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Shrewsbury High School Athletic Campus Evaluation and Feasibility Study Shrewsbury, MA

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enclosures

Gale JN 716700

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SHREWSBURY HIGH SCHOOL
ATHLETIC CAMPUS EVALUATION AND FEASIBILITY STUDY
SHREWSBURY, MA

SECTION 1.0 – BACKGROUND AND FEASIBILITY STUDY OBJECTIVES

Gale Associates, Inc. (Gale) was engaged to assist Shrewsbury High School (Shrewsbury) with a feasibility study for the development and reconfiguration of the School's athletic facilities located in Shrewsbury, MA. The School's athletic campus is located directly behind, or south of the school building. Currently, there is a need for a new, competition level, field at the stadium facility. The resultant feasibility study is intended to determine the viability of redeveloping and reconfiguring the existing athletic field areas to include a new synthetic turf game field at the stadium facility as well as improvements to the baseball and softball fields.

The process used to complete the feasibility study focused on three specific tasks, summarized as follows.

1. To perform a background investigation and site evaluation to determine the geotechnical, topographical and resource area constraints that may impact the development potential of the sites. Development of a base map will help to identify the prevailing site constraints related to the fields and surrounding areas.

2. To determine how the athletic facilities may be developed and reconfigured to best meet the athletic programming needs of the school.

3. To compile several conceptual layout schemes to demonstrate how the athletic fields might be organized and prepare cost estimates for each layout, in a manner suitable for comparison of the alternatives. While these pre-design cost estimates are suitable to assess project feasibility, they are not adequate for establishing actual project budgets.

This report documents the prevailing site conditions, conceptual development layouts, pre-design cost estimates and the permitting requirements to allow Shrewsbury to determine the most advantageous strategy for redeveloping the track and athletic fields at the School.

SECTION 2.0 – BASE PLAN DEVELOPMENT AND ASSESSMENT OF EXISTING FACILITIES

In order to facilitate the planning of the proposed athletic facility redevelopment, Gale prepared an Existing Conditions Base Plan (Enclosure 1). This plan is a compilation of Geographic Information Systems (GIS) data obtained from MassGIS, as well as existing conditions information provided by the School. No on-the-ground survey was completed during the base plan development. This Existing Conditions Plan provides sufficient detail for planning purposes. However, the Existing Conditions Plan is not suitable for design

development or construction purposes. A full existing conditions survey will be required for future design phases and proposed layout plans are subject to change.

In addition, Gale completed site visits to each of the athletic campus facilities to evaluate the topography, groundcover, geology, accessibility, proximity of abutters and potential environmental resource areas.

Athletic Campus Site Description. The athletic campus (Enclosure 1) is bordered by the school building to the north, wooded area and overhead utility lines to the east, wooded areas and Interstate 290 to the south, and wooded areas and a mature residential area to the west. There is a small parking area (about 18 spaces) located just to the north of the track. The remaining available parking is at the main school parking area located to the west of the school building.

There are a total of six (6) natural grass athletic fields located throughout the Shrewsbury athletic campus. Although the varsity baseball and varsity softball fields have rectangular field layouts within their respective outfields, they are considered as one field for the purposes of this feasibility study.

There are a total of six (6) tennis courts located on the western edge of the property, adjacent to the track. In addition to the tennis courts, there are also two (2) basketball courts located just to the north of the tennis courts, adjacent to the school access road. The courts were constructed in 2002 (over 12 years ago) and have not been resurfaced

Similar to the tennis courts, the existing track and stadium field facility was constructed in 20028 (over 12 years ago) and is about halfway through its useful lifespan. A typical track asphalt base mat has a life expectancy of around 20 to 25 years. Other than minor repairs, the track has never been re-surfaced. There is extensive cracking and worn areas throughout the existing track's latex surface.

As is shown in the photographic documentation (Enclosure 2), the track consists of an asphalt mat with a resilient track surfacing. There are 6 lanes in the ovals and 8 lanes in the straight away. There is worn areas throughout the track surface.

Soils. The United States Soil Conservation Services (USCS) mapping for the site identifies the soils as "Canton Fine Sandy Loam" and "Chatfield-Hollis-Rock Outcrop Complex." These classifications of soils consists of stony material at moderate to steep slopes and can be moderately draining. The unknowns are the amount of stone and how much it has compacted and if there is a shallow depth to ledge. This leads to variable soils, which are difficult to classify without onsite investigation.

Test pits were not performed within the field playing areas, due to the fields being used for sports. As a result, the depth of field topsoil was not evaluated. Athletic fields have been known to have topsoil layer depths ranging from 8 to 18 inches. Further evaluations will be needed during future design phases to accurately estimate construction costs.

Environmental Resource Areas. According to the Unites States Geological Survey (USGS) mapping, there is a small area within the current lower practice fields classified as bordering vegetative wetlands (BVW); any work within 100-ft of area is subject to regulation under the Wetlands Protection Act. However, the mapping is not representative of actual conditions, as this BVW is shown in the middle of the managed practice field's playing area. A Request for Determination of Applicability (RDA) may have to be submitted to the Shrewsbury Conservation Commission in order to confirm if the BVW actually exists.

According to the latest Massachusetts Natural Heritage & Endangered Species Program (NHESP) Atlas, there is no Priority Habitat of Rare Species or Certified Vernal Pools located within the project site.

Additionally, project site is located outside the 100-year flood zone, according to the Flood Insurance Rate Map (FIRM) for the site.

Topography. Topography data for project site was obtained through Mass GIS and record plans. In general, the athletic campus gently slopes (between 0 and 8 percent) from north to south then abruptly drops off soon after the limits of the athletic fields. Rock outcroppings were observed along the northeastern edge of the baseball and softball fields. Rock outcroppings may be indicators of ledge and perched water table and may impact the redevelopment potential at the site.

Field Assessments and Short Term Recommendations: As mentioned above, there are a total of six (6) individual athletic fields within the athletic campus, as is shown in the photographic documentation (Enclosure 2). The assessments were performed using accepted industry standards and guidelines, and are based on field usage, by sport, for each field.

The National Federation of State High School Associations (NFHS) and the Massachusetts Interscholastic Athletic Association (MIAA) Guidelines were followed in the evaluation of the field layouts and equipment. Similarly, the Architectural Access Board Guidelines were used to assess ADA compliance.

The fields were also evaluated for serviceability (systems and equipment in good repair and meeting the intended purpose) and safety. The findings within each functional area are categorized as they relate to the safety, serviceability and accessibility of the components.

Gale has compiled a summary list, provided below, detailing conditions and general observations of each field. Gale also included an evaluation of the tennis and basketball courts. The evaluations detail the general condition of each facility as observed by Gale at the time of the assessment. The individual field assessment results are summarized as follows:

Shrewsbury High School Athletic Campus

- Varsity Baseball Field / Multipurpose Rectangular Field

  - The turf is in fair condition.
  - Primarily used for baseball and soccer.
  - The outfield distance is excessively long (approx.. 400 feet)
  - Worn areas around goals need to be addressed.
  - There are no ADA accessible walkways to the field.
  - Spectator seating is located on elevated slope along back of Stadium Bleachers.
  - There are drainage structures at the east and west perimeters.
  - Field slopes towards east and west perimeters and these areas of field are poorly graded and have drainage issues particularly during the spring's wet season.
  - The field has irrigation.
  - Scoreboard is older generation (non LED). Difficult to see in direct sunlight.
  - There is no athletic lighting.

- Varsity Softball Field / Multipurpose Rectangular Field

  - The turf is in fair to good condition.
  - Drainage structures located only along northern section adjacent to baseball field.
  - Field has irrigation.
  - Perimeter fencing (installed in 2002) has tension wire instead of bottom rail. The fabric has become warped/loose in some areas and needs to be re-tensioned
  - Primarily used for varsity softball with soccer in the outfield.
  - Worn areas around goals were being addressed.
  - There are no ADA accessible walkways to the field.
  - Field has scoreboard.
  - Batting tunnel is located along the third base line and is in fair condition.
  - Backstop height is insufficient and need to be repaired in several areas.
  - Spectator seating consists of portable aluminum bleachers along the third base line.
  - There is no athletic lighting.

- Lower Practice Fields (2 Fields)

  - The turf is in poor condition, primarily due to poorly drained areas. According to school officials, this may be due to perched water from shallow ledge located under the playing areas.
  - Fields are "always wet" in the spring.

- Primarily used for practices.
- Backstop height is insufficient and need to be repaired in several areas.
- Perimeter fencing (installed in 2002) has tension wire instead of bottom rail. The fabric has become warped/loose in some areas and needs to be re-tensioned.
- There is no irrigation.
- There is no scoreboard(s).
- There is no athletic lighting.
- There are no formal drainage structures and fields rely on sheet flow for drainage.
- There are no ADA accessible walkways to the fields.
- Track Discus venue is located in the southeast corner of the fields. This is quite far from the other track throwing venues.

➢ <u>Field Hockey/LAX Field</u>

- The turf is in good condition overall the best condition of the fields observed.
- Primarily used for field hockey and lacrosse.
- There are several sinkholes developing around the perimeter drainage structures that need to be repaired.
- Area width is constrained by elevated berm to the east along the track side and grade drop off along the west side.
- There is no spectator seating for the field.
- There is no athletic lighting.
- There is irrigation.
- There are no ADA accessible walkways to the field.
- Field used for track javelin venue.

➢ <u>Track and Stadium Field Facility</u>

- The turf is in fair to poor condition; major depressions running along both sidelines. These do not allow the water to sheet flow towards the track's trench drains in a timely manner.
- The field is primarily used as the football and soccer game field.
- The field is drained by trench drains running along the inside edge of the track.
- Field is irrigated. Irrigation boxes located in close proximity to soccer layout limits.
- The track was constructed in 2002 and the asphalt base mat is over 14 years and track has not been overlaid.
- The D-areas are not paved, other than the high jump and LJ/TJ running lanes.
- Pole vault venue is located outside northern D-area and is in fair condition.

- The latex track surfacing is excessively worn and cracked and is beyond the point of being repaired. Track surfacing needs to be completely removed and track resurfaced.
- Track polymer slot-drains do not have track surfacing. Several sections are broken and need to be repaired.
- Edges of slot-drain and track surfacing have excessive plant growth intrusion resulting in detachment of latex track surfacing.
- LJ/TJ running lanes and take-off boards are worn.
- Perimeter fencing (installed in 2002) has tension wire instead of bottom rail. The fabric has become warped/loose in some areas and needs to be re-tensioned.
- Several fence posts are heaved and need to be repaired.
- The spectator seating at the home side needs some minor repairs at the seating planks.
- Field has athletic lighting system and the fixtures were re-lamped in 2012. However, it is an older generation system with no shielding at the fixtures.

➢ Tennis and Basketball Courts

- The tennis and basketball court venue is comprised of 6 tennis courts and 2 basketball courts built in 2002 and have not been resurfaced.
- There is evidence of full depth pavement cracking along the pavement cold joints and around the net post foundations.
- Several fence post foundations are now heaving.
- Several perimeter trench drains need to be cleaned and repaired.
- Cracks should be repaired and courts should be resurfaced.
- There is no athletic lighting.

Overall, the athletic fields are in fair condition, with the Field Hockey/LAX field in the best condition and the lower practice fields in the worst condition. Their condition is primarily due to the existing site constraints and the degree of the School's maintenance program. The fields throughout the property have deficiencies in similar areas, which include poor drainage, lack of ADA accessibility and permanent spectator seating.

It is not the intent of the field assessments to address the renovation and redevelopment recommendations for each facility. Those will be addressed in later sections of this report. Rather, these comments are intended to define general existing field conditions and establish those repairs and upgrades necessary to make the fields more fully serviceable, safe and compliant.

SECTION 3.0 - FIELD USE PRACTICES - REST AND INCLEMENT WEATHER

How a field is scheduled is an important consideration in its ability to sustain heavy use with an acceptable decrement in turf condition. Obviously, a field with 250 scheduled uses stretched out over the year (May through October), behaves differently than if this use was broken up with rest period(s) provided. Ideally, a natural turf field should have a 30-day rest

period during the active growing season (spring or fall) to repair the root zone damage it has sustained and to propagate new crown growth. Alternatively, this rest period can be in the summer time. However, a summer rest period is less effective, as the turf grass is somewhat dormant.

It should be noted that it only takes playing once on a very wet field to destroy the turf root zone for that season. An effort must be made not to play games or even practice on fields that are excessively wet. An inclement weather policy is strongly recommended as a management tool for preventing damage to fields in the event of inclement weather.

The enforcement of a restrictive inclement weather policy by field managers is the single best management practice available. A typical policy addresses the importance of not playing on fields during wet conditions. Such a policy protects the safety of players, the condition of the fields and serviceability of the facilities. It is also fiscally responsible to the School. The policy should outline condition assessment procedures and the responsibility of the Recreation Coordinator, athletic team staff and players, as they relate to inclement weather and field use. A complete inclement weather policy should include information on its purpose, implementation procedures, field closure guidelines, communication processes, procedure enforcement and penalty procedures. The inclement weather policy should be provided to all permitted field users, as well as posted at all facilities to inform unscheduled users of the importance of prohibiting use during inclement weather. However, the restrictions with MIAA/NFHS policies regarding the scheduling of games and seasons makes adhering to an inclement weather policy difficult.

SECTION 4.0 – SCHEMATIC PLANNING PROGRAM

The main goal of schematic planning program is to provide Shrewsbury with redevelopment options that best meet the needs of the School. Based on programming discussions with the School, the current stadium field facility is not capable of supporting the athletic program demands and the baseball field and lower practice fields are improperly graded and poorly drained. The schematic layout described below will provide the school with development alternatives that range from the redevelopment of the existing track and stadium field facility to the installation of a synthetic turf game field. Site amenities and supporting equipment have also been taken into consideration, specifically the location of grandstands, amenities buildings and athletic lighting.

SECTION 5.0 – SCHEMATIC DESIGN AND ESTIMATED PROJECT COSTS

The main goal of schematic planning program is to provide Shrewsbury with redevelopment options that best meet the needs of the School. Based on programming discussions with the School, the current poor drainage constraints of the lower practice fields put an additional demand on the remaining fields resulting in the athletic facilities as a whole not capable of supporting the athletic program demands. The schematic layout described below will provide Shrewsbury with development alternatives that range from the reconfiguration of the

existing field facilities to the installation of synthetic turf. Site amenities and supporting equipment have also been taken into consideration, specifically the location of a new synthetic turf field, athletic lighting and ADA accessible walkways. At Enclosure #3, we have provided schematic drawings showing alternative layouts and each option is described in detail below.

Conceptual School Layout Option 1 – (See Enclosure #3)

Master Plan Strategy. Under this option, the existing track will be resurfaced with resilient latex surfacing and the D-areas will be paved and surfaced as well. The running lanes to the field event venues such as pole vault, LJ/TJ, and javelin would also be resurfaced. The discus venue would be relocated next to the shot put venue in an effort to group the throwing events together. The track's existing galvanized chain link fence with be replaced with a black vinyl-coated chain link fence.

The stadium field within the track will also be a synthetic in-filled turf field, capable of supporting near continuous use. This construction includes a sub-surface drainage system, consisting of an engineered stone base with flat panel drains and collector pipes used to capture runoff, maximize groundwater recharge opportunity, and discharge overflow outside of the field area into existing track drainage system.

As part of this option, the varsity baseball and varsity softball fields will also be renovated to include new black vinyl-coated backstops (30-ft high) and perimeter fencing, new pre-fabricated dugouts with storage, new bullpens and batting tunnels. A new six (6) pole MUSCO athletic lighting system is proposed to light the baseball facility and a new four (4) pole MUSCO athletic lighting system is proposed for the softball field facility.

Additional improvements to the varsity baseball field will consist of the field being re-graded, receive new drainage and then re-seeded. The outfield fencing will also be brought in so that the center outfield distance is reduced to 350 feet.

The Field Hockey/LAX Field would also be converted to a synthetic turf field. As part of this option, a new 350-person grandstand will be installed along the eastern edge of the field, able to be accessed from the existing walkway along the track side. A new storage/amenities building is proposed at the end of the Field Hockey/LAX field. A new four (4) pole MUSCO athletic lighting system is proposed to light this field facility. Lastly, various walkway improvements will be included into the project to provide ADA accessible routes throughout the site.

The proposed improvements to the Lower Practice Fields will primarily consist of drainage improvements. A series of flat panel drains will be installed in a herringbone pattern (spaced 20-ft on center) within the field playing areas. These flat panel drains would then be connected to perimeter French drains (perforated pipe in stone) and outfall towards the fields' southern edge. Additional improvements to the fields would include new backstops (20-ft high), new dugouts (concrete slab with fencing), and new irrigation system.

In regards to the tennis courts, improvements will consist of repairing of cracks and fence post heaves and then the courts will be re-surfaced and re-striped.

Site improvements under this option will include a new storage/restrooms building located at the southern end of the Field Hockey/LAX Field to compliment and provide amenities to the new spectator seating and much needed storage. Finally, new walkways will be installed to provide ADA accessibility to all of the field facilities.

Cost Estimates – Conceptual HS Layout Option 1. The estimated costs have been summarized as follows:

Track and Stadium Field	
• Synthetic Turf Field (at Track)	$ 780,000
• Resurface Track	$ 270,000
• Pave D-Areas	$ 100,000
• Fencing Renovation (Black vinyl)	$ 45,000
• Scoreboard	$ 40,000
	$ 1,235,000
Field Hockey/ LAX	
• Synthetic Turf Field (at Field Hockey)	$ 850,000
• Athletic Lighting (4 poles at Field Hockey)	$ 350,000
• Grandstand (350 seat at Field Hockey)	$ 94,000
	$ 1,294,000
Varsity Baseball	
• Field Renovation (Re-grade, reseed, drainage)	$ 250,000
• Fencing (Black vinyl)	$ 49,000
• Athletic Lighting (6 poles at V. Baseball)	$ 450,000
• Backstop (30-ft)	$ 40,000
• Dugouts (Pre-fab, w/storage)	$ 45,000
• Bullpens/Batting tunnels	$ 28,000
• Scoreboard	$ 20,000
• Parking (24 spaces)	$ 75,000
	$ 957,000
Varsity Softball	
• Backstop (30-ft)	$ 35,000
• Dugouts (Pre-fab, w/storage)	$ 36,000
• Athletic Lighting (4 poles at V. Softball)	$ 280,000
• Safety Netting (20-ft)	$ 15,000
	$ 366,000
Practice Fields	
• Drainage Improvements (Slit drains)	$ 60,000
• Irrigation System	$ 80,000
• Backstops (2 at 20-ft)	$ 40,000
• Dugouts (4, Gameshade)	$ 28,000
• Fencing Renovations	$ 30,000
	$ 238,000

Tennis

• Crack Repair/Re-surfacing	$ 40,000

Site Improvements

• Amenities Building (storage, restrooms)	$ 330,000
• Walkways and appurtenances	$ 40,000
	$ 370,000

Summary – Conceptual HS Layout Option 1. The estimated costs have been summarized as follows:

• Total Cost	$ 4,498,000
• Design Contingency (20%)	$ 899,000
• Soft Costs (5%)	$ 225,000
	$ 5,622,000

Costs include soft costs (design, geotechnical, testing, etc.), taken as 5% of the constructed cost, as well as a 20% contingency. This estimate is an approximation and more detailed construction cost estimates will be prepared with the detailed design of the facility. Again, the pre-design cost estimates are not suitable for budget development, but are intended to provide a basis of comparison with other alternatives.

Conceptual School Layout Option 2 – (See Enclosure #3)

Master Plan Strategy. Similar to Option 1, this option include the same improvements to the track and stadium field and the same improvements to the varsity baseball and varsity softball fields. However, a new parking area with 24 spaces is proposed along the school access road adjacent to the baseball outfield.

For the Field Hockey/LAX Field, new athletic lighting and spectator seating will be installed. However the field will not be converted to synthetic turf, but remain a natural grass field.

The major change with this option is that a combination multipurpose synthetic turf field with softball field bump out is proposed for the eastern half of the Lower Practice Fields. There will be a new seven (7) pole MUSCO athletic lighting system installed to light this field facility. The western half of the practice field area will receive similar improvements as in Option 1 (irrigation system, backstops, and drainage improvements).

Tennis courts will receive crack repairs and new acrylic tennis surfacing. A new storage/restrooms building located at the southern end of the Field Hockey/LAX Field and new walkways will be installed to provide ADA accessibility to all of the field facilities.

Cost Estimates – Conceptual HS Layout Option 2. The estimated costs have been summarized as follows:

Track and Stadium Field		
•	Synthetic Turf Field (at Track)	$ 780,000
•	Resurface Track	$ 270,000
•	Pave D-Areas	$ 100,000
•	Fencing Renovation (Black vinyl)	$ 45,000
•	Scoreboard	$ 40,000
		$ 1,235,000
Field Hockey		
•	Field (drainage improvements)	$ 50,000
•	Athletic Lighting (4 poles at Field Hockey)	$ 350,000
•	Grandstand (350 seat at Field Hockey)	$ 94,000
		$ 494,000
Varsity Baseball		
•	Field Renovation (Re-grade, reseed, drainage)	$ 250,000
•	Fencing (Black vinyl)	$ 49,000
•	Athletic Lighting (6 poles at V. Baseball)	$ 450,000
•	Backstop (30-ft)	$ 40,000
•	Dugouts (Pre-fab, w/storage)	$ 45,000
•	Bullpens/Batting tunnels	$ 28,000
•	Scoreboard	$ 20,000
•	Parking (24 spaces)	$ 75,000
		$ 957,000
Varsity Softball		
•	Backstop (30-ft)	$ 35,000
•	Dugouts (Pre-fab, w/storage)	$ 36,000
•	Athletic Lighting (4 poles at V. Softball)	$ 280,000
•	Safety Netting (20-ft)	$ 15,000
		$ 366,000
Practice Fields		
•	Synthetic Turf Field (softball, multi-sport)	$ 1,200,000
•	Athletic Lighting (7 poles at syn. turf)	$ 540,000
•	Drainage Improvements (Slit drains)	$ 30,000
•	Irrigation System	$ 40,000
•	Backstops (2 at 20-ft)	$ 40,000
•	Dugouts (4, Gameshade)	$ 28,000
•	Fencing Renovations	$ 80,000
		$ 1,958,000
Tennis		
•	Crack Repair/Re-surfacing	$ 40,000

Site Improvements

• Amenities Building (storage, restrooms)	$ 330,000
• Walkways and appurtenances	$ 40,000
	$ 370,000

Summary – Conceptual HS Layout Option 2. The estimated costs have been summarized as follows:

• Total Cost	$ 5,380,000
• Design Contingency (20%)	$ 1,076,000
• Soft Costs (5%)	$ 269,000
	$ 6,725,000

Costs include soft costs (design, geotechnical, testing, etc.), taken as 5% of the constructed cost, as well as a 20% contingency. This estimate is an approximation and more detailed construction cost estimates will be prepared with the detailed design of the facility. Again, the pre-design cost estimates are not suitable for budget development, but are intended to provide a basis of comparison with other alternatives.

Conceptual School Layout Option 3 – (See Enclosure #3)

Master Plan Strategy. This option also includes the same improvements to the track and stadium field and the same improvements to the varsity baseball and varsity softball fields as with Option 1. However, as with Option 2, a new larger parking area with 36 spaces is proposed along the school access road adjacent to the baseball outfield.

Similar to Option2, new athletic lighting and spectator seating will be installed at the Field Hockey/LAX Field and the field will not be converted to synthetic turf, but remain a natural grass field.

The Lower Practice Fields and tennis courts improvements remain similar to Option 1, in addition to a new storage/restrooms building located at the southern end of the Field Hockey/LAX Field and new walkways will be installed to provide ADA accessibility to all of the field facilities. Layout Option 3 results in maximizing and combining the benefits from the previous two layout options.

Cost Estimates – Conceptual HS Layout Option 3. The estimated costs have been summarized as follows:

Track and Stadium Field	
• Synthetic Turf Field (at Track)	$ 780,000
• Resurface Track	$ 270,000
• Pave D-Areas	$ 100,000
• Fencing Renovation (Black vinyl)	$ 45,000
• Scoreboard	$ 40,000
	$ 1,235,000
Field Hockey	
• Field (drainage improvements)	$ 50,000
• Athletic Lighting (4 poles at Field Hockey)	$ 350,000
• Grandstand (350 seat at Field Hockey)	$ 94,000
	$ 494,000
Varsity Baseball	
• Field Renovation (Re-grade, reseed, drainage)	$ 250,000
• Fencing (Black vinyl)	$ 49,000
• Athletic Lighting (6 poles at V. Baseball)	$ 450,000
• Backstop (30-ft)	$ 40,000
• Dugouts (Pre-fab, w/storage)	$ 45,000
• Bullpens/Batting tunnels	$ 28,000
• Scoreboard	$ 20,000
• Parking (36 spaces, retaining wall)	$ 180,000
	$ 1,062,000
Varsity Softball	
• Backstop (30-ft)	$ 35,000
• Dugouts (Pre-fab, w/storage)	$ 36,000
• Athletic Lighting (4 poles at V. Softball)	$ 280,000
• Safety Netting (20-ft)	$ 15,000
	$ 366,000
Practice Fields	
• Drainage Improvements (Slit drains)	$ 60,000
• Irrigation System	$ 80,000
• Backstops (2 at 20-ft)	$ 40,000
• Dugouts (4, Gameshade)	$ 28,000
• Fencing Renovations	$ 30,000
	$ 238,000
Tennis	
• Crack Repair/Re-surfacing	$ 40,000
Site Improvements	
• Amenities Building (storage, restrooms)	$ 330,000
• Walkways and appurtenances	$ 40,000

	$ 370,000

Summary – Conceptual HS Layout Option 3. The estimated costs have been summarized as follows:

• Total Cost	$ 3,805,000
• Design Contingency (20%)	$ 761,000
• Soft Costs (5%)	$ 190,000
	$ 4,756,000

Costs include soft costs (design, geotechnical, testing, etc.), taken as 5% of the constructed cost, as well as a 20% contingency. This estimate is an approximation and more detailed construction cost estimates will be prepared with the detailed design of the facility. Again, the pre-design cost estimates are not suitable for budget development, but are intended to provide a basis of comparison with other alternatives.

SECTION 6.0 – PERMITTING

As a feasibility study, Gale did not complete a rigorous permitting review or meet with various permitting authorities. However, based on the project locations and scope, both of the project alternatives, as proposed above, would likely be subject to the following permitting requirements:

- Town of Shrewsbury Conservation Commission – Request for Determination of Applicability (RDA) and Con-Com review
- Town of Shrewsbury – Site Plan Review
- Town of Shrewsbury Building Inspector - Building Permit
- NPDES General Permit

A formal wetland delineation and site survey may need to be performed for later design phases of this project if the RDA determines that work within the lower practice fields falls within 100' of the bordering vegetated wetland and be subject to the Wetland Protections Act and Massachusetts Stormwater Regulations.

Synthetic infilled turf fields are typically considered an improvement to adjacent wetlands and drainage systems. Synthetic turf does not require the fertilizers, herbicides or pesticides that natural turf requires to remain playable. In addition, the vertical draining nature of such fields tends to greatly reduce stormwater flows in comparison to natural turf fields.

SECTION 7.0 - Comparison of Conceptual Layout Options

Conceptual Layout –Option 1

Advantages:

- This option provides a new track surface and fully paved D-areas with synthetic turf game field.
- This option provides second synthetic turf field at the lower practice field area.
- Spectator seating at Field Hockey/ LAX field.
- This option provides improvements to the baseball and softball fields.
- This option affords for storage/amenities building.
- It requires little to no encroachment into the wooded area adjacent to residential properties.

Disadvantages:

- It provided less additional parking than Option 3.

Conceptual Layout - Option 2

Advantages:

- This option provides a new track surface and fully paved D-areas with synthetic turf game field.
- New storage/restroom building.
- It requires little to no encroachment into the wooded area adjacent to residential properties.

Disadvantages:

- This is the most costly option.
- It requires more phasing coordination and programming.
- It provided less additional parking than Option 3.

Conceptual Layout – Option 3

Advantages:

- This is the least costly track option.
- New spectator seating.
- New athletic lighting systems.
- New storage/restroom building.
- This option provides improved drainage at lower practice fields.
- Crack repair and resurfacing of tennis courts.
- Additional parking is provided adjacent to baseball outfield.
- It requires little to no encroachment into the wooded area adjacent to residential properties.

Disadvantages:

- This option affords only one synthetic turf field.

The above mentioned advantages and disadvantages were thoroughly vetted with the School. The improvements would result in a new, state-of-the-art track and game field facility and a redeveloped baseball field with athletic lighting, improved drainage system, dugouts and backstop. The proposed synthetic turf field, with athletic lighting, would have a capacity of well over 600 scheduled team uses

SECTION 8.0 - MASTER PLAN IMPLEMENTATION – PHASING PLAN

It is apparent that the implementation of the entire Master Plan may not be feasible in a single project. This is due to the School's fiscal constraints and due to the impacts on current users, who have an on-going requirement for field space during the redevelopment process. The Master Plan is, therefore, broken into discrete projects. These are based on reasonable annual budget expenditures, priority of need and minimization of user impacts. In general, the principles behind the formulation of the Master Plan Phasing are:

- Accomplish the projects which result in the biggest impact first, to set the conditions for the project.
- Accomplish the remaining Master Plan elements in order of relative importance, based on projected use.
- Attempt to accomplish all elements of the Master Plan within four (or more) years, including the current year.
- Attempt to balance the School's expenditure on field renovation throughout the Master Plan implementation period.
- Schedule Master Plan elements which only provide for the renovation of an existing field in place, with no change in layout or use, late in the Phasing Plan.

The following phasing plan is an example of Option 1:

Phase 1, Fiscal Year 2016

Phase 1 should include the improvements to the track and installation of synthetic turf at the stadium field. The improvements to the tennis courts would also be included under this phase.

Given the limited damage to the surrounding, existing fields during construction, and the quick turn-around use of a synthetic turf field, this Phase will provide the School with the ability to relocate displaced users during the renovations to other fields during subsequent phases of the Master Plan.

Phase 2, Fiscal Year 2017

Phase 2 will focus the improvements to the varsity baseball field, with new athletic lighting, backstops, dugouts and new parking area.

Phase 3, Fiscal Year 2018

With the implementation of Phases 1 and 2, the School can shift its focus to the renovations to the Field Hockey/LAX Field to include new spectator seating and athletic lighting. Improvements to the Lower Practice Fields and Varsity Softball Field will also be included as part of this phase.

Phase 4, Fiscal Year 2019

With the field renovations completed, the School can start to look at other areas of their athletic campus where improvements can occur. This phase would also include construction of the storage/restroom building and any remaining site improvements carried over from the previous phases. As the last phase in the Master Plan, the School will be able to assess how the previous improvements / projects have affected the School's athletic program.

SECTION 9.0 – CONCLUSIONS AND RECOMMENDATIONS

Gale's preliminary findings are that the demands and needs of Shrewsbury's athletic programs cannot be supported with the current condition of the athletic campus facilities. As a result of this study, the School is presented with three alternative options that will not only improve the condition of the facilities, but are capable of supporting more demand with the use of synthetic turf and athletic lighting. Although permitting would most likely be involved, we feel this process could be overcome though proper planning and design.

The above mentioned options provide a new state-of-the-art track and game field facility and redeveloped baseball facility with improved drainage. Additionally the improvements to the track and game field facility and the baseball field may also serve as a focus point for everyone entering the athletic campus and provide a sense of school pride for all students.

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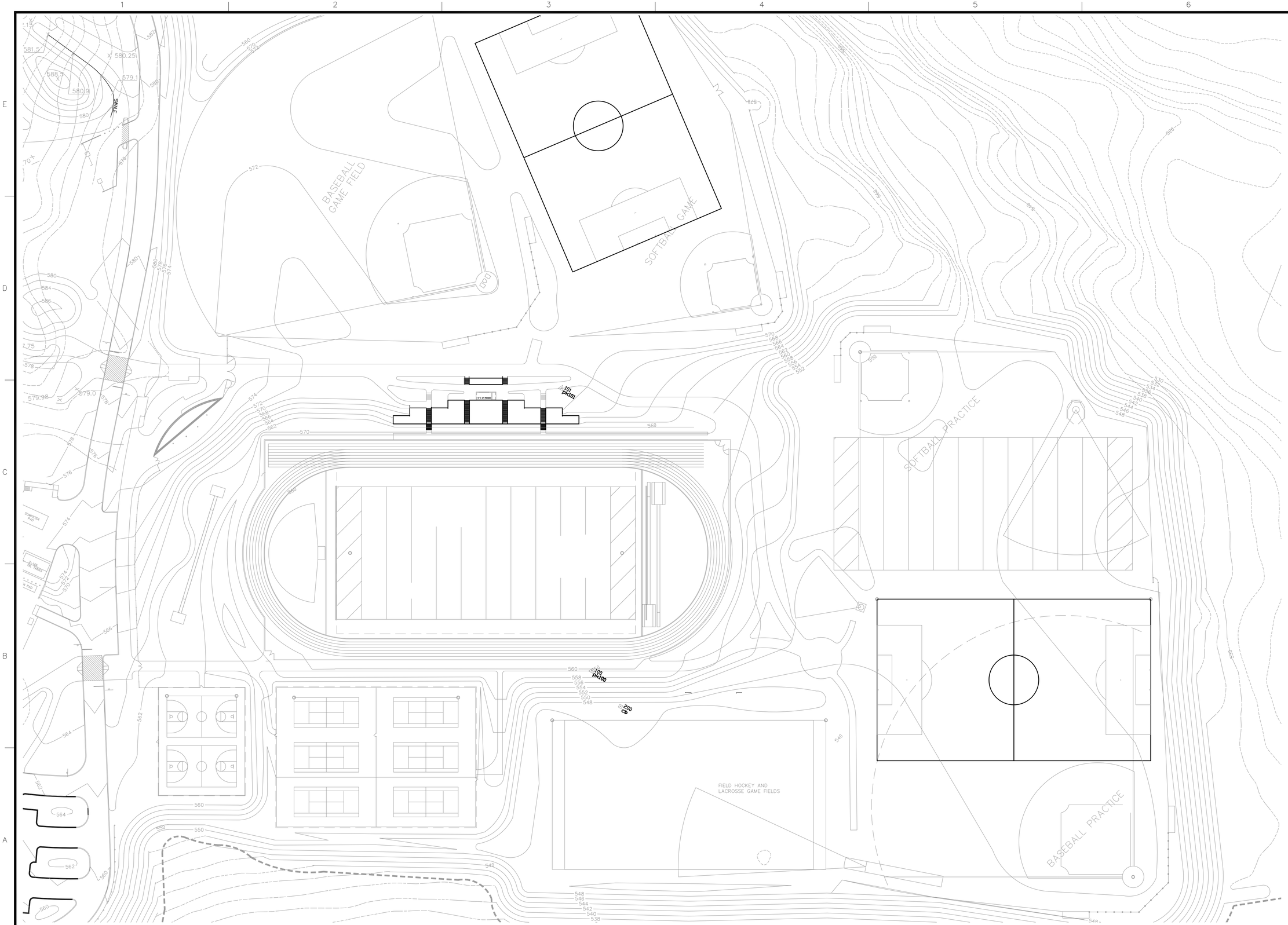

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PROJECT

ATHLETIC FIELD RENOVATIONS
SHREWSBURY HIGH SCHOOL
SEWALL STREET
SHREWSBURY, MA 01545

OWNER

REVISIONS

NO.	DATE	DESCRIPTION

CADD FILE	OPTION1
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DRAWN BY	WAH
CHECKED BY	
DATE	3/19/2015
DRAWING SCALE	1"=50'-0"

GRAPHIC SCALE

0 50' 100'

SHEET TITLE

EXISITNG CONDITIONS PLAN

DRAWING NO.

EX-1

PROJECT NO. 716700

PHOTOGRAPHIC DOCUMENTATION
Athletic Facilities Evaluation
Shrewsbury High School
Shrewsbury, MA
Gale JN 716700

Prevailing Site Conditions

Athletic Facilities

Track and Stadium Field:

Picture 1:

View of pole vault venue.

Picture 2:

Track surfacing worn at pole vault box.

Picture 3:

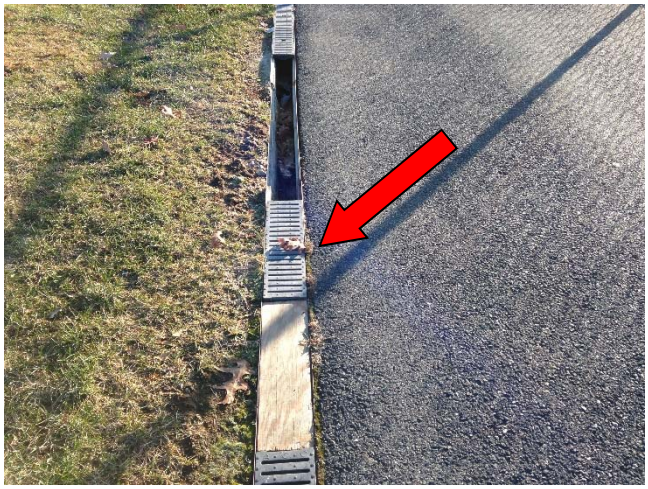
Fence post heaving at northern track chute extension. Also, no bottom rail for any of the fencing.

Picture 4:

Walkway along east edge of straightaway. Areas with excessive cross-slope and evidence of post heaves.

PHOTOGRAPHIC DOCUMENTATION
Athletic Facilities Evaluation
Shrewsbury High School
Shrewsbury, MA
Gale JN 716700

Picture 5:



Damaged trench drain section at paved walkway along east edge of straightaway.

Picture 6:

Stadium field athletic lighting. Older lighting generation with no shielding of fixtures.

Picture 7:

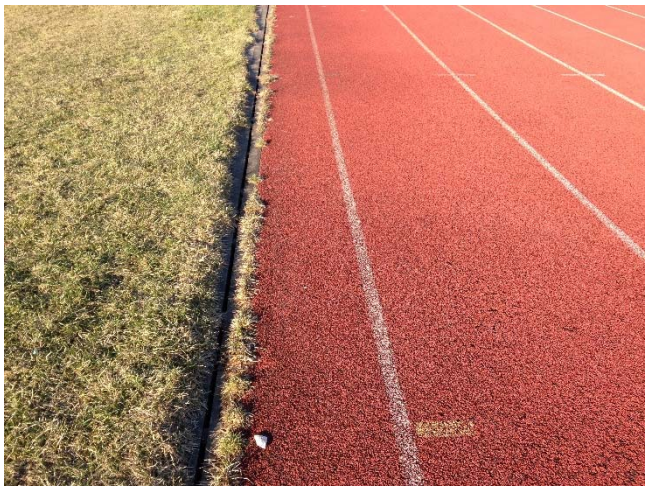
Track meets 1 meter recommended separation from outside lane to fence.

Picture 8:

Track meets 8 inch recommended separation from inside lane line to field (drain).

PHOTOGRAPHIC DOCUMENTATION
Athletic Facilities Evaluation
Shrewsbury High School
Shrewsbury, MA
Gale JN 716700

Picture 9:



Vegetation growth between track drain edge and track surfacing.

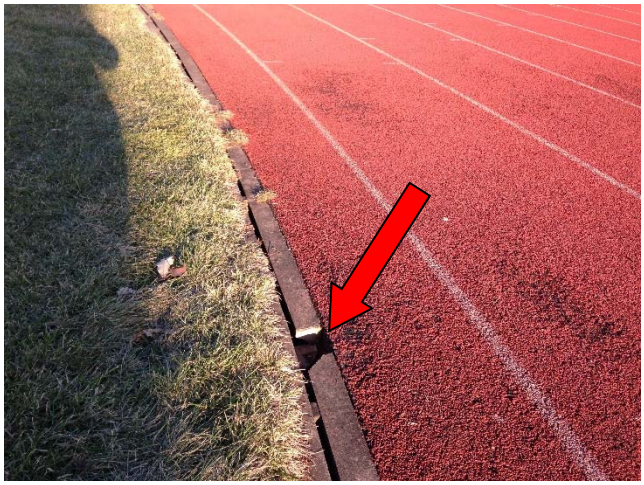
Picture 10:

Vegetation growth deteriorating surfacing and need to be removed.

Picture 11:

View of inline trench drain catch basin. Cover needs to be cleaned and debris in sump removed.

Picture 12:



Section of inline trench drain needing repair.

Picture 13:

Areas of worn track surfacing.

Picture 14:

Area of worn track surfacing.

Picture 15:

LJ/TJ venue with worn track surfacing along running lane.

Picture 16:

Takeoff board at LJ/TJ venue needs to be replaced.

Picture 17:

Previous repair of southern LJ/TJ running lane.

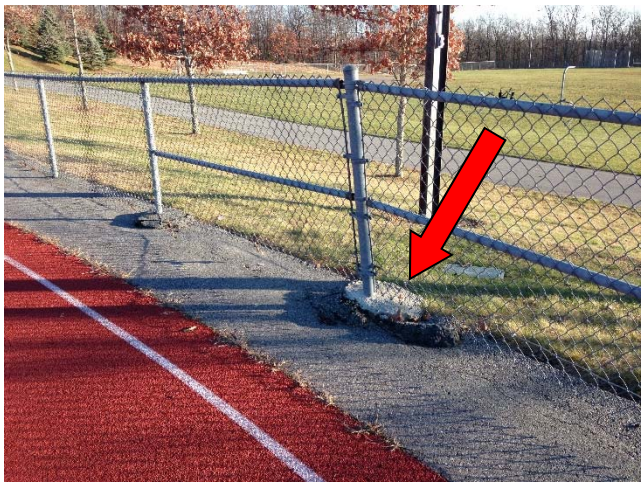
Picture 18:

LJ/TJ venue with worn track surfacing along running lane.

Picture 19:

View of fence posts heaves at southern end of track chute extension.

Picture 20:



View of fence posts heaves at southern end of track chute extension.

PHOTOGRAPHIC DOCUMENTATION
Athletic Facilities Evaluation
Shrewsbury High School
Shrewsbury, MA
Gale JN 716700

Picture 21:

View of Track scoreboard.

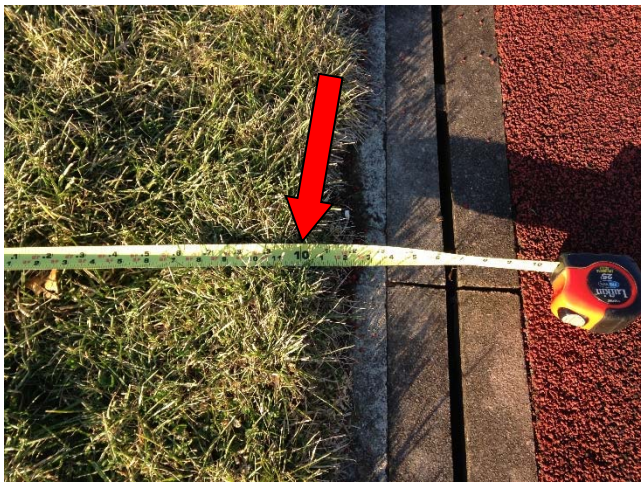
Picture 22:

View of football goal post and worn turf area around soccer goal area.

Picture 23:

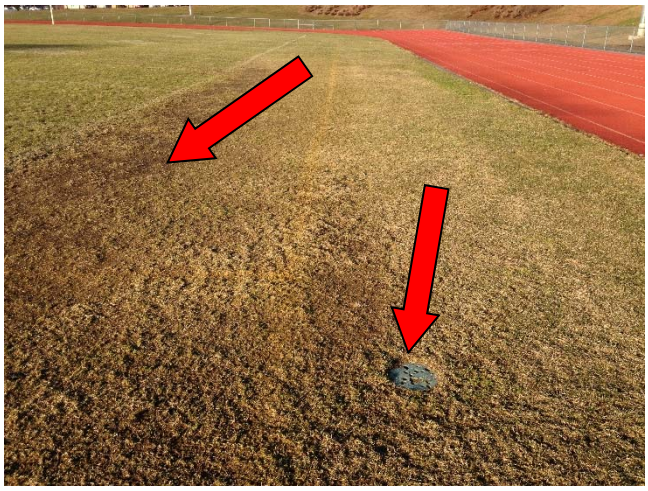
View of soccer corner kick area. Irrigation control boxes are within 1-ft of corner and impede with foot placement during kicks.

Picture 24:



Soccer safety run out area meets recommended 10-ft distance.

Picture 25:



View of uneven depressions, poorly drained areas of field, and irrigation box near soccer playing area.

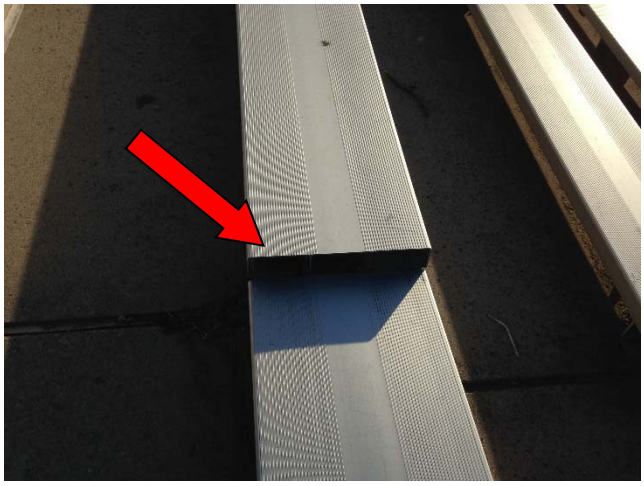
Picture 26:

View of uneven depressions, poorly drained areas of field.

Picture 27:

View of stadium bleachers.

Picture 28:



Section of bleacher aluminum seating offset and in need of repair.

Baseball Field:

Picture 29:

View of spectator seating on varsity baseball side.

Picture 30:

View of poorly drained area at baseball field.

Picture 31:

View of baseball backstop and fencing.

Picture 32:

Detached fence fabric at baseball backstop.

PHOTOGRAPHIC DOCUMENTATION
Athletic Facilities Evaluation
Shrewsbury High School
Shrewsbury, MA
Gale JN 716700

Picture 33:

Separated and warped fence fabric at baseball backstop.

Picture 34:

Worn turf area in front of baseball dugout. No protective fencing in front of dugout.

Picture 35:

Worn turf area at first base.

Picture 36:

Poorly drained area just outside baseball outfield.

Picture 37:

Drainage structure along baseball outfield and just outside playing limits.

Picture 38:

Baseball scoreboard.

Softball Field:

Picture 39:

Rock outcrop on the edge of 10-ft safety run out area at softball field outfield.

Picture 40:

Worn turf at goal area of softball field outfield.

Picture 41:

View of softball field backstop and fencing.

Picture 42:

No bottom rail at fencing to help support fence.

Picture 43:

View of softball dugout.

Picture 44:

Abrupt grade drop off directly behind softball dugout.

Picture 45:

Softball field backstop.

Picture 46:

Spectator seating at softball field. No ADA accessible walkway.

Picture 47:

Batting tunnel adjacent to softball field.

Picture 48:

Softball scoreboard.

Lower Practice Fields:

Picture 49:

View of practice softball field.

Picture 50:

View of ponding at skinned softball at lower practice fields.

Picture 51:

Poor drainage area at lower practice fields.

Picture 52:

Poor drainage area at lower practice fields.

Picture 53:

Discus venue at lower practice fields.

Picture 54:

Broken fence gate at southern edge of lower practice fields.

Picture 55:

View of ponding at skinned baseball at lower practice fields.

Picture 56:

Detached overhang section at practice fields backstop.

Picture 57:

Detached overhang section at practice fields backstop.

Picture 58:

Player dugout area at practice fields.

Picture 59:

Player dugout area at practice fields with abrupt change in slope behind seating.

Picture 60:

Clogged drain at southern end of Field Hockey/LAX field.

Field Hockey/LAX Field:

Picture 61:

Scoreboard at Field Hockey/LAX field.

Picture 62:

Abrupt grade change along western edge of Field Hockey/LAX field.

Picture 63:

Players seating area. No ADA accessible walkway.

Picture 64:

Sinkhole at Field Hockey/LAX field.

Picture 65:

Sink holes due to drainage at Field Hockey/LAX field.

Picture 66:

View of Field Hockey/LAX Field from toe of berm on track side.

Picture 67:

View of Field Hockey/LAX Field from top of berm on track side.

Picture 68:

Shot put venue. Minor maintenance needed to define edge.

Tennis Courts and Basketball:

Picture 69:

Visitor bleachers for stadium blocking ADA access to tennis courts.

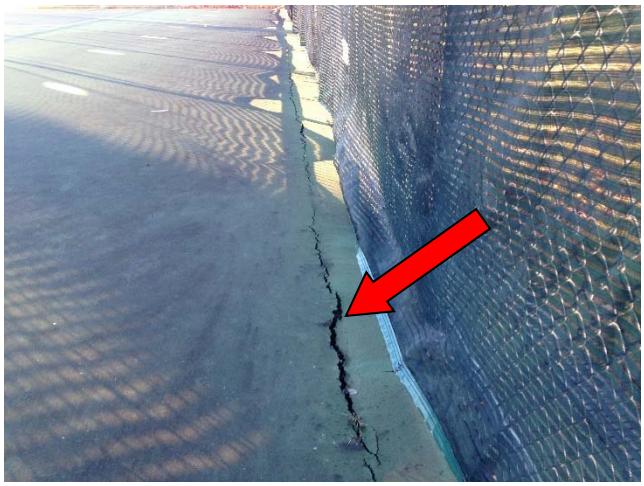
Picture 70:

Failure of pavement edge of walkway due to placement of Visitor bleachers for stadium.

Picture 71:

Cracking and settlement next to trench drain just outside south fencing.

Picture 72:



Cracking along inside of south fencing.

Picture 73:

Pavement cracking at netting post.

Picture 74:

Extensive pavement cracking at netting post.

Picture 75:

Cracking along pavement cold joints.

Picture 76:

Cracking along pavement cold joints with growth intrusion.

Picture 77:

Sediment accumulation at western edge. Area outside fence needs to be cleared so that sediment does not enter onto courts.

Picture 78:

Sediment accumulation and choked out trench drain.

Picture 79:

Gate latch broken.

Picture 80:

Heaving of fence post at basketball courts.

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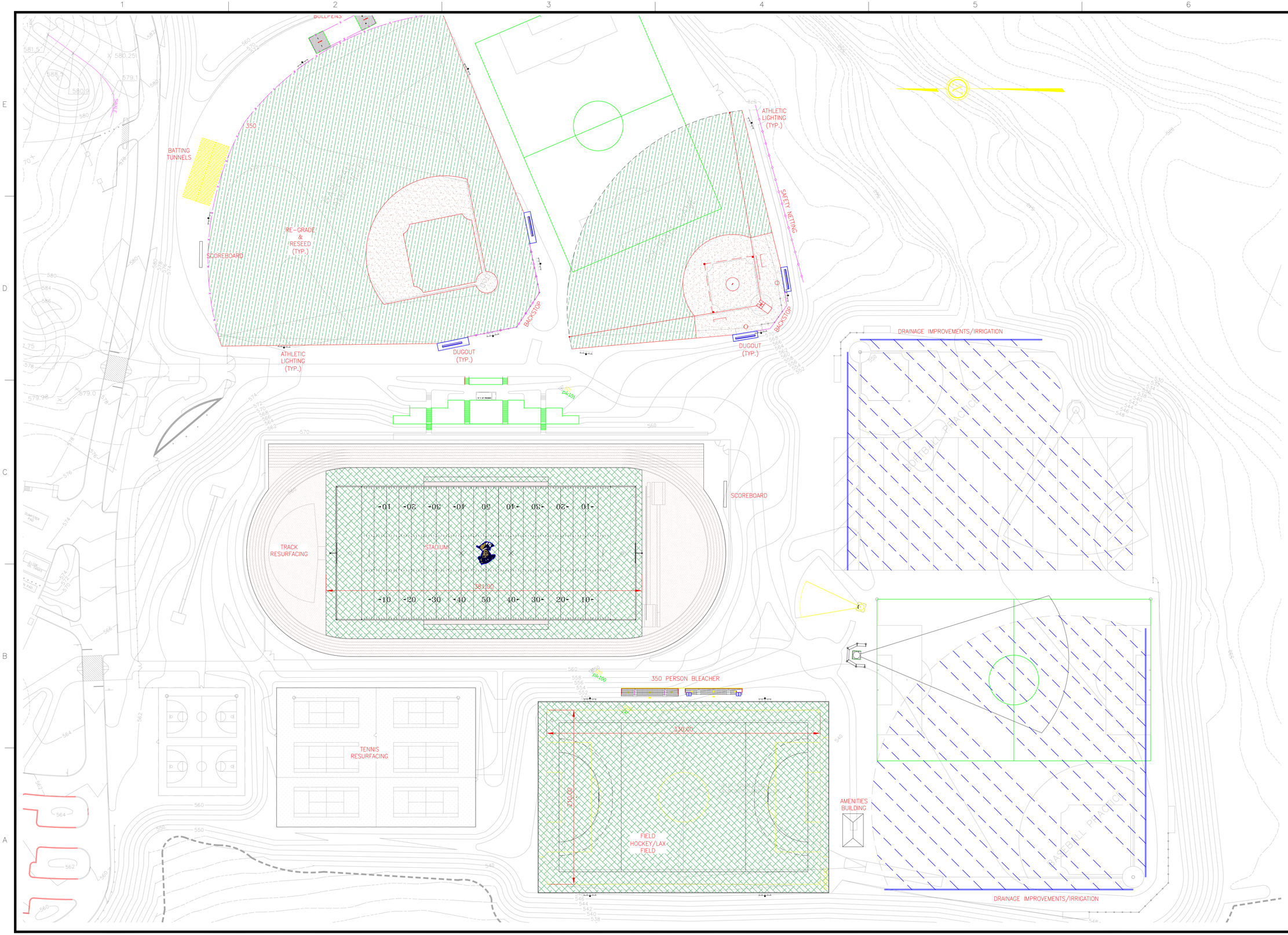

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OWNER

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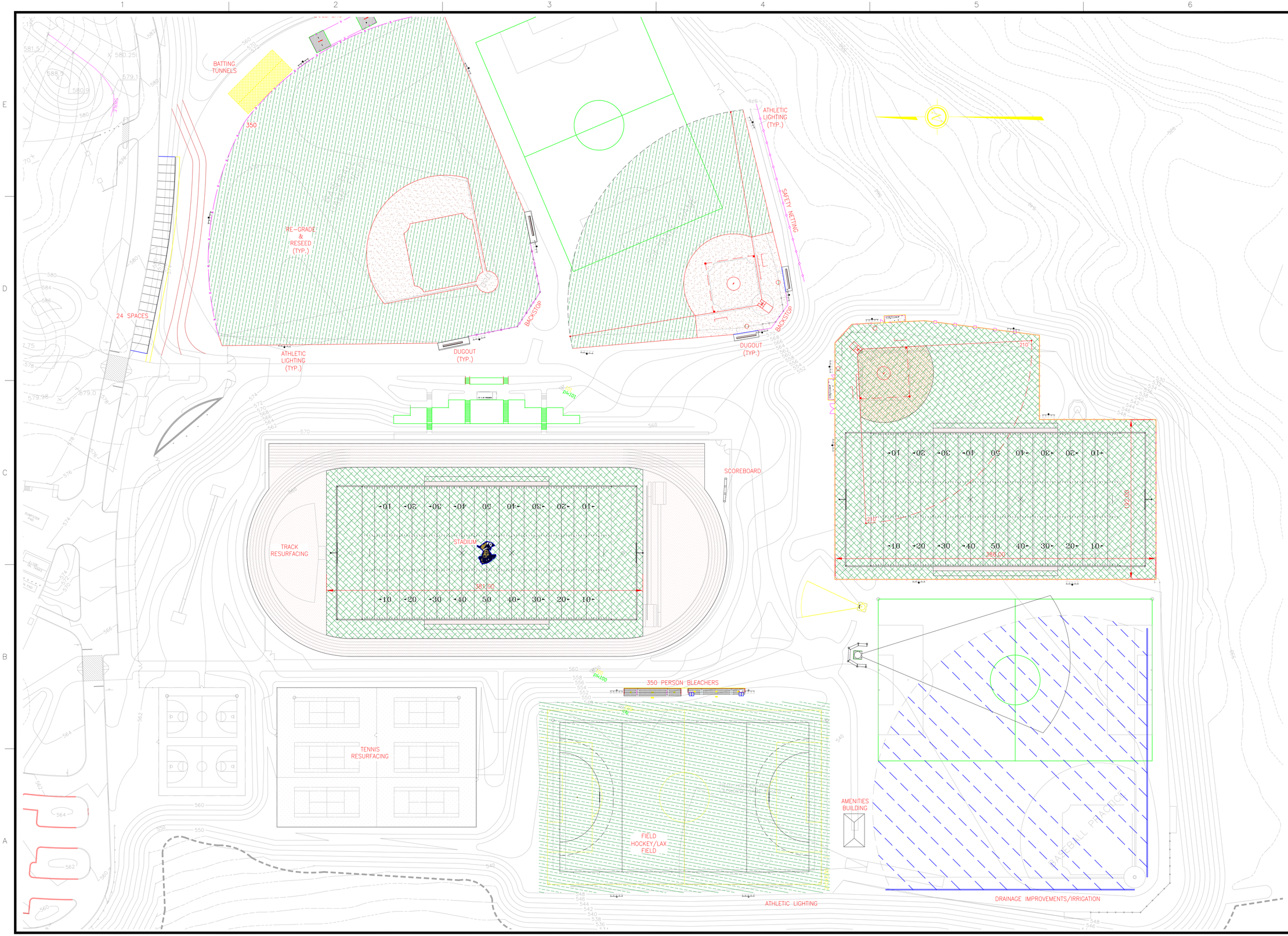

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PROPOSED LAYOUT PLAN

DRAWING NO.

SK-2

PROJECT NO. 716700

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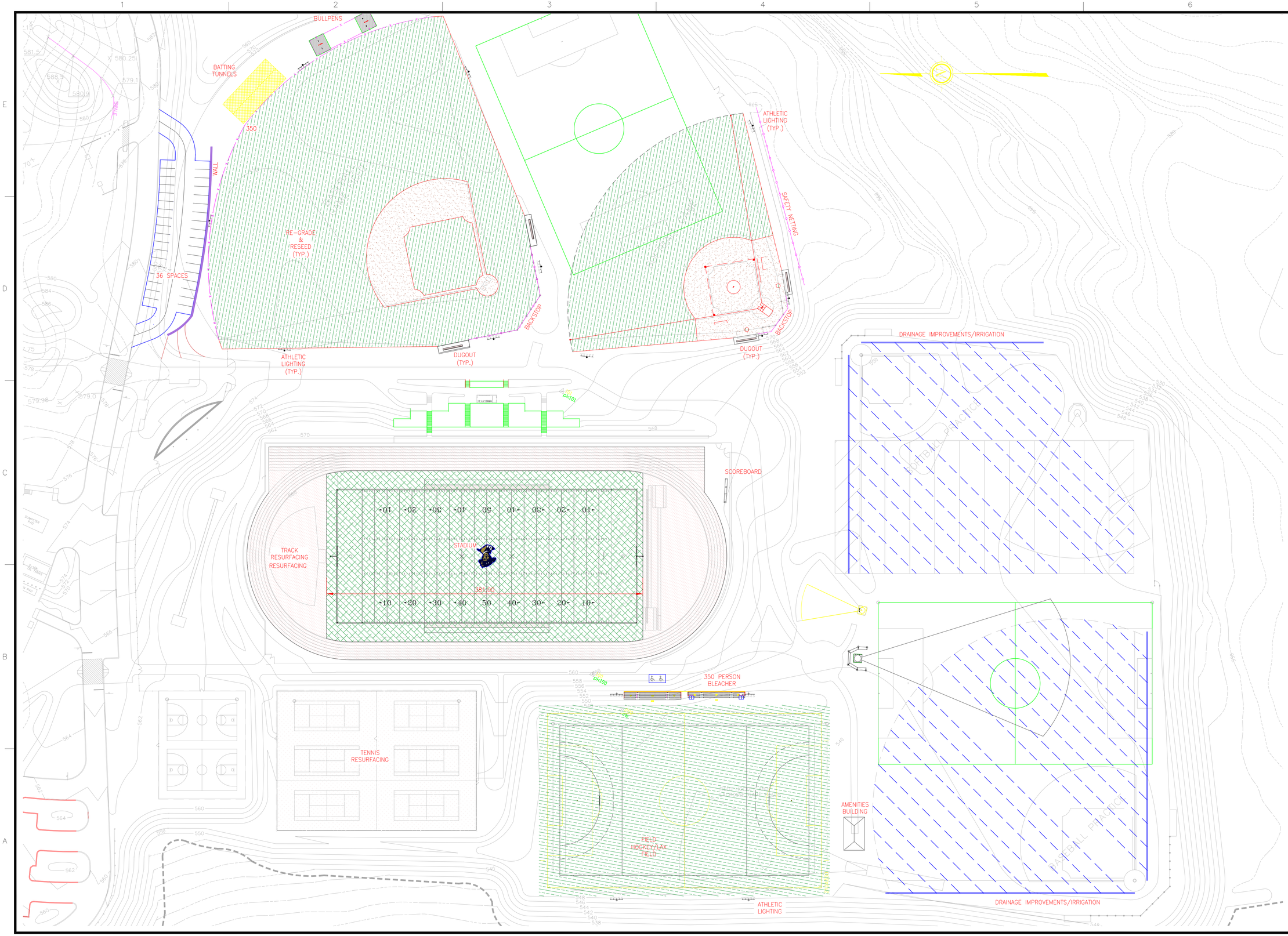

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SHEET TITLE

PROPOSED LAYOUT PLAN

DRAWING NO.

SK-3

PROJECT NO. 716700

RECOMMENDED MAINTENANCE TASKS & BUDGET

SHREWSBURY HIGH SCHOOL

ATHLETIC CAMPUS EVALUATION AND MASTER PLAN

A.1 RECOMMENDED MAINTENANCE TASKS

Soccer, football, softball, and baseball each dictate a different set of conditions, requiring unique management approaches, as each sport wears the turf differently (e.g., soccer goal mouths versus midfield and side line areas). Maintenance requirements also can vary within individual fields based on environmental conditions and changes in the micro climates (sun, shade, drainage, exposure to salt, traffic, etc.). Good turf managers are aware of these variations and apply maintenance accordingly. The following section outlines the tasks and scheduling required to properly maintain natural turf fields in order to formulate maintenance budgets. These are general recommendations and costs that have been obtained from various Owners throughout the northeast and generalized for the purposes of this report. Actual budgets may vary based on actual site conditions, quality of field construction and the turf managers actual budget and time allocations. A general description of typical athletic complex turfgrass maintenance tasks are outlined below.

A1.1 Testing. As an integral part of the Integrated Turf Management Program for natural turf, each field should have its topsoil tested annually for plant nutrient levels. Samples can normally be taken by on-site staff and sent to the UMASS Agricultural Extension Service for testing and results (www.umass.edu/soiltest/). These tests will determine the amounts of fertilizer, lime and sand topdressing that need to be applied as part of regular maintenance. Knowing these results prevents unnecessary fertilizer and lime applications, and can provide savings on maintenance costs and materials.

A1.2 Mowing. Turfgrass in areas of play is mowed at least weekly during the growing season to provide a suitable playing surface. Regular mowing practices enhance turf density, color, texture, root development, wear tolerance and other key aspects of turf quality. Mowing heights are adjusted from two and a half inches (2.5”) during the growing season until mid-July, to three and a half inches (3.5”) from mid-July to mid-September, and then gradually brought back down to two and a half inches (2.5). Clippings are either mulched and left behind, or collected and disposed of, depending on the height of the cut and thatch density targeted by the turf manager.

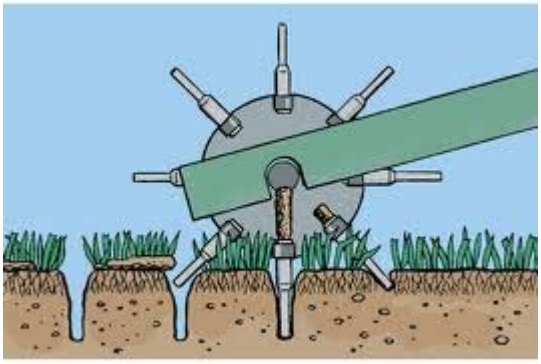
A1.3 Infield Maintenance - Baseball/Softball. During the spring (April-June), season, baseball/softball infields are typically dragged with a machine/drag-mat (intended for infield

work) and amended in order to smooth and dry the infield material, as well as to adjust grades at wear areas near the bases and home plate. The batter box and foul lines are also typically painted. For baseball, the pitcher's mound is adjusted and divots repaired. This work is typically performed weekly during the regular season, and sometimes prior to every game before big games or during play-offs. The budget should also account for the spring clean-up and preparation of the infields to remove leaves, weeds and replace bases.

A1.4 Irrigation. In the New England region, the irrigation season typically runs from June through August. During that period, each field footprint should receive one inch (1") of irrigation per week and be adjusted in accordance with precipitation. For a typical 90,000 SF soccer field, this equates to 54,000 gallons per week. Automatic irrigation systems should not be considered to be 'set and forget' systems. Field managers need to actively monitor irrigation to confirm proper timing, coverage and operation, and monitor irrigation with the goal of using water sparingly. Fields that are watered too much are susceptible to disease, early wear and over compaction. We recommend the use of intelligent controllers with moisture sensors. Maintenance budgets need to account for spring start up and repair of irrigation systems as well as fall winterization.

A1.5 Fertilizing. Fields are fertilized to provide micronutrients to the soil and "food" for the turfgrass plant. Fertilization should generally be performed in the early spring and summer, and later supplemented on selected fields in the early fall, as needed. This will confirm that sufficient nutrients are available to develop healthy root zones during the peak growth period, which includes May and June. Fertilization should be directly related to soil tests performed on an individual field and as part of an overall Integrated Turf Management Program. This is particularly important for facilities that border on wetland receptors that may be unnecessarily contaminated by over-fertilization. Once soil sample data has been obtained, fertilizer with the proper nitrogen/ phosphorus/potassium ratio should be obtained and applied at the recommended rates. Low solubility fertilizers, applied only at rates which ensure uptake, should be used to minimize groundwater or surface water impacts.

A1.6 Lime Application. Lime application is generally performed in late November, as it typically takes up to six (6) months to breakdown. Lime should only be applied to soil based on the results of the annual soil testing recommendations.



A1.7 Aeration. Aeration alleviates compaction and develops deep-rooted turf. It is accomplished by creating spaces in the turf, thus allowing moisture, nutrients and oxygen to penetrate to the root zone. Aeration also breaks up thatch, which helps contribute to the organic content of the soil and breaks the mat on the soil surface. High-use fields should be aerated two to three (2-3) times per year. We recommend six to seven inch (6"-7") hollow core aeration equipment be used for

aeration. If the intent is a long-term modification of the root zone, we recommend removing the plugs and top dressing the field with coarse sand.

A1.8 Topdressing. Topdressing is applied periodically, as a soil amendment, to maintain a smooth playing surface and to vary the root zone particle size distribution. Top dressing adds soil, sand or other beneficial organic material, and soil amendments (as determined by turf needs and based on agronomic testing) to the surface of the turf. It should always follow core aerating.

A1.9 Over-Seeding. Over-seeding is recommended for all high use athletic fields. Over-seeding is the spreading of seed over bare areas or areas that are stressed to enhance (fill in) the stressed/bare areas, establish new turf or improve the condition of the turf. The type of seed used, quantity and application timing varies with turf managers' preferences, time of year, and what they are trying to accomplish (quick patch or long term repair). Over seeding is typically timed to coincide with aeration and topdressing tasks.

A1.10 Pesticide and Herbicide Applications. Pesticides and herbicides should be used sparingly and only by licensed applicators. Pesticides should not be applied as a prophylactic, but rather in response to an observed pest or disease, and then tailored accordingly. Instructions and timing for application of pesticides and herbicides should be strictly followed as they are typically targeted at particular stages of growth of weeds or pests. The use of pesticides and herbicides on public properties is severely limited by Massachusetts Law on public properties and schools. Any chemicals used must be of recent manufacture and have quick, effective results. Chemicals that may present health hazards should not be used. Approved pesticides can be found on the State University System website and are known to change periodically. Again, pesticides should be applied only as part of an overall Integrated Turf Management Program and consistent with jurisdictional policy. This is particularly true for facilities that border on water courses or wetland receptors.

A1.11 Synthetic Turf Maintenance. Synthetic turf is not totally maintenance free. Typically turf only needs to be 'raked' or 'groomed' four times in a typical playing season (April – November). This groomer is a special attachment that tows behind a Gator or tractor. Grooming redistributes the sand and rubber infill, fills in typical wear spots at the goal mouths and improves field appearance as well as the cushioning and traction qualities of the sand and rubber infill. Spot sanitation and rinsing to remove bodily fluids can be done during events and should never be done in a 'blanket' application. Some Owners elect to do 'deep' grooming, which is typical done by a vendor who has the specialized equipment. Deep grooming machines remove the sand and rubber infill, rinse and filter it and replace it as the machine moves over the field. Magnets remove metal debris, and filters remove dust, sediment and debris from the infill. 'Deep' grooming should only be done 'as needed' and is not considered a regular maintenance task. Typically turf comes with an eight 8-year warranty, so Owners should not be paying for repairs or adjustments to the turf during that period.

A1.13 RECOMMENDED MAINTENANCE BUDGETS FOR EXISTING OR NEW FIELDS

The following anticipated maintenance costs are based on the tasks listed above. These costs have been gathered from Massachusetts municipalities over the past ten years and represent average estimated costs based on prevailing wage and materials rates. This calculation includes an estimate of the resources, manpower, equipment and materials to perform each activity on a typical natural turf playing field. In addition to material costs, this calculation accounts for labor and overhead costs, as well as equipment utilization rates and capitalization/depreciation. The following Table summarizes these calculations:

Maintenance Activity	Annual Qty for municipal level Rectangular field	Annual Qty for municipal level Diamond	AnnualTask Cost ($)	Annual Maintenance Cost Rectangular	Annual Maintenance Cost Diamond
Equipment Maintenance, service, inventory, training, etc	1	1	$2,850	$2,850	$2,850
Spring Inspection\sampling	1	1	$850	$850	$850
Fertilization	1	1	$1,254	$1,254	$1,254
Spring Clean-up	1	1	$1,316	$1,316	$1,316
Pesticide/herbicide Application	2	2	$363	$726	$726
Cut grass, empty trash, restripe, rake infield	0	18	$444	$0	$7,992
Cut grass, empty trash, restripe,	18	0	$375	$6,750	$0
Aerate	2	2	$288	$576	$576
Topdress	1	1	$1,504	$1,504	$1,504
Overseed	1	1	$963	$963	$963
Irrigation	18	18	$35	$630	$630
Lime Ph Adjustment	1	1	$574	$574	$574
Winterization/leaves/irrigation	1	1	$1,638	$1,638	$1,638
** maintenance activities based on recommended municipal level regimen					
**Operational costs include resources, manpow er equipment and materials			**Total Per field**	**$19,631**	**$20,873**

A1.14 SYNTHETIC TURF MAINTENANCE

Synthetic turf is not maintenance free, and its costs should be factored into facilities budgets just as much as natural turf. Synthetic turf needs to be groomed four 4-times per year. Assuming five (5) hours for two employees, touching up infill, grooming with a tractor and turf rake and clean up. At $250/hour for crew and machines is $1,250 per grooming, four times per year equals an anticipated turf maintenance budget of $5,000.

A1.15 ATHLETIC LIGHTING COSTS

In addition to the reduction in light spill and glare, todays athletic lighting systems also see a reduction (up to 50%) in energy consumption when compared to previous systems. The average energy consumption estimated over a 25-year span would be approximately 75.1 kW per hour per fixture.

The typical 25-year warranty would include repairs to any lamp outages, control issues and a group re-lamping after 5,000 hours of operation. Assuming energy costs of $0.19 per kWh, annual operating hours of 300, 400 and 500 hours would amount to approximately $4,300, $5,700, and $7,100 per year per field.

A1.16 SUMMARY

Using these basic estimated per-field unit costs, the implementation of a typical maintenance budget for the existing and proposed fields has been calculated.

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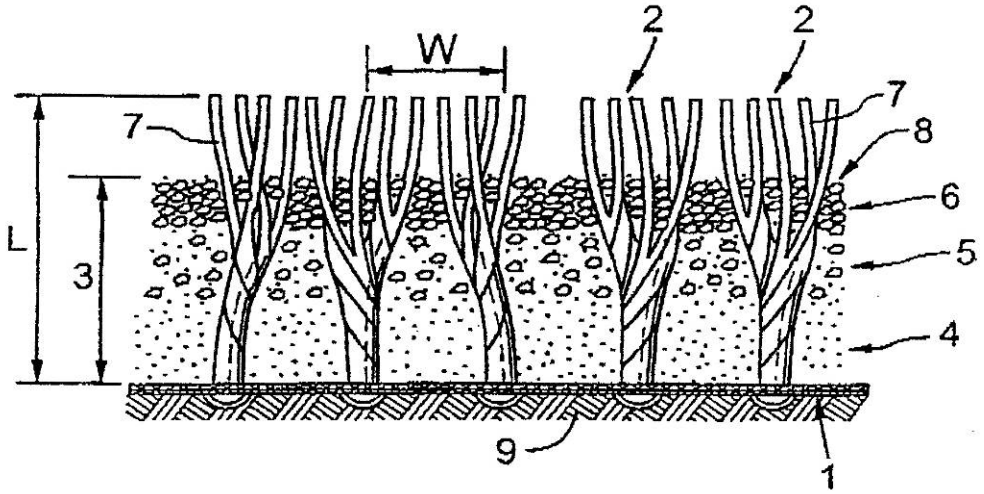
PLANNING CONSIDERATIONS – SYNTHETIC TURF

SHREWSBURY HIGH SCHOOL

ATHLETIC CAMPUS EVALUATION AND MASTER PLAN

A2.0 – PLANNING CONSIDERATIONS - SYNTHETIC TURF

Background. The schematics for proposed renovations on campus call for the installation of an infilled synthetic turf field. The use of synthetic turf is becoming more and more popular, despite environmental concerns, not because of the aesthetics or playability of turf, as much as for the increased use a synthetic turf field can sustain, while reducing maintenance requirements. An unlighted synthetic turf field can sustain twice the amount of play of a natural turf field, without sacrificing playability. With athletic lighting a synthetic field can sustain almost three times the amount of play of natural turf. This increased use can eliminate the need for municipalities to construct, and maintain, additional natural fields to accommodate the demand for more fields. Synthetic turf also can be used in any weather, and can take the pressure off of facilities managers for rescheduling events.



The current generation of Infilled Synthetic Turf is constructed by tufting long fibers of polyethylene through a carpet backing, with sand and rubber infill raked into the fibers to help the fibers stand up, as well as provide cushioning and footing for play. The carpet and infill are constructed on top of a free draining stone base that allows the turf to drain very quickly and remain playable in any weather.

A2.1 Maintenance. Another major advantage of synthetic turf is the relatively insignificant maintenance costs in comparison to natural turf. Synthetic turf does not need to be mowed, irrigated, fertilized, aerated, topdressed or striped. A well-researched estimate suggests that

the maintenance of a grass "game" field costs approximately $30,000 per year in terms of direct labor, materials and equipment costs. Typical annual maintenance for a synthetic turf field is approximately $5,000.00, which includes raking the field with a specialized brush, four times a year to redistribute infill and increase aesthetics and playability.

A2.2 Environment. Typically permitting review boards view synthetic turf as a benefit to the surrounding environment. Synthetic turf does not require the use of any fertilizers, herbicides, pesticides, mowing or irrigation to keep the field in playable condition. In addition the design of the fields typically reduces runoff volume to surrounding waterways, reducing the stress on overburdened waterways.

Since the first synthetic turf field was installed there have always been concerns about the health impacts that synthetic turf may have on players, as well the environment and the rainwater that leaches off the field during storms. There have been multiple studies on both these issues by the industry, state agencies and universities, and none of the studies to date have indicated any hazard to health or the environment that should prohibit the installation of synthetic turf, if it is properly designed and specified. The best independent source of these articles is the Penn State Website;
http://plantscience.psu.edu/research/centers/ssrc/research

A2.3 Safety. The safety of players on synthetic turf has also been a constant concern, and has affected how fields are designed, detailed and specified. There are many sports medicine and safety studies on player injuries and the general consensus is that synthetic infill turf is a safe alternative to natural turf. Though everyone agrees that a natural turf field in "pristine" condition is the best and safest playing surface, synthetic turf however is preferable to an under maintained, or frozen natural turf field. A number of leading sports medicine researchers have studied injury rates on all types of natural and synthetic surfaces, as have the NCAA and NFL. The amount of studies and conflicting results from different materials and methods sometimes lead to confusion and concerns about synthetic turf, and looking at only one study will not likely give a good representation of the available data. Again, one of the best sources of information that includes the most current, independent studies, on turf can be found from Pennsylvania State University at:
http://plantscience.psu.edu/research/centers/ssrc/research.

A2.4 Image and Branding. Synthetic turf offers a unique ability to insert distinctive markings, logos and graphics into the turf itself, which offers the municipalities an opportunity to "brand" their field with logos as well as provide donor recognition. The field logo, end zone markings, sideline markings, colored borders, etc. allow for field naming, and the development of a community or school image. Where the choice exists, student athletes will make decisions based on the perceived image of campus athletic facilities.

A2.5 Procurement Implications. The use of infilled synthetic turf has several implications for the public procurement process. There are currently about 45 different manufacturers of infilled turf and state procurement laws many times prohibit the use of proprietary specifications. This presents challenges for designers, specifiers and Owners who may have

a preference of one brand of turf over another. Regardless of preference, qualifications can be required of contractors and the ability to service new fields should be heavily weighed. Should private money be used to fund the project, restrictions to proprietary product specifications will not apply.

A2.6 Synthetic Turf Costs. While far less expensive than old-style synthetic AstroTurf nylon carpet, the latest generation of infilled synthetic fields are about 2.5 times more expensive than a newly constructed, high-quality grass field. Converting a typical 90,000 SF soccer/football field from grass to infilled turf costs roughly $850,000. The infilled synthetic turf's initial costs are, in theory, offset by the distinct advantages of increased usage, all-weather availability, increased durability, decreased maintenance, enhanced player safety, image and branding opportunities, as well as environmental sustainability (in some aspects). Since synthetic turf can be used two to three times as much as natural turf, when looking at turf with regards to a 'cost per use', the unrestricted use of synthetic turf is less than half the 'cost per use' of natural turf.

A2.7 Synthetic Turf Disadvantages. Apart from initial acquisition costs, there are three common concerns associated with the installation of synthetic turf. These are heat, environmental concerns and managing the end of life disposal of the turf.

A2.7.1 Heat. Because of the heat absorbing qualities of the materials Infilled synthetic turf is constructed of, these type of fields are typically hotter than surrounding pavement or lawn areas during the summer months. In direct sunlight, synthetic turf can be up to 40 degrees hotter at the surface of the field than surrounding natural turf. Here in New England this is more of an attribute than a disadvantage, as fields tend to melt snow quickly and be warmer to play on during colder months. South of the Mason-Dixon Line however, the heat issue is a significant and can restrict field use during the summer months. The further south you go, the more synthetic turf installation becomes undesirable because of the heat these fields retain.

Gale conducted a survey of forty (40) field managers in Massachusetts in order to evaluate how field Owners were addressing the heat issue. All of the respondents to the survey stated that the heat issue was either not a problem or was a minor and manageable issue. All of them stated they had never sustained a head injury attributable to the turf. Only one had used water to cool a field and all of them opined that they would still install an infilled turf field knowing what they now know about the heat issue. Several respondents also noted that it is the additional heat that allows them to play on the field earlier in the spring and remain on it later in the fall. The heat issue is real, however, and field managers and coaches need to be conscious of the temperature of the field and reschedule or restrict field use in hot weather.

A2.7.2 Health Concerns. Over the history of the latest generation of synthetic turf there have been numerous studies of the SBR crumb rubber used in turf and the turf fibers themselves that both propose a connection to health concerns and suggest that there is no link between turf materials and health concerns. As noted in Section A2.2 there are

many studies on the possible health and hazardous materials qualities of the latest generation of turf fibers and infill materials. Unfortunately, Owners need to weed through the sometimes passionate arguments and the many long scientific studies on turf materials to educate themselves on the various concerns surrounding turf in order to make a decision. To add to this process will be the consideration of the many alternative synthetic turf materials now available, all of which have their own pros and cons with regard to cost, maintenance and longevity.

A2.7.3 End of Life Disposal. Modern synthetic turf is constructed of polyethylene fibers and a urethane backing, which are considered petroleum based non-renewable resources. Field materials are not considered hazardous and can be recycled into other products, however the technology for efficiently harvesting old turf is not commonly available. Because of this, recycling fields is usually an additional cost to Owners. Currently most fields that are removed are taken to a conventional landfill or incinerator where they are considered as non-hazardous waste. The technology and availability of machinery to recycle turf is evolving however, and within 10 years recycling or repurposing old turf may be a cost effective option.

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