Hull High School

INFILLED SYNTHETIC TURF INFORMATIONAL PRESENTATION

February 9, 2016

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Senior Project Manager
Civil Engineering Division
Gale Associates, Inc.

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Overview

- Why are we doing this project?
- Why Turf?
- Environmental Concerns
- Current Cost Estimate
- Project Schedule
- Renderings/Lighting

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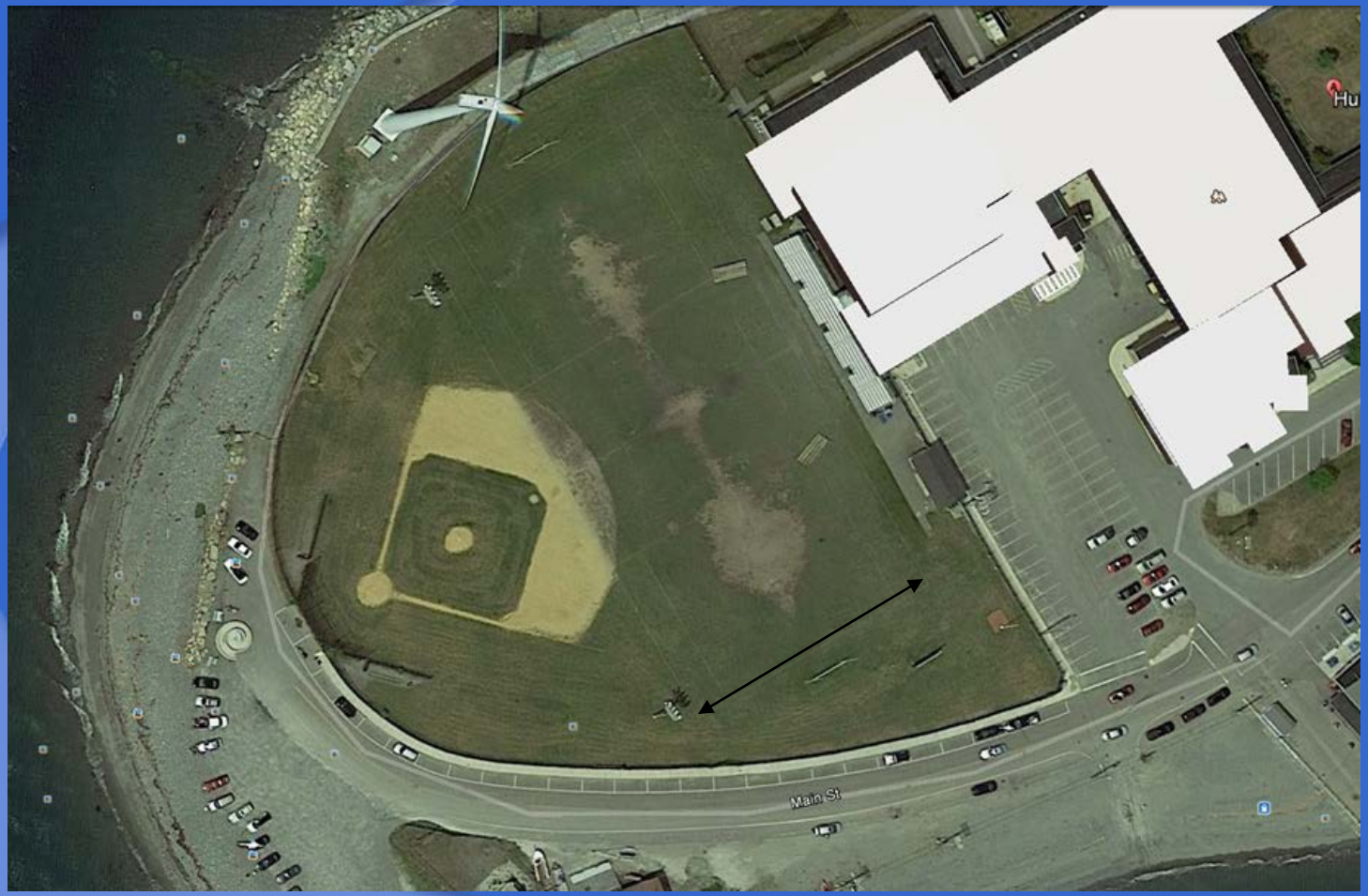
Project Goals?




SENIORS

Proposed Conditions

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Why Install Synthetic Turf Multi-Purpose Game Field?

“Filled” Synthetic Turf Advantages:

- Dramatically increased use (2-3 X)
- Allows full use of proposed athletic lighting
- Very low maintenance
- Grass-like look and performance
- All-weather availability
- Environmentally sensitive
- Permanent lines and markings
- Enhanced player safety
- Pay-to-play opportunities
- Image/Branding
- Immediate availability

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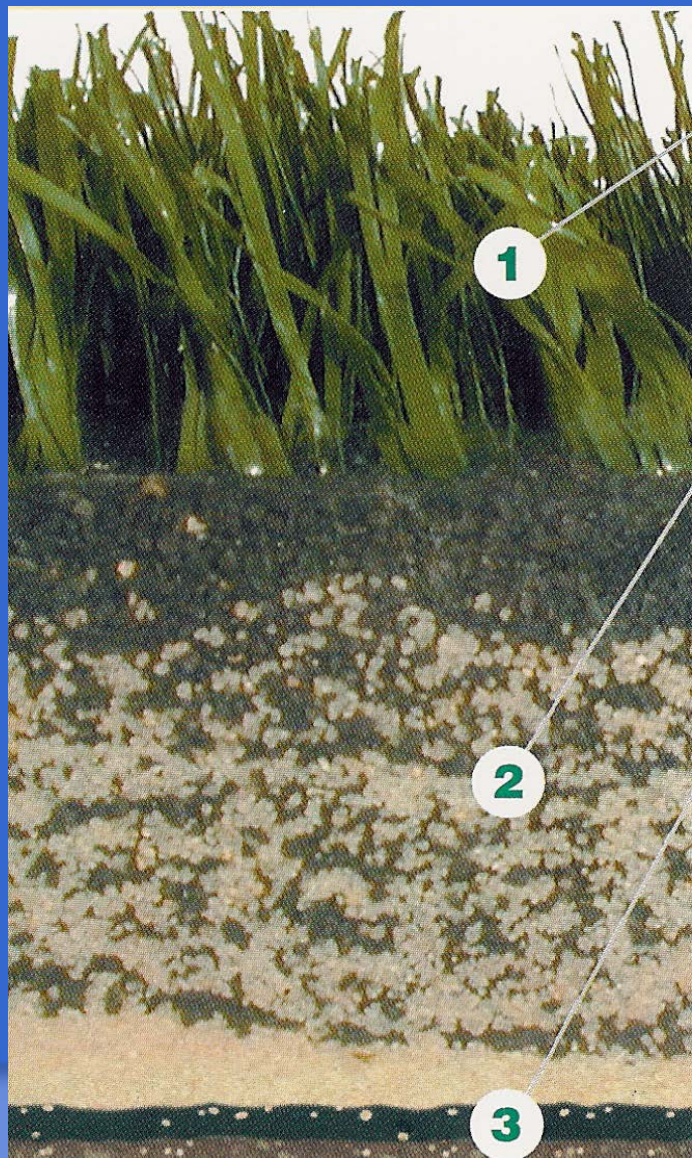
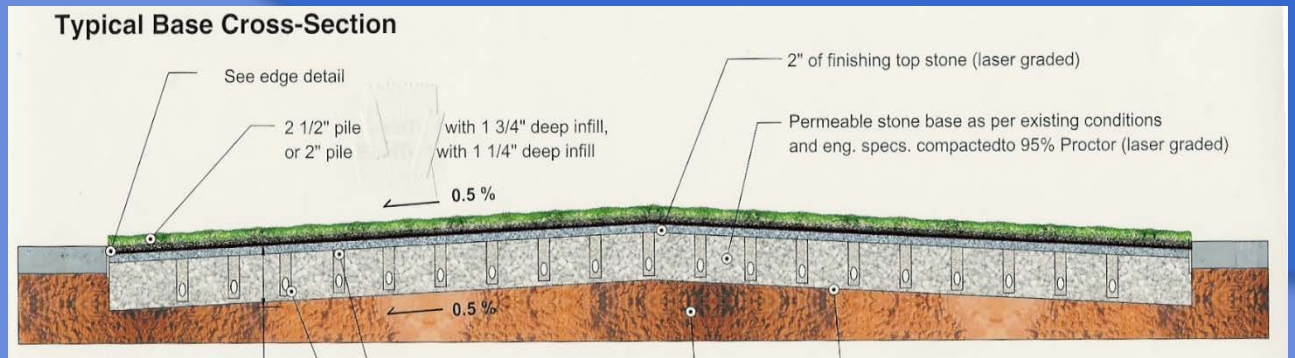
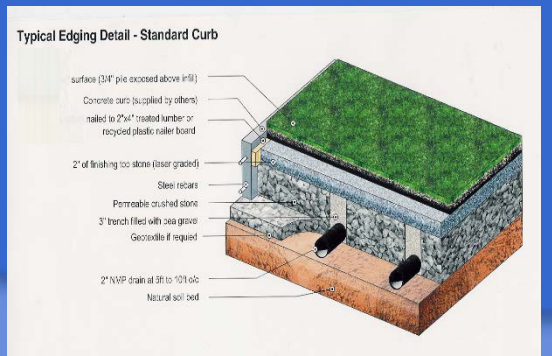


How will the soccer field be constructed?

What are the new field's main characteristics?

- **Top soil is removed to a depth of about 12 inches**
- **A concrete anchor curb is constructed around the field perimeter**
- **Drainage pipe is installed every 20-30 feet**
- **A free-draining stone base is installed and laser graded**
- **A slope of 0.5% is maintained across the field**
- **The carpet is installed on top of the stone**
- **Field lines and markings are permanently installed**
- **The carpet is "infilled" with silica sand & ground rubber crumb**





Does an infilled turf field extend the playing season?

Is it truly an all-weather surface?

Dartmouth College – Lacrosse Field:

- **Designed to drain over 16 in./hr**
- **The field may be plowed**

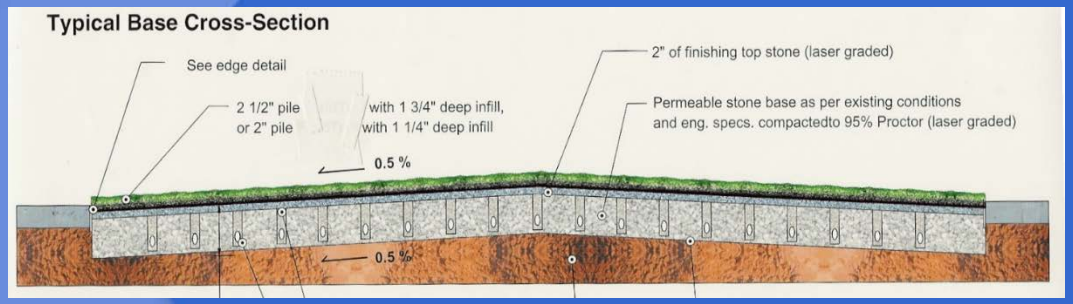
Early March

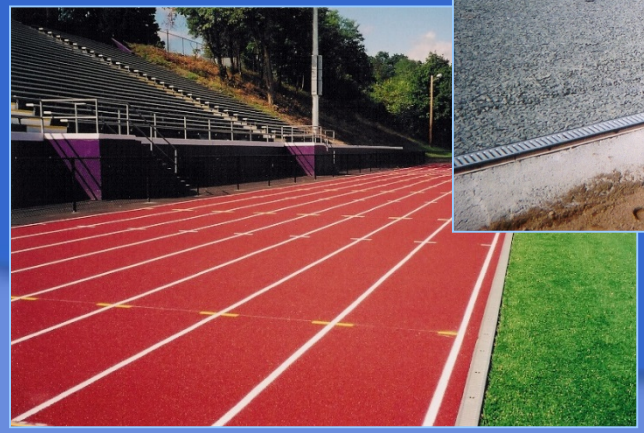
Snow Removal Operations

Same field, next day

Drainage Construction

- Rated at 16 inches/hour min.
- Where does it go?





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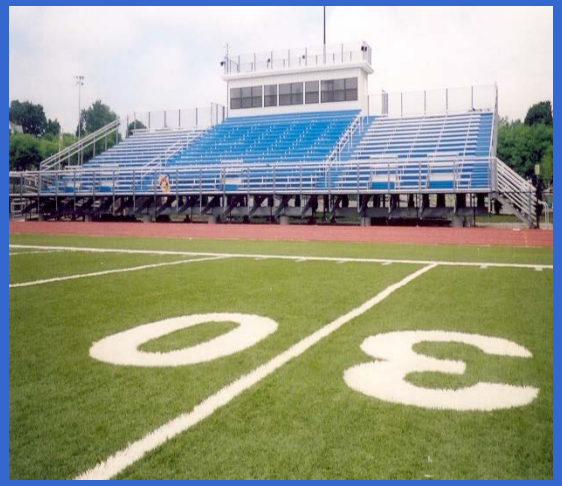
How Long Will the Carpet Last?
How Durable Is the Turf?

- **Today's infilled carpets expected to last 10-14 years**
- **UMASS Lowell (the oldest infilled field in New England) used a less durable technology carpet and still lasted 11 seasons of constant use**



UMASS Lowell - 1999

UMASS Lowell Users:

- *Football (2 Seasons)*
- *Field Hockey – Varsity & JV*
- *Soccer – Men & Women*
- *Lacrosse – Men & Women*
- *Intramurals*
- *Club Sports*
- *Community/Youth Sports*
- *Summer Camps/Clinics*
- *Baseball*
- *Softball*

Actual Use Statistics:

- *7 Hours/Day (Mon.-Fri.)*
- *12 Hours/Day (Sat.-Sun.)*
- *30 weeks per year (May-Nov.)*
- *1800 direct use hours per year*
- ***720 events/year @ 2.5 Hours/Event***
- *18,000 hours over the 10-year life*
- ***A well cared for Natural Grass field cannot maintain more than 300 uses.***

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Life Cycle Cost Benefits

Are there maintenance savings associated with the new field?

YES: Maintenance costs decrease by $30,000/year and the number of uses increases by 300%

Natural Turf Field Maintenance Cost (labor, material, depreciation):

▪ Mowing, 30 cuttings	$5,500
▪ Watering – ½-1 in./week @ 20 weeks	$5,000
▪ Irrigation Winterize/De-winterize	$4,000
▪ Fertilizer x 3, lime, pesticides	$6,000
▪ Aeration, topdressing, overseeding	$6,000
▪ Line markings (weekly @ 24 weeks)	$4,500
	$31,000/year

The Infilled Synthetic Turf Field is groomed with a towed groomer provided with the field, approximately 4-5 Times/Year: $1,000 / Year

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Course of Action 1:

Construction of a New Natural Turf Field

Assume: Insitu-Material

Topsoil Supplementation

(Sand; Micro-Nutrients)

New Irrigation

Formal Under-drainage

Premium Seed Mix/Sod

Cost: $350,000

Loss of Use First 2 years ($20,000, each year)

Renovation: Every 6 years at $40,000

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Course of Action 2:

Construct a Replacement Synthetic "Filled-Turf"

Assume: **Standard Installation by Industry Leader**
Formal Under-drainage
Standard curb/no track
8 year warranty/14 year life

Cost: $800,000* **No loss of use**

Renovation: Replace carpet at year 15
Repaint selected lines every 4 years

Includes design, permitting, bidding and construction costs

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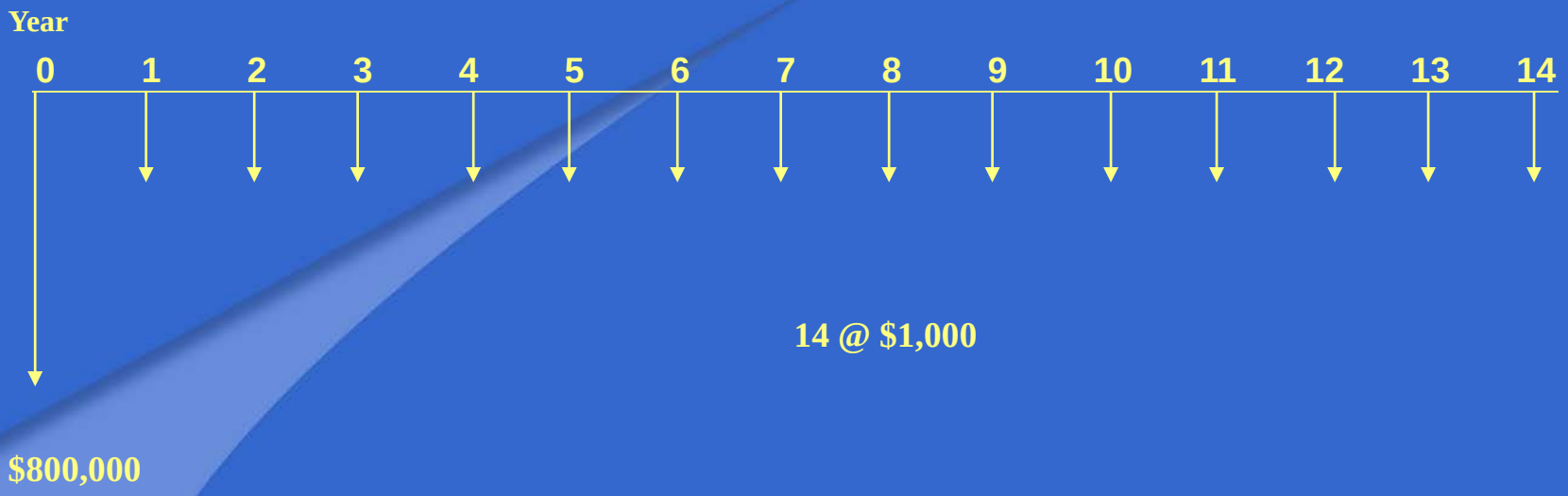
Course of Action 1 – Existing Field Reconstruction

$$NPV_{(I=3\%)} = 350{,}000 + 31{,}750\,(11.296) + 20{,}000\,(1.913) + 40{,}000\,(.837) + 40{,}000\,(.7014)$$

$$= \$808{,}428$$

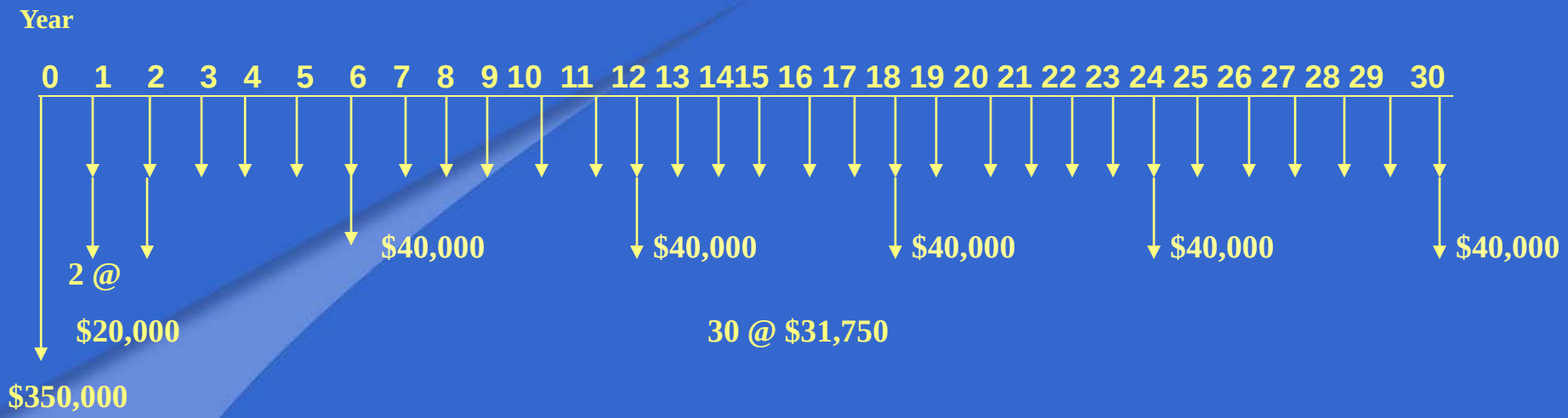
Course of Action 2 – “Filled Turf” Field



$$NPV_{(I=3\%)} = 800{,}000 + 1{,}000\ (11.296)$$

$$= \$812{,}134$$

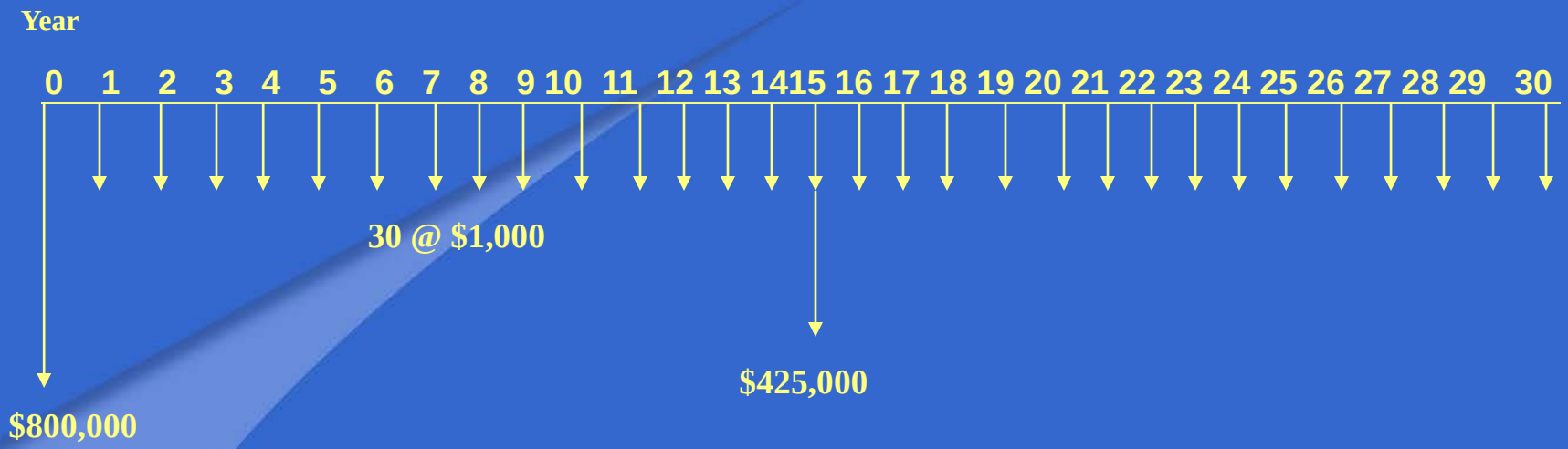
Course of Action 1 – Existing Field Reconstruction



$$NPV_{(I=3\%)} = 350{,}000 + 31{,}750\,(19.6) + 20{,}000\,(1.913) + 40{,}000\,(.837+.701+.588+.492+.412)$$

$$= \$1.1312M$$

Course of Action 2 – Infilled Synthetic Turf Field



$$NPV_{(I=3\%)} = 800{,}000 + 1{,}000\ (19.6) + .641\ (425{,}000)$$

$$= \$1.092\ M$$

Cost Conclusions: Assume interest rate = 3%

14 year analysis:

NPV COA 1 = $808,400 **cost/use = $808,400/200 (14) = $288/use**
NPV COA 2 = $812,134 **cost/use = $812,134/400 (14) = $145/use**

30 year analysis:

NPV COA 1 = $1.13M **cost/use = $1.13M/200 (30) = $188/use**
NPV COA 2 = $1.09 **cost/use = $1.09M/400 (30) = $91/use**

***Initial costs of synthetic ≈ 2x as much**

***Life cycle costs essentially the same over 14 years**
Life Cycle Costs slightly favor synthetic over 30 years

***Cost per use greatly favors synthetic, 2 : 1 over 14 or 30 years**

***Does not consider maintenance savings on other fields due to demand shift**

***Other savings (safety, pay to play, all weather, and community value are not considered and favor synthetic)**

Environmental/Health Concerns

Does an infilled turf field increase the risk of Staff Infections?

Should we Sanitize our fields periodically?

STAFF *Staphylococcus aureus*
MRSA *Methicillin-resistant Staphylococcus aureus*

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Staph Infection Risk In Synthetic Turf

Penn State Conclusions

- Staph survives on both natural grass and synthetic turf indoors multiple days
- Commercially available anti microbial treatments significantly decrease survival rate
- Outdoor survival rate much lower (temp/UV)
- Survival rate on natural grass comparable to synthetic turf outdoors

Survival of Staphylococcus on Synthetic Turf,

Andrew S. McNitt, The Pennsylvania State University,

Diane Petrunak, The Pennsylvania State University

Are “In-filled” turf fields as safe as natural grass?

A 5-year study by Dr. Bill Barnhill assessed high school athletes in Texas, comparing FieldTurf to natural grass, concluded:

- **A 66% reduction in neural injuries**
- **50% reduction in cranial/cervical injuries**
- **A 33% reduction in third degree injuries**

A 3-year study by Dr. Michael C. Meyers, PhD, FACSM, which assessed 704 Div. 1 NCAA football games comparing FieldTurf to natural grass concluded:

In regards to incidence of injury:

- *7% Fewer total injuries*
- *3% Fewer minor injuries*
- *19% Fewer substantial injuries*
- *22% Fewer severe injuries*

In regards to head, knee, and shoulder trauma:

- *12% Fewer concussions*
- *42% Lower anterior cruciate ligament trauma*
- *16 % Lower ACL and associated tissue trauma*
- *10% Fewer AC separations*
- *64% Fewer rotator cuff tears*
- *46% Lower incidence of shoulder lesions*

GMAX Testing, ASTM 355-95

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Are there health or environmental risks with infilled turf versus natural grass?

US CONSUMER PRODUCT SAFETY COMMISSION:

"There is no indication that exposure to the turf could pose any harm. We are not recommending that communities shut down their playing fields."

THE CENTER OF DISEASE CONTROL (CDC):

"Testing on FieldTurf fields have consistently shown 10-20 ppm or less then 5% of the lead level regarded as problematic."

NEW YORK DEPARTMENT OF HEALTH AND MENTAL HYGIENE:

"Based on existing HUD Guidelines and EPA standards, lead hazard risk assessments at these four DPR synthetic turf fields did not identify lead hazards."

NEW JERSEY DEPARTMENT OF HEALTH:

"Based on the state's recommendation, the committee voted in favor of re-opening the fields without restrictions."

MASSACHUSETTS DEPARTMENT OF ENVIRONMENTAL PROTECTION:

"MassDEP believes that this use of tire crumb rubber in synthetic turf athletic field to be an acceptable recycling/reuse of tire rubber that does not warrant further review by MassDEP."

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Turf Safety – Gale Specifications

- A letter holding the Owner, Designer and all other project consultants harmless for any violation of patent rights or infringements and claims related to hazardous materials (e.g. lead or zinc) or other environmental impacts.

- The Synthetic Turf Supplier/Installer provide a written statement that their product is lead free prior to installation. (The Federal requirement for lead in paint and similar surface coatings of a not to exceed limit 90 ppm, to be classified as “lead free”).

- Third party testing results must be submitted on the rubber crumb for review documenting the mechanical analysis reflecting maximum percentage values for fiber, metal, and mineral content.

- The General Contractor shall provide the necessary testing data to the Owner, verifying that the finished field meets the required shock attenuation (GMax), as per ASTM F355/F1936.

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GALE WATER QUALITY STUDY (Ongoing)

- Wayland High School
- Middlebury College, VT
- Mass Youth Soccer Complex, Lancaster, MA
- Quarterly testing of surface water, ground water and storm drains
- Full Spectrum testing
  - Organic Chemistry
  - Inorganic Chemistry
  - Metals
- Synthetic Precipitation Leaching Potential (SPLP)

The Brookwood School
Beverly, MA

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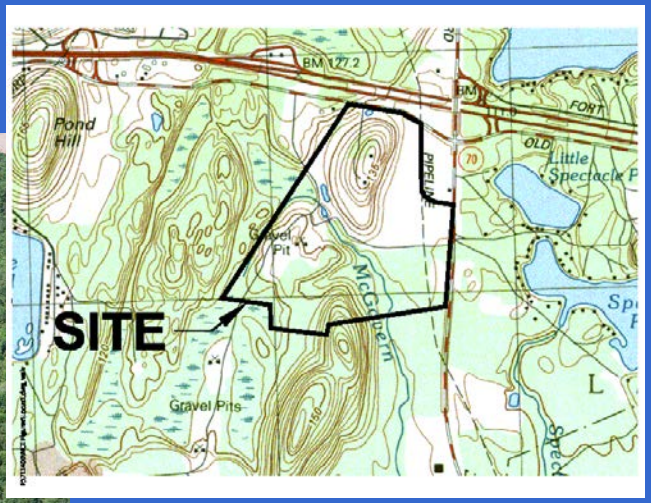
MASS YOUTH SOCCER COMPLEX
Lancaster, MA



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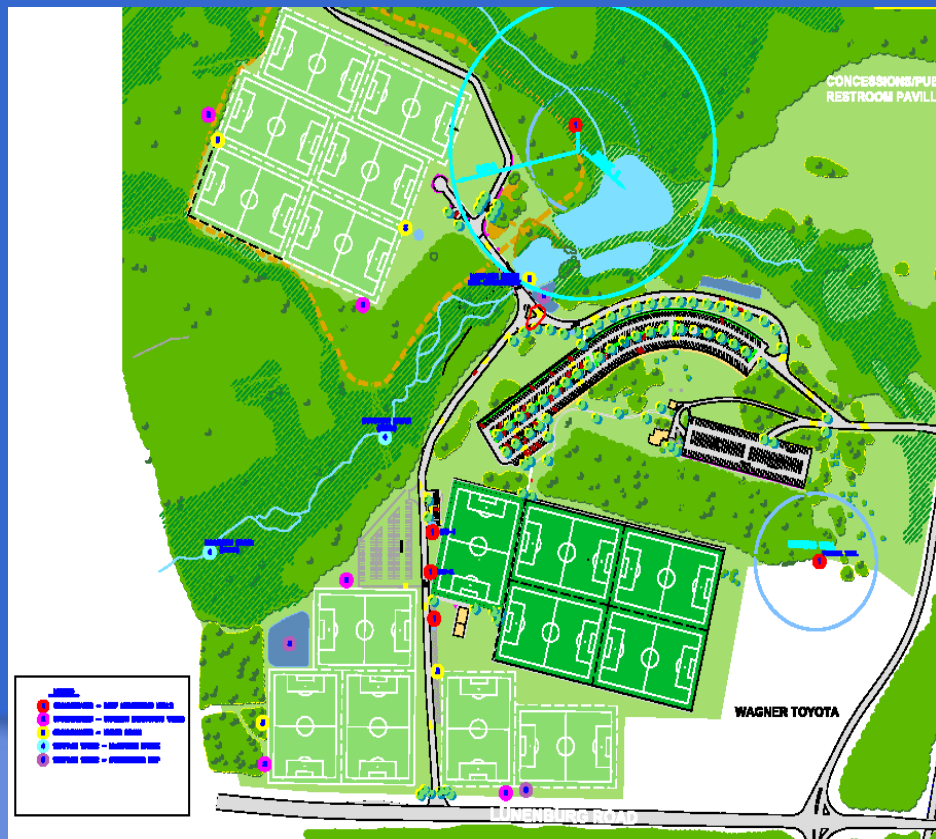
MASS YOUTH SOCCER COMPLEX
Lancaster, MA

Sampling Regimen

- **Surface Water Samples Quarterly**
- **Groundwater Samples Quarterly**
- **Stormwater Samples Bi-annually within 24 hours of 1 inch rain**

Tested For:

- *Temperature*
- *pH*
- *Specific Conductance*
- *Turbidity*
- *Nitrates, nitrites, ammonium-nitrogen*
- *Total phosphorus / ortho-phosphorous*
- *RCRA 8 Metals*
- *Organic chemistry / Pesticides*



Water Quality Testing Conclusions:

- No measurable impact on metal leachate under field conditions in short term
- Mass Youth Soccer increases in nitrogen and phosphorous (natural turf)
- Middlebury decreases in nitrogen and phosphorous (natural turf to synthetic)
- No measurable impact related to organic chemistry
- Total suspended solids improved
- More long term testing required, most avoid expense

Health and Environmental Safety Resources:

Penn State Center for Sports Surface Research

Synthetic Turf Council
www.syntheticturfcouncil.org

Conclusions:

- **Staff Concerns primarily related to indoor venues**
- **Water Quality Impacts appear to be negligible**
- **Lead Concerns have been resolved**
- **The is a large volume of data from governmental and other objective sources concluding insignificant environmental, health and safety risk. Study Ongoing.**
- **There are 15,000 infilled fields; Installed since 1995 (20 years)**
- **Not aware of a single finding under field conditions of significant risk.**

Are there environmental advantages with infilled turf versus natural grass?

- Made from 20,000 recycled tires
- Provide water savings of 160,000 gallons per year
- No application of pesticides
- No application of fertilizer

  (reduced nitrogen & phosphorous)
- NO pH adjustment
- Improved groundwater recharge
- No mowing, striping, aeration machines, etc.
- Managed natural turf is not environmentally friendly!

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Environmental Impact

- for the greenest artificial turf

- **Recycling turf:**
  - **Pelletizing and re-using the turf & backing**
  - **Complete removal of the infill for re-use on future installations**

Grinding

Field Removal

Pelletizing

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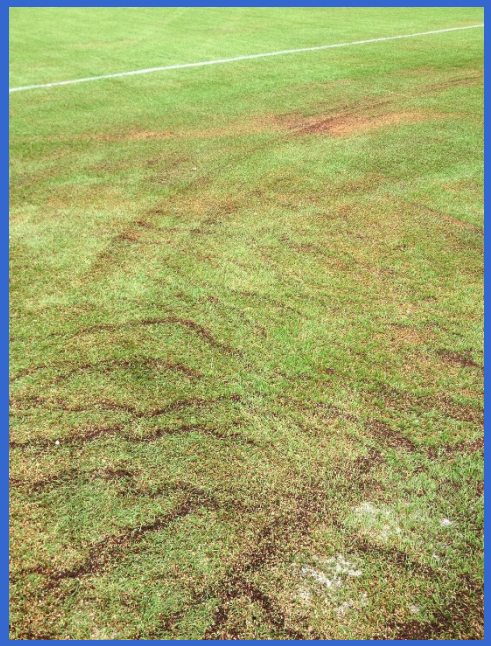
Alternative Infill



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Alternative Infill Costs

- Thermoplastic Elastomers +$580k
- Envirofill +$360k
- Cork +$150k

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Milestone Schedule

Event	Completion Date
Permitting	February 10, 2016 – March 2016
50% Design Development/Documents Complete	February 15, 2016
90% Design Development/Documents Complete	February 29, 2016
Advertise and Bid Period	February 29, 2016 – March 21, 2016
Bid Review and Award	March 21-May 16, 2016
Construction Documents Complete	May 2, 2016
Hull's Town Meeting	May 2, 2016
Hull's Town Funding Vote	May 16, 2016
Shop Drawing/Submittal Review	May 20, 2016
Pre-Construction Conference/Mobilization	May 23, 2016
Construction Period	May 23, 2016 – September 1, 2016
Beneficial Occupancy of Turf Field	September 1, 2016
Project Close-Out	September 15, 2016

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Cost Estimate

Schematic Cost Estimate - February 9, 2016

HULL HIGH SCHOOL

ITEM	DESCRIPTION	UNIT	QUANTITY	UNIT COST	COST	TOTAL COST
1	**General Conditions**					**$ 100,760.33**
a	Bonds and Insurance (5%)	LS	1	$ 80,760.33	$ 80,760.33	
b	General Conditions - Mobilization/Demobilization	LS	1	$ 20,000.00	$ 20,000.00	
2	**Erosion Control**					**$ 7,500.00**
a	Erosion Control Measures	LS	1	$ 7,500.00	$ 7,500.00	
3	**Site Preparation / Demolition**					**$ 137,685.00**
a	Strip and Haul topsoil (assume 10")	CY	11,965	$ 12.00	$ 143,580.00	
b	Misc. Demolition (backstops, lights, irrigation etc.)	LS	1	$ 30,000.00	$ 30,000.00	
c	Hull is able to Reuse Half of Topsoil	LS	1	$ (35,895.00)	$ (35,895.00)	
4	**Synthetic Turf Field Construction**					**$ 805,040.83**
a	Prepare sub-base, shape and compact	SY	15,334	$ 2.25	$ 34,501.75	
b	Stone Base under Field (12")	Ton	5,111	$ 36.00	$ 184,009.33	
c	Synthetic Turf	SF	138,007	$ 4.25	$ 586,529.75	
d	Field Striping	EA	3	$ 10,000.00	$ 30,000.00	
5	**Subsurface Drainage (Synthetic Turf Field)**					**$ 78,220.00**
a	Geotextile Separation Layer	SY	12764	$ 2.00	$ 25,528.00	
b	12" Flat Panel Drain	LF	3248	$ 4.00	$ 12,992.00	
c	18" Nyloplast Structures	EA	4	$ 1,800.00	$ 7,200.00	
d	10" Perf. HDPE Collector Pipe	LF	1300	$ 25.00	$ 32,500.00	
6	**Athletic Field Equipment**					**$ 70,000.00**
a	Backstop	EA	1	$ 45,000.00	$ 45,000.00	
b	Reinstall Scoreboard	LS	1	$ 10,000.00	$ 10,000.00	
c	Reinstall Football Goalposts	LS	1	$ 15,000.00	$ 15,000.00	
7	**Concrete**					**$ 90,930.00**
a	Cast in place Concrete Turf Anchor Curb	LF	1299	$ 70.00	$ 90,930.00	
8	**Jogging/Walking Track**					**$ 45,830.86**
a	Prepare sub-base, shape and compact	SY	1178	$ 2.25	$ 2,649.75	
b	Aggregate Base Course (10")	Ton	393	$ 35.00	$ 13,739.44	
c	Pavement (1.5" Binder course and 1.5" Wearing Course)	SY	1178	$ 25.00	$ 29,441.67	
d	Line Track	LS	1	$ 1,000.00	$ 1,000.00	
9	**Athletic Lighting (Alternate)**					**$ 375,000.00**
a	MUSCO Lighting Package	Pole	4	$ 75,000.00	$ 300,000.00	
b	Electrical Infrastructure / Hookup	LS	1	$ 75,000.00	$ 75,000.00	
10	**Entrance Way Improvements Allowance**					**$ 5,000.00**
a	Entrance Way Improvements Allowance	LS	1	$ 5,000.00	$ 5,000.00	
					Subtotal	**$ 1,710,967.03**
					Contingency (15%)	**$ 256,645.05**
					Total	**$ 1,967,612.08**
	Alternates					**$ 231,635.33**
a	Musco Light Poles for Baseball Field	Pole	2	$ 75,000.00	$ 150,000.00	
b	Track surfacing (Urethane)	SY	1178	$ 32.00	$ 37,685.33	
c	Bases	Set	1	$ 650.00	$ 650.00	
d	Portable Pitchers Mound	EA	1	$ 18,000.00	$ 18,000.00	
e	Soccer Goals	EA	2	$ 5,000.00	$ 10,000.00	
f	15' Polyboard Bench (Single Tier)	EA	4	$ 1,125.00	$ 4,500.00	
g	4' High Fence (between rect. Field & stands)	LF	240	$ 45.00	$ 10,800.00	

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Questions…

Lighting

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Enginers and Planers

- New York City Department of Health and Mental Hygiene, January 2008
- New Jersey Department of Health and Senior Services (NJDHSS), April 2008
- Dr. Davis Lee, Ph.D, Synthetic Organic Chemistry, Executive in Residence at the Georgia Institute of Technology School of Polymer, Textile, and Fiber Engineering, April 2008
- Toxicologist Dr. Barbara D. Beck, a Lecturer in Toxicology at Harvard; Former Chief of Air Toxics Staff in Region I EPA; Fellow, Interdisciplinary Programs of Health at the Harvard School of Public Health, May 2008
- Jeff Hageman, Centers for Disease Control, May 2006

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- California EPA Office of Environmental Health Hazard Assessment, July 2009, “Chemicals and Particulates in the Air Above the New Generation of Artificial Turf Playing Fields, and Artificial Turf as a Risk Factor for Infection by Methicillin-Resistant Staphylococcus Aureus (MRSA)”
- NCAA Director of Health and Safety, David Klossner, November 2006
- Michael C. Meyers, Ph.D, FACSM, Department of Health and Human Development, Montana State University
- U.S. Consumer Product Safety Commission, July 2008, “CPCS Staff Finds Synthetic Turf Fields OK to Install, OK to Play On”
- Center for Disease Control (CDC), June 2008, “Potential Exposure to Lead in Artificial Turf: Public Health Issues, Actions, and Recommendations”
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Engineers and Planners

- Aliapur & Ademe (Environmental French Agency), 2007, “Environmental and Health Evaluation of the Use of Elastomer Granulates (Virgin and from Used Tyres) as Filling in Third-Generation Artificial Turf”
- Office of Environmental Health Hazard Assessment/California Integrated Management Board, “Evaluation of Health Effects of Recycled Waste Tires in Playground and Track Products (January 2007)”
- Penn State - http://plantscience.psu.edu/research/centers/ssrc/research/synthetic-turf-research-penn-state
- Dr. Andrew McNitt, Associate Professor of Soil Science at Penn State University, June 2007, “A Survey of Microbial Populations in Infilled Synthetic Turf Fields”
- Allegheny County Health Department, October 2007

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