



Cost/Benefit Analysis for Artificial Turf Field

At Royal Oaks Park

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Executive Summary

This cost benefit analysis was prepared to understand the best use of natural or synthetic turf in park and joint use applications. In reviewing the cost benefit analysis, you will find the actual dollar cost for construction and maintenance over an eight-year period is less for natural turf than for synthetic turf. This may be unique to our climate, construction, maintenance and programming practices and may not apply to other climates or organizations.

Optimal demand for artificial turf:

- In sports complexes where there is a high level of competitive play and playing surfaces must be maintained in a consistent high condition.
- In areas where there are high park deficiencies resulting in more extreme levels of use for play or practice.
- Where it is important to reduce water and or chemical use.
- Where a consistently high appearance environment is needed.
- Where park or facilities deficiencies in an area on a site make it difficult to periodically close a field or area for the purpose of renovating or re-establishing a natural turf.
- As a strategy to reduce operating costs.

Natural Turf Benefits*

Groundwater preservation and recharge

1. Dense aboveground turfgrass biomass traps and holds water which reduces excess runoff and allows more water to infiltrate into the soil. Ten-thousand square feet can absorb up to 6000 gallons of water.
2. Extensive, fibrous turfgrass root system filters water percolating through the soil to enhance groundwater recharge.
3. Properly managed turfgrass ecosystems support abundant earthworm populations, which contribute to increased macropore space in the soil, resulting in higher soil water infiltration rates, higher water holding capacity, and improved soil structure.

Enhanced entrapment and biodegradation of synthetic organic compounds

1. Turfgrass systems catch and filter polluted runoff water.
2. Decaying turfgrass leaves, crowns, stems, roots, and thatch support large populations of microscopic decomposers that reside in the soil. Soil microbes also decompose pesticides, potentially noxious organic chemicals, and various bacteria producing bodily fluids such as blood, vomit, spit, and phlegm.

Soil erosion control and dust stabilization

4. Turfgrass root systems and aboveground canopy are one of the most cost-efficient ways to control water and wind erosion of soil and increase water infiltration into the soil.
5. Turfgrass functions as a vegetative filter that reduces the quantity of sediment entering surface streams and rivers.
6. High shoot density and root mass of turfgrass contributes to soil surface stabilization to reduce erosion. A high biomass matrix provides resistance to lateral surface water flow.
7. Turfgrasses act as a trap for dust and other particulate matter, improving air quality.

Improved atmospheric conditions

1. Turfgrass contributes to reductions in noise levels by absorbing, deflecting, reflecting, and refracting the various sounds. There are also reductions in discomforting glare and light reflection.
2. Turfgrass reduces atmospheric carbon dioxide and releases oxygen. Grass plants produce their own food through the process of photosynthesis. The plants take in carbon dioxide and convert it into simple sugars. As a result of photosynthesis and taking up of carbon dioxide, oxygen is released into the atmosphere.
 - a. During an active growing season, 25 square feet of healthy turf will provide enough oxygen for one adult person for one day.

Substantial heat dissipation-temperature moderation

1. Turfgrass dissipates high levels of radiant heat through the cooling process of transpiration.

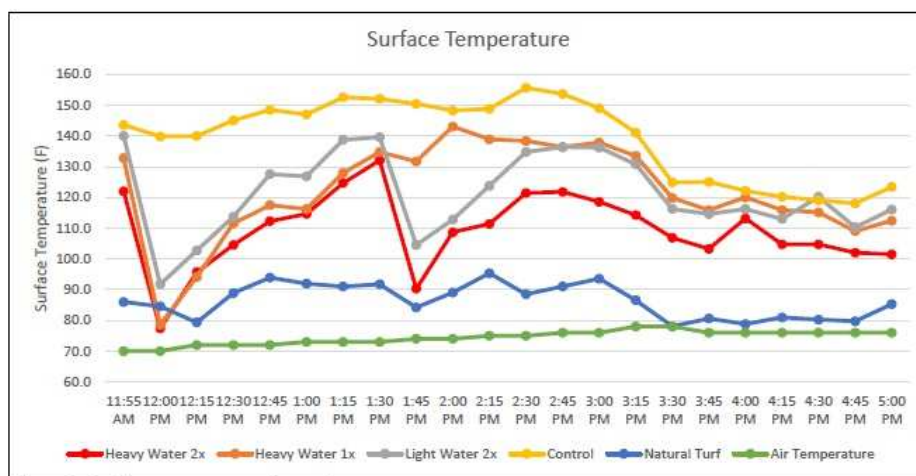


Figure 1. Surface temperatures for each treatment.

Table 1. Surface temperature for each treatment

Time	Heavy Water 2x	Heavy Water 1x	Light Water 2x	Control	Natural Turf	Air Temp.	Solar Radiation (W/m ²)
11:55 AM	122.0	132.8	140.0	143.6	86.0	70	932.0
12:00 PM	77.4	78.6	91.8	139.8	84.6	70	932.6
12:15 PM	95.7	94.1	102.7	140.0	79.3	72	749.8
12:30 PM	104.5	111.6	113.7	145.0	88.9	72	936.4
12:45 PM	112.3	117.5	127.6	148.5	93.9	72	979.9
1:00 PM	114.6	116.2	126.9	147.0	91.9	73	1055.2
1:15 PM	124.7	127.9	138.7	152.6	91.0	73	966.6
1:30 PM	132.1	134.8	139.6	152.1	91.8	73	958.6
1:45 PM	90.3	131.7	104.5	150.4	84.2	74	985.3
2:00 PM	108.7	143.1	112.8	148.3	89.1	74	949.0
2:15 PM	111.4	138.9	123.8	148.8	95.4	75	948.9
2:30 PM	121.5	138.4	134.8	155.7	88.5	75	1039.7
2:45 PM	121.8	136.4	136.4	153.7	91.0	76	899.3
3:00 PM	118.6	137.8	136.2	149.0	93.6	76	669.8
3:15 PM	114.3	133.5	130.8	141.1	86.5	78	828.9
3:30 PM	106.9	119.8	116.2	124.9	78.1	78	428.9
3:45 PM	103.3	115.9	114.6	125.1	80.6	76	721.2
4:00 PM	113.2	120.0	116.2	122.2	78.8	76	678.0
4:15 PM	104.7	115.9	113.0	120.2	81.0	76	620.3
4:30 PM	104.7	115.2	120.2	119.1	80.2	76	738.0
4:45 PM	102.0	109.0	110.3	118.0	79.7	76	454.1
5:00 PM	101.5	112.5	116.1	123.4	85.3	76	539.1

Treatments

- Heavy Water 2x – Irrigation (approximately 0.75") applied at both 12:00 PM and 1:30 PM
- Heavy Water 1x – Irrigation (approximately 0.75") applied at 12:00 PM
- Light Water 2x – Irrigation (approximately 0.10") applied at both 12:00 PM and 1:30 PM
- Control – No irrigation
- Natural Turf – Perennial ryegrass (*Lolium perenne*), no irrigation

****Penn State's Center for Sports Surface Research. 2012. Synthetic Turf Heat Evaluation – Progress Report. Available online:***
<http://plantscience.psu.edu/research/centers/ssrc/documents/heat-progress-report.pdf>
(verified 6/26/15)

Natural Turf Cons*

Wear & Tear

1. Fully programmed schedules cause wear and tear that detract from the fields aesthetic and overall turf health causing ruts, worn and bare areas.
2. Areas of high use (goalie box, center of flag football field and the crown of the fields) see exponentially more wear given their constant use.

Pesticides/ Fertilizer

1. In order to deter weed and insect overpopulation, pesticides and chemicals must be utilized.
2. A consistent fertilizer application plan is needed in order to maintain uniform green and dense turf.

Rainouts/ Saturation

1. Heavy saturation due to rain require anywhere from 2-8hrs of dry heat in order to resume play (sometimes days if direct sunlight is not inherent).
2. Heavily saturated fields are more susceptible to damage and is played on can cause injuries due to poor traction.

Maintenance

1. Natural Turf requires much more maintenance and oversight in order to keep standards.
2. Labor hours are higher for natural Turf
3. Field Painting will need to be completed weekly.

Artificial Turf Benefits*

Water Conservation

1. A typical grass sports field can use between 500,000 to a million gallons of water each year. Synthetic turf allows communities to conserve that water, which is particularly critical during times of drought. During 2008, more than 2.2 billion gallons of water was saved in North American schools, parks and professional sports stadiums.
2. Switching to synthetic grass allows consumers and businesses to save significantly on their water bills. Users often recover the installation costs within a few years by reducing the need for water and lawn maintenance costs.
3. A typical lawn of 1800 square feet can require 56,000 gallons of water for maintenance each year. Synthetic grass enables homeowners to conserve that water. Tax credits and rebates are being offered to residential and corporate users by an increasing number of local governments in light of the tremendous impact on water conservation.

Playability, Aesthetics and Hours of Use

1. Synthetic turf is a smart solution for overused, unsafe playing fields. A grass field simply cannot remain lush and resilient if it is used more than three to four days a week, or in the rain, or during the six months of the year when grass doesn't grow – otherwise the surface will become an unsafe, rock-hard, dirt field.

2. Communities need accessible, versatile play surfaces for youth and people of all ages. Parks and sports fields with synthetic turf promote year-round activity on safe and resilient surfaces. Increased activity helps reduce childhood obesity and promotes well-being.
3. Because synthetic turf can withstand so much wear and tear, many schools rent their synthetic turf fields to local sports team and organizations to bring in extra funding. In addition, reducing sports field maintenance budgets frees up new funds for the classroom.

**Synthetic Turf Council, Benefits of Synthetic Turf,*

www.syntheticturfCouncil.org/resource/resmgr/media/benefits_of_synthetic_turf.pdf.

Artificial Turf Cons

High heat dissipation

1. Most studies show a 30-40 degree increase in artificial turf temperatures versus natural turf.
2. This heat calls for increased watering for cooling purposes.
3. Given our climate, this can call for heat cancellations once surface temperatures reach extremely unsafe conditions (studies being preformed now to determine a threshold).

Heavy Financial Burden

1. On average turf fields can cost anywhere from high \$400,000's up to \$1,000,000 for construction and will require to be replaced every 10 years or so.
2. Although there is reduced maintenance cost, Artificial Turf is not maintenance free; Maintaining Artificial Turf requires additional machinery, which in turn equates to additional funds to maintain said machinery.

Crumb Rubber

1. In order to maintain a safe playing surface that is not too hard, companies utilize recycled rubber tire parts to help with shock absorbance. These small crumbs end up in socks, shoes, hair and stuck to individuals which will later need to be re-infilled.
2. Although studies due not show any harm coming from children playing on this material even when temperatures rise well over 120 degrees, there are gasses that are released from the rubber particles which are absorbed.
 - a. It should be noted that ingesting these materials however can be dangerous.

Permanent Lines

1. Use of the field will be less flexible given the use of permanent lines which are laid with the Turf.
2. Additional fields would still require painting.

Parameters for Analysis

- 320ft x 185ft field (59,200sqft which was rounded to 60,000sqft or 1.377acres)
- The conversion would take place on field #4 at Royal Oaks Park
- All current maintenance costs generated were derived from existing practices within contract scope
- All cost projections were based off vendor estimates and where a range was given we calculated the median price
 - Construction of Turf Fields Include:
 - Excavation and debris hauling of existing soil

- Subbase drainage system to allow for positive drainage (storm water engineering)
- Laying of Turf: with fixed fields (two (2) flag football, two (2) small sided soccer, and one full size soccer)
- All permits necessary
- Infill laying
- Furnish one tow behind broom/sweeper piece of equipment

Location



Hours of Operation

Park Hours: Monday-Sunday 7am-10pm

Scheduled Athletic Use: Monday – Friday 6pm-10pm & Saturday 8:30am-4pm

Vendor List

Vendors contacted for estimates:

- FieldTurf
- Mixto (through local provider “Hellas Construction”)
- Synthetic Lawns- No Response
- Nidy Sports- No Response

ARTIFICIAL TURF COST BENEFIT ANALYSIS

COMPANY NAME	Town of Miami Lakes			DATE CONDUCTED	8/1/2018
PROPOSED PRODUCT / INITIATIVE / SERVICE	Converting one full size field to artificial turf- FieldTurf			COMPLETED BY	J.A.B
CONSTANT OR CURRENT DOLLARS/YEAR	\$	40,172.68	STATUS QUO OR ALTERNATIVE	Status Quo	2018-2026

NATURAL GRASS COSTS								
COST PROFILE	YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5	YEAR 6	YEAR 7	TOTAL
Agronomics (w/ field painting)	\$ 16,539.62	\$ 16,539.62	\$ 16,539.62	\$ 16,539.62	\$ 16,539.62	\$ 16,539.62	\$ 16,539.62	\$ 132,316.96
Equipment	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Annual Resod (optional)	\$ 10,000.00	\$ 10,000.00	\$ 10,000.00	\$ 10,000.00	\$ 10,000.00	\$ 10,000.00	\$ 10,000.00	\$ 80,000.00
Labor (for one field)	\$ 13,633.06	\$ 13,633.06	\$ 13,633.06	\$ 13,633.06	\$ 13,633.06	\$ 13,633.06	\$ 13,633.06	\$ 109,064.48
Total 8 Year Cost								\$ 321,381.44

ARTIFICIAL TURF COSTS- FIELD TURF								
COST PROFILE	YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5	YEAR 6	YEAR 7	TOTAL
Construction of field (w/ equipment & field painting)	\$ 510,000.00	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 510,000.00
Maintenance	\$ 5,000.00	\$ 5,000.00	\$ 5,000.00	\$ 5,000.00	\$ 5,000.00	\$ 5,000.00	\$ 5,000.00	\$ 40,000.00
Patchwork	\$ 437.50	\$ 437.50	\$ 437.50	\$ 437.50	\$ 437.50	\$ 437.50	\$ 437.50	\$ 3,500.00
Logo at center field (optional)	\$ 12,000.00	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 12,000.00
	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Total 8 Year Cost								\$ 565,500.00

CUMULATIVE COST-BENEFITS PROFILE	YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5	YEAR 6	YEAR 7	YEAR 8	TOTAL
CUMULATIVE PRESENT VALUE TOTAL	\$ 40,172.68	\$ 40,172.68	\$ 40,172.68	\$ 40,172.68	\$ 40,172.68	\$ 40,172.68	\$ 40,172.68	\$ 40,172.68	\$ 321,381.44
CUMULATIVE PROJECTED TOTAL	\$ 527,437.50	\$ 5,437.50	\$ 5,437.50	\$ 5,437.50	\$ 5,437.50	\$ 5,437.50	\$ 5,437.50	\$ 5,437.50	\$ 565,500.00

QUALITATIVE BENEFITS	RELATED PARK OBJECTIVES	MEASURE OF EFFECTIVENESS
FieldTurf comes with 8yr warranty	Guaranteed quality	
FieldTurf field will be available year round	Reduced closures means year round use for park patrons	
FieldTurf can handle 4x more play	Less wear and bare areas after seasons	
FieldTurf will maintain aesthetics and playability throughout seasons	Always a clean look	
FieldTurf will reduce water consumption for irrigation	Water and money savings	
FieldTurf field will encounter less cancelled games	Smoother seasons with less rescheduled activities	

ARTIFICIAL TURF COST BENEFIT ANALYSIS

COMPANY NAME	Town of Miami Lakes			DATE CONDUCTED	8/1/2018
PROPOSED PRODUCT / INITIATIVE / SERVICE	Converting one full size field to Hybrid Artificial Turf- Mondo			COMPLETED BY	J.A.B
CONSTANT OR CURRENT DOLLARS	\$	42,172.68	STATUS QUO OR ALTERNATIVE	Status Quo	2018-2026

NATURAL GRASS COSTS								
COST PROFILE	YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5	YEAR 6	YEAR 7	YEAR 8
Agronomics (w/ field painting)	\$ 16,539.62	\$ 16,539.62	\$ 16,539.62	\$ 16,539.62	\$ 16,539.62	\$ 16,539.62	\$ 16,539.62	\$ 16,539.62
Labor (for one field)	\$ 13,633.06	\$ 13,633.06	\$ 13,633.06	\$ 13,633.06	\$ 13,633.06	\$ 13,633.06	\$ 13,633.06	\$ 13,633.06
Annual Resod (optional/ as needed)	\$ 12,000.00	\$ 12,000.00	\$ 12,000.00	\$ 12,000.00	\$ 12,000.00	\$ 12,000.00	\$ 12,000.00	\$ 12,000.00
	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Total 8 Year Cost								\$ 337,381.44

ARTIFICIAL GRASS COSTS- MIXTO HYBRID TURF SYSTEM								
COST PROFILE	YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5	YEAR 6	YEAR 7	YEAR 8
Construction of field (w/ equipment & field line inseams)	\$ 1,054,718.00	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Maintenance	\$ 5,000.00	\$ 5,000.00	\$ 5,000.00	\$ 5,000.00	\$ 5,000.00	\$ 5,000.00	\$ 5,000.00	\$ 5,000.00
Patchwork	\$ 437.50	\$ 437.50	\$ 437.50	\$ 437.50	\$ 437.50	\$ 437.50	\$ 437.50	\$ 437.50
								\$ -
	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Total 8 Year Cost								\$ 1,098,218.00

CUMULATIVE COST-BENEFITS PROFILE	YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5	YEAR 6	YEAR 7	YEAR 8
CUMULATIVE PRESENT VALUE TOTAL	\$ 42,172.68	\$ 42,172.68	\$ 42,172.68	\$ 42,172.68	\$ 42,172.68	\$ 42,172.68	\$ 42,172.68	\$ 42,172.68
CUMULATIVE PROJECTED TOTAL	\$ 1,060,155.50	\$ 5,437.50	\$ 5,437.50	\$ 5,437.50	\$ 5,437.50	\$ 5,437.50	\$ 5,437.50	\$ 5,437.50
								\$ 1,098,218.00

QUALITATIVE BENEFITS	RELATED PARK OBJECTIVES	MEASURE OF EFFECTIVENESS
Byr warranty	Guaranteed quality	
Available year round	Reduced closures means year round use for park patrons	
Can handle 4x more play	Less wear and bare areas after seasons	
Maintain aesthetics and playability throughout seasons	Always a clean look	
Reduce water consumption for irrigation	Water savings	
Will encounter less cancelled games	Smoother seasons with less rescheduled activities	

Analysis Summary

Upon completing this cost analysis, the results and financial numbers show how constructing and even maintaining an artificial field long term could cost 50.53-105.99% more every eight years. Given, there are some pros that can prove to be advantageous in regard to operations, playability and aesthetics; Artificial Turf will overall require a higher input of financial backing in order to obtain desired results.