APPENDIX

LIFE CYCLE COST ANALYSIS: SYNTHETIC VS NATURAL TURF

ASSUMPTIONS:

SYNTHETIC TURF

1. INITIAL cost to install synthetic turf (no asphalt required): for 78,000 sq. ft. (suitable for soccer as well as football): $375,000.00

2. Estimated cost to install porous dynamic base [including engineering, demolition, stabilization, materials and placement, including sod as necessary -- $200,000.00

3. Annual Maintenance Costs for Synthetic Turf -- $3500.00 (Including Prorated Cost of a Sweeper; 30 Sweepings of the Turf; Miscellaneous Repairs)

4. Annual Minimum Number of Events to be Used on the Synthetic Turf Field

   - Football Games = 20
   - Intramural/ P.E./classes = 160
   - Football Practice = 90
   - Football Playoff = 2
   - Playoff Football (Rental) = 20
   - Band Practice = 10
   - Lacrosse = 50

   TOTAL = 769

5. Total Minimum Twenty-year Life Cycle Number of Events – 15,380
6. Expected Minimum Life Cycle of Synthetic Turf – 10 years
7. Cost for Replacement of synthetic turf after ten years (fabric only) $375,000.00
8. Total life cycle cost (over 20 years in 2001$) = $1,020,000.00
The artificial grass can be used 7 to 10 times as often as a natural grass field:

### Cumulative Times a Field is used Artificial Versus Natural Grass

<table>
<thead>
<tr>
<th>Years</th>
<th>Artificial Grass</th>
<th>Annual Resodding</th>
<th>Resodding every three years</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2,000</td>
<td>76</td>
<td>76</td>
</tr>
<tr>
<td>5</td>
<td>4,000</td>
<td>380</td>
<td>380</td>
</tr>
<tr>
<td>10</td>
<td>6,000</td>
<td>760</td>
<td>760</td>
</tr>
<tr>
<td>15</td>
<td>8,000</td>
<td>1,140</td>
<td>1,140</td>
</tr>
<tr>
<td>20</td>
<td>10,000</td>
<td>1,520</td>
<td>1,520</td>
</tr>
</tbody>
</table>

The artificial grass becomes an attractive solution as it is not only more practical but also less costly financially.

### Cumulative Cost Per Use of Artificial Versus Natural Grass

<table>
<thead>
<tr>
<th>Years</th>
<th>Artificial Grass</th>
<th>Annual Resodding</th>
<th>Resodding every three years</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>$500.00</td>
<td>$76</td>
<td>$76</td>
</tr>
<tr>
<td>5</td>
<td>$1,000.00</td>
<td>$380</td>
<td>$380</td>
</tr>
<tr>
<td>10</td>
<td>$1,500.00</td>
<td>$760</td>
<td>$760</td>
</tr>
<tr>
<td>15</td>
<td>$2,000.00</td>
<td>$1,140</td>
<td>$1,140</td>
</tr>
<tr>
<td>20</td>
<td>$2,500.00</td>
<td>$1,520</td>
<td>$1,520</td>
</tr>
</tbody>
</table>
Over the lifetime of the field; the costs and usage experience can be summarized as follows:

**Total Costs:**
After about five years, the total costs maintenance and resodding natural grass equals or exceeds the total cost of an artificial grass field:

| Cumulative Cost of Artificial versus Natural Grass for a 78,000 square foot Athletic Field |
|---|---|---|---|---|---|
| Cumulative Cost | $- | $500,000 | $1,000,000 | $1,500,000 | $2,000,000 |
| Years | 1 | 3 | 5 | 7 | 9 |

- **Cumulative Costs of Artificial and Natural Grass Fields**
  - **Artificial Grass**
    - Years 1: $578,500
    - Years 5: $592,500
    - Years 10: $610,000
    - Years 15: $1,002,500
    - Years 20: $1,020,000
  - **Annual Resodding**
    - Years 1: $190,300
    - Years 5: $951,500
    - Years 10: $1,903,000
    - Years 15: $2,854,500
    - Years 20: $3,806,000
  - **Resodding every three years**
    - Years 1: $190,300
    - Years 5: $501,500
    - Years 10: $1,003,000
    - Years 15: $1,354,500
    - Years 20: $1,856,000
Life Cycle Cost Analysis:
Natural vs. Synthetic Turf

Artificial grass is an investment and the return on this investment can be evaluated by two key measures; increased usages and lower cost in the long term when compared with natural grass. Look at the numbers to see how *SmartGrass, on a cost per event basis, can mean big savings*. First, here’s the bottom line for the hypothetical example detailed below.

<table>
<thead>
<tr>
<th>Natural Grass</th>
<th>Synthetic Turf</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Cost per event</strong></td>
<td>$924.34</td>
</tr>
<tr>
<td><strong>Number of events</strong></td>
<td>1,520</td>
</tr>
</tbody>
</table>

Now, let’s look at the details. Our hypothetical example considers the costs for a 78,000 square foot field suitable for both football and soccer, over a 20 year period.

<table>
<thead>
<tr>
<th>Natural Grass</th>
<th>Synthetic Turf</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Initial cost &amp; Periodic (resodding or installation)</strong></td>
<td>$150,000&lt;sup&gt;1&lt;/sup&gt;</td>
</tr>
<tr>
<td><strong>Porous dynamic base installation</strong></td>
<td>N/A</td>
</tr>
<tr>
<td><strong>Annual maintenance costs</strong></td>
<td>$40,300&lt;sup&gt;4&lt;/sup&gt;</td>
</tr>
<tr>
<td><strong>Annual number of events</strong></td>
<td>76&lt;sup&gt;6&lt;/sup&gt;</td>
</tr>
<tr>
<td><strong>Turf fabric replacement after 10 years</strong></td>
<td>N/A</td>
</tr>
<tr>
<td><strong>Additional resoddings over 20 year period</strong></td>
<td>$450,000&lt;sup&gt;8&lt;/sup&gt;</td>
</tr>
<tr>
<td><strong>Total 20 year cost in 2001 dollars</strong></td>
<td>$1,405,000</td>
</tr>
</tbody>
</table>

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<sup>1</sup> Excludes excavation, irrigation system, drainage, etc.
<sup>2</sup> No asphalt required.
<sup>3</sup> Includes engineering, demolition, stabilization, materials and placement, sod as necessary.
<sup>4</sup> Athletic-caliber football stadium field. Mowing, maintenance, water, equipment at $30,000, overseeding at $600, fertilizer at $8000, wetting agents at $1200, weed treatment at $500.
<sup>5</sup> Includes prorated sweeper cost, 30 turf sweepings, miscellaneous repairs.
<sup>6</sup> Varsity Football (12), Varsity Practice (20), Playoff (2), Band/Dance/PE (15), Soccer (25), Graduation (2)
<sup>7</sup> Football Games (20), Football Practice (90), Football Playoff (2), Rental for Playoff Football (5), Intramural/PE/Classes (160), Soccer Games m/w (45), Soccer Practice (160), Field Hockey (60), Lacrosse (50), Miscellaneous Community Use (50), Band Practice (10), Graduation (2)
<sup>8</sup> Number of additional resoddings is 3.0.
LIFE CYCLE COST COMPARISON
NATURAL VS. SYNTHETIC

FORMULA I (TOTAL LIFE CYCLE COST):

\[
\text{cost of initial } + \text{[cost of annual } \times 20 \text{ yrs]} + \text{cost of turf} = \text{LIFE CYCLE COST}
\]

\begin{align*}
\text{installation} & \\
\text{maintenance} & \\
\text{replacement} & (\text{Synthetic})
\end{align*}

\[\text{vs.}\]

\[
\text{cost of initial } + \text{[cost of annual } \times 20 \text{ yrs]} + \text{cost of} = \text{LIFE CYCLE COST}
\]

\begin{align*}
\text{installation} & \\
\text{maintenance} & \\
\text{resodding} & (\text{Grass})
\end{align*}

FORMULA II (PER USE COST):

\[
\text{cost of } + \text{cost of annual maintenance } \times 20 \text{ yrs} / \# \text{ events} = \text{PER USE COST}
\]

\begin{align*}
\text{installations} & \\
\text{per yr } \times 20
\end{align*}

TOTAL LIFE CYCLE COSTS

SYNTHETIC TURF
575,000 + (3500 \times 20) + 375,000 = $1,020,000.00

NATURAL GRASS
150,000 + (40,300 \times 20) + 450,000 = $1,405,000.00

PER USE COSTS

SYNTHETIC TURF
\[
1,020,000 / 15,380 = \text{\$66.32 COST PER EVENT / USE}
\]

NATURAL GRASS
\[
1,405,000 / 1,520 = \text{\$924.34 COST PER EVENT / USE}
\]
1. **Estimated cost for resodding new natural grass field (excluding excavation, irrigation system, drainage, etc.):** $150,000.00

2. **Annual (estimated) maintenance costs for a suitable athletic-caliber natural grass field at football stadium—**
   - Over seeding = $600.00
   - Fertilizer = $8000.00
   - Wetting agents = $1200.00
   - Weed treatment = $500.00
   - Mowing/maintenance/watering/equipment (estimate) = $30,000.00

   **TOTAL = $40,300.00**

3. **Annual number of events to be held on the natural grass field a stadium**
   - Varsity Football = 12
   - Varsity Practice = 20
   - Playoff = 2
   - Soccer = 25
   - Graduation = 2
   - Band/Dance/P.E. = 15

   **TOTAL = 76**

4. **Total number of events = 1520 (over twenty years)**

5. **Additional resodding costs over 20 year life cycle: $450,000.00 (3.0 additional resoddings over 20 years)**

6. **Total life cycle cost (over 20 years): $1,405,000.00**