Hillsborough Recreation Department

Synthetic Turf Feasibility Study

At Crocker Middle School
and
North Elementary School

February 19, 2013

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VERDE DESIGN

cpm. complexity simplified.

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I. Executive Summary

Capital Program Management, Inc. and Verde Design were commissioned to prepare a feasibility study of either improving the existing natural grass fields at Crocker Middle School and North Elementary School or replacing the existing play surfaces with synthetic turf. Meetings were conducted with the design team, and representatives of the Hillsborough Recreation Department, and the Hillsborough City School District. The proposed project area was walked and evaluated for potential field improvements at both schools. Multiple design concepts were developed and presented to the Department / District staff. Based on comments and feedback, the designs were consolidated into two concepts as provided in Appendix "A" of this report. Also a Master Plan was developed to ensure that the new field layouts would accommodate a future tennis court expansion project. A copy of the Master Plan is also located in Appendix "A".

Concept A is to only make improvements to the North field and Concept B is to make improvements at both the North and Crocker fields. Both concepts include the option to either replace the existing turf with synthetic turf or to replace with natural turf. Either concept will require review and approval from the Division of the State Architect (DSA) for handicapped accessibility. This will trigger the need to install the code required handicapped accessibility accommodations. These requirements include new accessible access ramp(s) to the play field(s), accessible toilet room facilities, and accessible drinking fountains. Both concepts include re-grading, new sub-grade drainage, and the required mitigation of the storm drainage run-off. The improvements at the North field include a new perimeter track around the playfield area. The improvements at the Crocker field include a new retaining wall to increase the usable field area.

The conceptual project budget for renovating just the North field (Concept A) with natural grass is approximately $1.4 Million. The same scheme with synthetic turf is approximately $2 Million. The conceptual project budget costs for renovating both the North and Crocker (Concept B) fields with natural grass is approximately $2.5 Million and $3.8 Million to replace with synthetic turf. Note that the above budget numbers are escalated to account for inflationary factors for only 1-year which would be the soonest this project could be implemented. Please refer to Appendix "B" for detailed breakdown of the budget.

This field study evaluates annualized replacement / renovation costs associated with natural grass as compared to synthetic turf. Also it addresses the amount of use each athletic surface would successfully support. Synthetic turf can essentially allow for three times as much play on its surfaces compared to natural grass, which is due to the reality that grass cannot take the wear that synthetic turf can accommodate. In addition, natural grass surfaces need to be closed during inclement weather to protect the surface, and the fields need to be closed annually for renovation practices such as top dressing and overseeding.

The analysis includes a ten year life cycle cost for the field areas. When natural grass and synthetic turf field surfaces are considered, including annual costs such as water usage, maintenance costs, and field replacement at the end of the ten year life cycle, synthetic turf surfacing will only cost slightly more than natural grass.

The quantity of annual hours of use for each field surface was also considered, which allowed for the comparative cost of each surface type per hour of field use. Based on capital and annual maintenance / usage costs, each hour of field use for a natural grass field is approximately three times as expensive compared to the cost of a hour of synthetic turf field usage. This is largely due to the number of hours of play that a synthetic turf field can accommodate, as well as the annual costs that are burdened in maintaining a natural grass surface.

When these types of cost evaluations are provided, synthetic turf can appear attractive to a number of owners once you look beyond the initial construction costs.

II. Introduction

Capital Program Management (CPM) and Verde Design have been tasked to provide a comparative analysis for renovating the existing natural grass play field or replacing the two fields at Crocker and North Schools with synthetic turf. We also reviewed the existing uses of these two fields. This data for each play field is provided as attached spreadsheets that were provided by the Hillsborough Recreation Department. Verde Design identifies the recommended hours of use for these natural grass play fields, as well as the projected hours of use that would be possible if the fields were redeveloped with synthetic turf.

In subsequent sections of the document we provide an analysis for comparing these two field surfaces based on the following criteria:

1) Existing Field Use
2) Water Conservation
3) Maintenance
4) Operational Costs (inclusive of potential hidden costs)
5) Risk Management

This analysis will discuss issues of natural grass and synthetic turf from these points of view. Each surface has advantages and disadvantages of using one over the other, though some of these are open to opinion and discussion. This document is an attempt to make the comparison as objective as possible. Many communities are burdened with field overuse and a growing community demand. We feel that most users and the community as a whole would prefer a well maintained natural grass field, but in many instances a synthetic turf field can align better with the demand and type of use that the field is ultimately exposed to on a regular basis.

III. Programming Meetings Summary

Meetings were held on November 16, 2012 and December 11, 2012 with representatives from the Hillsborough Recreation Department and the Hillsborough City School District. The purpose of the meetings was to allow the CPM / Verde Design team to hear from the owner how the fields at Crocker / North Schools are utilized and the limitations and challenges they posed from a perspective of use, maintenance, and field condition. The Department provided information in terms of seasonal usage for the fields, as well as maintenance activities that were prescribed for the fields by an outside consultant.

The first meeting spoke to the process, the final deliverables for the February 2013 Recreation Commission meeting, and the specifics of how the fields were used and the issues that the fields have experienced due to wear, weather, and maintenance. The subsequent meeting provided the owner an opportunity to review concepts developed by CPM / Verde Design for potential synthetic turf field layouts at both fields. Comments and preferences were noted in the meeting and concepts were refined and focused to the stated needs of the owner representatives. These recommendations are now incorporated into the two concepts.

Turf Study – Hillsborough Recreation Department

Attendees for both meetings:

- Tony Giacomazzi, Hillsborough Recreation Department - Director
- Larry Raffo, Hillsborough City School District – Facility Department
- Rollie Carr, Hillsborough City School District – Maintenance & Operation Department
- Will Murphy, Hillsborough Recreation Department – Fields Maintenance
- Devin Conway, Verde Design
- Ron Edwards, Verde Design
- Mike Wassermann, Capital Program Management

A. **Initial Turf Study:** The following items were discussed by the District / Department staff during the initial meeting on November 16, 2012.
   - Ownership of the fields is with the School District. The Recreation Department is a joint powers entity with members of the commission comprised of two board members from Hillsborough City School District, two council members from the Town of Hillsborough, and a community member at large.
   - Town of Hillsborough would likely have a financial vested interest in converting one of the fields to synthetic turf.
   - Concours D'Elegance Event at Crocker / North, which was always a concern for transitioning either of these two fields (especially North) to synthetic turf, is no longer held at these schools and is now off site. This was a significant hurdle in

terms of vehicle access, turf protection, and logistics from limiting exposure of damage to the new synthetic turf.

- Both schools are technically off limits to dogs, but that is not the reality as the fields are used due to their park-like setting and open access. It is not uncommon to have dogs off leash on the fields (especially outside of school hours). The general sentiment by staff is that dog owners who frequent these fields would be against synthetic turf.
- There is no specific use dog park within Town limits, which can be a hot button issue among that user group.
- North field is used more by dog owners and outside groups (both permitted and unauthorized / unofficial users) due to the larger field size and easier access and adjacency to parking.
- Larger groups such as youth baseball, lacrosse and soccer groups have annual contracts. Others that have permits to use the fields do so on "per use" rates.
- Drainage issues have been a primary concern on both fields from the maintenance perspective.
- If synthetic turf is installed at either field, maintenance will want to have access along the field perimeter for maintaining the trees and landscaping outside the field area.
- The existing two tennis courts that separate the two field areas are used heavily by the community.
- Desires for any field renovation include keeping at least one full size youth baseball backstop and the opportunity to utilize smaller portable backstops that will not damage the playing surface.
- A perimeter pathway that can act as a track / jogging surface would be desirable, especially if it has an all-weather surface like most high schools. It could also double as the maintenance pathway, provided it was wide enough for vehicles and the surface would not be damaged.
- Desire by owner is any field improvements will allow for more total use by eliminating the need to close the field during inclement weather and for grass rehabilitation period.
- There is no desire to add field lighting or increase the number of hours of use or more user groups.

B. **Conceptual Improvement Plans:** The following items were discussed by the District / Department staff during the initial meeting on December 11, 2012.

- We reviewed several different preliminary schemes. It was agreed to create two schemes, one that was for the improvements at North only and a second that would include both Crocker and North. Both concepts would have the option for either natural turf of synthetic turf.

- The existing Crocker field is fairly large but is awkwardly shaded to maximize the layout of the play fields. It was suggested that a retaining wall along Ralston Avenue be included to maximize the field areas.

- We reviewed the location of the backstop at Crocker and considered relocating, but due to concerns with foul balls and the proximity to Ralston Avenue decided to retain its current location.

- The previously proposed expansion to the tennis courts was included on the various conceptual plans. It was agreed to remove this from the proposed field improvement plans since it is not part of this feasibility study. However, it was important to make sure we provided enough room to accommodate the potential future project.

- The master plan that was created for the Measure B bond program also needed to be considered to ensure that the new field improvement project would not preclude the ability for the School District to implement its master plan in the future.

- We discussed the CEQA requirements and need to include those costs in the project budget.

IV. Existing Field Use and Condition

The play fields at Crocker Middle School and North School are native soil natural grass. Crocker's field has a skinned infield and backstop at the northernmost corner. Separating these two field areas is an approximate nine foot tall slope and two tennis courts. The fields are used for youth baseball, soccer, flag football, lacrosse and other organized team sports.

Crocker Field from southern corner

North Field from parking lot sidewalk

Field use hours in the Fall and Spring, when most of the organized use is scheduled with the Recreation Department, are as follows:

Crocker Field

1. Monday thru Friday: approx. 2-3 hours/day plus physical education classes
2. Saturday: approx. 8 hours/day
3. Sunday: approx. 3 hours/day

North Field

1. Monday thru Friday: approx. 2 hours/day plus physical education classes
2. Saturday: approx. 7-8 hours/day
3. Sunday: approx. 4-5 hours/day

Due to the poor drainage and water infiltration rates, the fields have to be regularly closed from use in the rainy season. They also have to be closed for rehabilitation in preparation for the upcoming school year. The result is that the fields cannot be used as often as necessary during the year.

We recommend that for typical heavy impact activities such as soccer, lacrosse and flag football, clay soil dominated natural grass fields should not exceed five hours of use per day. In addition, the use of the field for these types of activities should be restricted during rain events and when the fields are near saturation as the activities will further compact the soils and damage the turf surface. With these considerations, the native soil natural grass play fields at Crocker and North field can successfully accommodate up to 1225 hours annually.

In comparison, synthetic turf fields do not have this same limitation as it is not millions of living plants. The synthetic turf will not require the field to be closed for the standard two months a year maintenance period, which would provide a possible 3,240 hours of play a year. This increase of leasable hours also enables the Recreation Department to increase revenue while decreasing maintenance and water costs.

Below is a chart showing the recommended days and hours of use that the two types of playing surfaces can generally accommodate. In a general sense, it would be reasonable to assume that for a natural grass surface to be considered well maintained, playable and aesthetically pleasing, it could provide approximately 1/3 the annual amount of usage that a synthetic turf field could provide for the same types of uses.

	Natural Grass	Synthetic Turf
Estimated Days of Use Per Year (less 75 rest, 30 avg. rain days, 15 wet days)	245	360
Acceptable Hours/Day of use for heavy impact activities	5	9
Annual hours available	1,225	3,240

V. Water Conservation:

Typical native soil natural grass fields use on average 900,000 gallons of water per year. This equates to approximately 1,295,100 gallons and 1,660,500 gallons used annually to water the Crocker and North Schools' fields, respectively. Renovating the natural turf fields will likely not noticeably reduce the watering requirements for the field areas. This is because any reductions created due to improved irrigation would likely be largely offset by better draining soils, thus increasing the need for additional water.

Alternatively, if these field areas are reconstructed as synthetic turf fields, essentially the amount of water used on these fields will drop to nominal levels. Water would still be required to periodically clean the fields. In other climates water is also typically used on the fields to cool the playing surface. However, this will not be a significant issue in Hillsborough due to the temperate micro-climate.

Synthetic turf fields can preserve a valuable resource (water). In addition, the elimination of the water can result in significant cost savings. If both of the play fields were to become synthetic turf, based on the current rate that the Town of Hillsborough charges the Hillsborough City School District for water usage ($6.28 per unit of water), the District would save approximately $25,000 per year. This would likely equate to approximately $250,000 during the life of these turf fields.

VI. Maintenance and Operation Costs

A native soil natural grass field requires several methods of field maintenance. The most common type of regular field maintenance is mowing of the grass, which will occur roughly 80 times per year per field. The field is typically also fertilized and knife aerated on a monthly basis. Less frequent maintenance activities on a natural grass playing field include annual deep tine aeration, grass overseeding, and sand top dressing, as well as spot irrigation and sod repair as needed. This level of work on a natural grass play field can exceed $25,000 per acre each year.

A synthetic turf field, in contrast, typically will have considerably less field maintenance. This is usually limited to pick up of trash (as needed) and field grooming, which is recommended to occur every 6-8 weeks. There is also significantly less setup time because the sports field lines can be permanently installed, eliminating the need for striping the field prior to each game or event. This grooming and field cleaning on the synthetic turf play field can cost between $8,000-10,000 per acre each year.

One consideration also to consider is that waterfowl tend to like synthetic turf less than natural grass, as it does serve as a food source. This in turn reduces maintenance and the sanitation concerns related to excrement and other bird-related issues.

The operational costs can be broken down to staff, material, and usage rates. As noted in prior sections, the annual cost to maintain the two existing native soil natural grass fields at Crocker and North can exceed $80,000 cumulative of these above costs. In comparison, synthetic turf in these two field areas would have annual operational cost savings of approximately $60,000 compared to natural grass field areas. See table on the next page for a comparative analysis for field operational costs for both surface types.

Natural Grass versus Synthetic Turf - North Field Comparison

Annual Maintenance and Irrigation	Natural Grass	Synthetic Turf
Mowing – 80,400 sf (1.85 ac.) @ 0.5 ac/hr x $50/hr - 80 times per year	$14,800	$0
Irrigation Repair	$2,500	$0
Annual Turf Repair	$4,000	$500
Overseed - one annual application of grass	$13,000	$0
Aeration / knife Bermuda - 4 times per year	$16,000	$0
Top Dressing - 2 times	$4,500	$0
Fertilize & Materials	$3,500	$0
Watering (natural grass assume 1,200 units/ ac/ year @ $6.28/ unit)	$13,940	$1,000
Debris / Trash pick-up (labor cost estimate)	$5,000	$8,000
Field Grooming (6 x per year)		$7,500
Estimated Annual Maintenance and Irrigation Cost	**$77,240**	**$17,000**

VII. Risk Management

The risk of continuing to maintain natural grass playing fields is that someday someone could get injured due to a deterioration of the playing field surface. Due to the commitment of the District's maintenance staff and its dedication to keep the fields in good condition, it would seem that this is an unlikely scenario. However, the challenges in keeping the playing fields in optimum condition, as well as the lost hours due to winter weather and the impacts of rain on the fields, are noted and the District has wanted to evaluate the opportunities and challenges in rebuilding the two field areas in synthetic turf.

Natural grass is a living plant that generates oxygen and lowers the carbon footprint. Generally speaking people have an emotional connection with natural grass. It smells good, looks good and feels good. However, one match on a muddy field can ruin the field for a good portion of the season. The fertilizing and watering demands for the fields are not ideal, but effective maintenance can provide a quality playing field surface.

By contrast, synthetic turf does not require the use of pesticides or fertilizers, and water use is limited to pre/post event watering as needed to wash down the field. Several published studies have documented that synthetic turf results in fewer injuries than on natural grass fields, largely due to most natural turf fields' uneven playing surfaces, dry/hard soil, ruts, gophers, and sprinkler heads. Some tradeoffs to synthetic turf can include the potential negative emotional appeal because the field is seen as "plastic." Also, when first installed synthetic fields can smell like tires due to crumb rubber infill. Surface temperatures can be considerably higher than those of natural grass. In some cases, we have seen over 50 degrees difference between the two playing surfaces during warm and hot days.

Also regarding synthetic turf, some perceptions and misunderstandings include that breathing in the 'smell' of the recycled tire rubber is harmful to your health, especially as the infill gets hotter. This has been determined to not be accurate according to the 2010 California State Office of Environmental Health Hazard Assessment (OEHHA) study. The study concluded that from the air samples collected from above synthetic turf, the VOC concentrations were below the limit of detection. It was also found that there is no correlation between the concentrations or types of VOCs above synthetic turf and the surface temperature.

Another study tackled the concern around staph infections, less commonly known as methicillin-resistant staphylococcus aureus (MRSA). The turf products have been claimed to be an ideal growing medium of various bacterium, most notably MRSA. This has been studied extensively, including a report written by Dr. Andy McNitt of Pennsylvania State University. Dr. McNitt and his team tested twenty fields between 2006 and 2007. They found no presence of staph bacteria or MRSA, and actually determined that synthetic turf, and the associated infill, is not a hospitable environment for microbial growth. And that natural grass and soil is a far better microbial growth environment than synthetic turf. In addition, the OEHHA study also found that fewer bacteria (MRSA and other *Staphylococci* capable of infecting humans) were detected on synthetic turf compared to natural grass.

Another finding by the American Journal of Sports Medicine, during a study of high school athletes' injuries, found that play on synthetic turf resulted in high rates of skin abrasions and muscle strains. However, head injuries (i.e. concussions) and ligament tears were more prevalent on natural grass fields.

There have also been reports of lead in the synthetic turf products. While prior generations of synthetic turf, the original Astro Turf and others, had some levels of lead in the turf fibers, currently supplied turf products (including those being considered for this project) are "lead free." Testing of the installed products on other facilities show levels of lead that are equivalent to 1/5 that allowed in children's toys per the Consumer Product Safety Commission (CPSC) guidelines.

VIII. California Environmental Quality Act (CEQA)

The California Environmental Quality Act (CEQA) must be addressed for all projects being contemplated in the State. The conversion of an existing natural turf field to synthetic turf is no exception. Different entities have addressed the compliance with CEQA differently. Some have considered the action as "Categorically Exempt" thus requiring no action be taken. While others have taken the extreme opposite position and considered the action significant, thereby requiring a full "Environmental Impact Report". The recommended approach is to prepare an "Initial Study" to determine the impacts and then mitigate them to less than a significant level. This is referred to as a "Mitigated Negative Declaration". There is no real standard determinations since different turf conversion projects with different scope with varying site conditions, provide different levels of potential impact to the environment.

In Hillsborough, the intent of the proposed project is to replace the natural turf of the sports field with synthetic turf at Crocker Middle School and /or North Elementary school to enable HCSD to better use those facilities on a year-round basis. It is not the intent to expand the use at night with lighting and there would be no additional sports programs anticipated to use the sports fields compared to existing conditions. Based on the preliminary description provided, it appears the principal physical environmental changes would be short-term construction impacts; potential long-term changes in drainage and stormwater runoff at the fields; and the potential for turf fields to result in greater annual use and related effects on an annual basis. CPM has coordinated the necessary tasks with Environmental Science Associates (ESA) who has performed similar tasks for the Hillsborough City School District for all projects under the Measure B bond program. The following environmental review task description and cost estimates were development based on these initial assumptions.

Task 1: Initial Environmental Review

Depending on the level of detail of information available regarding the proposed project at the time of environmental review, and the range of potential environmental issues, ESA would prepare an initial environmental review document – this could take the form of an initial study checklist or a technical memorandum – and provide the substantive evidence to determine 1) if this project would be eligible for a Categorical Exemption from CEQA, and if so, that no potential exceptions would apply; or 2) these projects are ineligible for a Categorical Exemption, and therefore subject to the environmental requirements of CEQA. ESA would rely on consultation with CPM, Hillsborough Recreation Department, and HCSD, as appropriate, to describe fully the proposed improvements, to allow ESA to conduct the necessary environmental review. ESA would submit a draft copy of the initial environmental review document to CPM for review and comment.

Task 2: Categorical Exemption

If HCSD determines the projects are eligible for a Categorical Exemption, ESA would prepare and file the Notice of Exemption(s) for the project with the County Clerk. Under this scenario, CEQA environmental review and documentation (i.e., Task 3) would not be required.

Task 1 + Task 2 Costs:
Depending on complexity and the level of detail of information available regarding the proposed project, costs could range on the order of between about $7,500 and $12,000. This task assumes one field reconnaissance trip, one in-person meeting with staff, and one round of review by staff of the draft environmental document. This task assumes no quantitative transportation, air quality or noise analysis, hydrologic calculations, and/or Phase I site assessment would be required.

Task 3: Potential CEQA Review

Based on the results of Task 1, if it is determined that the proposed project is ineligible for a Categorical Exemption, ESA would provide CPM and HCSD a scope of work and cost estimate for preparing the appropriate CEQA environmental document (i.e., either a Negative Declaration [ND], Mitigated Negative Declaration [MND], or Environmental Impact Report [EIR]) to fulfill CEQA requirements.

Task 3 Costs:
Costs for formal CEQA documents can vary broadly, and for a project such as that proposed can commonly occur in the range of $30,000 to $80,000 for a ND or MND and $100,000 to $200,000 for an EIR, and in some cases, more, depending on complexity, potential controversy, and range and level of detail of environmental issues analyzed.

These costs have been included in the preliminary project budget included in Appendix “B”.

IX. Conceptual Plan and Costs

Two concept plans, Concept A and Concept B, are presented in this report. Also included is the Master Plan that addresses the proposed future expansion of the existing tennis courts. Each concept was evaluated for an overall project budget for both natural grass and synthetic turf. Concept A is to only make improvements to the North field and Concept B is to make improvements at both the North and Crocker fields. The improvements at the North field include a new perimeter track around the playfield area. This will require review and approval from the Division of the State Architect (DSA) for handicapped accessibility and will trigger the need to install the code required handicapped accessibility accommodations. These requirements include new accessible access ramp(s) to the play field(s), accessible toilet room facilities, and accessible drinking fountains. Both concepts include re-grading, new sub-grade drainage, and the required mitigation of the storm drainage run-off.

The improvements at the Crocker field include a new retaining wall ranging from 3-feet to 9-feet retained height along the Ralston Avenue frontage. This will allow for the play field usable area to be maximized, regardless if it is natural grass or synthetic turf. The infield would be synthetic turf if the field is turf, and if the field is natural grass, the infield would be a traditional skinned surface. Under both field surfacing options a new chain link backstop and team "dugouts" (fenced area with bench, but not recessed below grade) are proposed.

The conceptual project budgets include all necessary "soft" costs. These include the estimated costs for the preparation of plans and specifications, agency approval, inspection, testing, survey, CEQA consulting, printing, bidding, and project management costs. The soft costs also include contingencies for both "soft" costs and for the "hard" or construction costs. In addition, we have to anticipate inflationary costs. Currently the market is unstable and it is difficult to determine the appropriate amount of escalated costs to assume. In some recent years the amount of escalation has increased by as much as 14% and as little as a negative 4%. We have used 4% as the industry standard based on the 20-year historical average. However, this could vary significantly.

The conceptual project budget for renovating just the North field (Concept A) with natural grass is approximately $1.4 Million. The same scheme with synthetic turf is approximately $2 Million. The conceptual project budget costs for renovating both the North and Crocker (Concept B) fields with natural grass is approximately $2.5 Million and $3.8 Million to replace with synthetic turf. Note that the above budget numbers are escalated 4% to account for inflationary factors for only 1-year which would be the soonest this project could be implemented.

Please refer to Appendix "B" for detailed breakdown of the budget.

X. Conclusions and Next Steps

The evaluation of playing fields and what surface is most appropriate for a particular site and client is complex, and can be looked at from multiple perspectives, most of which are identified and discussed in this document. In terms of simple empirical data, a synthetic turf field will cost approximately three times that of a natural grass field in up front capital costs.

However, when annual recommended maintenance costs are factored into the equation, over a ten year life cycle for synthetic turf, its surface will ultimately cost approximately thirty percent more than the grass field. And when field longevity and usage hours are factored into the evaluation, the net cost per hour of use one can get on a synthetic turf field can be less than one half that of a natural grass field, largely due to the significant increase in the number of days and hours that a synthetic turf field can accommodate.

There are environmental benefits of a synthetic turf field. In addition to the significant water savings there is the elimination of chemicals being applied to the fields, as well as a significant reduction of carbon emissions and gas savings from traditional turf maintenance equipment.

On the next page is a chart that shows these general comparisons, using the North Field design as shown in Concept A as a case study.

Construction	Natural Grass	Synthetic Turf
Unit hard cost per square foot	**$4.00**	**$10.00**
Estimated Hard Cost of Construction	$321,600	$804,000
Annual Maintenance	**Natural Grass**	**Synthetic Turf**
Mowing – 80,400 sf @ 0.5 ac/hr x $50/hr - 80 times per year	$14,800	$0
Irrigation Repair	$2,500	$0
Annual Turf Repair	$4,000	$500
Overseed - one annual application of grass	$13,000	$0
Aeration / knife Bermuda - 4 times per year	$16,000	$0
Top Dressing - 2 times	$4,500	$0
Fertilize & Materials	$3,500	$0
Watering natural grass (assume 1,200 units/ ac/ year @ $6.28/ unit)	$13,940	
Debris / Trash pick up (labor cost estimate)	$5,000	$8,000
Field Grooming (6 x per year)		$7,500
Estimated Annual Maintenance Cost	**$77,240**	**$16,000**
Life Cycle Cost Comparison	**Natural Grass**	**Synthetic Turf**
Year 1 Construction	$321,600	$804,000
Maintenance	$77,240	$16,000
Year 2 previous year plus 4%	$80,330	$16,640
Year 3 previous year plus 4%	$83,543	$17,306
Year 4 previous year plus 4%	$86,884	$17,998
Year 5 previous year plus 4%	$90,360	$18,718
Minor Field Renovation (at $0.85/sf for natural turf only)	$68,340	$0
Year 6 previous year plus 4%	$93,974	$19,466
Year 7 previous year plus 4%	$97,753	$20,245
Year 8 previous year plus 4%	$101,643	$21,055
Year 9 previous year plus 4%	$105,708	$21,897
Year 10 previous year plus 4%	$109,936	$22,773
Minor Field Renovation (at $0.85/sf for natural turf only)	$68,340	$0
Synthetic Turf Replacement ($5.50/sf for turf disposal & replacement)		$442,200
10 Year life cycle cost	**$1,385,631**	**$1,438,298**
Estimated Days of Use Per Year (less 75 rest, 30 avg. rain days, 15 wet days)	245	360
Cost per day of availability based 10 yr life cycle cost	$565	$400
Cost per Hour of Availability to Play		
Hours/day OK for sustained turf growth with Soccer	5	9
Annual hours available	1,225	3,240
Cost per hour of use	**$113**	**$44**