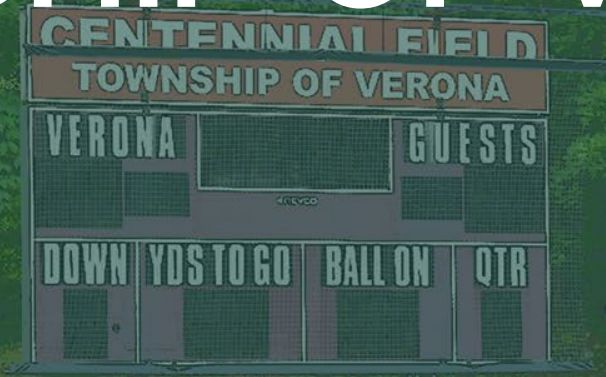


TOWNSHIP OF VERONA



MONTCLAIR
STATE UNIVERSITY

PSEG Institute for
Sustainability Studies
Green Teams

SUSTAINABLE
VERONA 
Creating a Greener Community



MEET THE TEAM



Emma GrantBier
Psych and Environmental
Studies
Oberlin College



Mustafa Kayali
Finance
Montclair State
University



Mutanu Mbithi
Public Health & Biology
St. Lawrence
University



Roberto Riviere
Environmental
Engineering
PUPR



Eline Xia
Sustainability & Political
Science
Stockton University



MONTCLAIR
STATE UNIVERSITY

PSEG Institute for
Sustainability Studies
Green Teams

SUSTAINABLE
VERONA 
Creating a Greener Community

NFL Players Association Requests Natural Grass Fields Following Aaron Rodgers' Season-Ending Injury

A study published by  The New York Times playing on artificial turf

NFL owners say grass vs. turf debate isn't as clear as NFLPA claims



... BBC

 USA Today

Grass vs. Turf: It's so hot in Texas, turf is melting cleats



It's that time of year in Texas where every day is over 100 degrees. This is terrible as is, but even more so if you play football.

Turf vs. Grass injuries: what athletes need to know

USA Today, 2015

Turf fields are  Inquirer.com

About 20% of

Why parents and coaches of cancer-stricken athletes are worried about artificial turf

Six former Phillies died from the same brain cancer. We tested the Vet's turf and found dangerous chemicals. Tests run on two samples of old Vet...

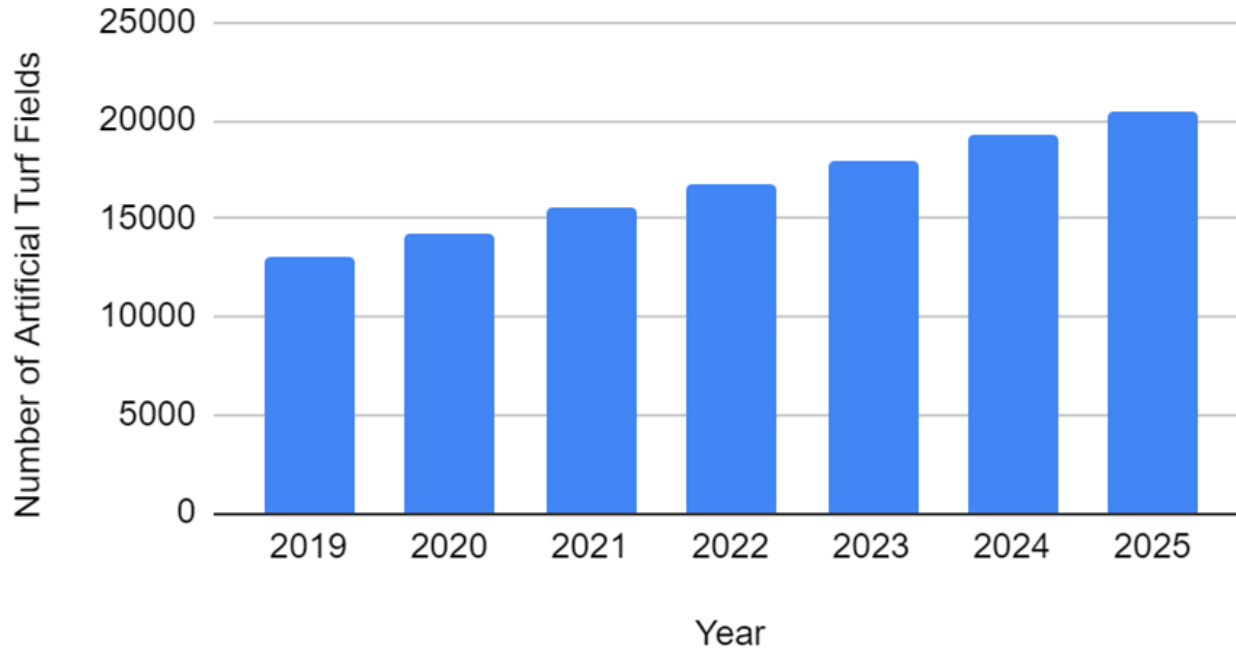




CENTENNIAL FIELD

BACKGROUND

Number of Artificial Turf Fields in the US



DELIVERABLES

ENVIRONMENTAL IMPACT



CHEMICAL EXPOSURE



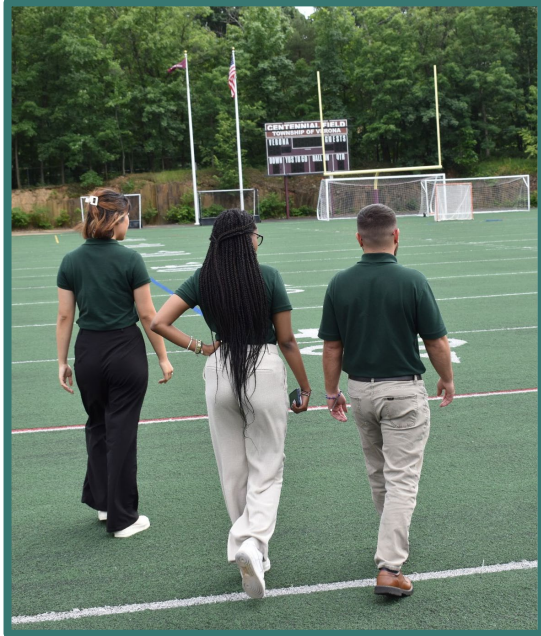
INJURY



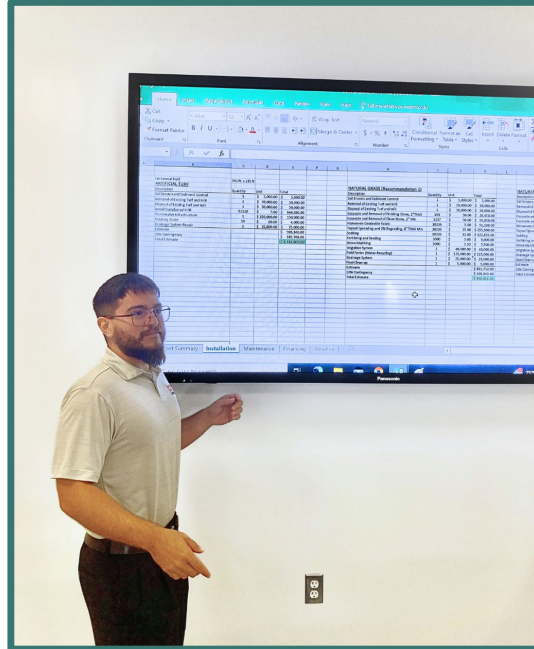
**SUSTAINABLE
VERONA**
Creating a Greener Community

DELIVERABLES

PLAYABLE HOURS



COST BENEFIT ANALYSIS



HEAT DISPARITIES



MONTCLAIR
STATE UNIVERSITY

PSEG Institute for
Sustainability Studies
Green Teams

SUSTAINABLE
VERONA
Creating a Greener Community

METHODS



LITERATURE
REVIEW



SUBJECT
EXPERTS



DATA
COLLECTION



ENVIRONMENTAL IMPACT ASSESSMENT





	Artificial Turf	Natural Grass
Water Usage	390,000-450,000gal water/year	0.5-1 mil gal water/year
Runoff	Impervious surface	Effective water infiltration
Pollution - chemicals	Microplastics, chemical/metal leaching	Pesticides, fertilizers, & maintenance
Emissions	~55.6 tCO ₂	~18.5 tCO ₂

ENVIRONMENTAL IMPACT ASSESSMENT



“Forever Field”
Inquirer.com

ENVIRONMENTAL IMPACT ASSESSMENT

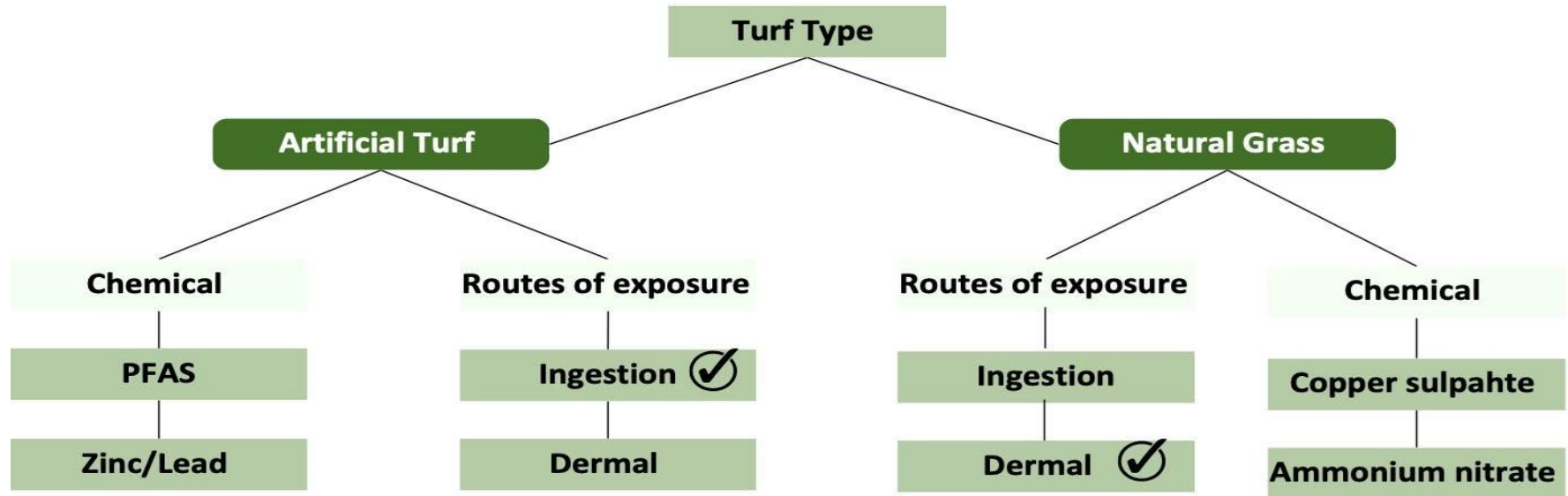
	Artificial Turf	Natural Grass
Water Usage		
Runoff		
Emission		
Pollution - chemicals		

CHEMICAL EXPOSURE

PFAS- FOREVER CHEMICALS

water repellent PFAS PFOA PFOS
chemical compounds forever chemicals
Water Pollution toxic and carcinogenic
biochemistry cancer polyfluoroalkyl waterproof PFAS Human health
environmental damage Perfluoroalkyl and Polyfluoroalkyl
water-resistant properties impermeable warning

CHEMICAL EXPOSURE



INJURY

	ARTIFICIAL TURF	NATURAL GRASS
Overall Lower Extremity Injuries	=	=
Knee	=	=
Hip	=	=
Foot and Ankle	↑	
Concussions	?	?
Abrasions	↑	

SURFACE HEAT



VERONA

91°

Sunny
H:92° L:68°

⚠️ Severe Weather

Air Quality Alert. These conditions are expected to last until 11:00PM, Tuesday, June 18. Additional alert: Heat Advisory.
National Weather Service

Sunny conditions will continue for the rest of the day. Wind gusts are up to 13 mph.

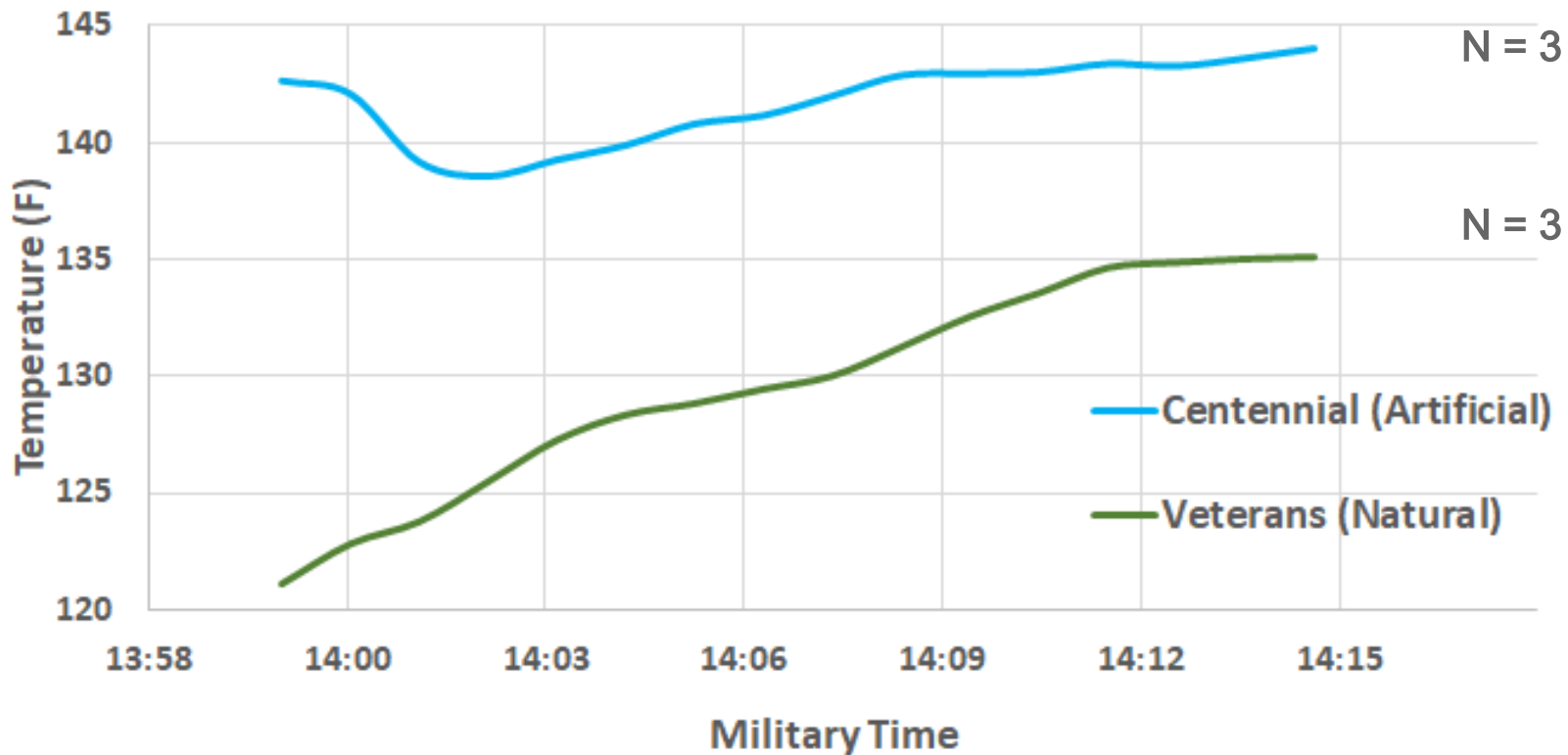
Now	3PM	4PM	5PM	6PM	7PM
91°	92°	91°	90°	88°	86°

10-DAY FORECAST



SURFACE HEAT

Temperature of Centennial vs Veterans Over Time 06/18/24



SURFACE HEAT

Difference Between Centennial (Artificial) & Veterans (Natural) Temperature Over Time



SURFACE HEAT

Difference between Centennial (Artificial) & Veterans (Natural) Temperature Over Time



Scheduled Annual Usage (Hours)

0 500 1000 1500 2000 2500 3000 3500

CENTENNIAL

1348

ARTIFICIAL TURF CLAIMS

3000

MAHWAH TOWNSHIP

1100

} Local Artificial Turf

VILLAGE OF RIDGEWOOD

1500

MAHWAH TOWNSHIP

640

} Local Natural Grass

VILLAGE OF RIDGEWOOD

1292

MARBLEHEAD

1395

SPRINGFIELD

850

OHIO STATE UNIVERSITY

1125

VIRGINIA TECH

825

} Other Natural Grass
Case Studies

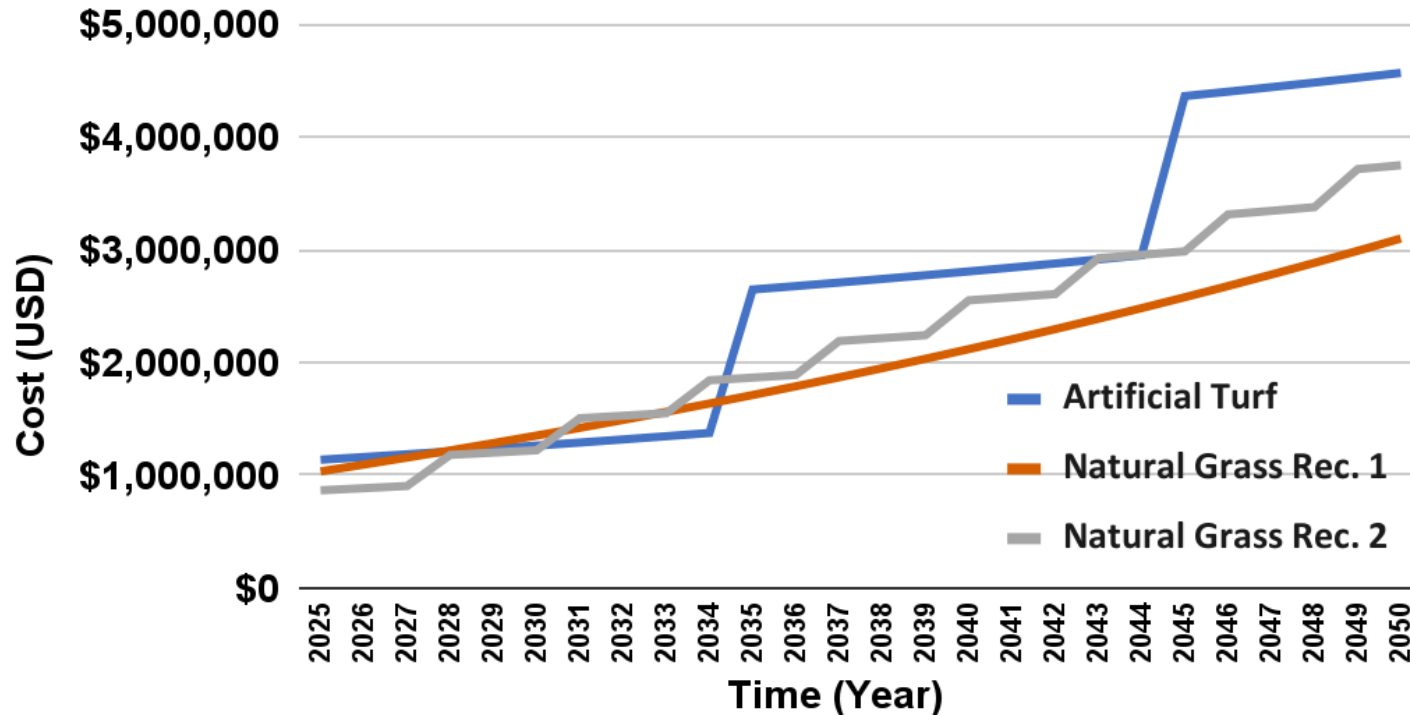
Data from:
Township of
Verona,
Synthetic Turf
Council,
Township of
Mahwah,
Village of
Ridgewood,
Toxic Use
Reduction Institute,
DC Community
Meeting (May 30,
2024)

COST ANALYSIS

Centennial Field	Artificial Turf	Natural Grass (Rec. 1)	Natural Grass (Rec. 2)
Installation Total	\$ 1,114,608	\$ 1,073,054	\$ 848,054
Annual Maintenance Total	\$ 23,270	\$ 59,000	\$ 18,483
2025 Total Cost	\$ 1,137,878	\$ 1,132,054	\$ 866,537
2050 Cumulative Cost	\$ 4,568,608	\$ 3,197,745	\$ 3,749,828

COST ANALYSIS

Cumulative Cost Over Time



RECOMMENDATIONS

	ARTIFICIAL TURF		NATURAL GRASS	
	Rec. 1	Hybrid turf	Rec. 1	Rec. 2
CONSTRUCTION	Stormwater infrastructure	Sand-based construction	Recycle water	Drainage & irrigation
TYPE / MATERIAL	Natural / TPE infill	Stitched system	Kentucky bluegrass / Perennial ryegrass	Tall fescue
MAINTENANCE	Hardness testing Frequent infill replacement	Tining Dethatching Brushing	Frequent aeration FT organic land management	PT management Organic pesticides

ACKNOWLEDGEMENTS



**SUSTAINABLE
VERONA** 
Creating a Greener Community

Kevin O'Sullivan
Kerry Bass

MONTCLAIR
STATE UNIVERSITY

PSEG Institute for
Sustainability Studies
Green Teams

Im an Cumberbatch
Leonard Richardson
Dr. Josh Galster
Dr. Amy Tuininga



College of Science and Mathematics

Thank you!



PSEG



Office of the Provost and Academic Affairs



National Institute of Food and Agriculture
U.S. DEPARTMENT OF AGRICULTURE

PSEG ISS is generously supported by the National Science Foundation under NSF HSI (Hispanic-Serving Institutions) HRD Grant No. 1953631, NSF IUSE (Improving Undergraduate STEM Education) DUE Grant No. 2013495, and NSF INCLUDES DBI Grant No. 1744460. Any opinions, findings, and conclusions or recommendations expressed in this material are those of the author(s) and do not necessarily reflect the views of the National Science Foundation.

This research was supported by the intramural research program of the U.S. Department of Agriculture, National Institute of Food and Agriculture, Research and Extension Experience for Undergraduates, GRANT13698714, Accession Number: 1030103. The findings and conclusions in this preliminary presentation have not been formally disseminated by the U. S. Department of Agriculture and should not be construed to represent any agency determination or policy.

