brand used on Wayland's field, than on grass fields. The rate of anterior cruciate ligament (ACL) injuries was 88 percent higher , the study said. Ankle sprains were 32 percent higher.

Dr. Elliot Hershman, a Jets team orthopedist, noted that the NFL research may not apply to lower levels of football or to other sports.

But data from the Wayland High School athletic department shows a large number of knee, leg, and ankle injuries after the turf field was installed. In fact, an ACL injury occurred on Sept.19, 2007, only four days after the field was first opened. The injured student took more than a year and surgery to recover. Another student received an ACL injury later in that same short season. Both occurred while playing football.

The following spring, lower limb injuries included two ankle sprains and two quadriceps strains. These all occurred while playing lacrosse. Both boys and girls were injured.

In the fall of 2008 there were two ACL injuries. One was during football practice and the other from girls' soccer. In addition, a field hockey goalie suffered a medial collateral ligament strain. There were three ankle injuries, one a fracture. Also, a soccer player suffered a hip strain and another child suffered a back injury.

The spring of 2009 saw many fewer injuries, including only one ankle sprain. And the fall brought only one ankle sprain and one knee contusion.

But 2009 also brought seven concussions. This is a type of injury that turf field manufacturers and proponents often claim is less common on turf fields, compensating, they say, for any increase in leg injuries. In all, there were 13 concussions on the turf field in the 2-1/2 year period from fall of 2007 through fall of 2009. Concussions have been in the news lately as causing lifelong damage, including possible early onset dementia.

ACL injuries have also made the news recently, as possibly causing early onset of arthritis. "People who tear their ACL have a 50 to 75 percent chance of

developing severe osteoarthritis in 10 to 20 years", says Dr. John Hardin, the chief science officer of the Arthritis Foundation, quoted in the Boston Globe. "Even though the orthopedic surgery is very effective in getting you back to playing your sport, it doesn't change your odds of developing severe osteoarthritis and we really don't know why."

Researchers have measured much higher stresses on a player's legs on artificial turf than on natural grass. As a player pivots, the plastic strands simulating grass "grab" his foot. Natural grass, on the other hand, tears and allows scraping of the underlying soil, absorbing energy in the process. The same tearing and scraping that protects players also leads to higher maintenance costs for natural grass; such costs are part of the rationale for conversion to artificial turf.

A number of other injuries were documented on the Wayland field during the period, including thumb fractures, neck strain, wrist fracture, an apparent episode of fainting, and a stroke. Very high temperatures, over 160 degrees Fahrenheit, have been measured on the field. Such temperatures could have led directly or indirectly to some of these injuries by affecting coordination or consciousness.

A request for comparable data from the period before the installation of the turf field resulted in only three seasons worth of information. In those three seasons only one ACL injury occurred. Seven lower body injuries were recorded. That compares to 18 lower body injuries on the turf field over five seasons. It is unclear if the number and types of games played per season pre- and post-turf were comparable.

There were six concussions in the three pre-turf seasons.

Outgoing Selectman Michael Tichnor cited Wayland's "first turf field" as one of the accomplishments of his six years as a selectman. Tichnor was the most prominent proponent of the field, pushing the Board of Selectmen to support the construction and fund part of the nearly $1 million cost with Community Preservation funds, which was later judged illegal in a court case involving a similar project in Newton. Department of Environmental Protection orders resulting from appeals to the turf field proposal resulted in over $100,000 of required drainage work charged to the water department, never reported to taxpayers but included in water fees.

When the plans to build the field were being debated in front of the DEP, Town Administrator Fred Turkington argued that completing the turf field was necessary to protect children's safety.

-- Tom Sciacca

Tom Sciacca

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FOR IMMEDIATE RELEASE

Breaking News for Back to School: Recent Artificial Turf Study
Shows Carcinogens and Toxins in Synthetic Fields

North Haven, Conn., August 30, 2010 - Synthetic turf fields have been installed at schools across the country, and the findings of a new artificial turf study show that these fields contain chemical carcinogens, neurotoxins, respiratory toxins and skin and eye irritants. The Synthetic Turf Council says that there are more than 5,500 artificial turf fields installed nationwide.

Due to the tremendous growth of this industry and because so many students play on artificial turf, the Connecticut Department of Environmental Protection (CT DEP) embarked on a study of the fields' potential health effects. Those results were recently released.

Air tests on actual fields show the presence of chemical carcinogens, neurotoxins, respiratory toxins and skin and eye irritants. The concentrations vary among fields and among samples by factors of two to 10 times. Increasing the period of air sampling from two hours to six hours raised the number of different chemicals identified on the fields.

A sampling of just some of the chemicals off-gassing from the fields includes benzothizole - according to the Material Safety Data Sheet (MSDS) is harmful if swallowed or inhaled; toluene - the MSDS says is a skin, eye, and respiratory irritant and can cause headaches; acetone - the MSDS safety sheet says is a skin, eye, and respiratory irritant, and can affect the central nervous system; zinc - a respiratory irritant; acenaphthene - a carcinogen; and naphthalene - which is listed as a possible carcinogen.

After performing a peer review of the CT DEP's Artificial Turf Study, the Conn. Academy of Science and Engineering (CASE) advised that the findings "be softened" to avoid alarming the public. CASE warned, "Parents may be motivated to withdraw their children from beneficial athletic activities, and schools and towns will consider the financially wasteful removal of existing fields."

The assessment of the findings was modified so not to cause concern among the public, warns Environment and Human Health Inc., a non-profit organization comprised of physicians and public health professionals.

Dr. D. Barry Boyd, Oncologist at the Greenwich Hospital and the Yale Cancer Center, said,"While fear of raising concerns may be an understandable motive for limiting public information about risk, the long recognized goal of limiting childhood exposures to environmental hazards must take precedent. Because artificial turf playing fields are disproportionately used by children and adolescents, these childhood exposures to environmental carcinogens may add to lifelong risk of cancer as well as the exposures to the many respiratory irritants and toxicants found off-gassing from these fields."

The health assessment looked at one chemical at a time for the artificial turf's affect on people's health - yet the data indicates that children are being exposed to a soup of toxins from these fields, and these exposures are experienced all at the same time.

The data also shows that the more people who are playing on a field the more toxins are released -- and thus the greater the exposures to students.

The study indicates a very high variability of the levels of toxins found in each field. Since there are 40,000 used tires in each field, enormous variability of toxins would be expected.

The actual field-testing took place last summer when temperatures were unusually cool, between 70 and 80 degrees. Environment and Human Health, Inc. (EHHI) points out that the temperatures this summer have consistently reached 90 degrees with fields frequently exceeding temperatures over 135 degrees. If the testing had been done this summer, the off-gassing of chemicals would have been higher and health risks shown in the report would have been greater.

The National Center for Catastrophic Sport Injury Research at the University of North Carolina reported that more than 40 football players nationwide have died of heatstroke since 1995 -- 31 of whom were high school athletes.

Dr Boyd stressed that, "it is essential that we have better measurements of individual exposures from artificial turf during periods of high temperatures, as many children participate in sports on these fields throughout the summer months when the high heat causes greater exposures to multiple toxic compounds simultaneously."

Although new fields off-gas more chemicals, all the fields tested were two years old or older.

There is nothing in this press release and executive summary that reduces EHHI's concern about children playing on artificial turf. In fact the data from this study suggests that we all should be more concerned than ever.

The CASE Report shows how concerned CASE was about the study's findings. Their quote, "It is almost certain that the 'headline' conclusion of the CT Department of Public Health (DPH) report will become the focus of media reports and will unnecessarily frighten parents as well as school and municipal supervisors. Parents may be motivated to withdraw their children from beneficial athletic activities, and schools and towns will consider the financially wasteful removal of existing fields. This would be an unfortunate result, one that would likely pose greater risks to the welfare of Connecticut than the continued use of outdoor Artificial Turf Fields."

This was their explanation for urging that the data assessment from the report be "softened."

The report and its executive summary can be found on the Conn. Department of Environmental Protection's website:

http://www.ct.gov/dep/cwp/view.asp?a=2690&Q=463624&depNav_GID=1511>http://www.ct.gov/dep/cwp/view.asp?a=2690&Q=463624&depNav_GID=1511

Environment and Human Health, Inc. (EHHI) is a nine-member, non-profit organization composed of doctors, public health professionals and policy experts. It is dedicated to protecting human health from environmental harms through research, education and improving public policy. EHHI does not receive any funds from businesses

www.SynTurf.org

"sunshine is the best disinfectant" – L. Brandeis

The Thermal Physics of Artificial Turf

By Tom Sciacca*

Abstract:
It has long been noted that artificial turf athletic fields can get very hot. However, no one has yet written on the thermal mechanisms involved in this phenomenon. As a result, data is taken and presented randomly resulting in widely varying reports of just how hot these fields can get. Because of ignorance of the conditions which influence temperature elevation it is difficult to plan to deal with the problem. The author presents a model for understanding the factors involved. The key observation is that these fields are excellent thermal radiation absorbers while being thermally conductive insulators.

The Data

Reports of elevated temperature readings from artificial turf athletic fields are easy to find on the web. The details, however, vary widely. Some refer to elevations over ambient of only ten or fifteen degrees (all temperature references in this paper will be in degrees Fahrenheit, for ease of understanding by American non-technical readers). Other reports speak of temperatures over 200 degrees. In August and September of 2007 I visited various artificial fields in the Boston area and measured temperatures under varying conditions using a thermocouple, which is basically a point measurement device. This is in contrast to all other reported measurements that I have seen referenced, which either used an infrared thermometer pointed at the surface or a meat thermometer thrust into the infill (the layer of ground up old tires used as the primary cushion on the current generation of artificial fields). The use of the thermocouple allowed me to gain an insight into the mechanisms involved in the heating of the fields.

A summary of the results follows. A complete record of the raw data is appended.

DATE	FIELD	AMBIENT TEMP	FIELD TEMP	TEMP RISE
8/3	L-S	91	156	65
8/14	L-S	78	136	58
8/28	CUT	79	140	61
9/5	CUT	71	139	68
9/13	CUT	67	126	59
9/13	L-S	70	145	75
9/20	WAY	76	142	66

All dates are in 2007. L-S is Lincoln-Sudbury Regional High School athletic fields, Sudbury, Mass. CUT is Cutting Athletic Field, Sudbury, Mass. WAY is Wayland High School athletic field, Wayland, Mass. Ambient temps are in degrees Fahrenheit, taken in shade three feet above ground to the side of the field. Field temps are on the field surface.

Some of the most important information, however, is not captured in the quantitative data but in observations made as the data was taken.

1. Temperatures were highest right on the surface of the ground tire "infill". Pushing the thermocouple even a small fraction of an inch into the material resulted in a noticeable drop in temperature. Pushing it an inch or two further resulted in drops of tens of degrees.
2. A puff of wind would result in a noticeable drop in temperature. This could be seen because the thermocouple has negligible thermal mass and responds nearly instantaneously.
3. As can be seen in the appended raw data, measurements of nearby black asphalt surfaces showed much lower temperatures.
4. Evening visits to these sites resulted in the observation that the fields were cool (essentially ambient) while the nearby asphalt surfaces remained quite warm.

Key Observation

The above observations can be explained by noting that the ground up rubber tires have two key thermal characteristics. First, they are black, which we know from high school physics means they are excellent thermal radiation absorbers. (In fact, tires contain large quantities of carbon black). Second, they contain great quantities of air space and rubber itself is a poor thermal conductor, making the layer of rubber "infill" an excellent thermal insulator. Thermal energy will therefore be absorbed on the surface of the field but will not be dissipated into the mass of the field material. This allows temperatures to rise far higher than on other nearby black surfaces, such as asphalt. The asphalt mass absorbs the thermal energy and thus integrates the temperature rise over time, reducing it during the day but allowing it to remain high after the radiation input is removed at night. Temperatures on the rubber field surface, on the other hand, will drop almost immediately as solar input drops.

The Model

Integrating the above information into a conceptually quantitative model results in the following:

TT= AT + SI - DH
Where TT= Turf Temperature
AT= Ambient Temperature
SI= Solar Input, which is a function of time of day and time of year, minus cloudiness
DH= Dissipated Heat, which seems to be largely a function of wind strength and characteristics of the particular turf sample

Discussion

It should be obvious that the temperature of the field will be a function of the ambient temperature.

Solar energy is the fundamental input causing temperature elevation. Because of the lack of thermal mass in the field material, peak temperatures will be reached shortly after peak inputs occur. There were insufficient samples taken to determine this with any precision, but it is almost certainly within two hours of solar noon (approximately 1 PM Daylight Savings Time) and probably within an hour. Future research should narrow this range. Seasonally, peak inputs will occur in late June, but note that the highest temperature elevations in this sample were measured near the fall equinox- all other conditions were optimum, overcoming the effect of reduced seasonal solar input. Measurements taken under comparable conditions next June on these same fields should prove extremely interesting. Finally, the effect of cloud cover is critical. Field temperatures drop noticeably as a cloud passes, and then rise immediately when the sun is exposed again. Haze and high thin cloudiness also serve to reduce solar input.

In keeping with the requirements of the law of conservation of energy, energy is obviously dissipated from the fields or the temperature would increase without bound. And just as obviously, all three thermal transport mechanisms- radiation, conduction, and convection- are involved.

We know from elementary physics that black surfaces will be efficient radiators of infrared energy just as they are efficient absorbers, and that the magnitude of energy radiated will be proportional to the temperature. This is of particular interest in the case of an athletic field because the most likely objects in the path of that radiation are players. Of equal interest is the fact that players will be exposed to maximum thermal radiation from below at the same time as they are exposed to maximum radiation from above, i.e., the sun.

Conduction will occur to the material beneath the surface, to the air immediately above it, and to the shoes and bodies of players standing on or otherwise in contact with the surface. As noted above, conduction to the bulk material beneath the surface appears to be much less significant with the material of these artificial fields than with many other familiar surfaces, and this is almost certainly a major factor in allowing the surfaces to reach temperature extremes. Conduction to the air above appears to be a major cooling mechanism, as immediate temperature drops were observed after wind gusts and fields in general seemed to be cooler on windy days (further quantifying this effect may be a subject for future research). Conduction to shoes and bodies of players will certainly not be significant to cooling the field, but is of interest because of its potential to cause injury. There are

reports of blisters on players' feet caused by conduction of artificial field heat through shoes, especially with metal spikes.

Finally, convection will become important on still days to transport heated air away from the surface.

Sample Characteristics

There appears to be variation from one field to another, and even from one area to another area in the same field, in thermal characteristics. This bears further investigation. Possibilities include:
1. Variations in the ratio of plastic "grass" filaments (polyethylene or polypropylene) to the total surface area. These strands may act as shade for the ground tire layer and also as heat dissipation fins. They are also a different color from the black tires. There are major differences in the coverage ratio from one field to another.
2. Slight variations in the grade of portions of the field from horizontal, and therefore angle to the sun.
3. Variations in the chemical composition of the ground tires, and consequent differences in thermal absorption and radiation characteristics. This material is salvaged from the waste stream and may be highly variable.

Other Thermally Related Issues

There are reports of outgassing of several toxic chemicals when artificial turf fields heat up. This bears further investigation, and the parameters defined above may help to choose test conditions most appropriate to investigate the phenomena. In addition, leaching of toxic liquids and dissolved solid materials has been reported and will probably be a function of temperature. Again, the information presented above may aid in this investigation.

Future Plans

Further sampling will be done in the spring of 2008 to attempt to define truly worst case conditions. Anecdotal reports of temperatures exceeding 200 degrees provide a motivation for further research.

Appendix

Raw Data

Lincoln-Sudbury athletic fields. Temps in degrees
F, taken at surface.
Instrumentation: Fluke Model 87 Digital Voltmeter, 80TK Thermocouple
Module, Type K Thermocouple.

August 3, 2007, 2PM. Hazy Sun.
Ambient (shade, 3 feet off ground): 91
Clover Patch (green, two inches high): 93
Grass athletic field (grass brown and dry): 109
Asphalt (black): 135
Old Synthetic Turf Field: 143
New Synthetic Turf Field: 156

August 14, 2007, 2:15PM Mostly Cloudy
Ambient (shade, 3 feet off ground): 78
Grass Field: 98
Asphalt: 131
Old Turf Field: 127
New Turf Field: 136

Waltham Veteran's Field
August 16, 2007, 11AM, Hazy sun
Ambient: 85
Turf: 128
Adjacent grass: 85
Asphalt: 120

Greater New Bedford Vocational
August 24, 2007. 1:30PM, High Clouds, 20MPH wind
Ambient: 83
Turf: 136
Asphalt: 116

For Reference:

Ashland State Park Beach
August 25, 2007, 2PM, Sunny
Ambient: 89
Beach Sand: 129

Sudbury Cutting Field
August 28, 2007, 11:45 AM, partly cloudy
Ambient: 79
Asphalt: 116
Turf: 140

Sudbury Cutting Field
September 5, 2007, 12:15 PM, sunny
Ambient: 71
Asphalt: 112
Turf: 139

Lincoln-Sudbury
September 8, 2007, 3:15 PM, Partly Cloudy, windy
Ambient 96
Old Field: 125
New Field: 132

Sudbury Cutting Field
September 13, 2007, 11:45 AM, clear, calm
Ambient: 67
Asphalt: 106
Turf: 126

Lincoln-Sudbury
September 13, 2007, 2:10 PM, a few clouds
Ambient: 70
Grass (green): 88
Asphalt: 116
New Field: 136
Old Field: 145
(Note: Old field measurement taken in a different section from previous measurements, near corner closest to new field. Readings from other spots were in the 130's)

Wayland High School
September 20, 2007, 12 noon, clear, calm
Ambient: 76
Grass: 93
Track: 101
Turf: 142

* Tom Sciacca is a retired electrical engineer, whose professional work included design of computerized data acquisition systems used for precision temperature measurements, using thermal physics extensively in his circuit and systems design work. He holds a patent for a novel home heating system. A graduate of Massachusetts Institute of Technology, he is a former conservation commissioner for the Town of Wayland, Mass.