ARM Group LLC
Engineers and Scientists

August 9, 2021

Ms. Gina Wolfman
Senior Project Developer
Greenskies Clean Energy LLC
127 Washington Ave,
West Building, Garden Level
North Haven, CT 06473

Re: Goshen Farm Solar Project
Goshen, CT
Glare Analysis Summary
ARM Project 21010522

Dear Ms. Wolfman:

ARM Group LLC (ARM) has prepared this summary of the glare analysis associated with the Greenskies Clean Energy LLC (Greenskies) Goshen Farm Solar Project located in Goshen, Connecticut. ARM understands that this proposed solar project has an estimated system size of 4.0 MW AC and is adjacent to a private airfield.

The studies performed and summarized herein were conducted by ARM to analyze the glare from the solar panels and its potential to cause a visual after-image. The ForgeSolar PV Planning & Glare Analysis software was utilized for this analysis which classifies glare in three categories: green, yellow and red. "Green" glare has a low potential to cause an after-image, "yellow" has the potential to cause an after-image, and "red" glare has a high potential to cause an after-image and the potential to cause retinal damage. The duration, measured in minutes, is an annualized (minutes per year) duration of the anticipated glare exposure.

Project Description & Summary of Existing Studies

Located approximately 3 miles northwest of Goshen CT, the solar project is proposed on a 69-acre parcel of land at 129 Bartholomew Hill Road (Lat. 41°15'13" N, Long. 73°16'39" W). The project development will include solar panels on a 25° tilt angle with a southerly orientation and an average panel height of 10 feet above existing grade. The site is located adjacent to the Wings AGO Airstrip (CT42). The airstrip is private with no commercial traffic, a non-paved landing strip and no air traffic control tower.

Greenskies provided Notice of Proposed Construction to the Federal Aviation Administration (FAA) and received acceptance of the project's construction on June 8, 2021 (*Attachment 1*). Greenskies also provided and prepared a Glare Analysis (*Attachment 2*) which was provided on June 8, 2021 to the Connecticut Airport Authority's Engineering and Environmental Services. The glare analysis was performed by the ForgeSolar software.

The provided glare analysis evaluated the effect of the proposed solar project on the neighboring airfield. For the study, the development was separated into northern and southern sections (PV array 1 and PV array 2, respectively) and assessed glare on north and south inbound air traffic. The study assessed that north and south inbound traffic would experience glare from both sections of arrays that would have a potential for causing a visual after-image. However, south inbound air traffic would experience a greater duration and higher potential of after-image. The predicted time of day for this potential was between the hours of 4:30 and 6:00 PM.

ARM Glare Analysis

Utilizing the ForgeSolar software package, ARM recreated the glare study as performed by Greenskies to further refine the results. ARM's access to the program allows for additional site inputs for analysis such as adjustments based upon ground slope, panel installation area size and surrounding tree heights. ARM's glare study also separated the solar development into northern and southern sections (PV array 1 and PV array 2, respectively) to remain consistent with the previous study, and also analyzed the development from the perspective of north and south inbound air traffic.

Per the attached North Side Split Site Report (*Attachment 3*) the northern section of the arrays will not produce a glare on either the north or south inbound air traffic.

Per the South Side Split Site Report (*Attachment 4*), south inbound air traffic will experience approximately 5,343 minutes of "yellow" glare annually between 4:30 and 6:00 PM only and only between the months of late April to late August. This potential for glare will occur along the south inbound flight path, starting from approximately 800 feet (0.15 miles) from the southern edge of the airport runway. Based upon the average landing speeds of single engine private planes of 75-105 miles per hour (65-90 knots), this exposure to glare would be for approximate 6-8 seconds. This time of potential glare exposure is based upon the time it takes for a plane to travel the 800 feet during an approach.

ARM also performed a graphical line of sight study of the panels to incoming air traffic utilizing AutoCAD. ARM created a profile of the south inbound flight path and compared it to the anticipated reflection off the panels to determine points at which a pilot could experience a glare from the southern section of the site, please refer to Fig. 1 and 2 below. The profile utilized a threshold landing height of 50 feet at the southern edge of the runway, an approach angle of 3% and an average tree height of 55 feet. Using a maximum panel reflection angle of 24°, an approaching pilot could have a glare exposure at a flight height of between 82 to 200 feet above

the ground. This result confirms the findings of the two glare studies. It should also be noted that a segment of the glare event for the approach will be shielded by the existing trees and limits the potential for glare to 800 feet from the southern edge of the runway.

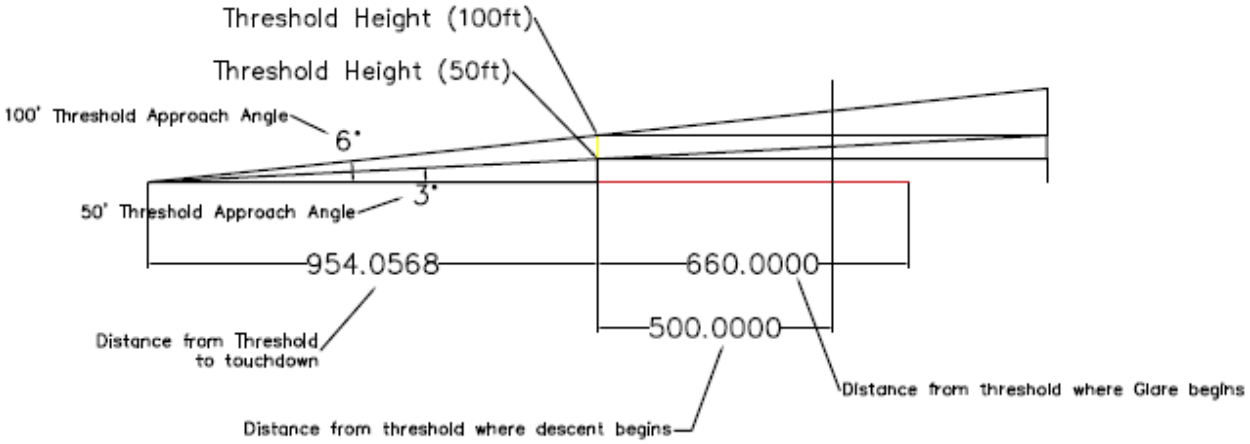


Figure 1: South Inbound Approach Profile

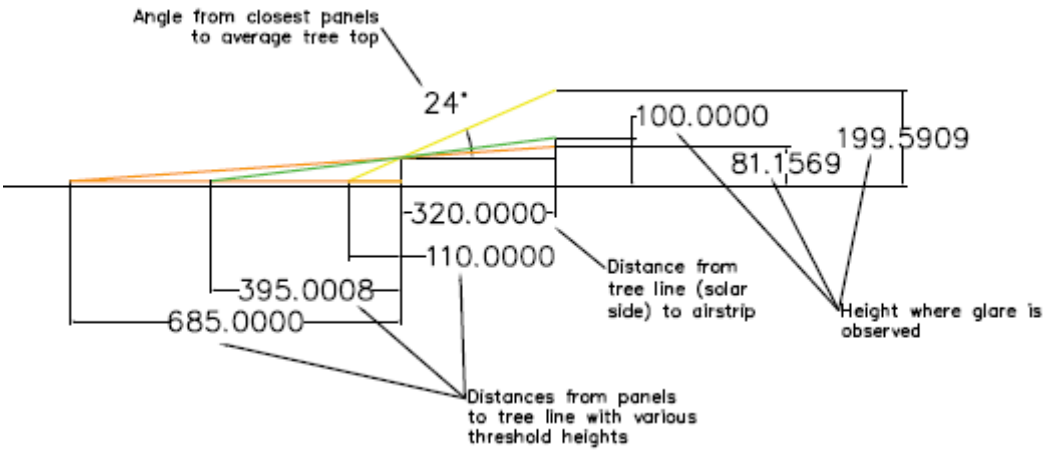


Figure 2: South Inbound Approach Panel Angle Exposure

Conclusion

Upon review of the Greenskies and ARM glare studies as well as ARM's graphical analysis, ARM can confirm that planes approaching from the south may experience a glare from the solar development for a brief amount of time during their landing approach, please refer to Fig. 3 below. The time of day for this exposure is limited to late afternoon/early evening beginning at approximately 4:30 PM, and there is not expected to be any exposure to glare after 6:00 PM. Glare potential is only anticipated from late April to late August. Also, this exposure is further limited to less than 800 feet from the southern edge of the runway and for a duration of between 6-8 seconds for south inbound planes.

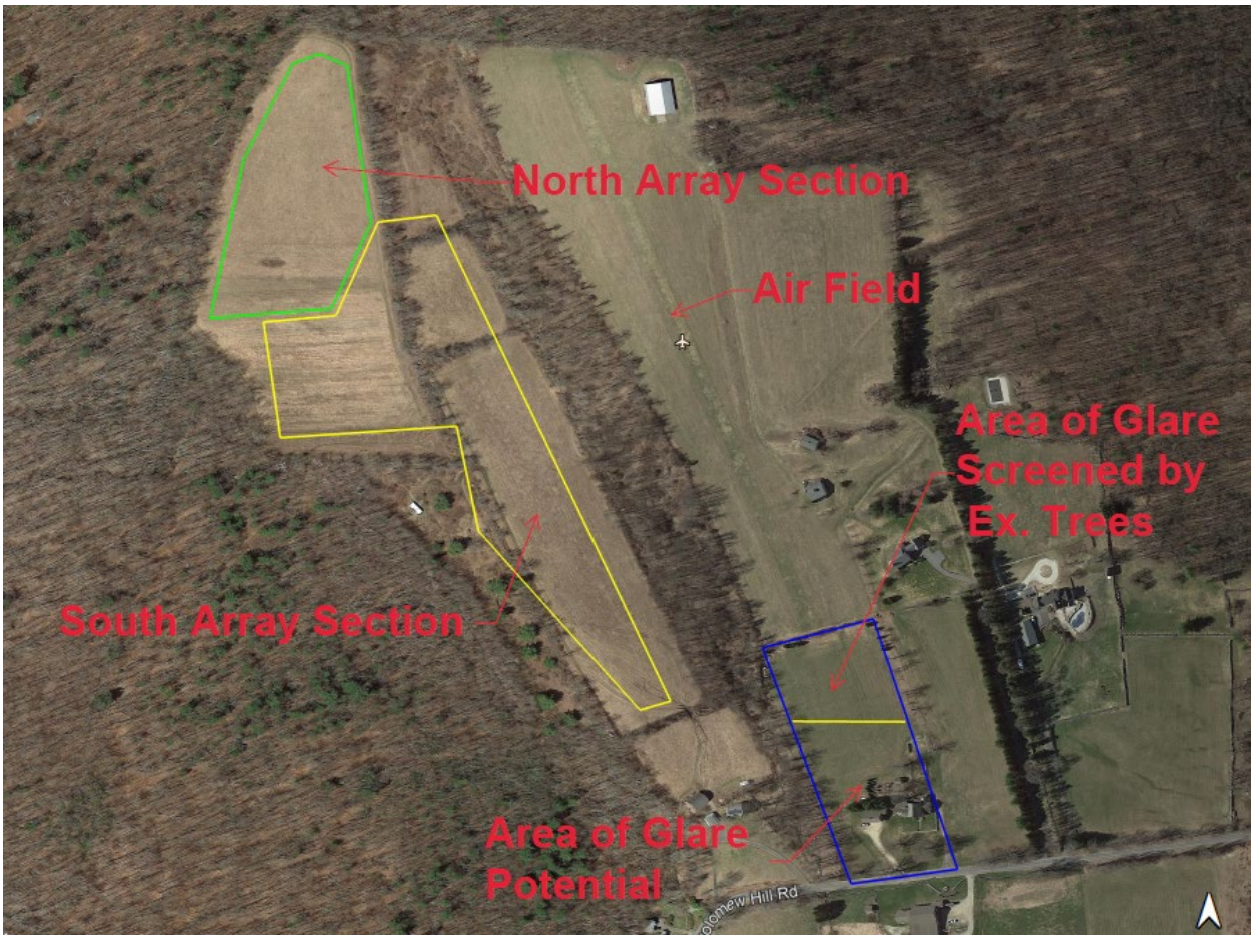


Figure 3: South Inbound Glare Exposure Area

Based upon the results of both the ForgeSolar and graphical analysis of the proposed solar development, the risk level for afterimage inducing glare from the development can be categorized as low for inbound flights from the south.

If you have any questions or require additional information, please do not hesitate to contact the undersigned at 717-508-0553. ARM appreciates the opportunity to provide this proposal and looks forward to our work together on this project.

Respectfully submitted,
ARM Group LLC

James C. Brandt
Senior Engineer,
Renewable Energy &
Distributed Generation

QA Review Performed By: Daniel L. Long, Project Manager / Engineering Director, Renewables

Attachments:

1. FAA Verification and Notice of Construction
2. Goshen SCEF Project at 129 Bartholomew Hill Road; Glare Analysis
3. ARM – North Side Split Glare Analysis
4. ARM – South Side Split Glare Analysis

Attachment 1
FAA Verification and Notice of Construction

Federal Aviation Administration

« OE/AAA

Notice Criteria Tool

Notice Criteria Tool - Desk Reference Guide V_2018.2.0

The requirements for filing with the Federal Aviation Administration for proposed structures vary based on a number of factors: height, proximity to an airport, location, and frequencies emitted from the structure, etc. For more details, please reference CFR Title 14 Part 77.9.

You must file with the FAA at least 45 days prior to construction if:

- your structure will exceed 200ft above ground level
- your structure will be in proximity to an airport and will exceed the slope ratio
- your structure involves construction of a traverseway (i.e. highway, railroad, waterway etc...) and once adjusted upward with the appropriate vertical distance would exceed a standard of 77.9(a) or (b)
- your structure will emit frequencies, and does not meet the conditions of the FAA Co-location Policy
- your structure will be in an instrument approach area and might exceed part 77 Subpart C
- your proposed structure will be in proximity to a navigation facility and may impact the assurance of navigation signal reception
- your structure will be on an airport or heliport
- filing has been requested by the FAA

If you require additional information regarding the filing requirements for your structure, please identify and contact the appropriate FAA representative using the Air Traffic Areas of Responsibility map for Off Airport construction, or contact the FAA Airports Region / District Office for On Airport construction.

The tool below will assist in applying Part 77 Notice Criteria.

Latitude:	41 Deg 51 M 14.84 S N
Longitude:	73 Deg 16 M 42.03 S W
Horizontal Datum:	NAD83
Site Elevation (SE):	1580 (nearest foot)
Structure Height :	12 (nearest foot)
Traverseway:	No Traverseway (Additional height is added to certain structures under 77.9(c)) User can increase the default height adjustment for Traverseway, Private Roadway and Waterway
Is structure on airport:	(•) No ( ) Yes

Results

You do not exceed Notice Criteria.

Federal Aviation Administration

« OE/AAA

Notice of Proposed Construction or Alteration - Off Airport

Add a New Case (Off Airport) - Desk Reference Guide V_2018.2.1

Add a New Case (Off Airport) for Wind Turbines - Met Towers (with WT Farm) - WT-Barge Crane - Desk Reference Guide V_2018.2.1

Project Name: GREEN-000623878-21 **Sponsor:** Greenskies Clean Energy

Details for Case : Goshen SCEF

Show Project Summary

Case Status

ASN:	2021-ANE-3642-OE	**Date Accepted:**	06/07/2021
Status:	Accepted	**Date Determined:**	
		Letters:	None
		Documents:	06/07/2021 11851_SCEF 1, 129...
Public Comments:	None		06/07/2021 Figure 2 - Propos...
			06/07/2021 Goshen-FAA Projec...
			Project Documents: 03/24/2021 Goshen-FAA Projec...

Construction / Alteration Information

Notice Of:	Construction
Duration:	Temporary
if Temporary :	Months: 4 Days: 0
Work Schedule - Start:	03/01/2022
Work Schedule - End:	07/01/2022

For temporary cranes-Does the permanent structure require separate notice to the FAA?
To find out, use the Notice Criteria Tool. If separate notice is required, please ensure it is filed.
If it is not filed, please state the reason in the Description of Proposal.

State Filing: Filed with State

Structure Summary

Structure Type:	Solar Panel
Structure Name:	Goshen SCEF
FDC NOTAM:	
NOTAM Number:	
FCC Number:	
Prior ASN:	

Structure Details

Latitude:	41° 51' 13.62" N
Longitude:	73° 16' 38.94" W
Horizontal Datum:	NAD83
Site Elevation (SE):	1560 (nearest foot) PASSED
Structure Height (AGL):	12 (nearest foot)
Current Height (AGL): ** For notice of alteration or existing provide the current AGL height of the existing structure. Include details in the Description of Proposal*	(nearest foot)
Minimum Operating Height (AGL): ** For aeronautical study of a crane or construction equipment the maximum height should be listed above as the Structure Height (AGL). Additionally, provide the minimum operating height to avoid delays if impacts are identified that require negotiation to a reduced height. If the Structure Height and minimum operating height are the same enter the same value in both fields.*	(nearest foot)
Requested Marking/Lighting:	None
Other :	
Recommended Marking/Lighting:	
Current Marking/Lighting:	None
Other :	
Nearest City:	Goshen
Nearest State:	Connecticut
Description of Location: *On the Project Summary page upload any certified survey.*	129 Bartholomew Hill Rd., Goshen, CT
Description of Proposal:	4 +/- MW AC PV solar energy facility

Proposed Frequency Bands

Select any combination of the applicable frequencies/powers identified in the Colo Void Clause Coalition, Antenna System Co-Location, Voluntary Best Practices, effective 21 Nov 2007, to be evaluated by the FAA with your filing. If not within one of the frequency bands listed below, manually input your proposed frequency(ies) and power using the Add Specific Frequency link.

Add Specific Frequency

Low Freq	High Freq	Freq Unit	ERP	ERP Unit

Previous Back to Search Result Next

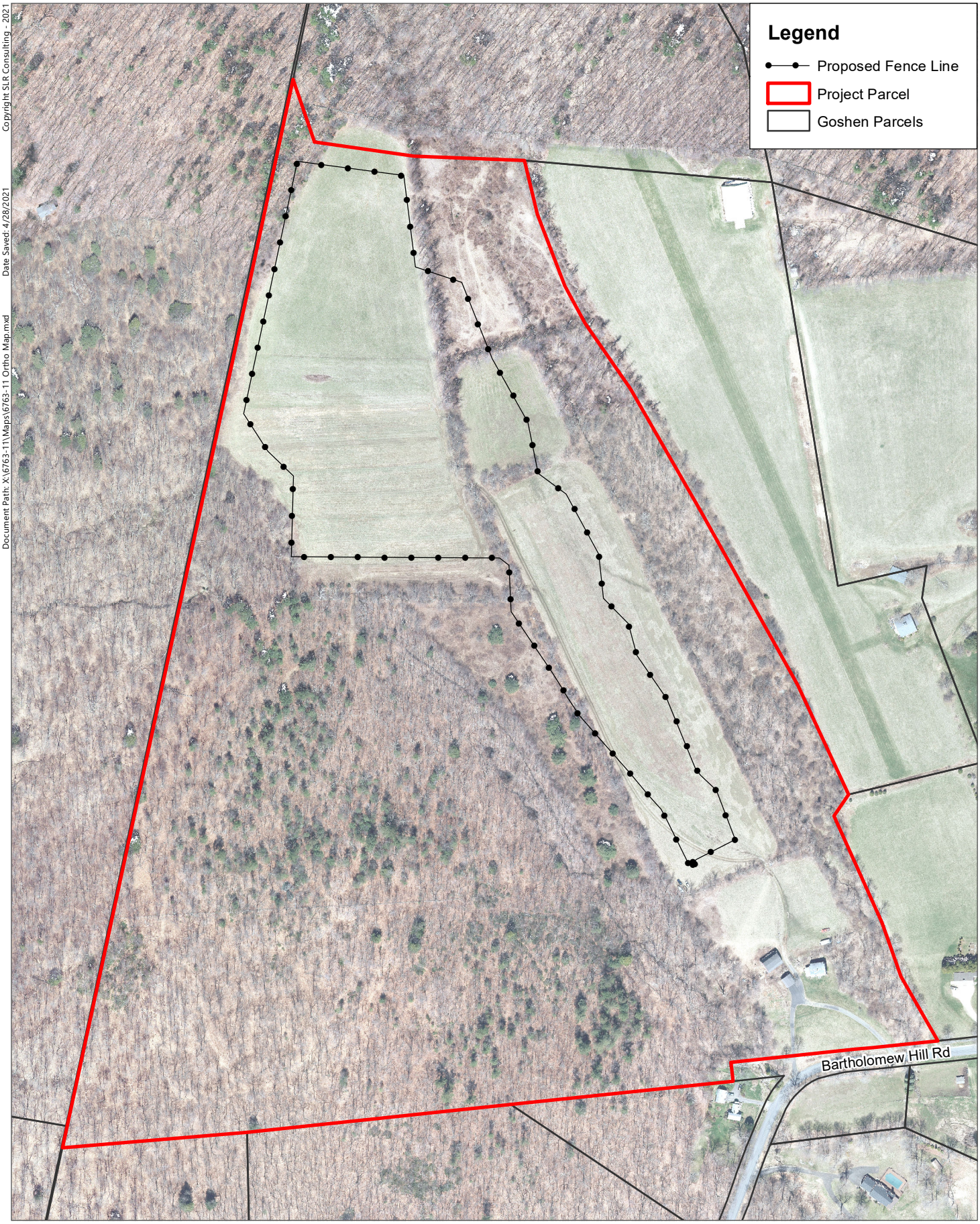


Figure 2 - Proposed Project Area Aerial Map

Greenskies Goshen PV Solar Facility

Goshen, Connecticut

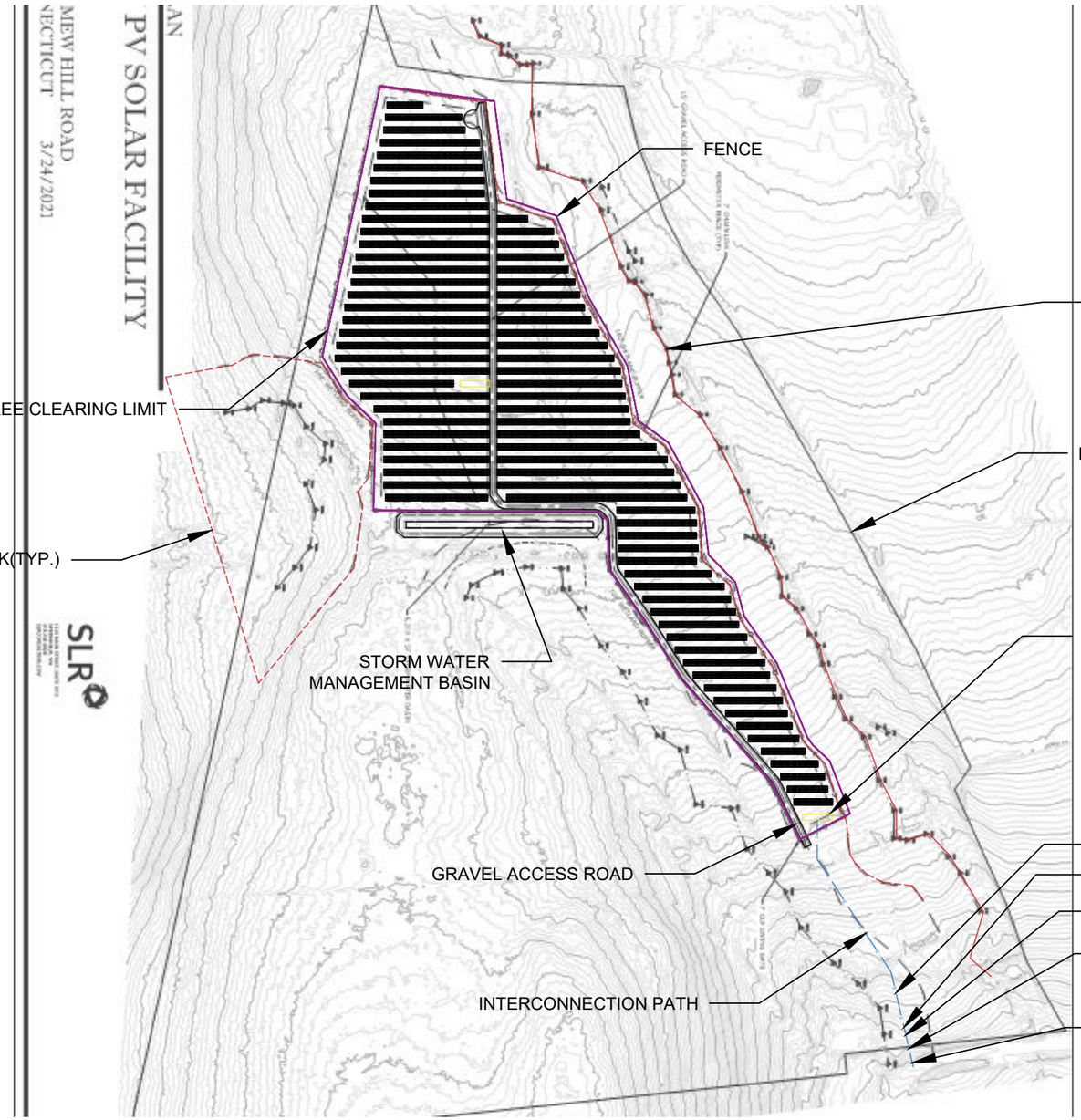
0 150 300

Feet

1 in = 300 feet

N

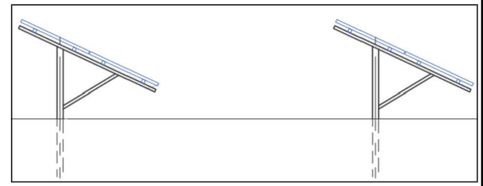
SLR
1350 MAIN STREET
SUITE 1012
SPRINGFIELD, MA 01103
413.241.6920



1 S.01 PROPOSED PV SOLAR ARRAY LAYOUT
1"=300'

SYSTEM INFORMATION	
SYSTEM SIZE (DC)	4,708 KW
SYSTEM SIZE (AC)	3,984 KW
PANEL SIZE	CS3Y-475MB-AG*
PANEL QUANTITY	9,912
PANEL TILT	25°
PANEL AZIMUTH	0°
ROW SPACING	14'
GCR	49%
INVERTER SIZE	(24) SOLECTRIA XGI 166*
ESTIMATED ANNUAL PRODUCTION	6,229 MWh

*Preliminary equipment selection, equivalent alternative may be used in actual installation



RACKING CROSS-SECTION
(NOT TO SCALE)

PROGRESS SET
NOT FOR CONSTRUCTION

Greenskies
127 WASHINGTON AVENUE
NORTH HAVEN, CT 06457
PH - 860.398.5408
FAX - 860.398.5423

REVISIONS:

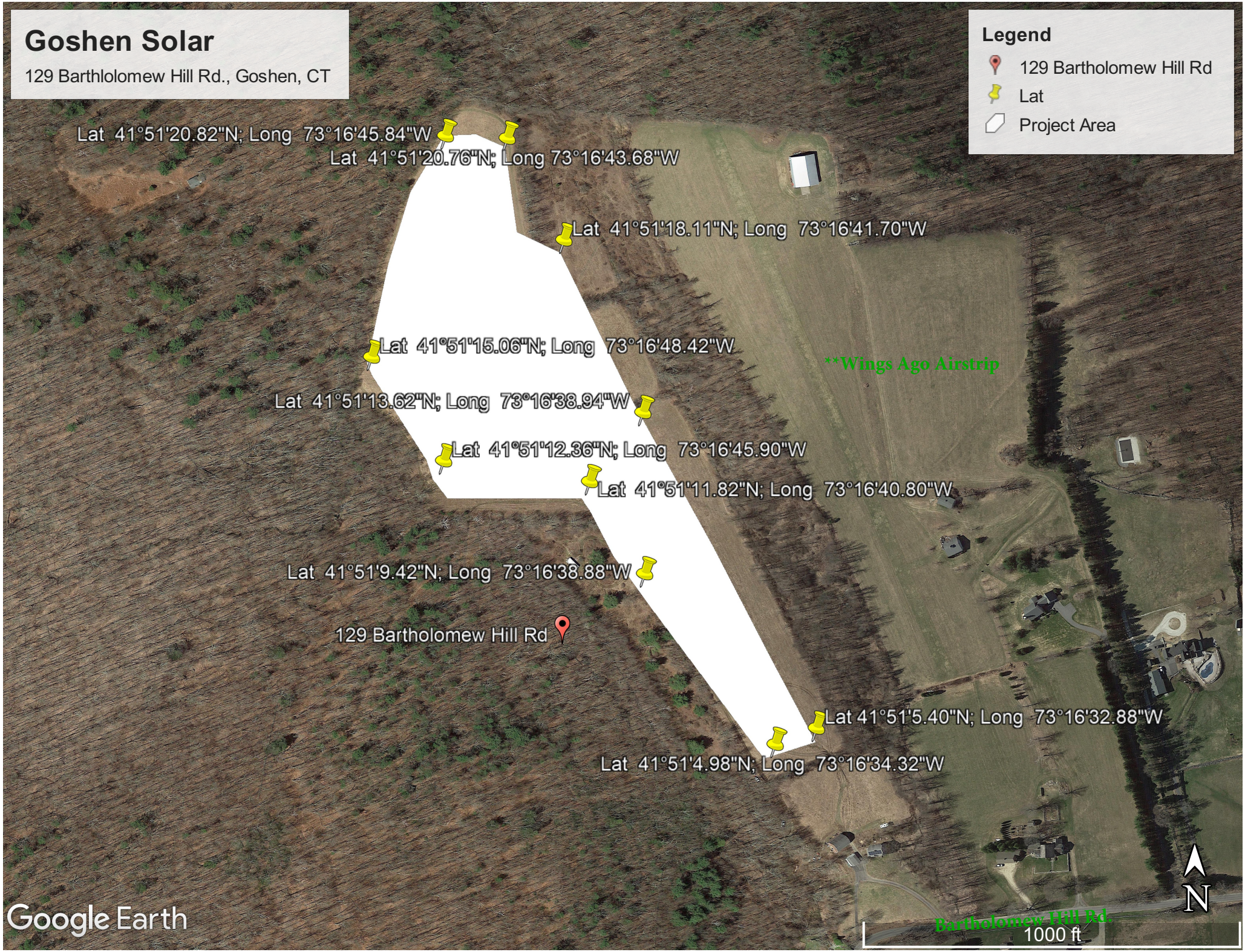
NO.	DATE	DESCRIPTION

PROPOSED SITE PLAN

SCEF 1 GOSHEN FARM
PV SOLAR ARRAY
129 BARTHOLOMEW HILL ROAD
GOSHEN, CT 06756

BATCH NO.:	PROPOSAL
DRAWN BY:	KK
SCALE:	AS NOTED
DATE:	07 APRIL 2021

PV.03


Goshen Solar
129 Barthlolomew Hill Rd., Goshen, CT
Legend
129 Bartholomew Hill Rd
Lat
Project Area
Lat 41°51'20.82"N; Long 73°16'45.84"W
Lat 41°51'20.76"N; Long 73°16'43.68"W
Lat 41°51'18.11"N; Long 73°16'41.70"W
Lat 41°51'15.06"N; Long 73°16'48.42"W
**Wings Ago Airstrip
Lat 41°51'13.62"N; Long 73°16'38.94"W
Lat 41°51'12.36"N; Long 73°16'45.90"W
Lat 41°51'11.82"N; Long 73°16'40.80"W
Lat 41°51'9.42"N; Long 73°16'38.88"W
129 Bartholomew Hill Rd
Lat 41°51'5.40"N; Long 73°16'32.88"W
Lat 41°51'4.98"N; Long 73°16'34.32"W
Google Earth
N
Bartholomew Hill Rd
1000 ft

Attachment 2
Goshen SCEF Project at 129 Bartholomew Hill Road; Glare Analysis

TO:	Robert Bruno, Director of Planning, Engineering and Environmental Services, Connecticut Airport Authority
FROM:	Gina Wolfman, Senior Developer
DATE:	June 8, 2021
RE:	Greenskies Clean Energy LLC – Goshen SCEF Project at 129 Bartholomew Hill Road; FAA Correspondence and Glare Analysis

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As a follow-up to our recent communications, please see the following attached items:

- Figure 2 – Proposed Project Area Aerial Photo Map
- Figures 7A & 7B – Site Layout & Grading Plans
- FAA Screening documentation;
- FAA Notice of Proposed Construction or Alteration – Off Airport;
- Glare analysis report; and
- Wings Ago Airstrip (CT42) information sheet from the FAA database.

As you're aware, I'm managing a 4-MW AC Shared Clean Energy Facility ("SCEF") project in Goshen, CT. The Project site is located on a 69.1-acre parcel, in the RA5 residential zoning district, at 129 Bartholomew Hill Rd. Greenskies Clean Energy LLC plans to submit a Petition to the CT Siting Council. See attached Figure 2 – Proposed Project Area Aerial Photo Map.

With regard to the surrounding area, there is forested, undeveloped land to the north, and west of the site in the Town of Cornwall. To the east and south of the property are a few single-family residences and farmland. In addition, the Wings Ago Airstrip, a private use grass strip/air field, is located on the parcel to the east at 161 Bartholomew Hill Rd. The distance from the edge of the proposed project to the airstrip is approximately 470 +/- feet. There is a 220 +/- foot wooded buffer between the proposed Project and Wings Ago Airstrip, with trees approximately 40-50 feet tall; the airstrip is located another 160 +/- feet east of the tree line.

As we typically do, Greenskies ran an FAA screening for the project and results showed the proposed Project does not meet the notice criteria (see attached results). We initially reached out to you since we are not sure how the private Wings Ago Airstrip is regulated. The attached information sheet from the FAA database does not provide information on the current, specific type and frequency of use. According to Project site landowner and Town officials, the facility does not appear to have been used recently and/or consistently in recent years. Our understanding is that the airstrip is infrequently used by/made available to small craft/biplane operators for grass landing training, however, that's not documented through FAA. Greenskies plans to reach out to the owner of the airstrip.

127 Washington Avenue
West Bldg, Lower Level
North Haven, CT 06473

After you conducted an initial review of the Project location, you requested a glare study be performed to see if there are any effects to the aircraft approaches. You requested this be done before submitting the Petition, rather than wait for the CT Siting Council to recommend (or not recommend) a review by the CT Airport Association. Please see attached ForgeSolar Glare Analysis report. Since no specific input data was available, the analysis was run using the default settings for 2-mile flight paths to FAA regulated facilities. The analysis did not account for physical obstructions between reflectors and receptors. This includes buildings, tree cover and geographic obstructions. The existing wooded area between the proposed SCEF project and the airstrip, therefore, was not considered in the analysis.

Results:

The Project was divided into two array areas – northern or PV Array 1 and southern or PV Array 2. Flight path 1 is the approach from the south and flight path 2 is the approach from the north. Results for PV Array 1 indicate 2,467 minutes of yellow glare for Flight Path 1 between the hours of 1700 to 1800 (5:00 PM – 6:00 PM) May through mid-August. The daily duration of glare ranges from 20 – 25 minutes. For Flight Path 2, results show 0 minutes of glare.

Results for PV Array 2 indicate 6,319 minutes of yellow glare and 520 minutes of green glare for Flight Path 1 between the hours of 1700 to 1800 (5:00 PM – 6:00 PM) May through mid-August. The daily duration of yellow glare is about 60 minutes. For Flight Path 2, results show 0 minutes of glare.

If you are able to provide any of the following site-specific information about the Wings Ago Airstrip, we could revise the analysis:

1. Hours of operation and frequency of use;
2. Direction of approach for landing – do the planes come in from the north or south?
3. Threshold height – the runway is 1600 feet long and is used for small craft grass landings; the software used to analyze glare defaults to a 50-ft threshold for FAA facilities; based on your expertise, could you recommend a more accurate threshold height for this private facility?
4. Glide slope - the software used to analyze glare defaults to a glide slope of 3 for FAA facilities; based on your expertise, could you recommend a more accurate glide slope for the types of planes utilizing this private facility?

Please provide an opinion and/or determination of potential glare impact on Wings Ago Airstrip operations. Thank you for you review and please feel free to reach out with any additional information or questions.

127 Washington Avenue
West Bldg, Lower Level
North Haven, CT 06473

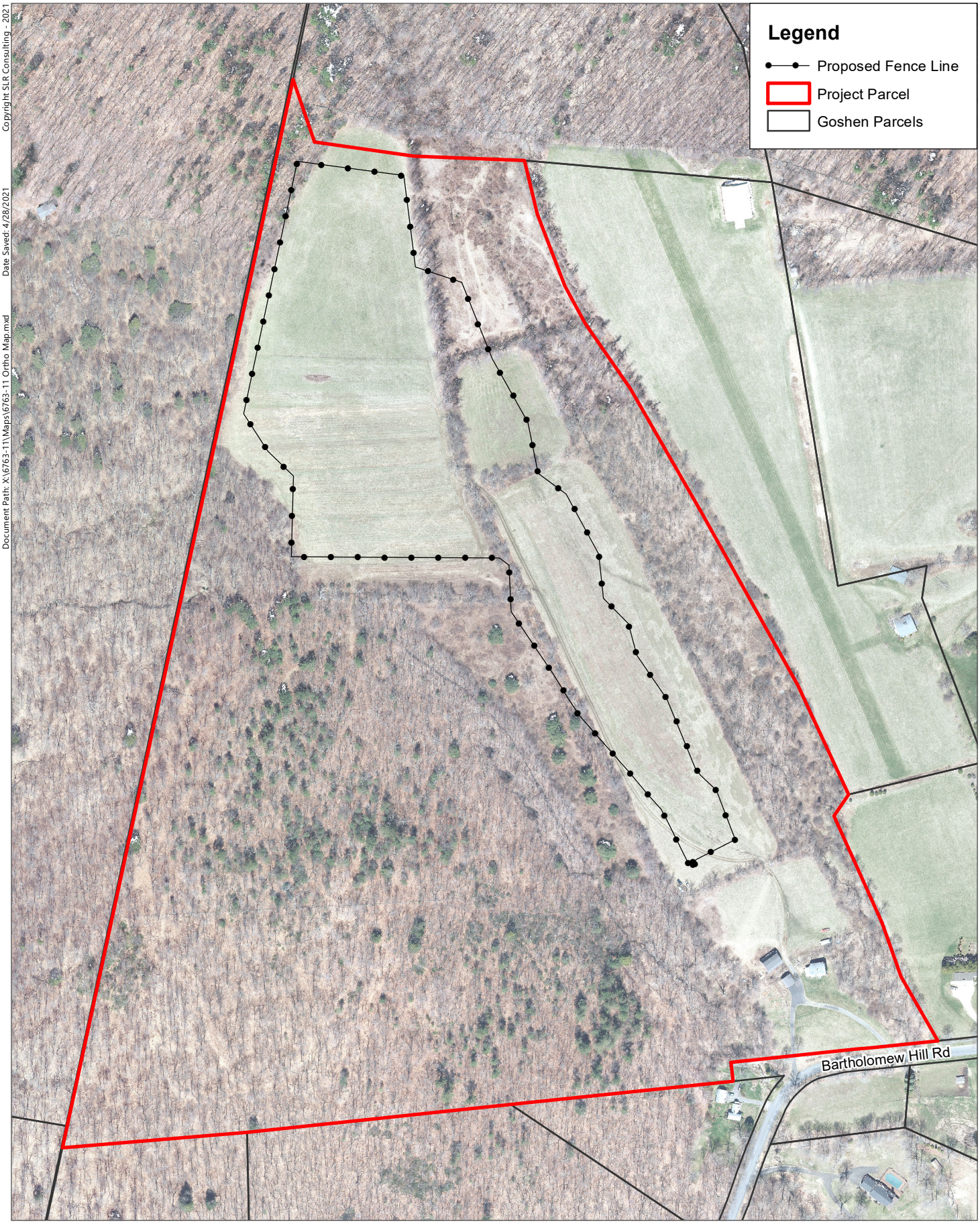


Figure 2 - Proposed Project Area Aerial Map

Greenskies Goshen PV Solar Facility

Goshen, Connecticut

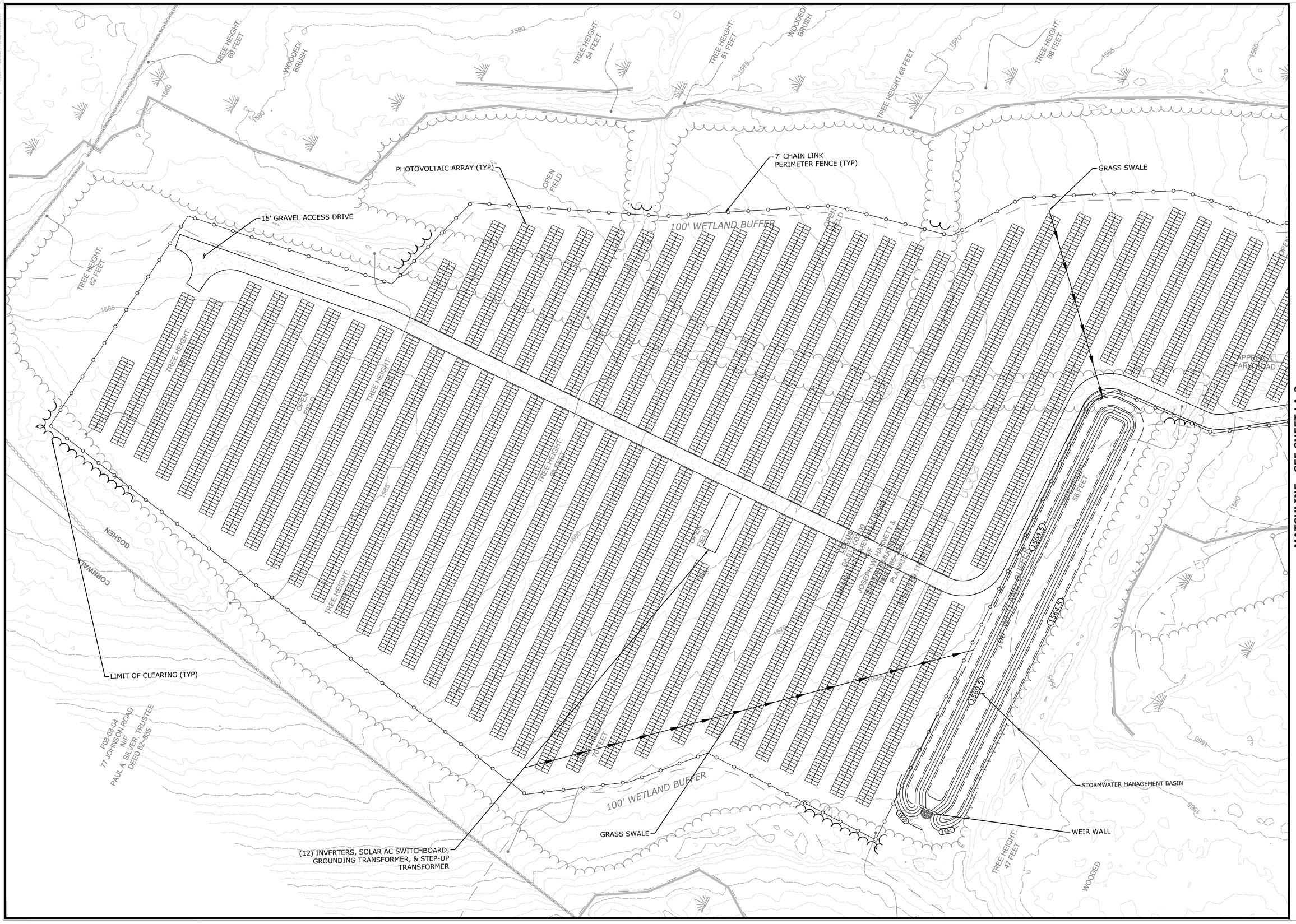
0 150 300

Feet

1 in = 300 feet

N

SLR
1350 MAIN STREET
SUITE 1012
SPRINGFIELD, MA 01103
413.241.6920



0' 20' 40'
0 1/2" 1"

SLR
1350 MAIN STREET, SUITE 1012
SPRINGFIELD, MA
413.452.0445
SLRCONSULTING.COM

DESCRIPTION	DATE	BY

NOT FOR CONSTRUCTION

SITE LAYOUT & GRADING PLAN

GOSHEN PV SOLAR FACILITY
GREENSKIES CLEAN ENERGY LLC
129 BARTHOLOMEW HILL ROAD
GOSHEN, CONNECTICUT

MRG	HMM	MRG
DESIGNED	DRAWN	CHECKED

SCALE: 1"=40'

DATE: APRIL 21, 2021

PROJECT NO.: 16763.00011

SHEET NO.: 06 OF 12

SHEET NAME: LA-1

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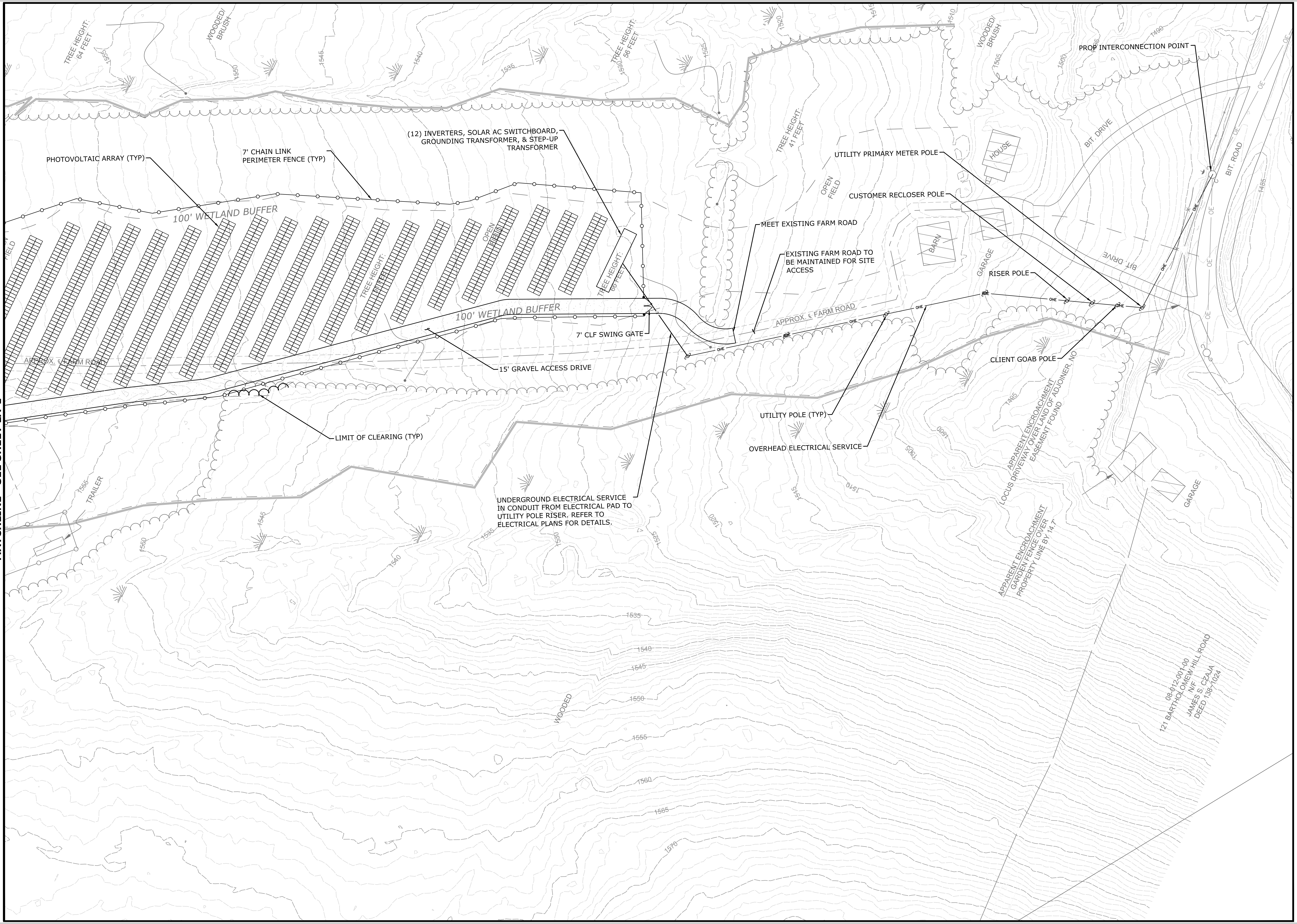

SLR
1350 MAIN STREET, SUITE 1012
SPRINGFIELD, MA
413.241.6920
SLRCONSULTING.COM

DESCRIPTION	DATE	BY

NOT FOR CONSTRUCTION

SITE LAYOUT & GRADING PLAN

GOSHEN PV SOLAR FACILITY
GREENSKIES CLEAN ENERGY LLC

129 BARTHOLOMEW HILL ROAD
GOSHEN, CONNECTICUT

MRG	HMM	MRG
DESIGNED	DRAWN	CHECKED

SCALE: 1"=40'

DATE: APRIL 21, 2021

PROJECT NO.: 16763.00011

SHEET NO.: 07 OF 12

SHEET NAME: LA-2

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FORGESOLAR GLARE ANALYSIS

Project: **Goshen SCEF**
Proposed 4 MW AC ground mount solar energy facility at 129 Bartholomew Hill Road, Goshen, CT.

Site configuration: **Untitled**
Analysis conducted by Greenskies Developer (devteam@greenskies.com) at 21:44 on 10 May, 2021.

U.S. FAA 2013 Policy Adherence

The following table summarizes the policy adherence of the glare analysis based on the 2013 U.S. Federal Aviation Administration Interim Policy 78 FR 63276. This policy requires the following criteria be met for solar energy systems on airport property:

- No "yellow" glare (potential for after-image) for any flight path from threshold to 2 miles
- No glare of any kind for Air Traffic Control Tower(s) ("ATCT") at cab height.
- Default analysis and observer characteristics (see list below)

ForgeSolar does not represent or speak officially for the FAA and cannot approve or deny projects. Results are informational only.

COMPONENT	STATUS	DESCRIPTION
Analysis parameters	PASS	Analysis time interval and eye characteristics used are acceptable
2-mile flight path(s)	FAIL	Flight path receptor(s) receive yellow glare
ATCT(s)	N/A	No ATCT receptors designated

Default glare analysis parameters and observer eye characteristics (for reference only):

- Analysis time interval: 1 minute
- Ocular transmission coefficient: 0.5
- Pupil diameter: 0.002 meters
- Eye focal length: 0.017 meters
- Sun subtended angle: 9.3 milliradians

FAA Policy 78 FR 63276 can be read at https://www.federalregister.gov/d/2013-24729

SITE CONFIGURATION

Analysis Parameters

DNI: peaks at 1,000.0 W/m^2
Time interval: 1 min
Ocular transmission coefficient: 0.5
Pupil diameter: 0.002 m
Eye focal length: 0.017 m
Sun subtended angle: 9.3 mrad
Site Config ID: 53492.9600

PV Array(s)

Name: PV array 1
Axis tracking: Fixed (no rotation)
Tilt: 25.0°
Orientation: 180.0°
Rated power: -
Panel material: Light textured glass without AR coating
Reflectivity: Vary with sun
Slope error: correlate with material

Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	41.855843	-73.279252	1584.94	10.00	1594.94
2	41.855796	-73.278694	1583.34	10.00	1593.34
3	41.855188	-73.278586	1584.15	10.00	1594.15
4	41.855076	-73.278200	1579.96	10.00	1589.96
5	41.853926	-73.277599	1572.61	10.00	1582.61
6	41.853222	-73.277213	1560.42	10.00	1570.42
7	41.853222	-73.279316	1561.05	10.00	1571.05
8	41.853494	-73.279488	1560.59	10.00	1570.59
9	41.853718	-73.279423	1563.90	10.00	1573.90
10	41.854037	-73.279981	1562.54	10.00	1572.54
11	41.855236	-73.279702	1586.69	10.00	1596.69

Name: PV array 2
Axis tracking: Fixed (no rotation)
Tilt: 25.0°
Orientation: 180.0°
Rated power: -
Panel material: Light textured glass without AR coating
Reflectivity: Vary with sun
Slope error: correlate with material

Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	41.853158	-73.277127	1559.81	10.00	1569.81
2	41.851528	-73.275947	1528.92	10.00	1538.92
3	41.851416	-73.276355	1529.72	10.00	1539.72
4	41.853238	-73.277556	1562.22	10.00	1572.22

Flight Path Receptor(s)

Name: FP 1
Description:
Threshold height: 50 ft
Direction: 337.1°
Glide slope: 3.0°
Pilot view restricted? Yes
Vertical view: 30.0°
Azimuthal view: 50.0°

Point	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
Threshold	41.852471	-73.274724	1548.03	50.00	1598.04
Two-mile	41.825837	-73.259602	1309.56	841.93	2151.49

Name: FP 2
Description:
Threshold height: 50 ft
Direction: 163.5°
Glide slope: 3.0°
Pilot view restricted? Yes
Vertical view: 30.0°
Azimuthal view: 50.0°

Point	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
Threshold	41.855380	-73.276526	1589.90	50.00	1639.91
Two-mile	41.883108	-73.287538	945.74	1247.62	2193.36

GLARE ANALYSIS RESULTS

Summary of Glare

PV Array Name	Tilt (°)	Orient (°)	"Green" Glare min	"Yellow" Glare min	Energy kWh
PV array 1	25.0	180.0	0	2,467	-
PV array 2	25.0	180.0	520	6,319	-

Total annual glare received by each receptor

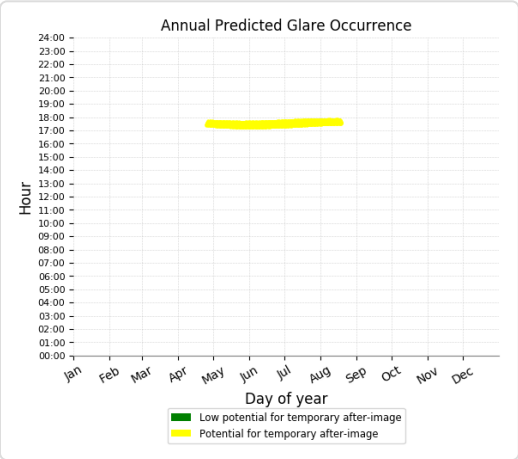
Receptor	Annual Green Glare (min)	Annual Yellow Glare (min)
FP 1	520	8786
FP 2	0	0

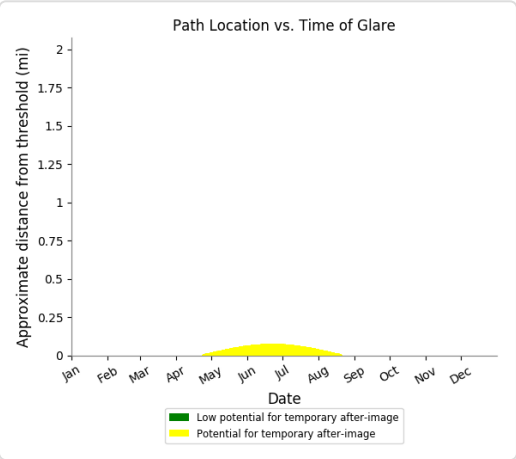
Results for: PV array 1

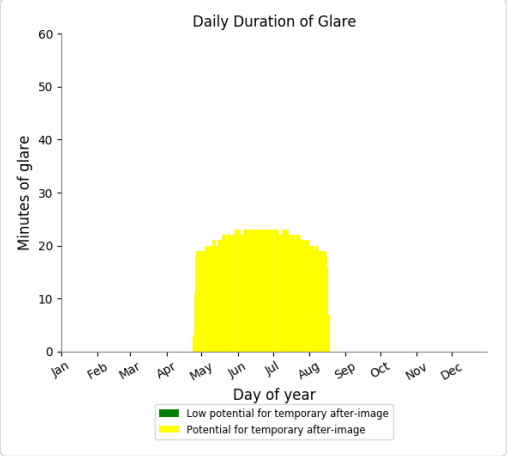
Receptor	Green Glare (min)	Yellow Glare (min)
FP 1	0	2467
FP 2	0	0

Flight Path: FP 1

2467 minutes of yellow glare
0 minutes of green glare







Flight Path: FP 2

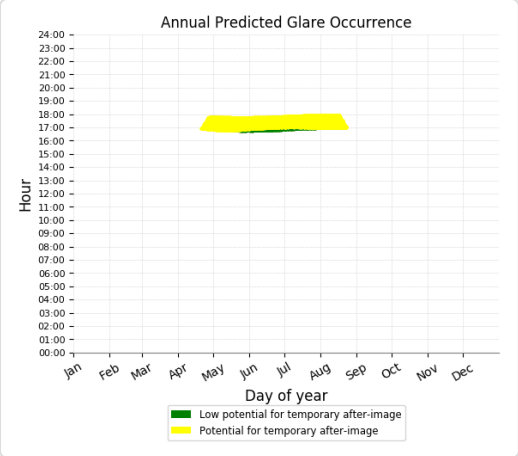
0 minutes of yellow glare
0 minutes of green glare

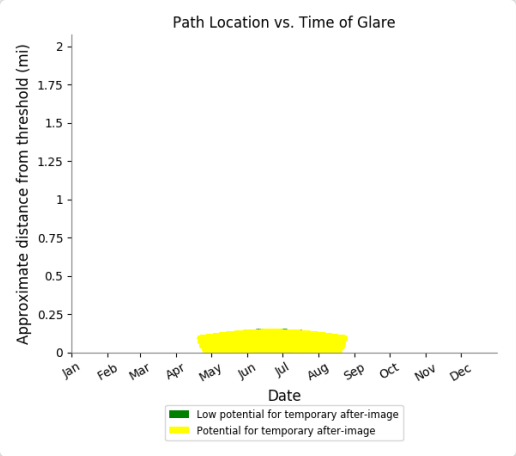
Results for: PV array 2

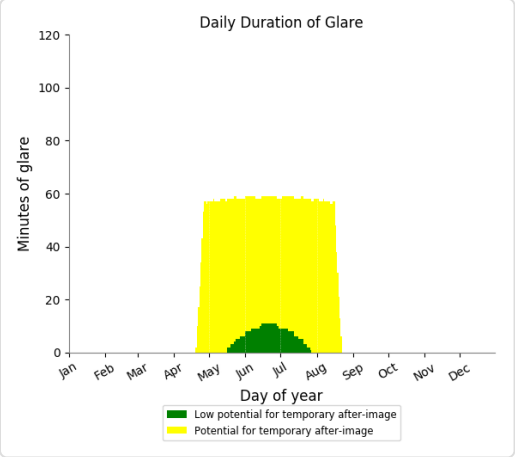
Receptor	Green Glare (min)	Yellow Glare (min)
FP 1	520	6319
FP 2	0	0

Flight Path: FP 1

6319 minutes of yellow glare
520 minutes of green glare







Flight Path: FP 2

0 minutes of yellow glare

0 minutes of green glare

Assumptions

"Green" glare is glare with low potential to cause an after-image (flash blindness) when observed prior to a typical blink response time.
"Yellow" glare is glare with potential to cause an after-image (flash blindness) when observed prior to a typical blink response time.
Times associated with glare are denoted in Standard time. For Daylight Savings, add one hour.
Glare analyses do not account for physical obstructions between reflectors and receptors. This includes buildings, tree cover and geographic obstructions.
Several calculations utilize the PV array centroid, rather than the actual glare spot location, due to algorithm limitations. This may affect results for large PV footprints. Additional analyses of array sub-sections can provide additional information on expected glare.
The subtended source angle (glare spot size) is constrained by the PV array footprint size. Partitioning large arrays into smaller sections will reduce the maximum potential subtended angle, potentially impacting results if actual glare spots are larger than the sub-array size. Additional analyses of the combined area of adjacent sub-arrays can provide more information on potential glare hazards. (See previous point on related limitations.)
Glare locations displayed on receptor plots are approximate. Actual glare-spot locations may differ.
Glare vector plots are simplified representations of analysis data. Actual glare emanations and results may differ.
The glare hazard determination relies on several approximations including observer eye characteristics, angle of view, and typical blink response time. Actual results and glare occurrence may differ.
Hazard zone boundaries shown in the Glare Hazard plot are an approximation and visual aid based on aggregated research data. Actual ocular impact outcomes encompass a continuous, not discrete, spectrum.
Refer to the Help page at **www.forgesolar.com/help/** for assumptions and limitations not listed here.

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Aeronautical Information Services

Airport ID

Data Effective: **04/22/2021 - 05/20/2021**

CT42

WINGS AGO AIRSTRIP

GOSHEN , CT - UNITED STATES

All Summary Operations Communications NAVAIDS Weather RWY 18/36 Heliports Charts Contacts Remarks

Summary

Latitude/Longitude	41-51-14.28 N / 73-16-32.31 W
Elevation	1585 FT
Variation	14 W 1985
From city	3 miles NW of GOSHEN, CT
ARTCC	ZBW
Section chart	NEW YORK
Time Zone	UTC-5(-4DT)

View active NOTAMS

OPERATIONS

Airport Status	Operational
Minimum Operational Network	No

Facility use	Private use only
Control Tower	No air traffic control tower at airport
Tower Hours	
Apch/Dep Hours	
FSS	BRIDGEPORT FSS (BDR) Toll Free: 1-800-WX-BRIEF
NOTAMs Facility	
Attendance	UNATNDD
Wind Indicator	Yes
Segmented Circle	No
Lights	
Beacon	
Landing Fee	No
Fuel	NONE
Fire and Rescue	
Int'l Operations	

COMMUNICATIONS

UNICOM:	None
CTAF:	None
ATIS:	None

NAVAIDS

NAVAIDS:

Type	ID	Name	Frequency	Hours	Distance	Bearing	Remarks
VOR/DME	PWL	PAWLING	114.3 MHz	24 Hours	15.4 nm	70.7°	• OPERATIONAL IFR
VOT	BDL	BRADLEY	111.4 MHz	24 Hours	26.8 nm	260.0°	• OPERATIONAL IFR
VORTAC	BAF	BARNES	113 MHz	24 Hours	31.1 nm	233.7°	• OPERATIONAL RESTRICTED • VORTAC UNUSBL 310-340 DEGS BYD 25 NM BLO 6500 FT. • VOR UNUSBL249-260 BYD 10 NM BLO 10000

NDB	PFH	PHILMONT	272 KHz	24 Hours	31.2 nm	140.1°	• OPERATIONAL IFR
TACAN	CEF	WESTOVER	114 MHz	24 Hours	39.3 nm	238.6°	• OPERATIONAL RESTRICTED • NO-NOTAM MP 1100-1500Z++ FRI. • TACAN AZM UNUSBL 001-089 BYD 35 NM BLW 7000 FT; 090-110 BLW 8000 FT; 111-180 BYD 20 NM BLW 7000 FT; 220-240 BYD 24 NM BLW 4000 FT; 305-320 BYD 15 NM BLW 4000 FT. • DME UNUSBL 001-089 BYD 20 NM BLW 7000 FT; 090-110 BLW 8000 FT; 111-180 BYD 20 NM BLW 7000 FT; 220-240 BYD 24 NM BLW 4000 FT; 305-320 BYD 15 NM BLW 4000 FT.
DME	HVN	NEW HAVEN	109.8 MHz	24 Hours	39.6 nm	333.8°	• OPERATIONAL RESTRICTED • DME UNUSBL BYD 19 NM.
FAN MARKER	SKU	STANWYCK		24 Hours	39.7 nm	60.2°	• OPERATIONAL VFR ONLY

WEATHER

ID	Type	Frequency	Phone	Distance	Remarks
CT71	WX AWOS-AV	129.825 MHz		23.0 nm	• AWOS-AV WX BCST ON 129.825 (3 MIC CLICKS).
OXC	WX AWOS-3PT	132.975 MHz	203-262-1190	23.6 nm	
BDL	WX ASOS	118.15 MHz	860-386-3480	27.0 nm	
MMK	WX ASOS	134.925 MHz	203-639-9405	28.8 nm	
HFD	WX ASOS		860-527-5837	28.9 nm	

RUNWAY 18/36

Dimensions	1600 ft. x 40 ft.
Surface Type	TURF
Surface Condition	
Treatment	

Runway Edge Lights	
PCN	
Single Wheel	
Double Wheel	
Double Tandem	
Dual Double Tandem	

Base End: 18

Traffic Pattern	Left
Runway End Identifier Lights	No

Reciprocal End: 36

Traffic Pattern	Left
Runway End Identifier Lights	No

HELIPORTS

None

CHARTS

Chart data valid from 0901Z 04/22/21 to 0901Z 05/20/21.

CONTACTS

OWNER

WINGS AGO, INC.
161 BARTHOLOMEW HILL ROAD
GOSHEN, CT 06756
UNITED STATES
Phone: (860) 782-1077

MANAGER

PETER BUJNOWSKI
161 BARTHOLOMEW HILL ROAD
GOSHEN, CT 06756
UNITED STATES
Phone: (860) 782-1077

REMARKS

- FOR CD CTC YANKEE APCH AT 860-386-3597

Attachment 3
ARM North Side Split Glare Analysis

FORGESOLAR GLARE ANALYSIS

Project: **Goshen Farm**
Site configuration: **North Side Split**
Analysis conducted by Aaron Miller (amiller@armgroup.net) at 18:28 on 28 Jul, 2021.

U.S. FAA 2013 Policy Adherence

The following table summarizes the policy adherence of the glare analysis based on the 2013 U.S. Federal Aviation Administration Interim Policy 78 FR 63276. This policy requires the following criteria be met for solar energy systems on airport property:

- No "yellow" glare (potential for after-image) for any flight path from threshold to 2 miles
- No glare of any kind for Air Traffic Control Tower(s) ("ATCT") at cab height.
- Default analysis and observer characteristics (see list below)

ForgeSolar does not represent or speak officially for the FAA and cannot approve or deny projects. Results are informational only.

COMPONENT	STATUS	DESCRIPTION
Analysis parameters	PASS	Analysis time interval and eye characteristics used are acceptable
2-mile flight path(s)	PASS	Flight path receptor(s) do not receive yellow glare
ATCT(s)	N/A	No ATCT receptors designated

Default glare analysis parameters and observer eye characteristics (for reference only):

- Analysis time interval: 1 minute
- Ocular transmission coefficient: 0.5
- Pupil diameter: 0.002 meters
- Eye focal length: 0.017 meters
- Sun subtended angle: 9.3 milliradians

FAA Policy 78 FR 63276 can be read at https://www.federalregister.gov/d/2013-24729

SITE CONFIGURATION

Analysis Parameters

DNI: peaks at 1,000.0 W/m^2
Time interval: 1 min
Ocular transmission coefficient: 0.5
Pupil diameter: 0.002 m
Eye focal length: 0.017 m
Sun subtended angle: 9.3 mrad
Site Config ID: 56752.10019

PV Array(s)

Name: PV array 1
Axis tracking: Fixed (no rotation)
Tilt: 25.0°
Orientation: 180.0°
Rated power: -
Panel material: Smooth glass with AR coating
Reflectivity: Vary with sun
Slope error: correlate with material

Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	41.854119	-73.279526	1569.92	0.00	1569.92
2	41.854117	-73.280159	1564.01	0.00	1564.01
3	41.855180	-73.279808	1584.88	0.00	1584.88
4	41.855923	-73.279282	1585.82	0.00	1585.82
5	41.855987	-73.278960	1580.95	0.00	1580.95
6	41.855887	-73.278755	1582.55	0.00	1582.55
7	41.854823	-73.278550	1582.86	0.00	1582.86
8	41.854127	-73.278802	1576.77	0.00	1576.77

Flight Path Receptor(s)

Name: 36 - Landing 2
Description:
Threshold height: 50 ft
Direction: 335.8°
Glide slope: 3.0°
Pilot view restricted? Yes
Vertical view: 30.0°
Azimuthal view: 50.0°

Point	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
Threshold	41.851927	-73.274451	1537.87	50.00	1587.87
Two-mile	41.825555	-73.258521	1290.22	851.11	2141.33

GLARE ANALYSIS RESULTS

Summary of Glare

PV Array Name	Tilt (°)	Orient (°)	"Green" Glare min	"Yellow" Glare min	Energy kWh
PV array 1	25.0	180.0	0	0	-

Total annual glare received by each receptor

Receptor	Annual Green Glare (min)	Annual Yellow Glare (min)
36 - Landing 2	0	0

Results for: PV array 1

Receptor	Green Glare (min)	Yellow Glare (min)
36 - Landing 2	0	0

Flight Path: 36 - Landing 2

0 minutes of yellow glare
0 minutes of green glare

Assumptions

"Green" glare is glare with low potential to cause an after-image (flash blindness) when observed prior to a typical blink response time.
"Yellow" glare is glare with potential to cause an after-image (flash blindness) when observed prior to a typical blink response time.
Times associated with glare are denoted in Standard time. For Daylight Savings, add one hour.
Glare analyses do not account for physical obstructions between reflectors and receptors. This includes buildings, tree cover and geographic obstructions.
Several calculations utilize the PV array centroid, rather than the actual glare spot location, due to algorithm limitations. This may affect results for large PV footprints. Additional analyses of array sub-sections can provide additional information on expected glare.
The subtended source angle (glare spot size) is constrained by the PV array footprint size. Partitioning large arrays into smaller sections will reduce the maximum potential subtended angle, potentially impacting results if actual glare spots are larger than the sub-array size. Additional analyses of the combined area of adjacent sub-arrays can provide more information on potential glare hazards. (See previous point on related limitations.)
Glare locations displayed on receptor plots are approximate. Actual glare-spot locations may differ.
Glare vector plots are simplified representations of analysis data. Actual glare emanations and results may differ.
The glare hazard determination relies on several approximations including observer eye characteristics, angle of view, and typical blink response time. Actual results and glare occurrence may differ.
Hazard zone boundaries shown in the Glare Hazard plot are an approximation and visual aid based on aggregated research data. Actual ocular impact outcomes encompass a continuous, not discrete, spectrum.
Refer to the Help page at **www.forgesolar.com/help/** for assumptions and limitations not listed here.

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Attachment 4
ARM South Side Split Glare Analysis

FORGESOLAR GLARE ANALYSIS

Project: **Goshen Farm**
Site configuration: **South Side Split**
Analysis conducted by Aaron Miller (amiller@armgroup.net) at 13:01 on 28 Jul, 2021.

U.S. FAA 2013 Policy Adherence

The following table summarizes the policy adherence of the glare analysis based on the 2013 U.S. Federal Aviation Administration Interim Policy 78 FR 63276. This policy requires the following criteria be met for solar energy systems on airport property:

- No "yellow" glare (potential for after-image) for any flight path from threshold to 2 miles
- No glare of any kind for Air Traffic Control Tower(s) ("ATCT") at cab height.
- Default analysis and observer characteristics (see list below)

ForgeSolar does not represent or speak officially for the FAA and cannot approve or deny projects. Results are informational only.

COMPONENT	STATUS	DESCRIPTION
Analysis parameters	PASS	Analysis time interval and eye characteristics used are acceptable
2-mile flight path(s)	FAIL	Flight path receptor(s) receive yellow glare
ATCT(s)	N/A	No ATCT receptors designated

Default glare analysis parameters and observer eye characteristics (for reference only):

- Analysis time interval: 1 minute
- Ocular transmission coefficient: 0.5
- Pupil diameter: 0.002 meters
- Eye focal length: 0.017 meters
- Sun subtended angle: 9.3 milliradians

FAA Policy 78 FR 63276 can be read at https://www.federalregister.gov/d/2013-24729

SITE CONFIGURATION

Analysis Parameters

DNI: peaks at 1,000.0 W/m^2
Time interval: 1 min
Ocular transmission coefficient: 0.5
Pupil diameter: 0.002 m
Eye focal length: 0.017 m
Sun subtended angle: 9.3 mrad
Site Config ID: 56777.10019

PV Array(s)

Name: PV array 1
Axis tracking: Fixed (no rotation)
Tilt: 25.0°
Orientation: 180.0°
Rated power: -
Panel material: Smooth glass with AR coating
Reflectivity: Vary with sun
Slope error: correlate with material

Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	41.853337	-73.277721	1566.46	6.00	1572.46
2	41.852718	-73.277552	1558.22	0.00	1558.22
3	41.851407	-73.276111	1527.82	6.00	1533.82
4	41.851499	-73.275832	1527.50	6.00	1533.50
5	41.854866	-73.278123	1580.49	6.00	1586.49
6	41.854798	-73.278458	1583.35	0.00	1583.35
7	41.854772	-73.278557	1581.11	6.00	1587.11
8	41.854194	-73.278710	1577.47	0.00	1577.47
9	41.854181	-73.278701	1577.39	0.00	1577.39
10	41.854031	-73.279560	1567.91	0.00	1567.91
11	41.853298	-73.279373	1560.67	0.00	1560.67

Flight Path Receptor(s)

Name: 36 - Landing
Description:
Threshold height: 50 ft
Direction: 335.8°
Glide slope: 3.0°
Pilot view restricted? Yes
Vertical view: 30.0°
Azimuthal view: 50.0°

Point	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
Threshold	41.851947	-73.274443	1537.95	50.00	1587.95
Two-mile	41.825585	-73.258482	1288.33	853.07	2141.40

GLARE ANALYSIS RESULTS

Summary of Glare

PV Array Name	Tilt (°)	Orient (°)	"Green" Glare min	"Yellow" Glare min	Energy kWh
PV array 1	25.0	180.0	0	5,343	-

Total annual glare received by each receptor

Receptor	Annual Green Glare (min)	Annual Yellow Glare (min)
36 - Landing	0	5343

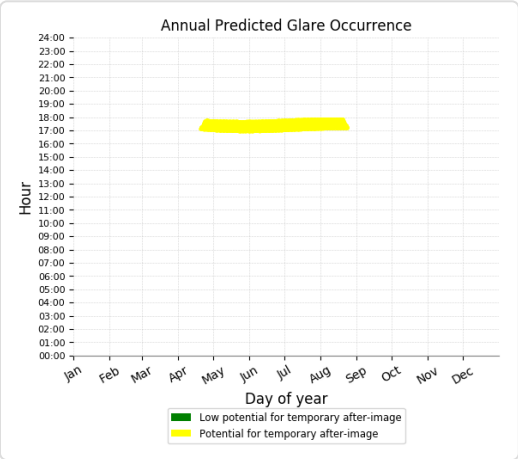
Results for: PV array 1

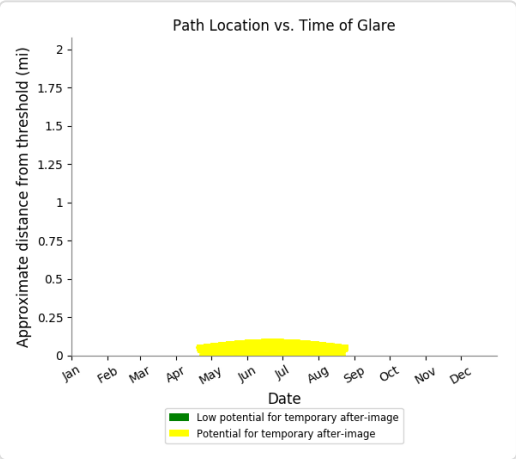
Receptor	Green Glare (min)	Yellow Glare (min)
36 - Landing	0	5343

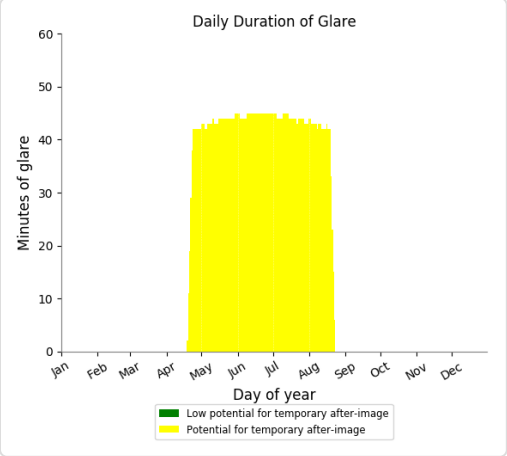
Flight Path: 36 - Landing

5343 minutes of yellow glare

0 minutes of green glare







Assumptions

"Green" glare is glare with low potential to cause an after-image (flash blindness) when observed prior to a typical blink response time.
"Yellow" glare is glare with potential to cause an after-image (flash blindness) when observed prior to a typical blink response time.
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Several calculations utilize the PV array centroid, rather than the actual glare spot location, due to algorithm limitations. This may affect results for large PV footprints. Additional analyses of array sub-sections can provide additional information on expected glare.
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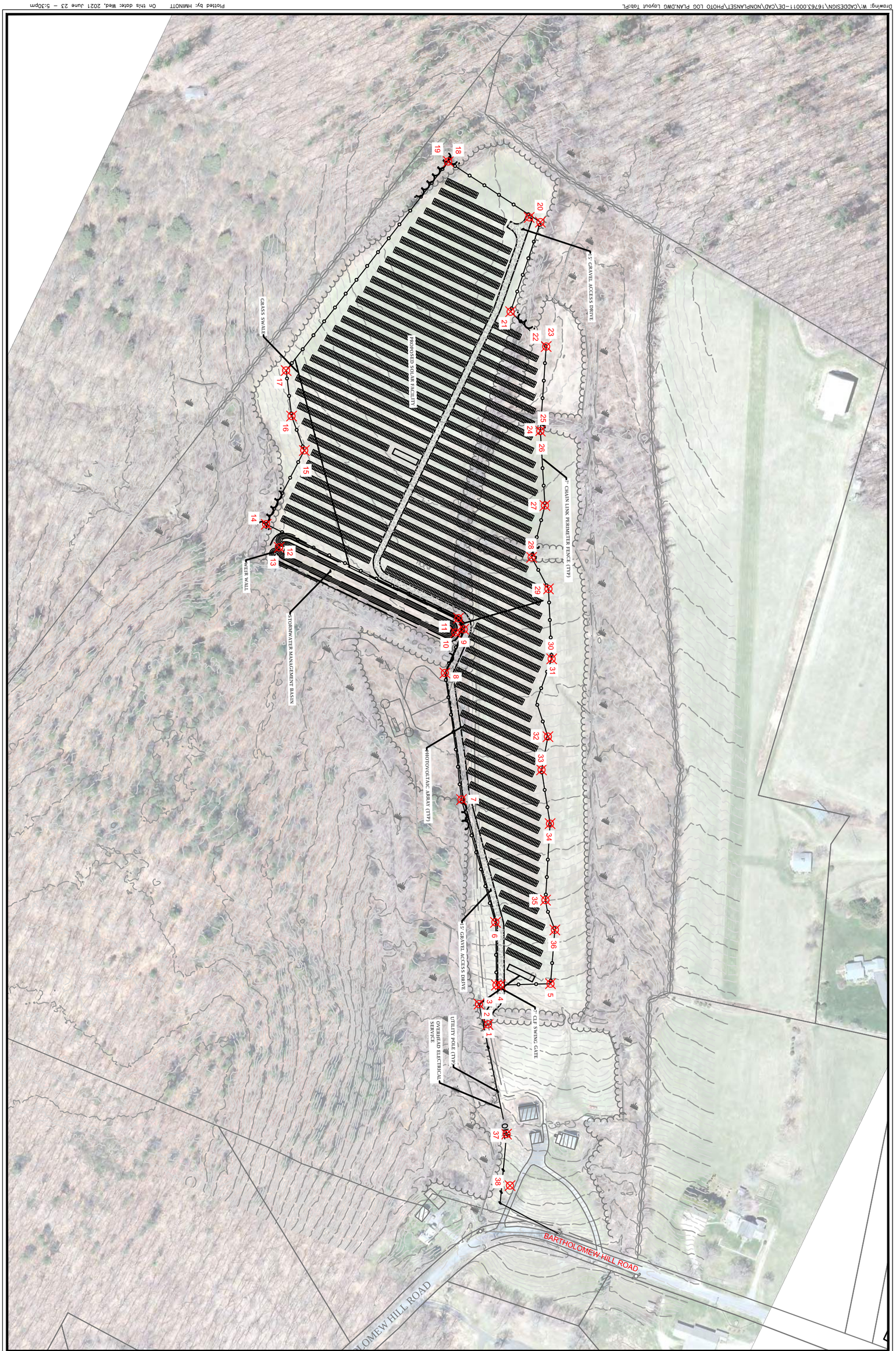

SHEET NO.	PL	DESIGNED	HMM
PROJECT NO.	16763.00011	DRAWN	HMM
DATE	JUNE 25, 2021	CHECKED	MRG
SCALE	1"=200'		

PHOTO LOG

GOSHEN PV SOLAR FACILITY
GREENSKIES CLEAN ENERGY LLC

129 BARTHOLOMEW HILL ROAD
GOSHEN, CONNECTICUT

REVISIONS

SLR
1350 MAIN STREET, SUITE 1012
SPRINGFIELD, MA
413.241.6020
SLRCONSULTING.COM

Copyright Milone & MacBroom, Inc - 2020

Drawing: W:\CADDESIGN\16763.00011-DE\CAD\NONPLANSET\PHOTO LOG PLAN.DWG Layout Tab:PL
Plotted by: HMINOTT On this date: Wed, 2021 June 23 - 5:30pm

Photo 1
Access Road Looking North

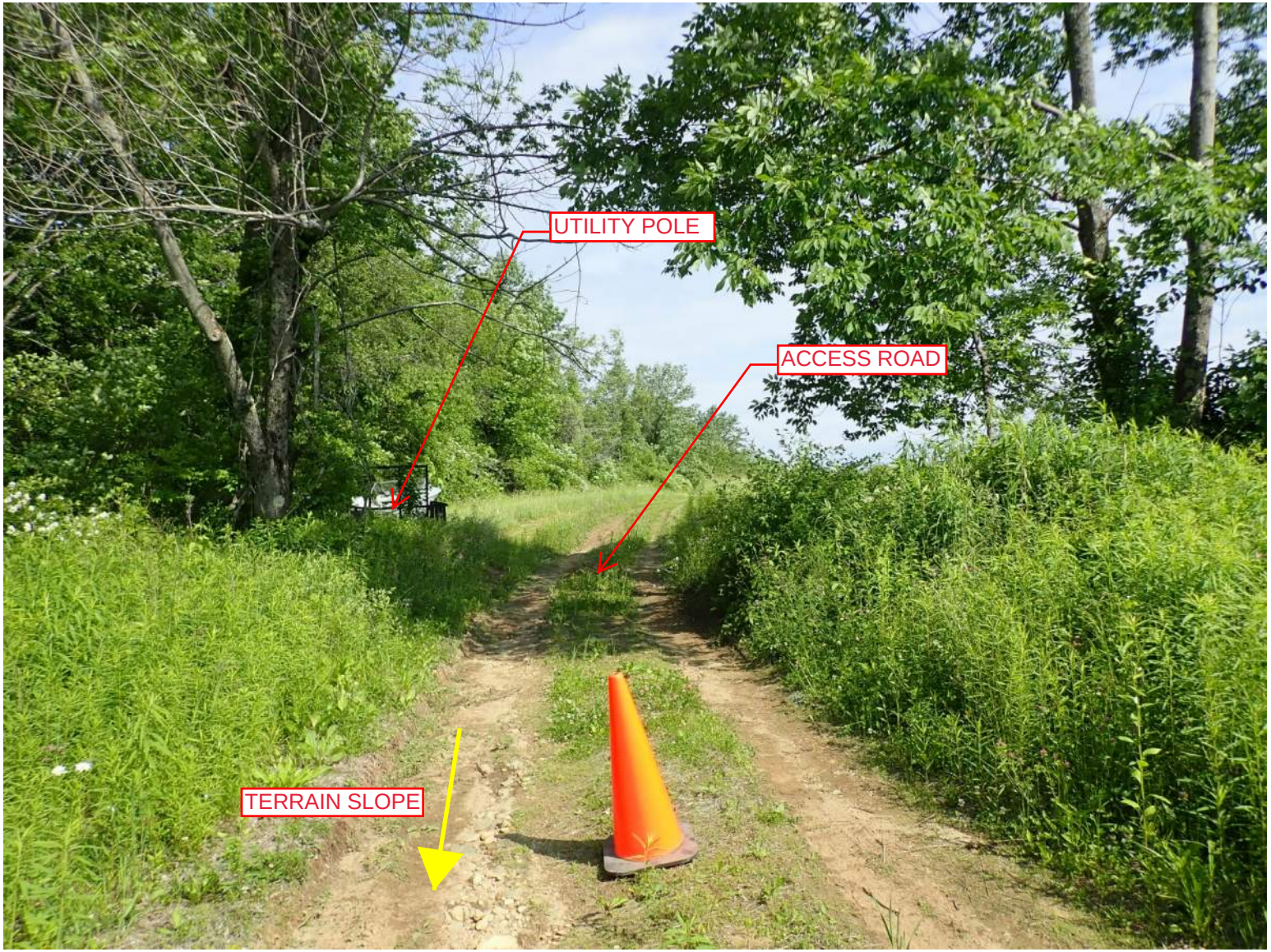

Photo 2
Access Road Looking South

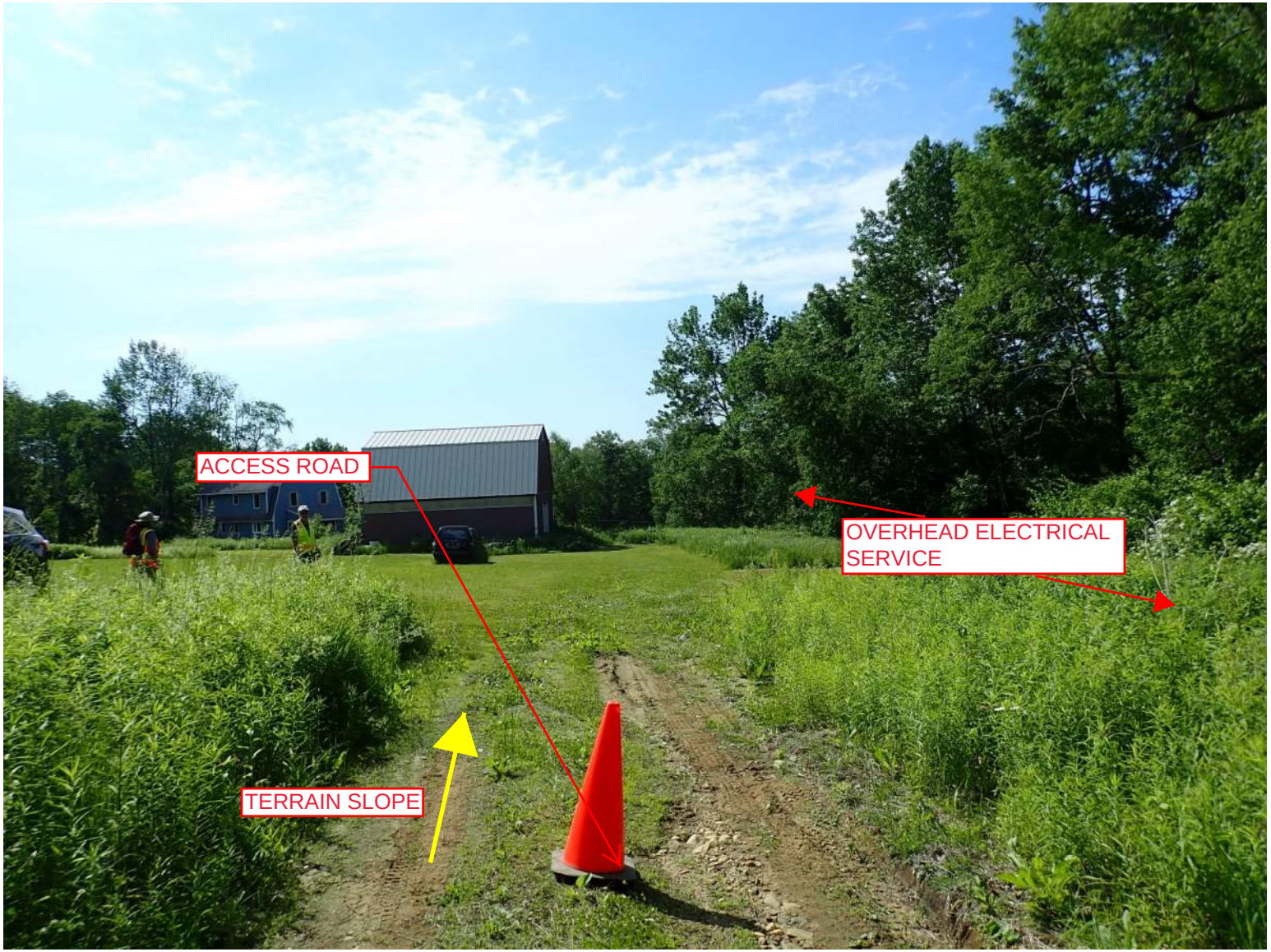

Photo 3
Looking West

Photo 4
South Fence Looking North

Photo 5
Southeast Fence Corner Looking Northeast

Photo 6
Southeast Fence Looking Northeast

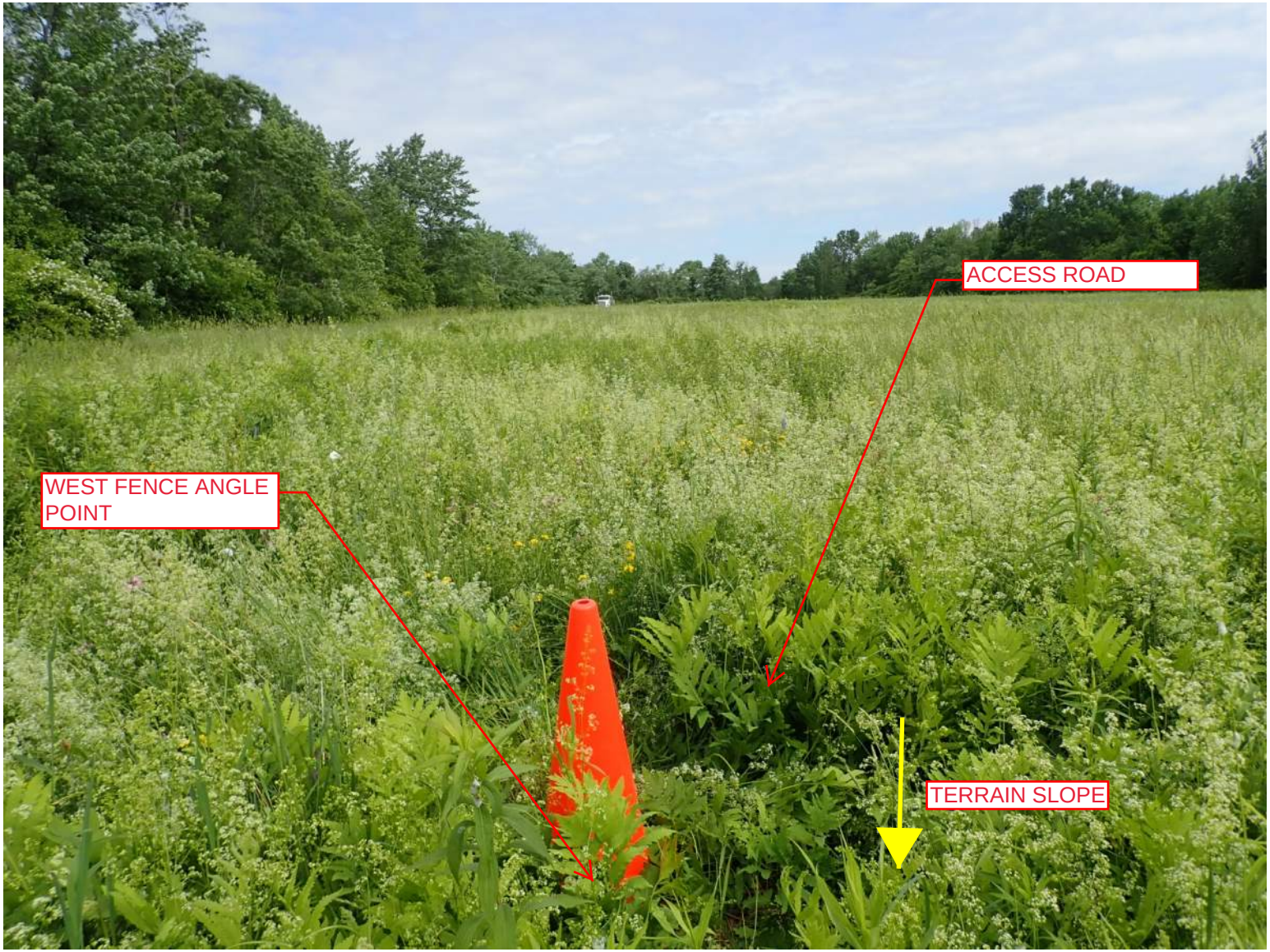

Photo 7
Southwest Fence Angle Point Looking East

Photo 8
Fence Angle Point Looking West

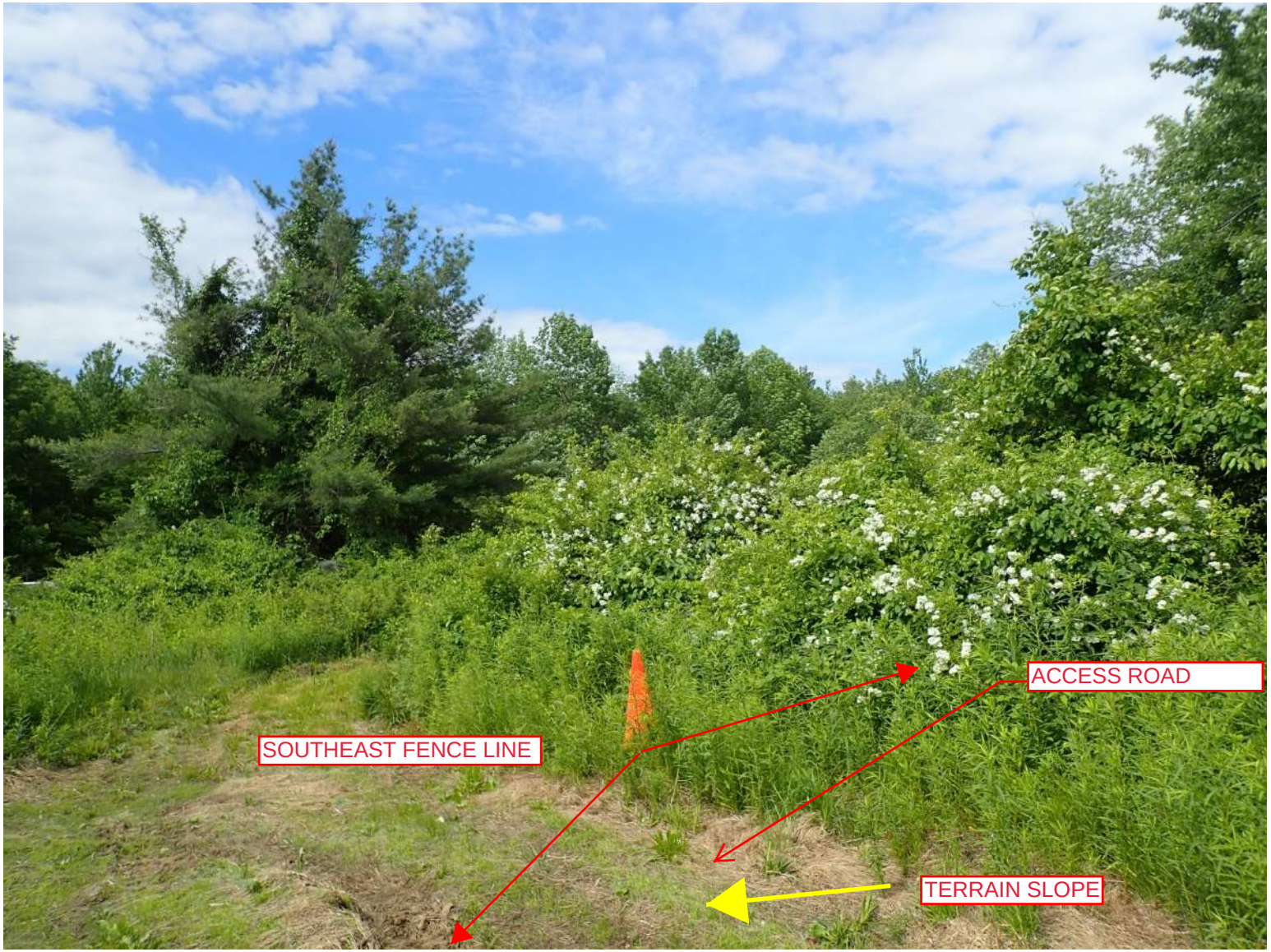

Photo 9
East End of Stormwater Management Basin Looking East

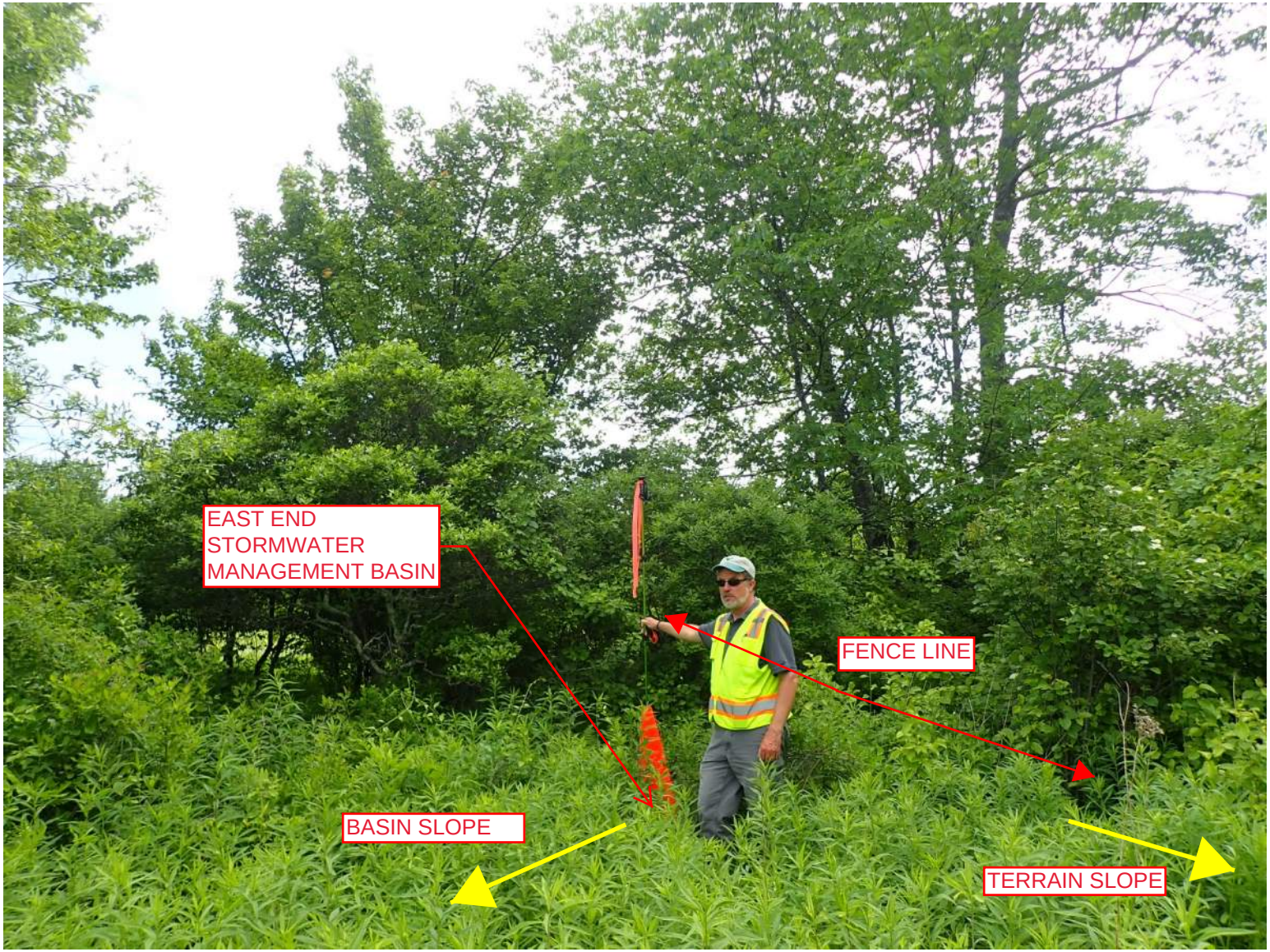

Photo 10
Fence Angle Point Facing Northeast

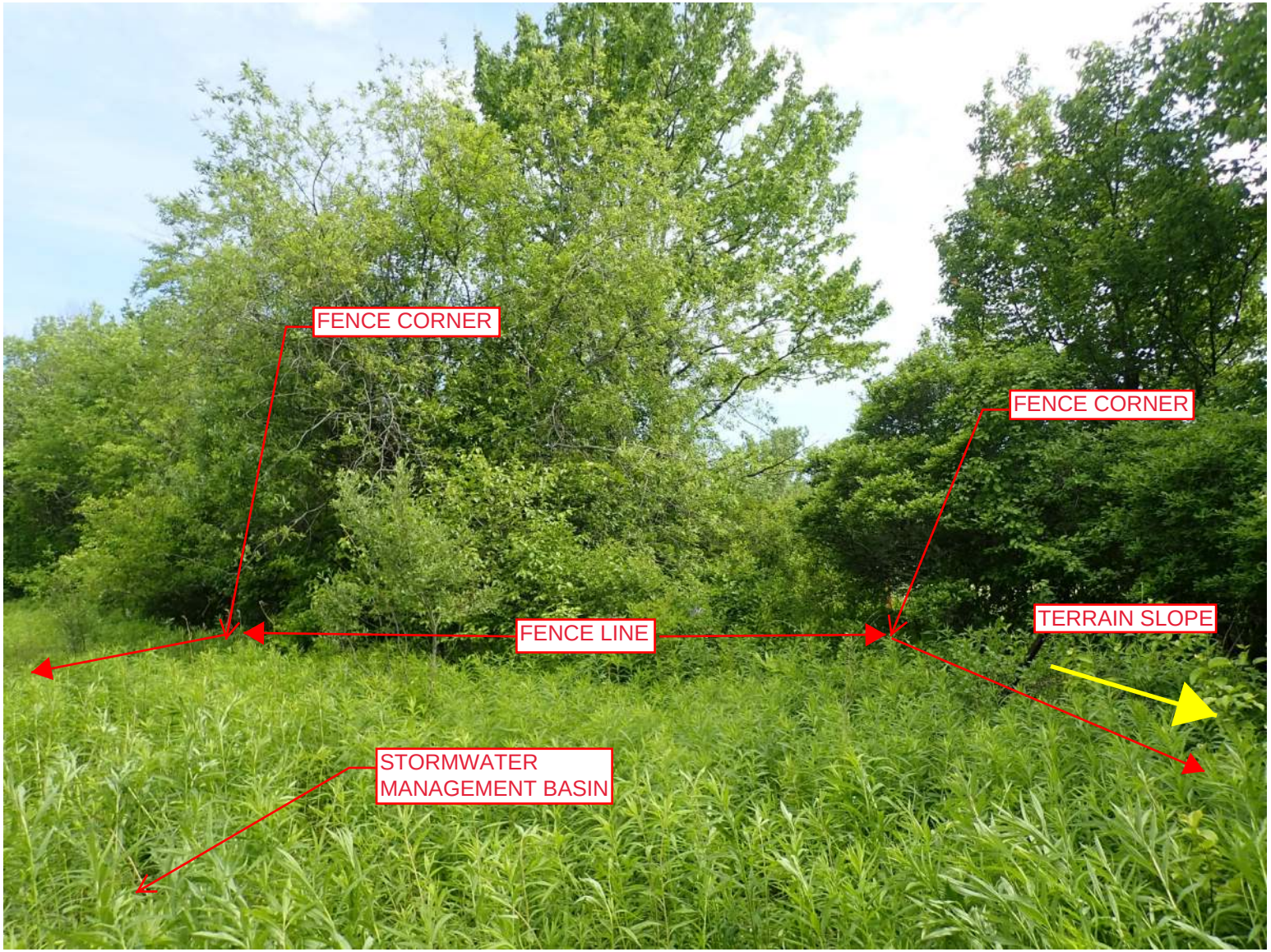

Photo 11
Fence Angle Point Facing Northeast

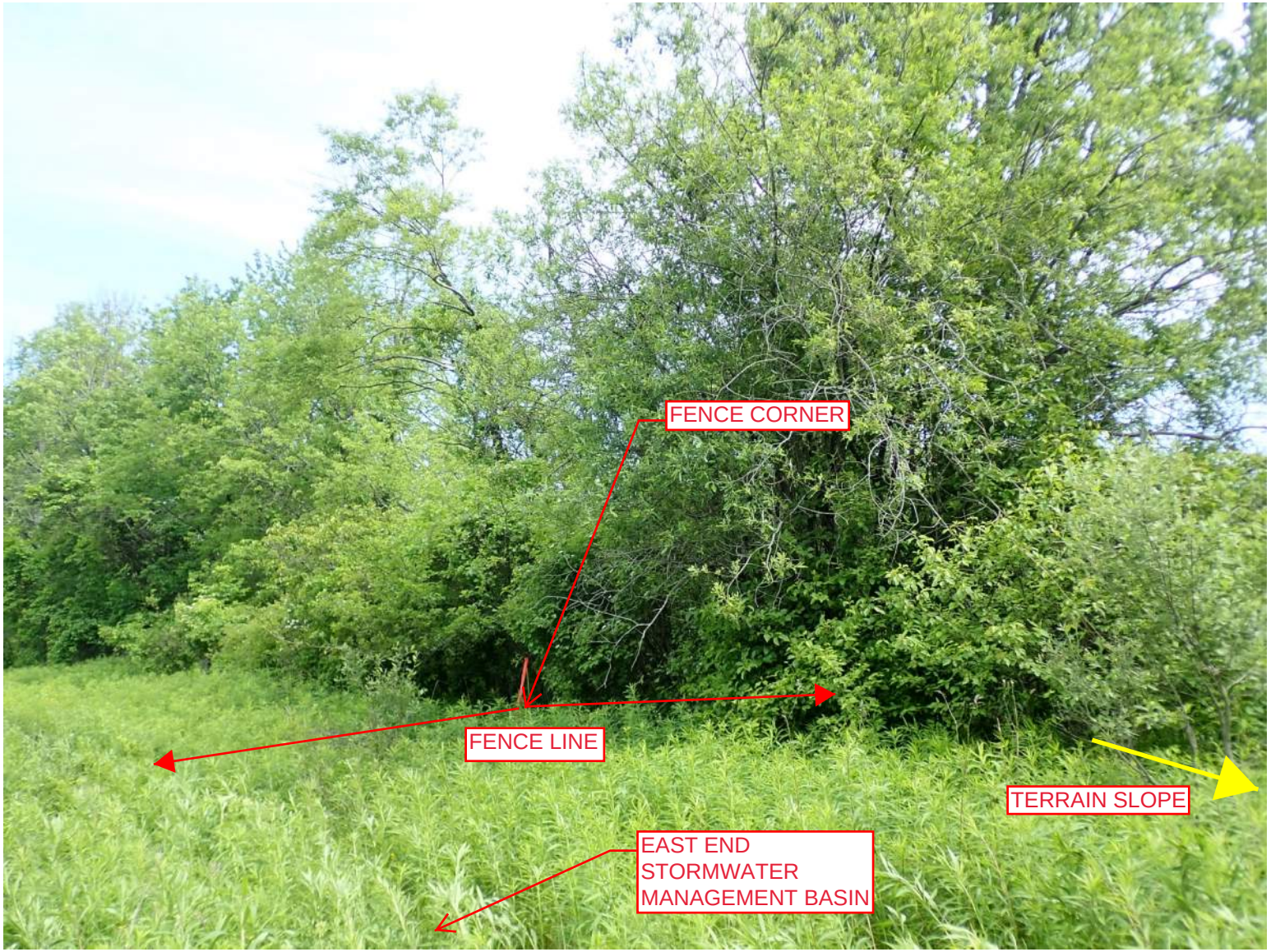

Photo 12
Weir Wall Looking West

Photo 13
Weir Wall Looking North

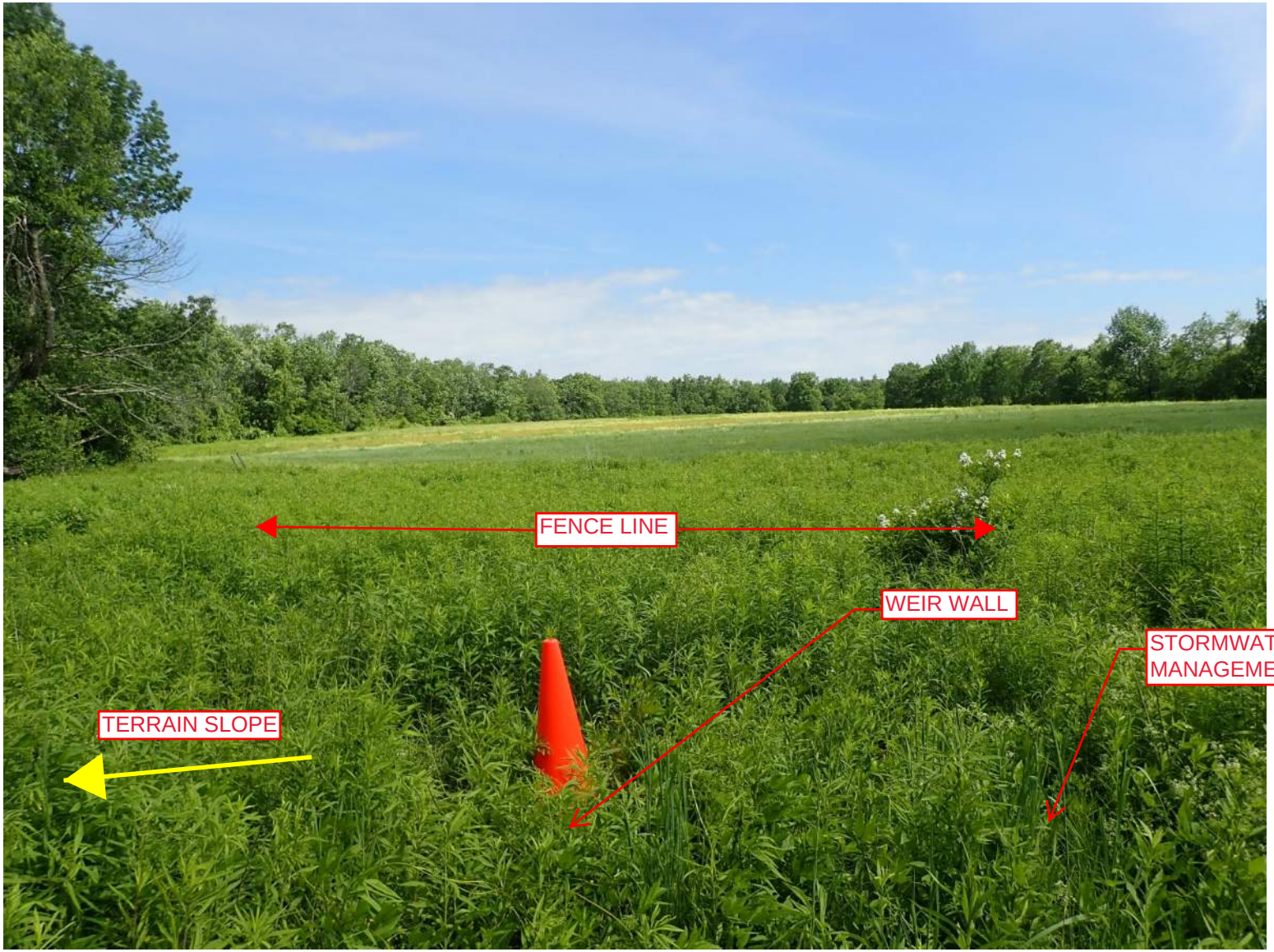

Photo 14
Southwest Fence Corner Looking East

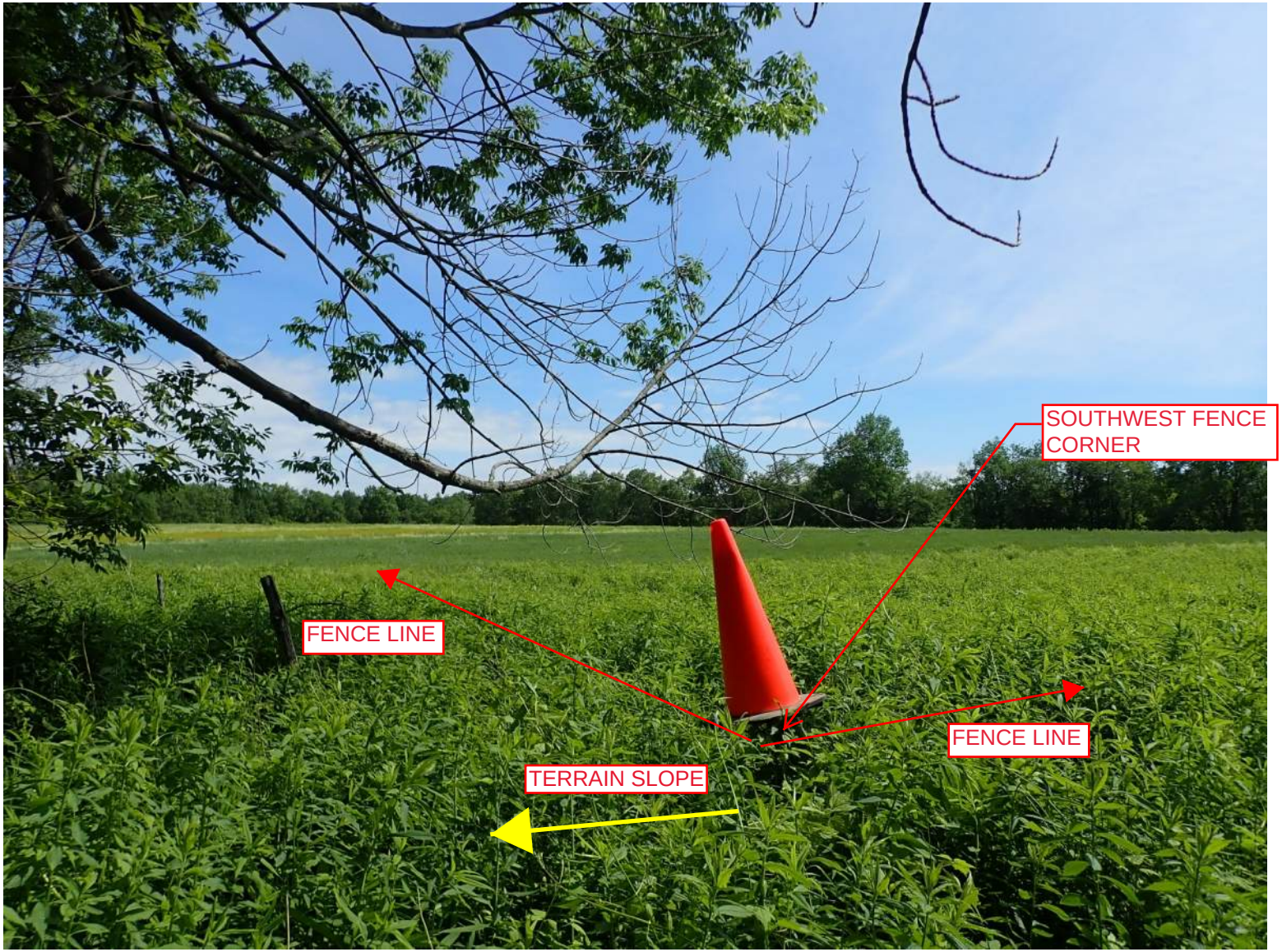

Photo 15
Fence Angle Point Looking Northwest

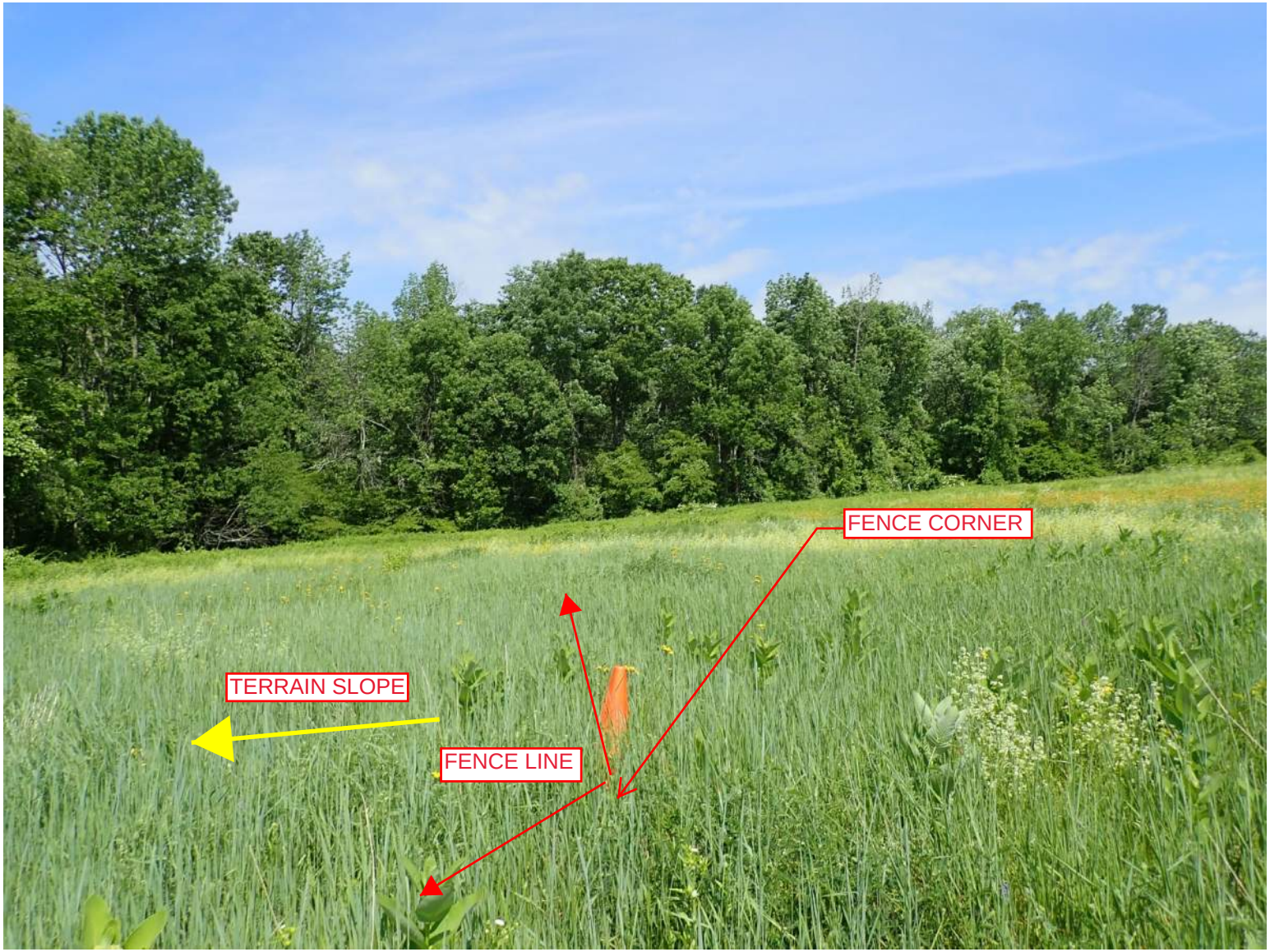

Photo 16
Fence Angle Point Looking North

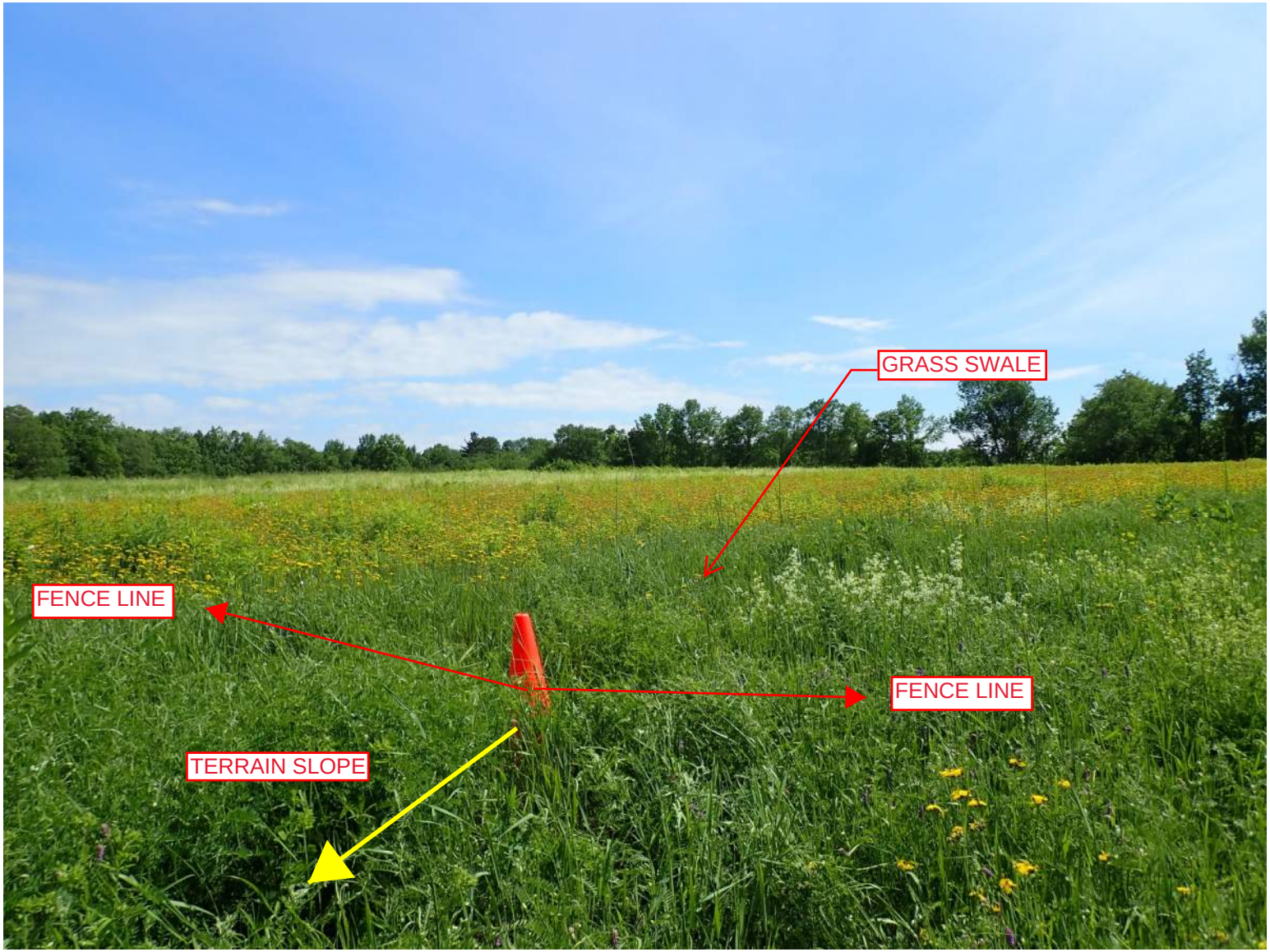

Photo 17
Southwest Fence Corner Looking North

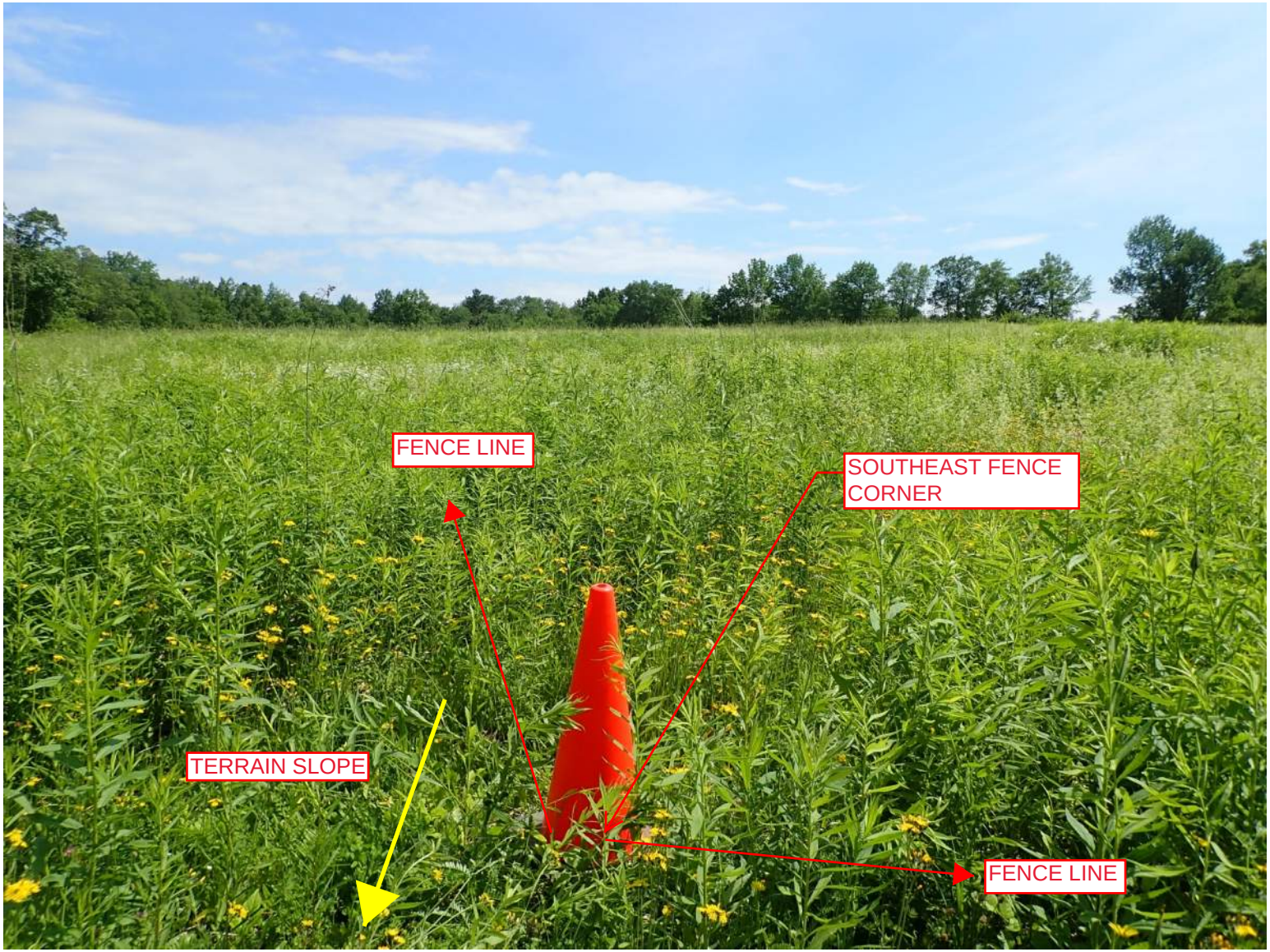

Photo 18
Northwest Fence Corner Looking South

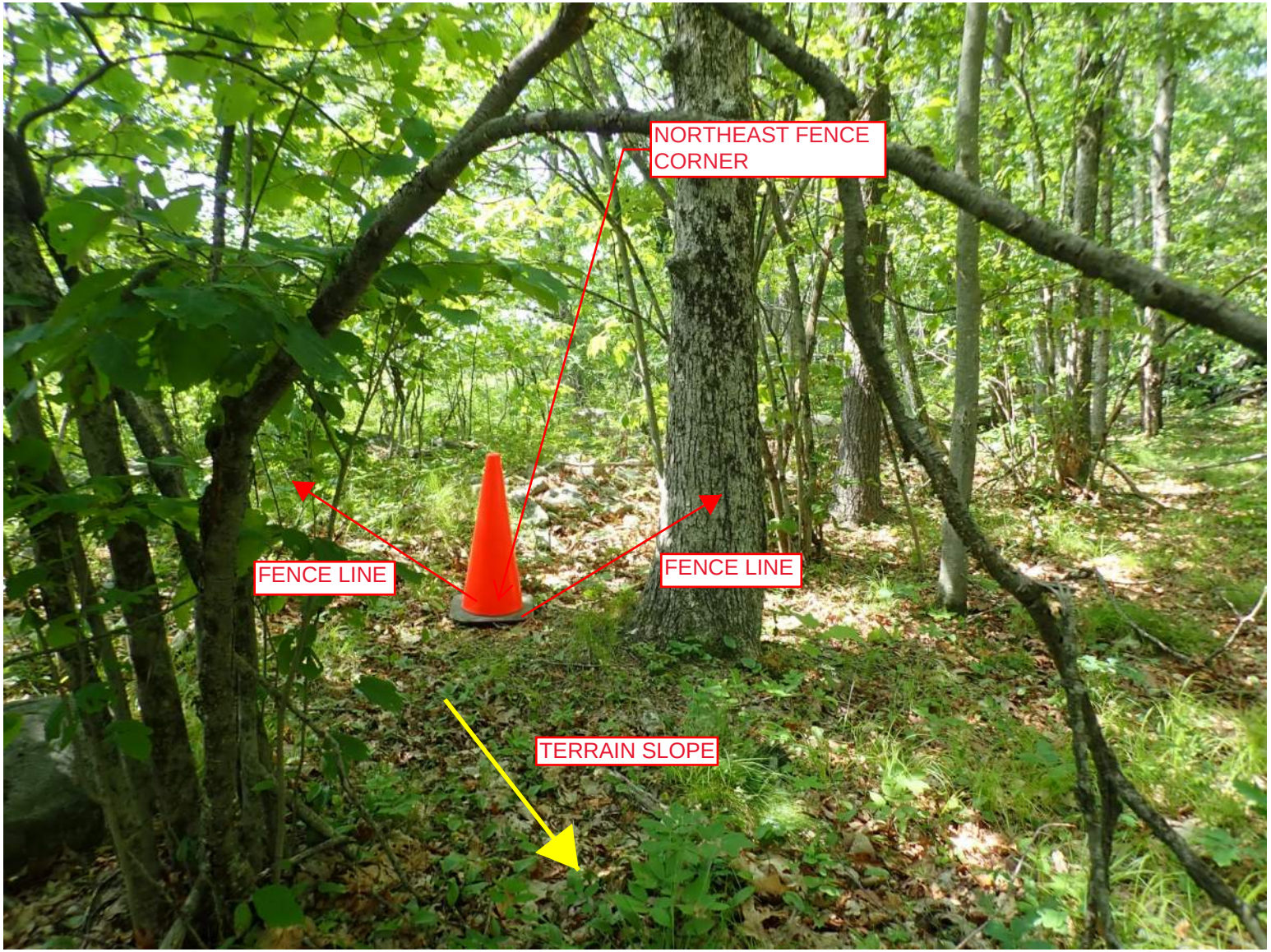

Photo 19
Northwest Fence Corner Looking East

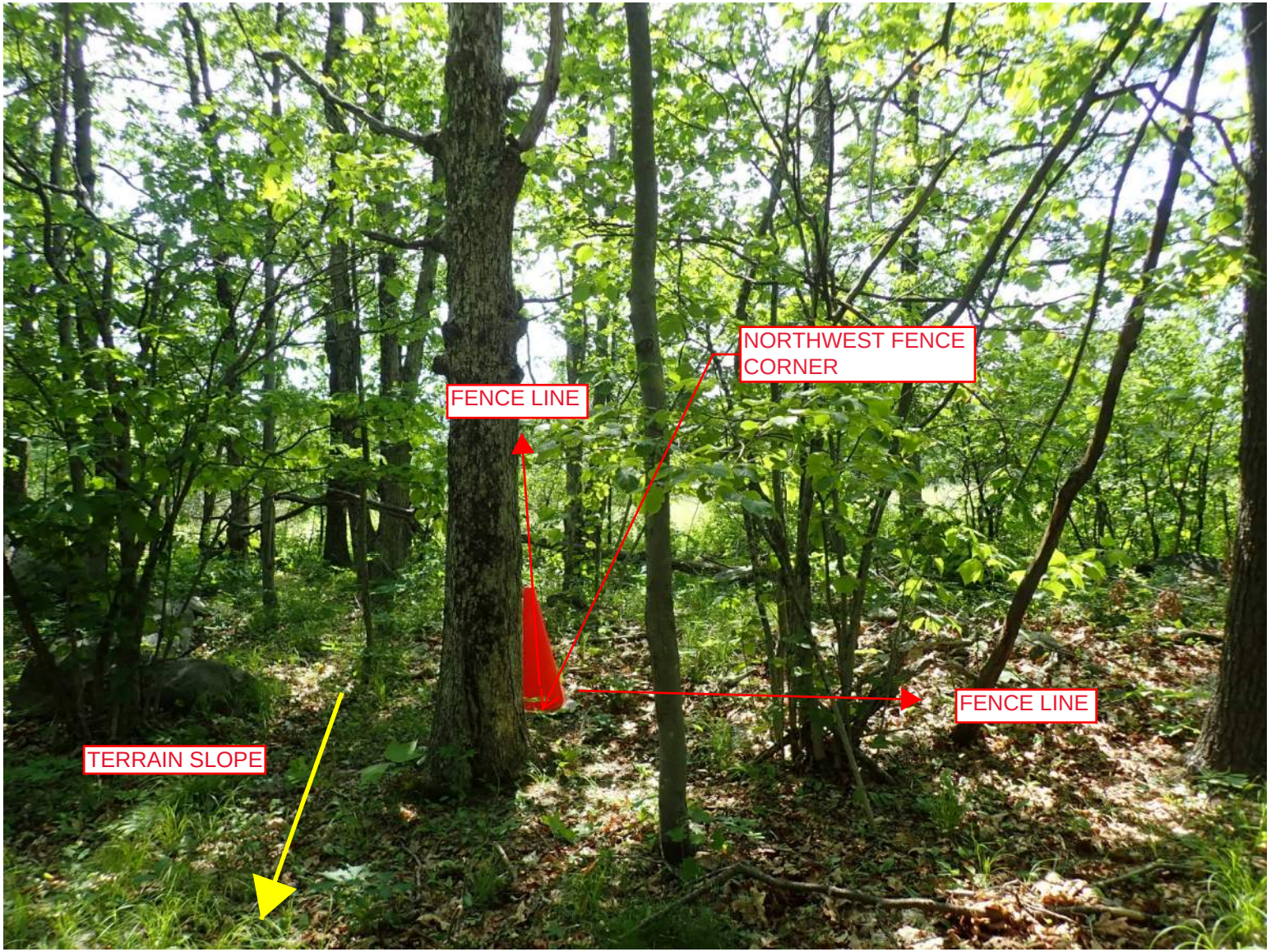

Photo 20
Northeast Fence Corner and Access Road Looking Southeast

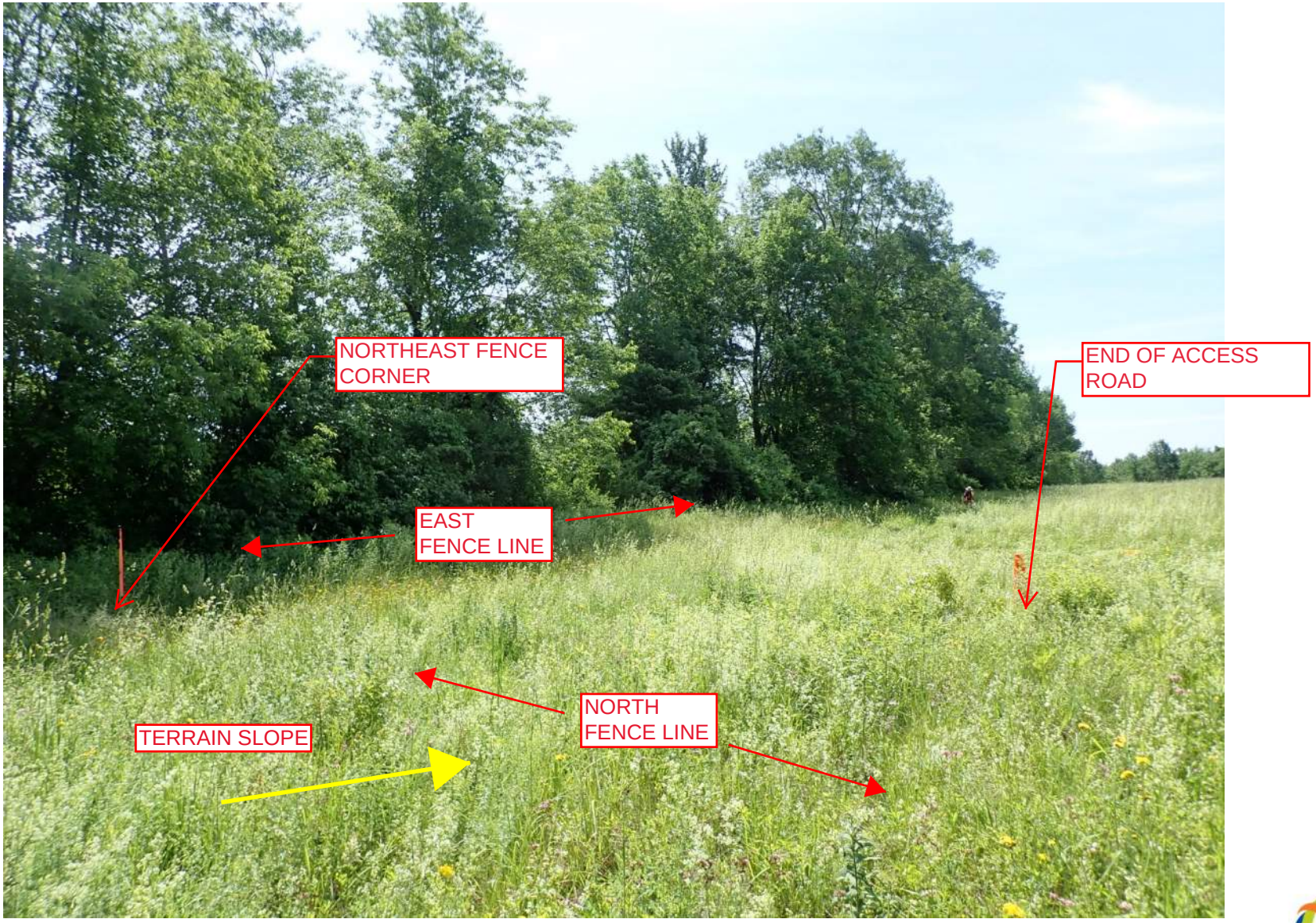

Photo 21
East Fence Angle Point Looking North

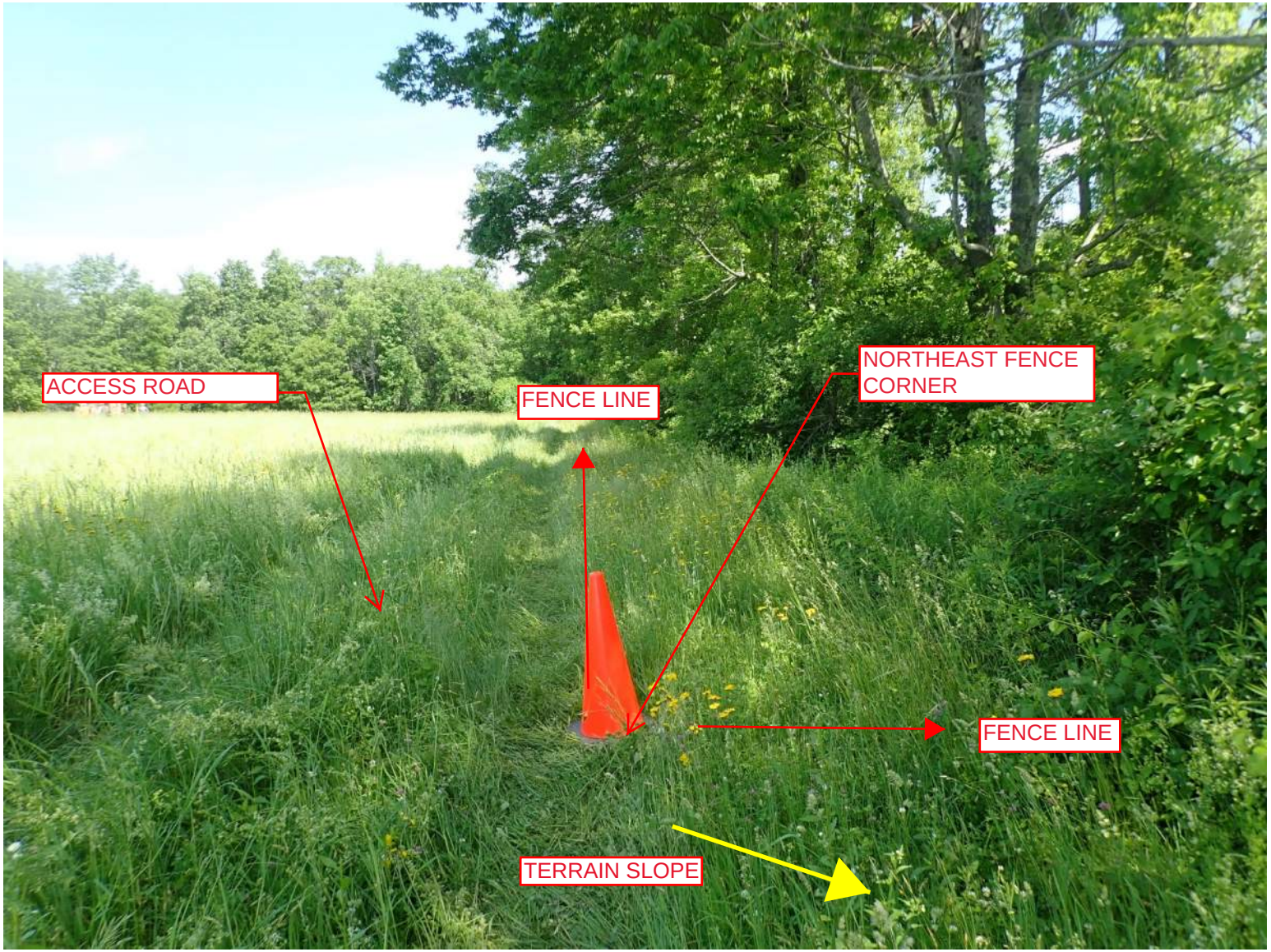

Photo 22
Northeast Fence Angle Point Looking East

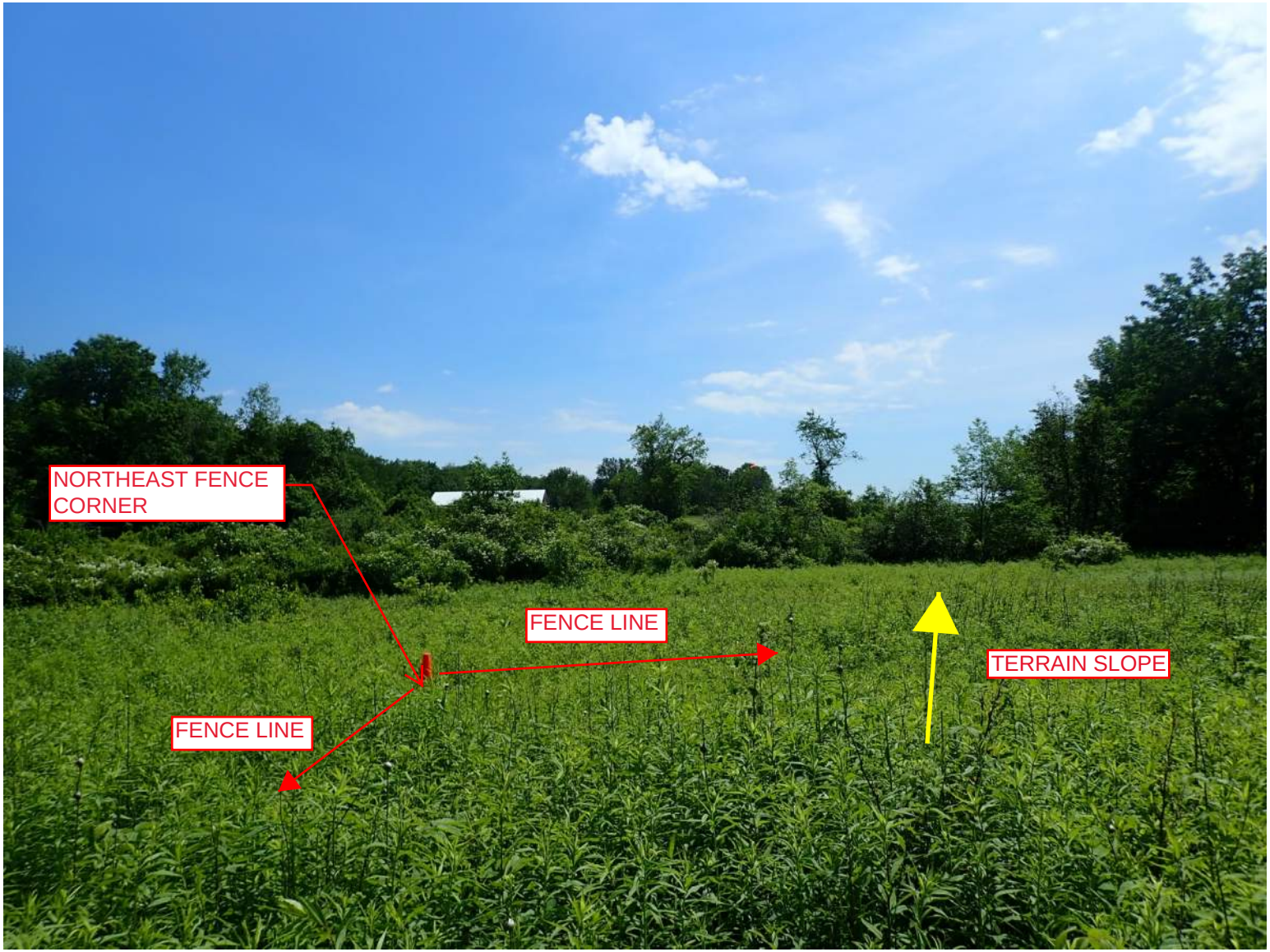

Photo 23
Northeast Fence Angle Point Looking South

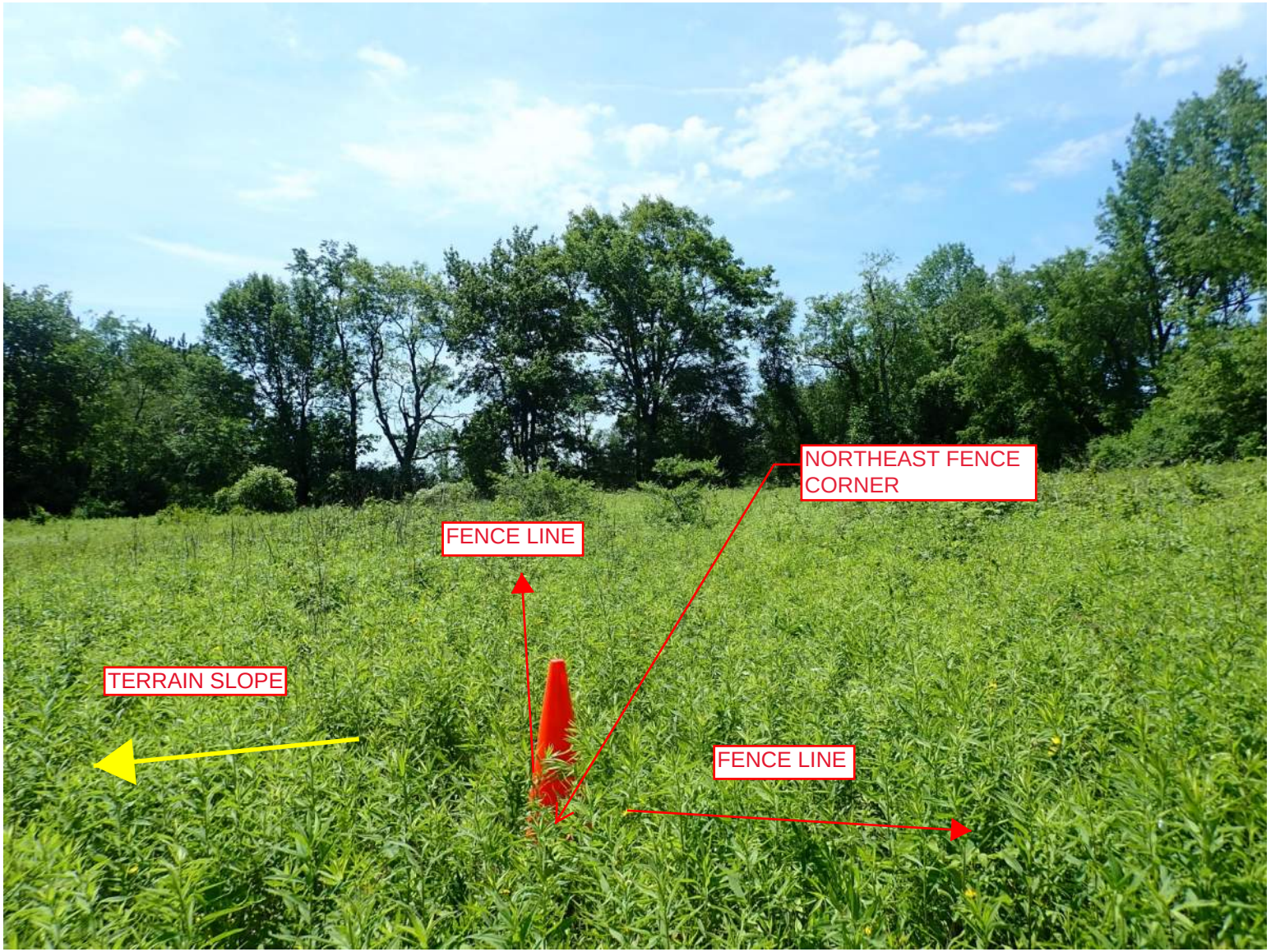

Photo 24
East Fence Angle Point Looking East

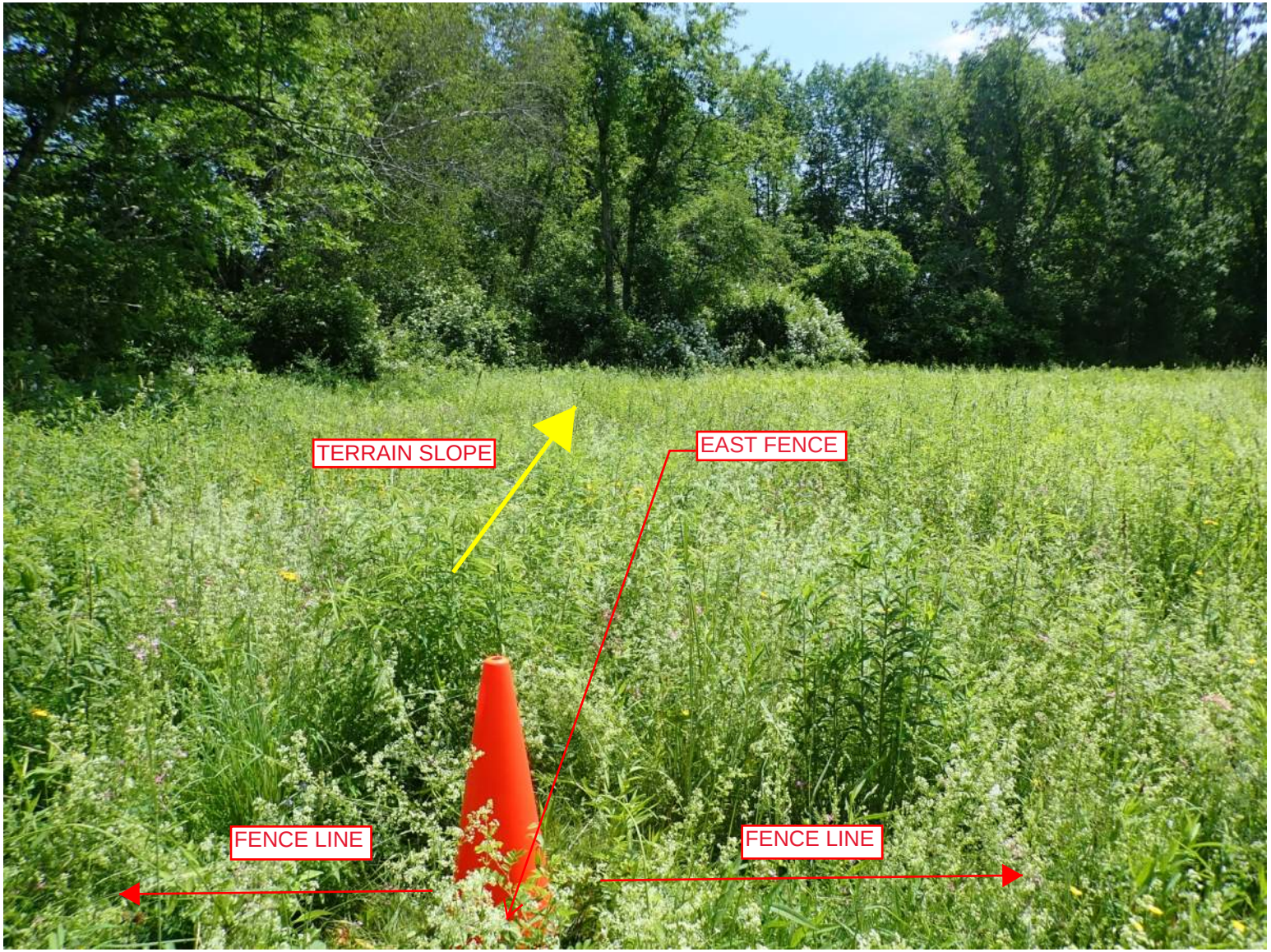

Photo 25
East Fence Angle Point Looking South

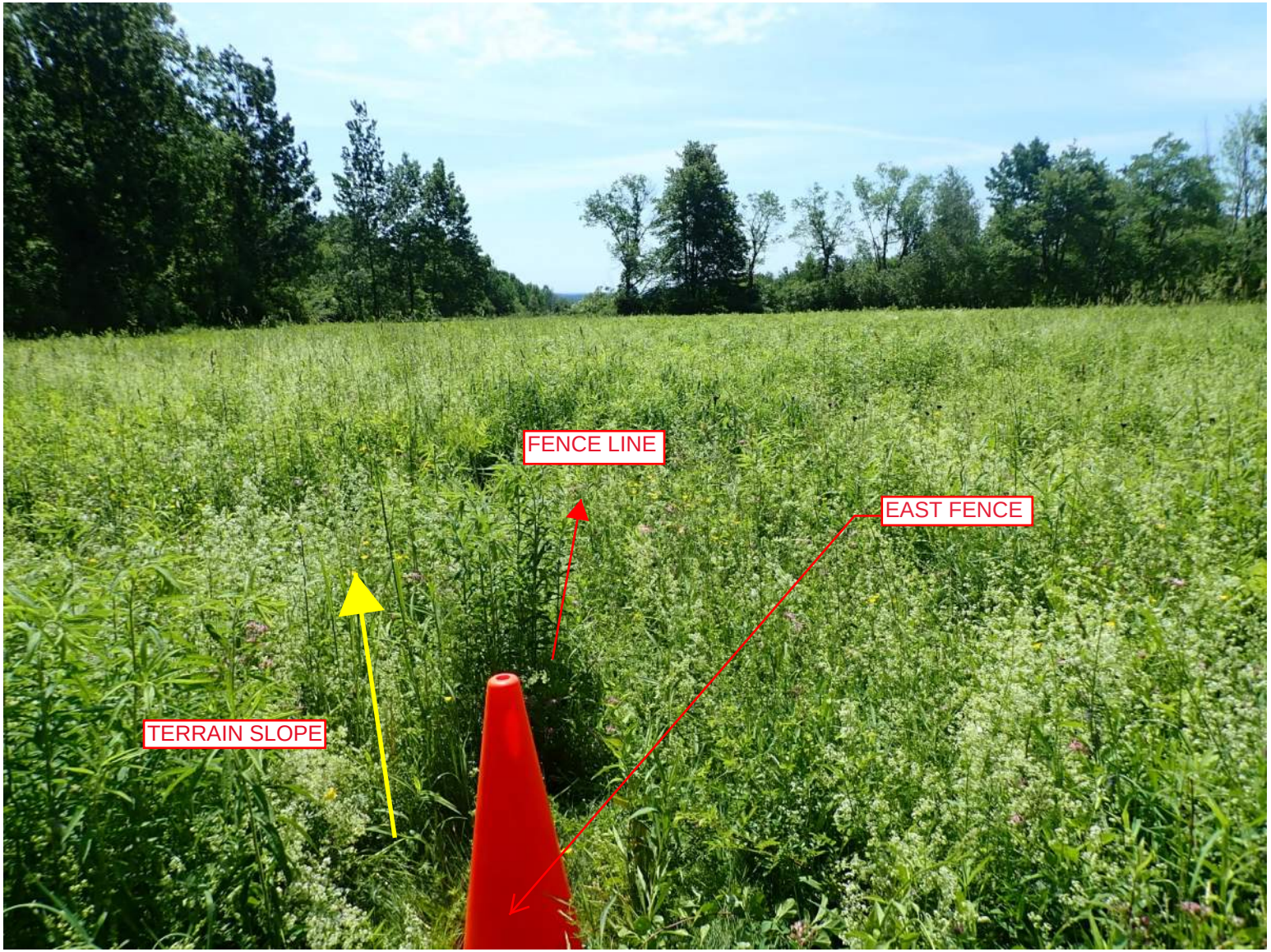

Photo 26
East Fence Angle Point Looking North

Photo 27
East Fence Angle Point Looking East

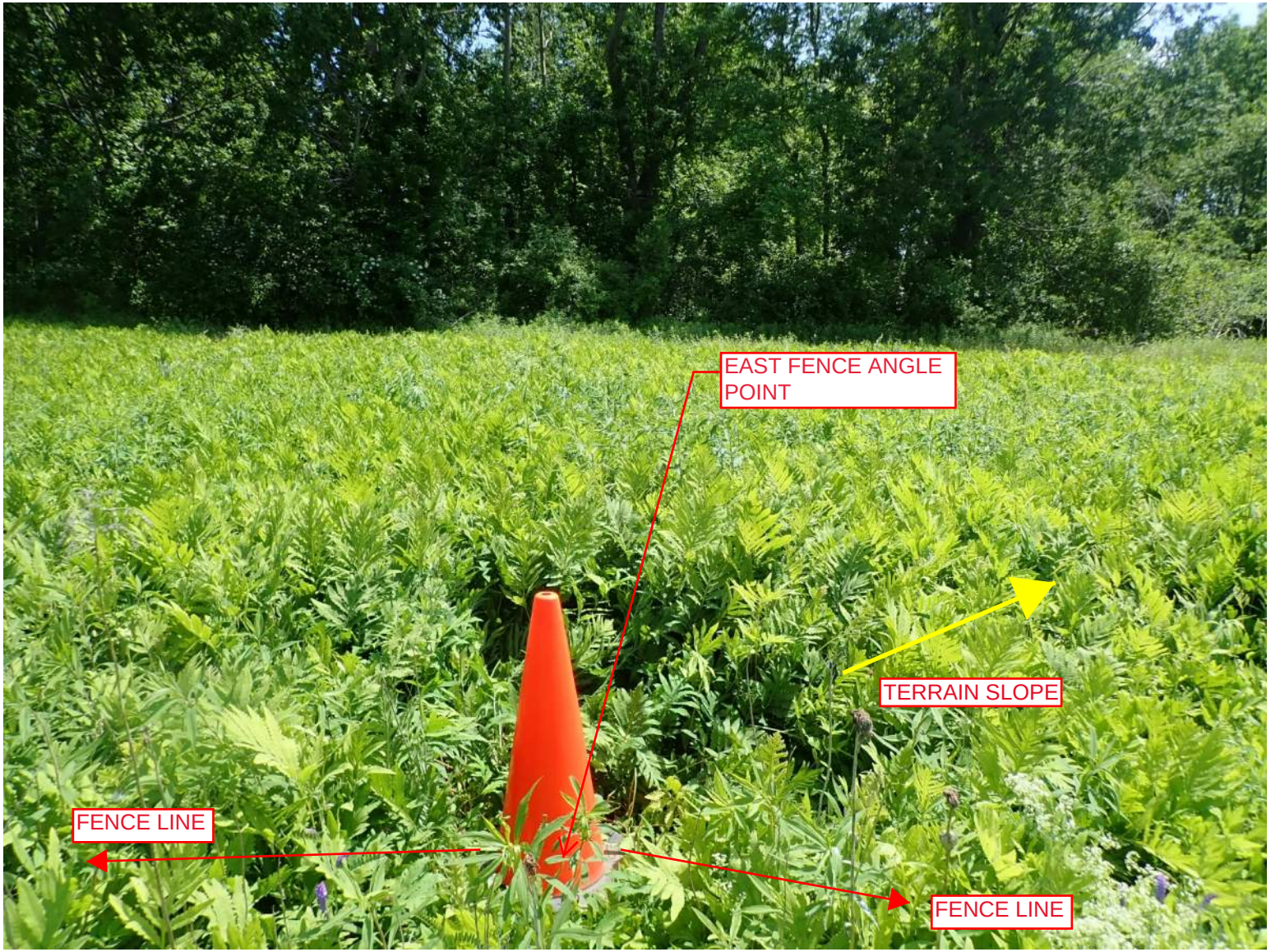

Photo 28
East Fence Angle Point Looking South

Photo 29
East Fence Angle Point Looking East

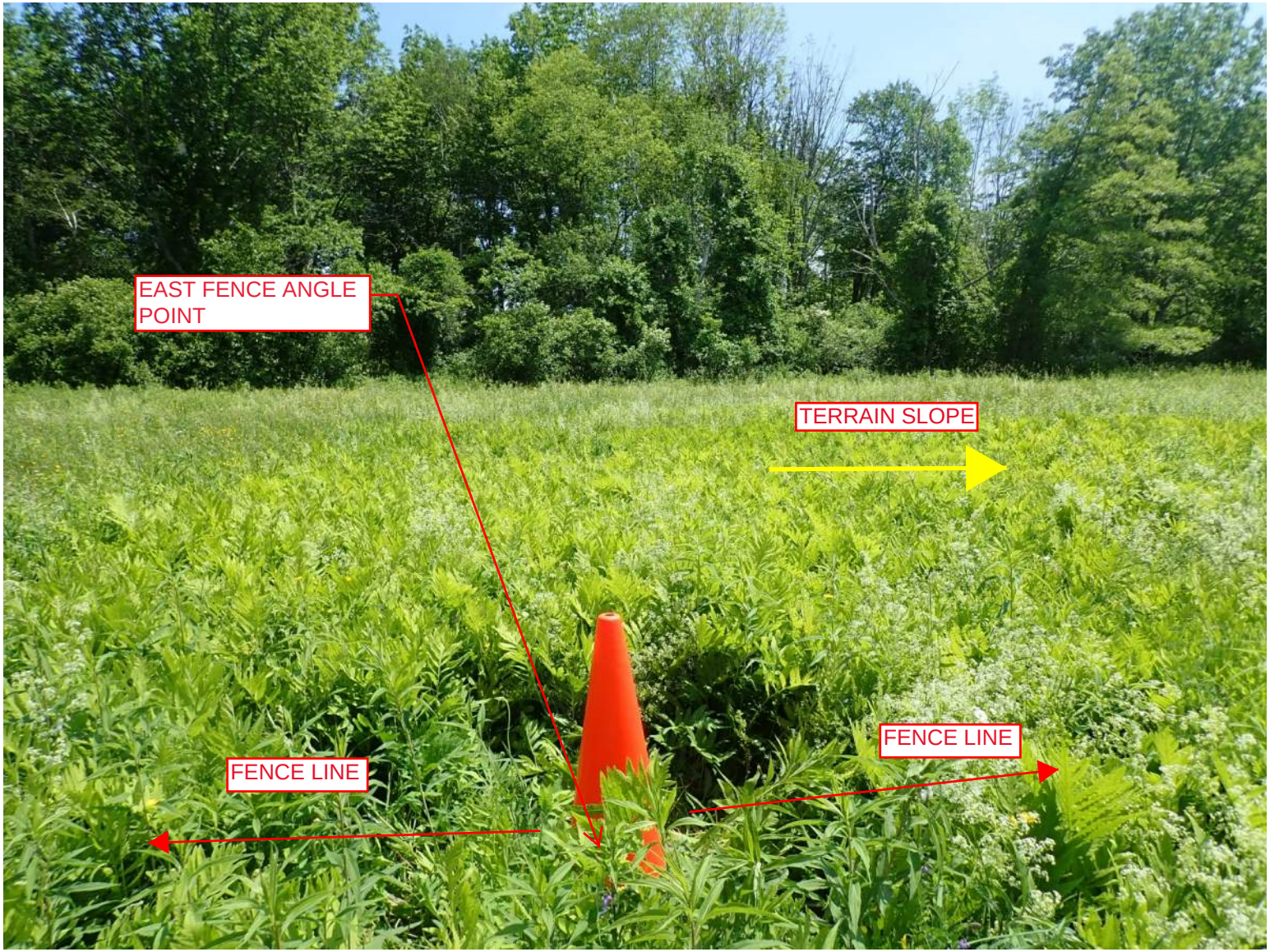

Photo 30
East Fence Angle Point Looking South

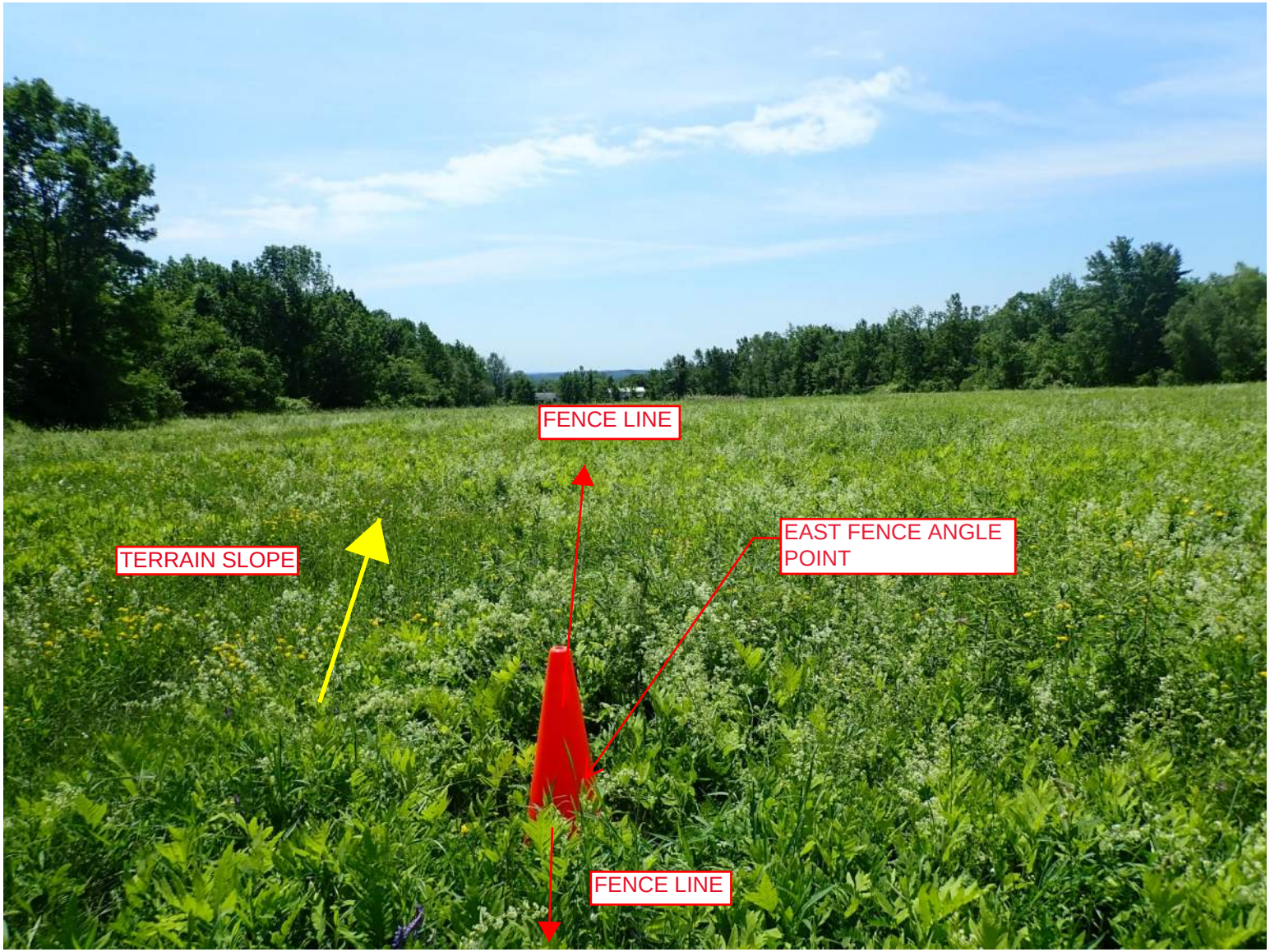

Photo 31
East Fence Angle Point Looking North

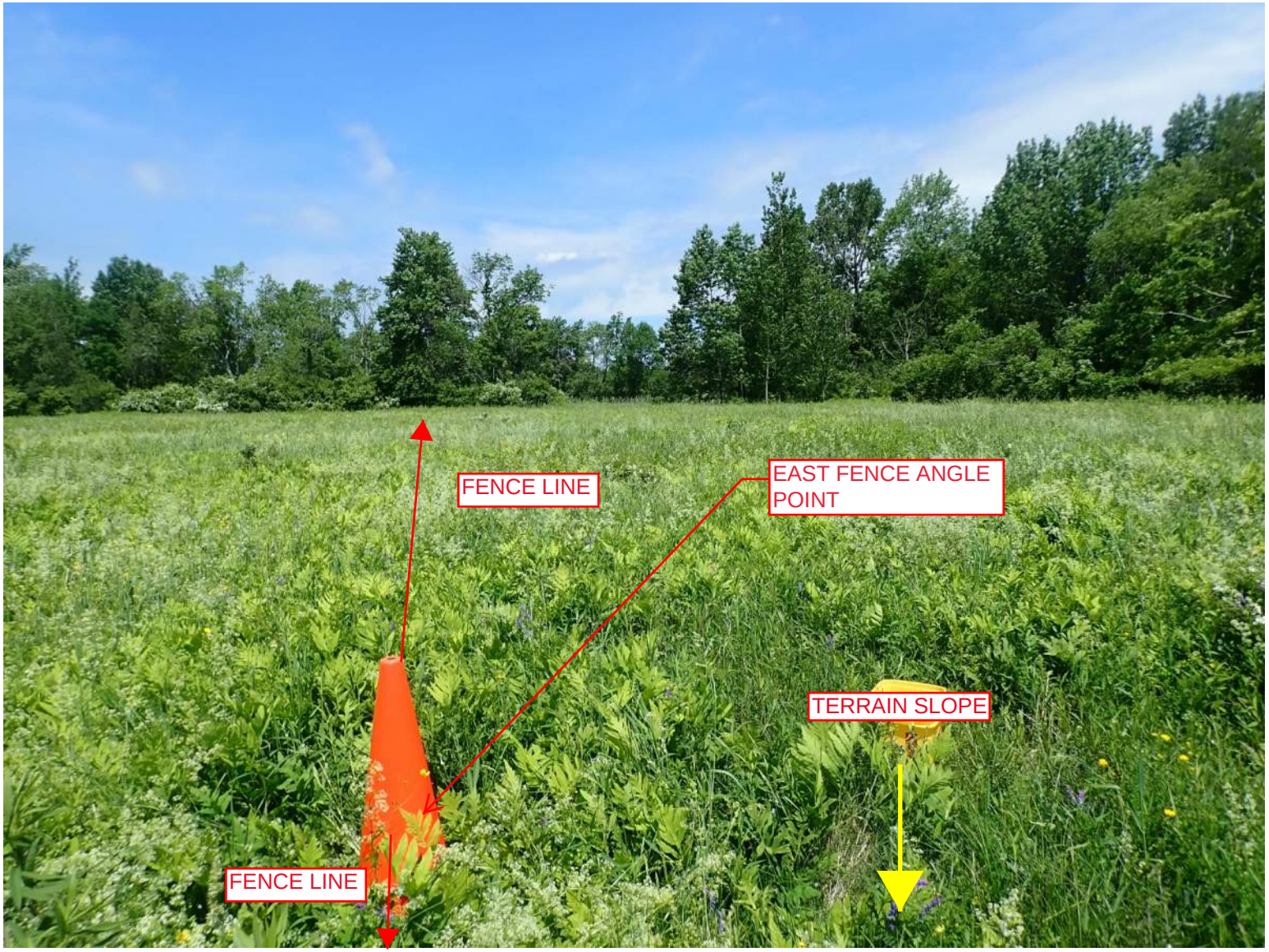

Photo 32
East Fence Angle Point Looking East

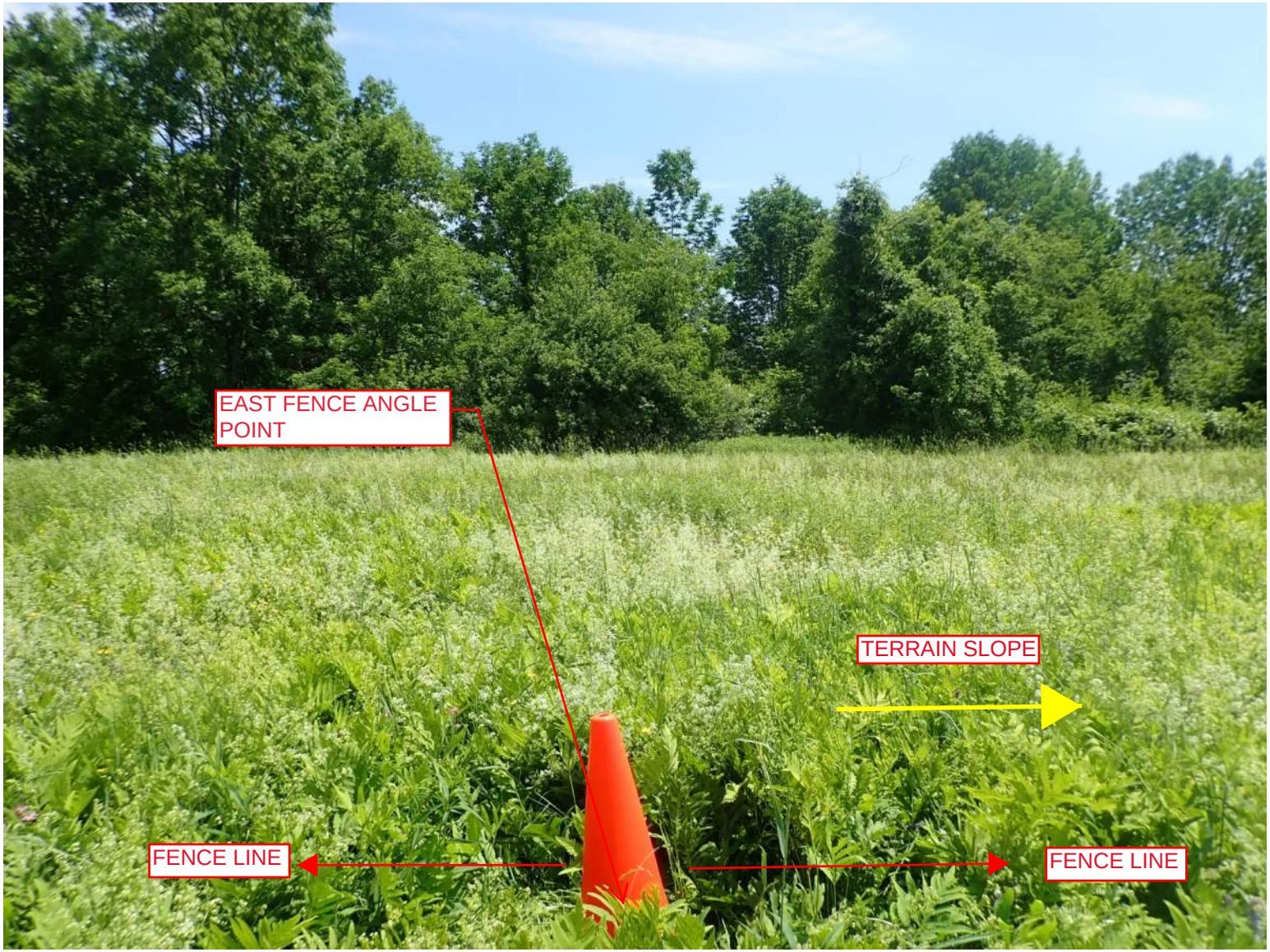

Photo 33
East Fence Angle Point Looking South

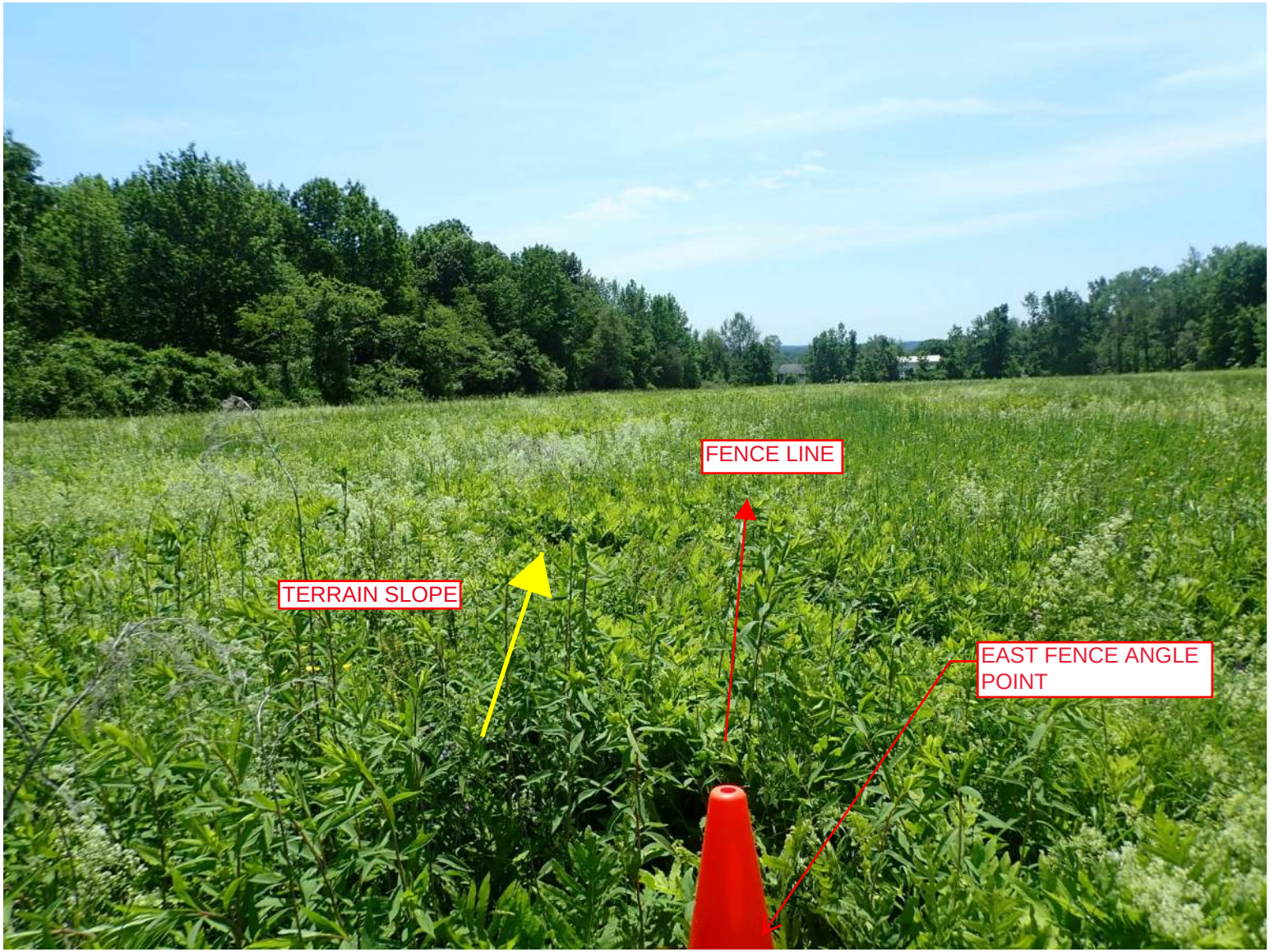

Photo 34
East Fence Angle Point Looking North

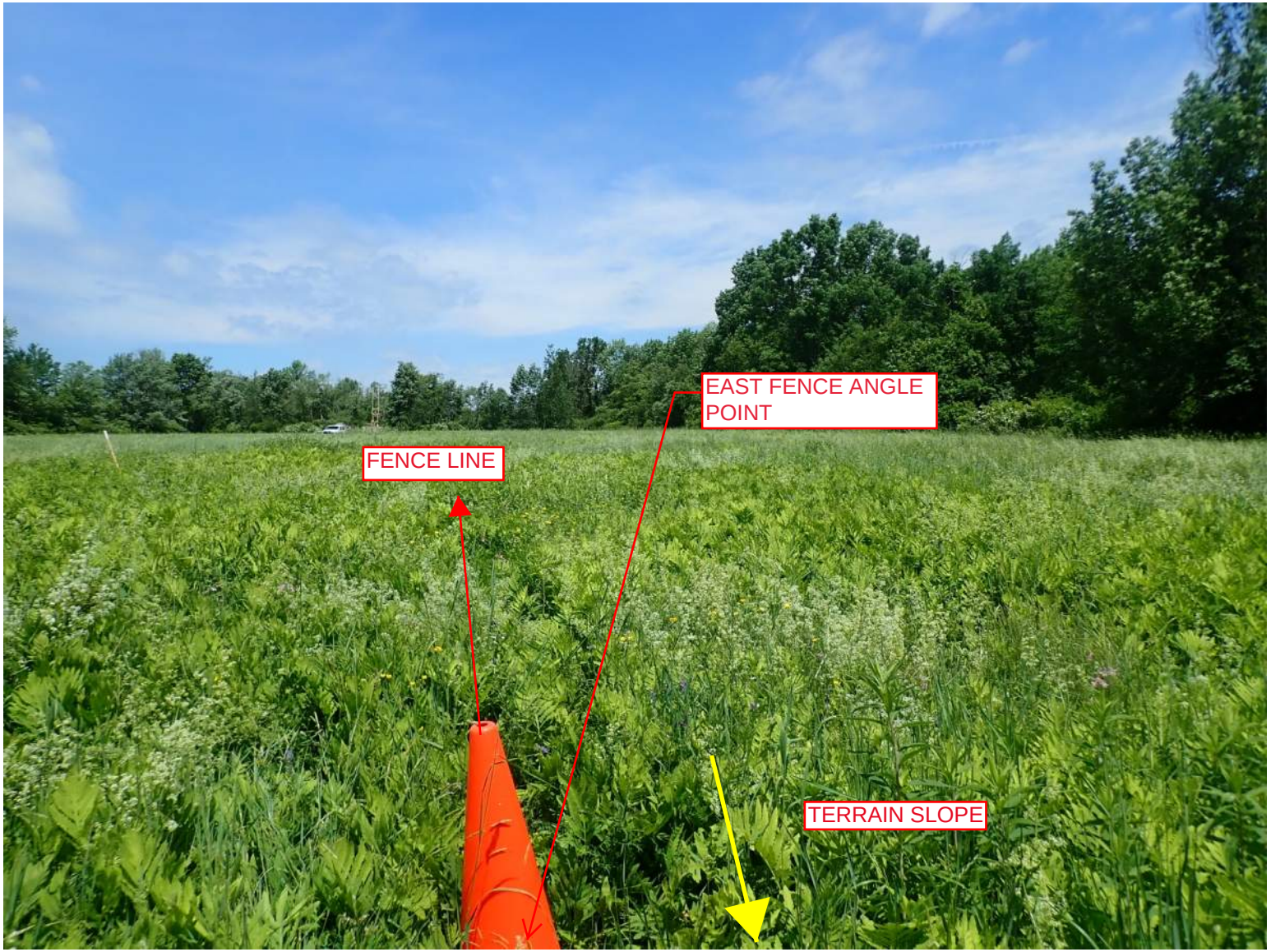

Photo 35
East Fence Angle Point Looking East

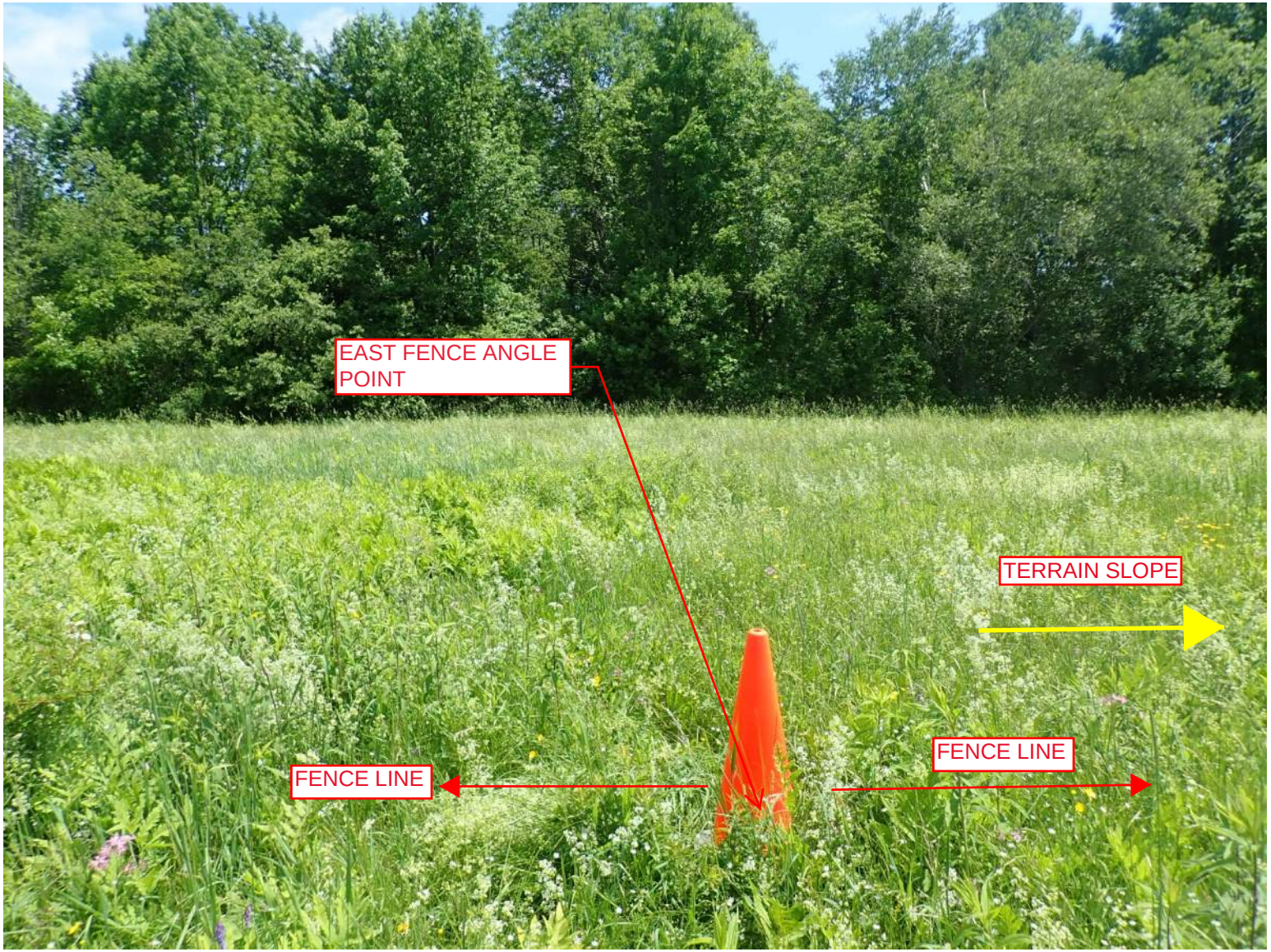

Photo 36
East Fence Angle Point Looking North

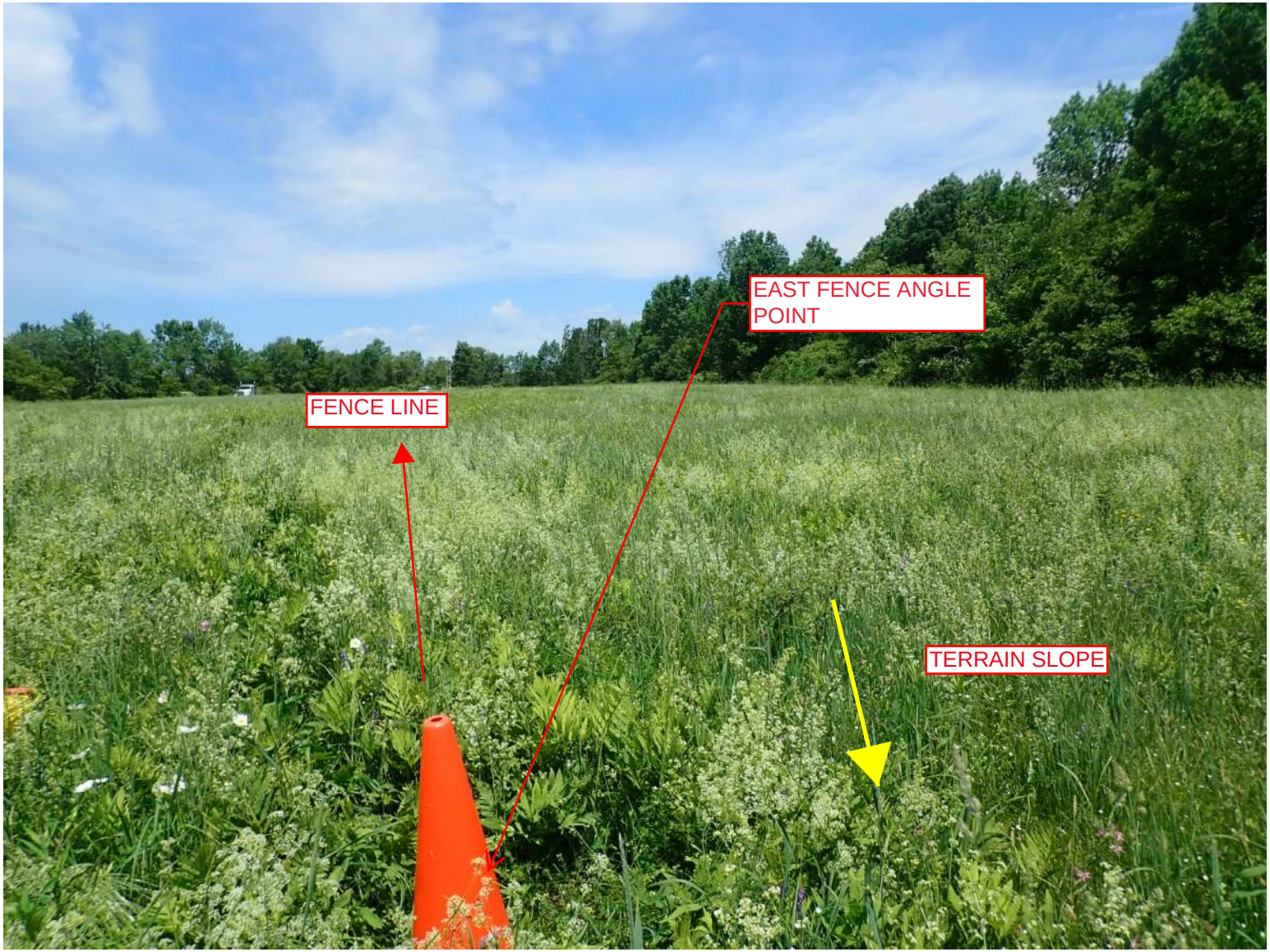

Photo 37
Utility Pole (photo taken on location)

Photo 38
Final Utility Pole Location