GOODENOUGH RESIDENCE
31 BLUE BARQUE ROAD
CHILMARK, MA 02535

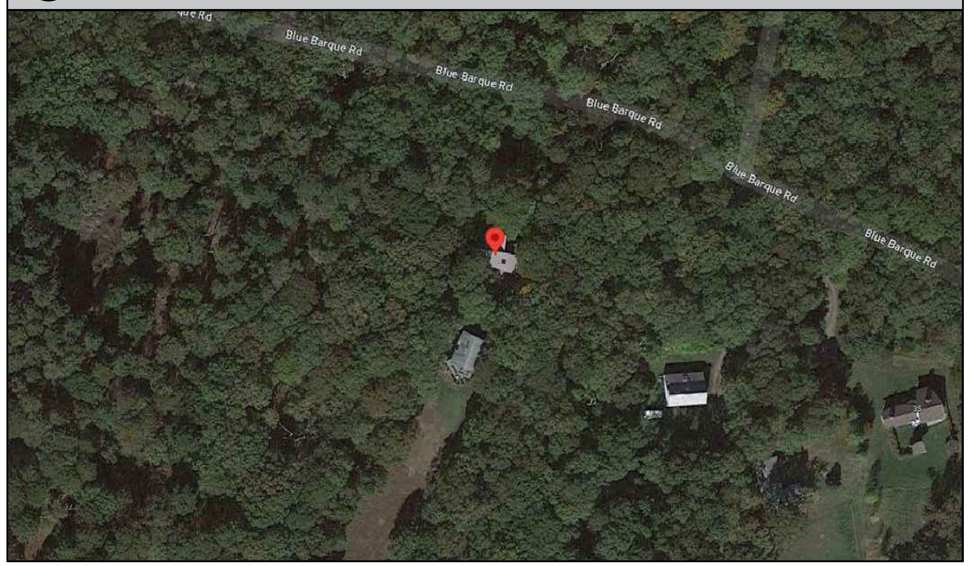
11.340kW$_{DC}$, 10.000kW$_{AC}$
GROUND MOUNTED PHOTOVOLTAIC SYSTEM

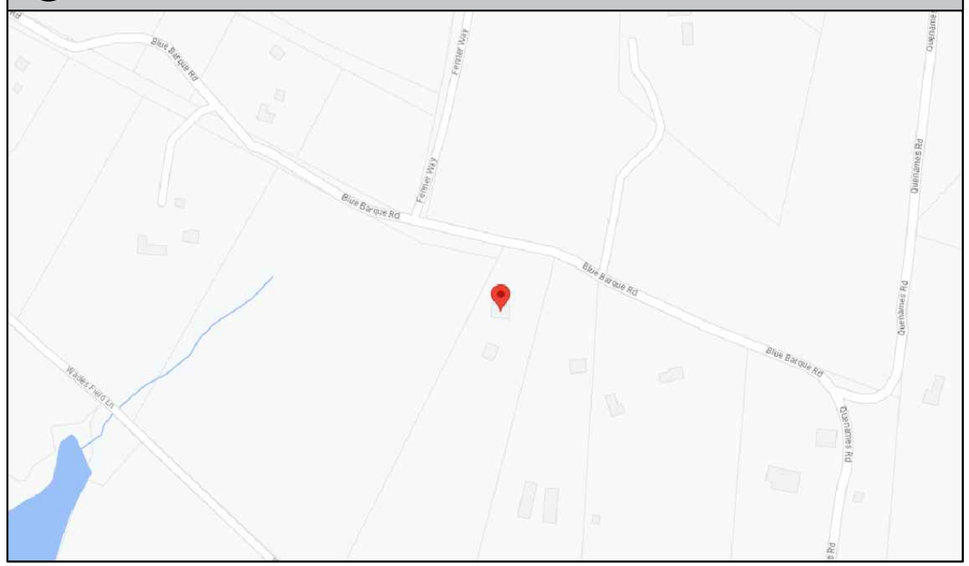
PHOTOVOLTAIC SYSTEM DETAILS
- MODULES = HANWHA Q.PEAK DUO BLK ML-G10+ 405W (28 PCS)
- INVERTER = SOLAREDGE SE10000H-US (1 PCS)
- RACKING SYSTEM = SUNMOTO SUNTURF GROUND MOUNT
- DATA ACQUISITION = SOLAREDGE INVERTER DIRECT, SOLAREDGE INTERNAL IMPORT/EXPORT METER, PV PRODUCTION METER

AUTHORITY HAVING JURISDICTION
- BUILDING AUTHORITY = TOWN OF CHILMARK
- CODE REFERENCE = 2023 NEC
- ELECTRICAL UTILITY COMPANY = EVERSOURCE

DESIGN CRITERIA
- DESIGN WIND LOAD = 140MPH
- EXPOSURE CATEGORY = C
- HIGH TEMP (ASHRAE 2% HIGH) = 27°C
- LOW TEMP (ASHRAE EXTREME LOW) = -17°C

SHEET INDEX

SITE MAP


VICINITY MAP


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DESIGNER

GOODENOUGH RESIDENCE
31 BLUE BARQUE ROAD
CHILMARK, MA 02535

SOLAR INDIVIDUAL PERMIT PACKAGE

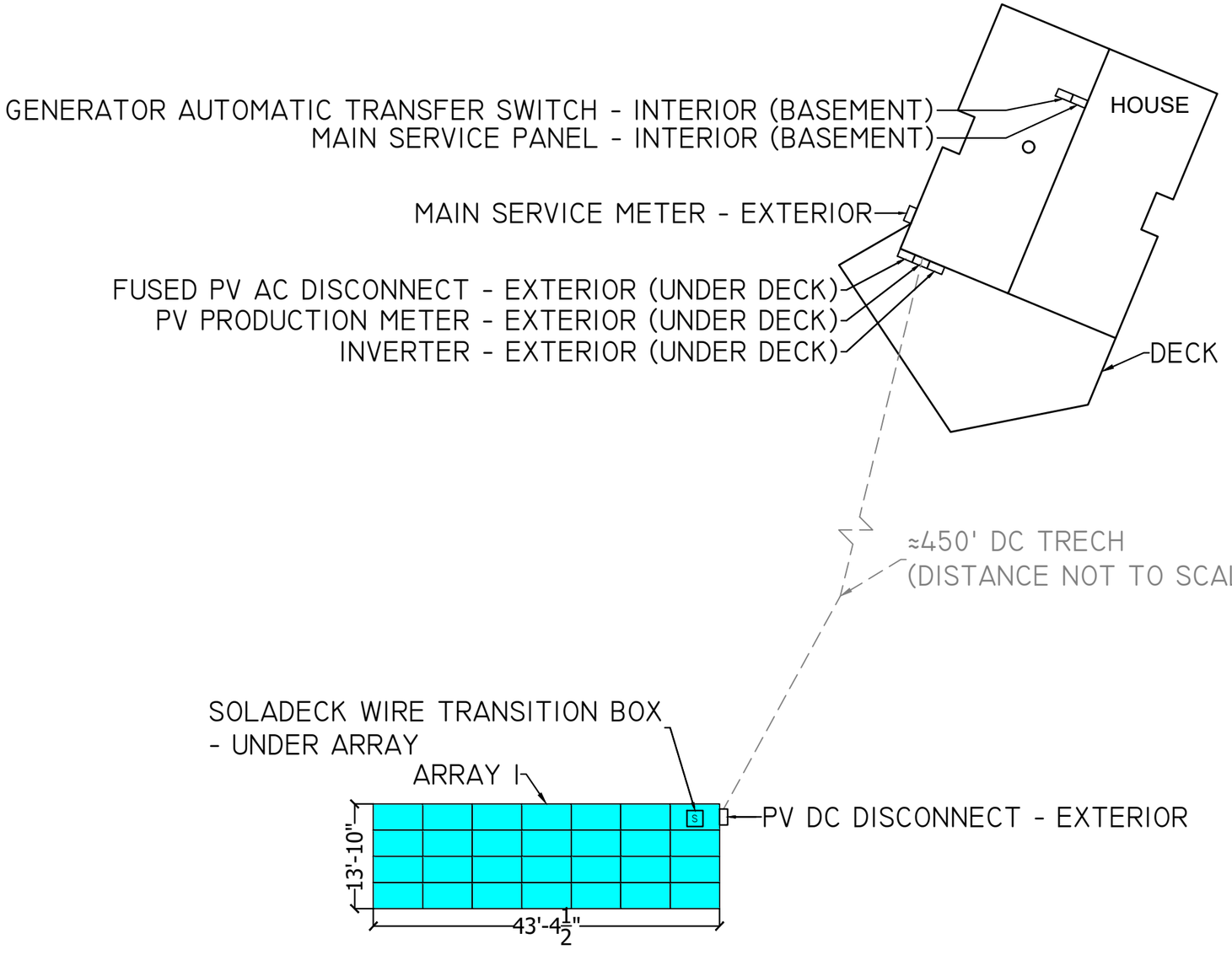
SYSTEM DETAILS: 11.340kW$_{DC}$, 280.000kW$_{AC}$
- 28 HANWHA Q.PEAK DUO BLK ML-G10+, 405W MODULES
- 1 SOLAREDGE SE10000H-US INVERTER

CONTACT: ROB MEYERS
- ENERGY@SOUTHMOUNTAIN.COM
- (508) 693-4850

DRAFTER: LEROY FRANKLIN

VERSION 1 PUBLISHED 2023.09.28

GENERAL INFO
NOT TO SCALE
PV-G.0



N

ARRAY INFORMATION	
MOD QTY	28
TILT	20°
AZIMUTH	180°

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ARRAY LAYOUT

1/16" = 1'-0"

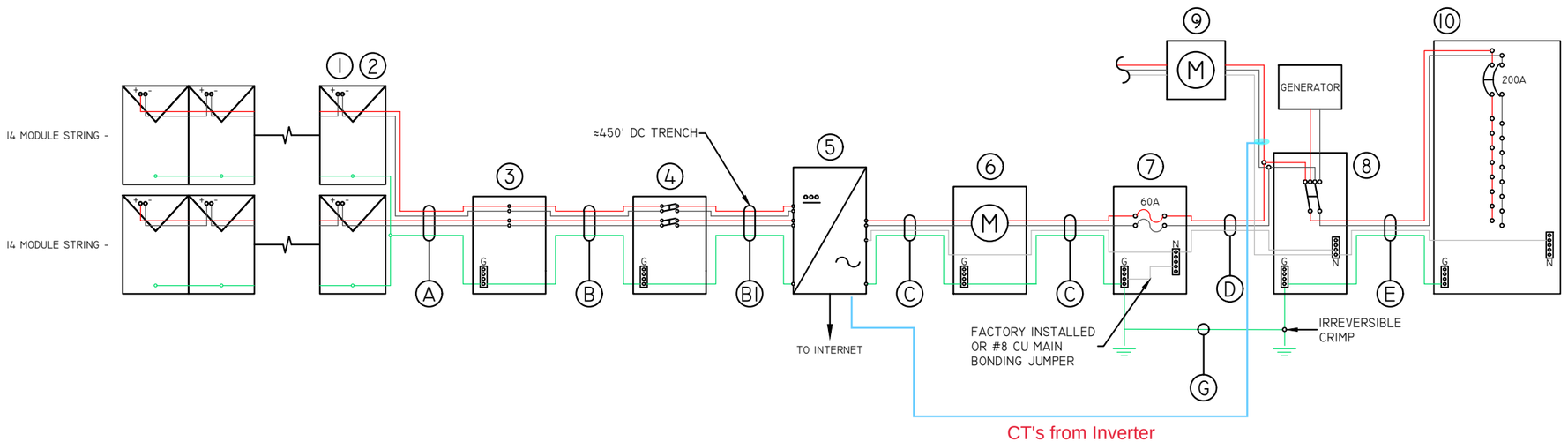
PV-A.1

ELECTRICAL EQUIPMENT SCHEDULE		
KEY	QTY	NOTES
1	28	(N) HANWHA Q.PEAK DUO BLK ML-G10+ PV MODULE 405W
2	28	(N) SOLAREDGE S440 POWER OPTIMIZER, MOUNTED TO RACKING
3	1	(N) JUNCTION BOX (NEMA 3R)
4	1	(N) PV DC DISCONNECT, NEMA 3R, 30A, 800VDC
5	1	(N) SOLAREDGE SE10000H-US INVERTER (W/ DC DISCONNECT)
6	1	(N) PV PRODUCTION METER, LEVER BYPASS, 200A, 240V
7	1	(N) FUSED PV AC DISCONNECT, NEMA 3R, 60A FUSES, 240V (LOCKABLE W/ VISIBLE OPEN)
8	1	(E) GENERATOR AUTOMATIC TRANSFER SWITCH, 240V
9	1	(E) UTILITY METER, 200A, 240V
10	1	(E) MAIN SERVICE PANEL, 200A BUS, 200A MAIN, 240V

CONDUCTOR SCHEDULE			
KEY	QTY	CONDUCTORS	CONDUIT
A	4	#12 CU PV WIRE	FREE AIR OR 3/4" (OR LARGER) EMT
	1	#10 CU EGC (THHN/THWN2)	
B*	4	#12 CU (THHN/THWN2)	1/2" (OR LARGER) EMT/PVC
	1	#12 CU EGC (THHN/THWN2)	
BI*	4	#6 CU (THHN/THWN2)	2" (OR LARGER) PVC, ≈450' DC TRENCH
	1	#10 CU EGC (THHN/THWN2)	
C	3	#6 CU (THHN/THWN2)	3/4" (OR LARGER) EMT/NMC
	1	#10 CU EGC (THHN/THWN2)	
D	3	#6 CU (THHN/THWN2)	3/4" (OR LARGER) FMC/EMT
G	1	#6 CU GEC (BARE CU)	FREE AIR
E	EXISTING		

*METALIC INTERIOR, PVC EXTERIOR

GENERAL
1. (N) NEW & (E) EXISTING
2. PLACARDING AS REQUIRED PER NEC 690.13, 690.15, 690.31, 690.51, 690.7, 690.56, 705.10, 705.12
3. PLACARD AT METER INDICATING "PHOTOVOLTAIC SYSTEM CONNECTED"
4. SERVICE DISCONNECTS SHALL BE GROUPED AND/OR MARKED WITH LOCATION DESCRIPTION(S)
5. GEC SHALL BE CONTINUOUS PER 250.64(C)
6. PV WIRED INTO MAIN PANEL BREAKER
7. MINIMUM WIRE SIZES BASED ON A TOTAL SYSTEM VOLTAGE DROP OF LESS THAN 2%



PV INTERCONNECTION: LINESIDE CONNECTION AT MAIN SERVICE METER [WILL NEED JUNCTION BOX OR ENCLOSURE FOR INTERCONNECTION]

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VERSION 1 PUBLISHED 2023.09.28

LINE DIAGRAM
NOT TO SCALE

PV-E.1

HANWHA Q.PEAK DUO BLK ML-G10+ MODULE SPECIFICATIONS & CALCULATIONS

ITEM	NOTE / CALC	UNIT	INSTALLED DETAIL
LOCATION			CHILMARK, MA 02535
AMBIENT HIGH TEMPERATURE (TMAX)	ASHRAE 2%	°C	27
AMBIENT LOW TEMPERATURE (TMIN)	ASHRAE EXTREME MIN	°C	-17
MODULE TEST TEMPERATURE (TTEST)	MODULE SPEC	°C	25
DELTA LOW TEMPERATURE (TD)	TMIN - TTEST	°C	-42
MODULE POWER STC (P)	MODULE SPEC	WATTS (W)	405
MODULE OPERATING VOLTAGE (VMP)	MODULE SPEC	VOLTS (V)	37.39
MODULE OPEN-CIRCUIT VOLTAGE (VOC)	MODULE SPEC	VOLTS (V)	45.34
MODULE COEFFICIENT, VOLT/TEMP (COEFF)	MODULE SPEC	(%/°C) / 100	-0.0027
MODULE OPERATING CURRENT (IMP)	MODULE SPEC	AMPS (A)	10.83
MODULE SHORT-CIRCUIT CURRENT (ISC)	MODULE SPEC	AMPS (A)	11.17
MODULE MAX VOLTAGE (VMAXMOD)	(VOC + VOC(TD*COEFF))	VOLTS (DC)	50.48
MODULE MAX CURRENT (IMAX)	(ISC * 1.25)	AMPS (DC)	13.96
MIN AMPACITY REQUIRED PER NEC	(IMAX * 1.25)	AMPS (DC)	17.45

SOLAREDGE S440 POWER OPTIMIZER SPECIFICATIONS & CALCULATIONS

ITEM	UNIT	SPECIFIED LIMIT	INSTALLED DETAIL
MAX INPUT POWER (WDC MAX)	WATTS (DC)	440	405
MIN INPUT VOLTAGE (VDC MIN)	VOLTS (DC)	8.0	37.39
MAX INPUT VOLTAGE (VDC MAX)	VOLTS (DC)	60	14.18
MAX SHORT-CIRCUIT CURRENT (ISC)	AMPS (DC)	14.50	11.17
MAX STRING POWER (WDC)	WATTS (DC)	5700	5670
MIN STRING SIZE		8	
MAX OUTPUT CURRENT	AMPS (DC)	15	
MAX OUTPUT VOLTAGE	VOLTS (DC)	60*	

*OPTIMIZER OUTPUT VOLTAGE RANGE BETWEEN 60-85 VDC - STRING VOLTAGE IS REGULATED BY THE INVERTER (NOT TO EXCEED 480VDC)

NOTE: CALCULATED VALUES ARE THE ABSOLUTE MIN/MAX OF ALL ARRAYS USING THIS POWER OPTIMIZER CONFIGURATION
-MAXIMUM STRING VOLTAGE IS 480VDC (INVERTER REGULATED)

SOLAREDGE SE10000H-US INVERTER SPECIFICATIONS & CALCULATIONS

ITEM	NOTE / CALC	UNIT	INSTALLED DETAIL
INVERTER MAX POWER (WAC MAX)	INVERTER SPEC	WATTS (AC)	10000
INVERTER INPUT VOLTAGE (VDC MAX)	INVERTER SPEC	VOLTS (DC)	480
INVERTER OUTPUT VOLTAGE (VAC NOM)	INVERTER SPEC	VOLTS (AC)	240
INVERTER OUTPUT FREQUENCY	INVERTER SPEC	HERTZ	60
INVERTER OUTPUT CURRENT (IAC)	INVERTER SPEC	AMPS (AC)	42
DC OPTIMIZED INPUT VOLTAGE (VOPT)	INVERTER SPEC	VOLTS (DC)	400
INVERTER PHASE	INVERTER SPEC	PHASE	1
COMPLIANCE	INVERTER SPEC		UL1741/IEEE1547
INVERTER GROUNDING	INVERTER SPEC		UNGROUNDED
INVERTER QUANTITY	INVQTY	QUANTITY	1
MODULE QUANTITY PER BRANCH CIRCUIT	MODQTY	QUANTITY	14
MAX INPUT CURRENT PER STRING (IMAXDC)	(MODQTY*WDC)/VOPT	AMPS (DC)	14.18
MAX OUTPUT CURRENT (IMAXAC)	(IAC*1.25)	AMPS (AC)	52.50

CONDUCTOR SIZING CALCULATIONS

KEY	SIZE	CU/AL	INSULATION	CALC. TYPE	AMPACITY (A) W/O DERATES	TEMP. DERATE	FILL DERATE	RESULT (A)	REQ'D (A)	OCPD
A	#12	CU	PV WIRE	COU	30	0.96	0.80	23.04	15.00	
				TERM	25			25	18.75	
B	#12	CU	THHN/THWN2	COU	30	0.96	0.80	23.04	15.00	
				TERM	25			25	18.75	
BI	#6	CU	THHN/THWN2	COU	75	0.96	0.80	57.60	15.00	
				TERM	65			65	18.75	
C	#6	CU	THHN/THWN2	COU	75	0.96	1.00	72.00	42.00	
				TERM	65			65	52.50	60A

1) CONDITION OF USE (COU): (AMPACITY * TEMP. DERATE * FILL DERATE) VS. REQ'D (IMAX)
2) TERMINALS (TERM): AMPACITY AT TERMINALS. VS. REQ'D, (IMAX * 1.25)

NOTE: ALL WIRES SIZED #10 OR LESS ARE IN COMPLIANCE WITH 2023 NEC 240.4(D).
FEEDER CONDUCTORS CAN BE SIZED IN ACCORDANCE WITH 2023 NEC 310.12(C).

STRING CONFIGURATION

STRINGS	QUANTITY	MODULES	OPTIMIZERS
STRING 1	14	Q.PEAK DUO BLK ML-G10+	SOLAREDGE - S440
STRING 2	14	Q.PEAK DUO BLK ML-G10+	SOLAREDGE - S440

INTERCONNECTION CALCULATIONS
MAIN SERVICE METER

ITEM	UNIT	PANEL
BUS RATING	AMPS	200
MAIN DISCONNECT	AMPS	200
PV OCPD USED	AMPS	60*

*LINESIDE CONNECTION PER 2023 NEC 705.11, 230.82(6)

VOLTAGE DROP CALCULATIONS

DC (4 #6, 1 #10)

VOLTAGE (V)	400	VOLTAGE DROP (V)	6.63
CURRENT (A)	15		
WIRE LENGTH (ONE WAY) (FT)	450	% VOLTAGE DROP	1.66
WIRE RESISTANCE (OHM/KFT)	0.4910		

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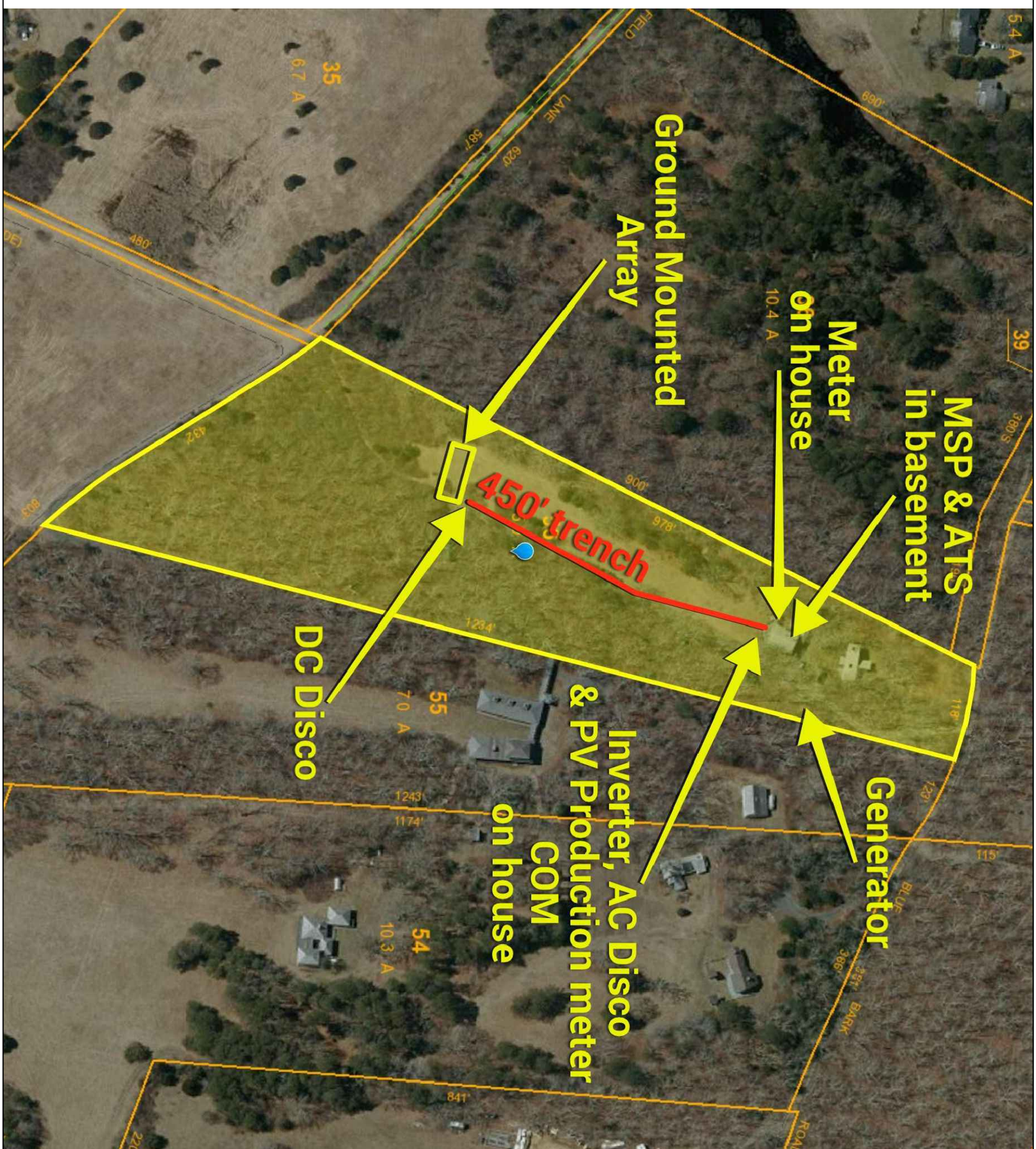
ELECTRICAL CALCS
NOT TO SCALE

PV-E.2



PROPERTY SITE MAP

NOT TO SCALE

PV-E.3

SYSTEM DETAILS: 11.340kW$_{DC}$, 280.000kW$_{AC}$
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SOLAR INDIVIDUAL PERMIT PACKAGE

CONTRACTOR

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PHOTOVOLTAIC
AC DISCONNECT

NEC 690.13(B):
(1) LOCATED AT AC DISCONNECT

PHOTOVOLTAIC POWER SOURCE

NEC 690.31(D)(2):
LABELING REQUIRED FOR ALL WIRING METHODS AND ENCLOSURES THAT CONTAIN PV SYSTEM DC CIRCUIT CONDUCTORS. SPACING BETWEEN LABELS SHALL NOT BE MORE THAN 10'.

PHOTOVOLTAIC
SYSTEM CONNECTED

NEC 690.54:
(1) LOCATED AT MAIN BILLING METER

PHOTOVOLTAIC AC DISCONNECT

RATED AC OUTPUT CURRENT:	42.00A
NOMINAL OPERATING AC VOLTAGE:	240V

NEC 690.54:
(1) LOCATED AT AC DISCONNECT

PHOTOVOLTAIC
DC DISCONNECT

NEC 690.13(B):
(1) LOCATED AT DC DISCONNECT

PANEL FED BY
PV AND UTILITY

NEC 705.12(C):
(2) LOCATED AT MAIN AC PANEL & ANY SUBPANEL

RAPID SHUTDOWN SWITCH FOR SOLAR PV SYSTEM

NEC 690.56(C)(2):
(1) LOCATED AT AC DISCONNECT

MAXIMUM SYSTEM VOLTAGE	480V
MAXIMUM CIRCUIT CURRENT	18.75A
MAX RATED OUTPUT CURRENT OF THE CHARGE CONTROLLER IF INSTALLED	

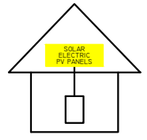
NEC 690.53:
(1) LOCATED AT DC DISCONNECT

⚠ WARNING
POWER SOURCE
OUTPUT CONNECTION
DO NOT RELOCATE

NEC 705.12(B)(3)(2):
(1) LOCATED AT PV BREAKER

SOLAR PV SYSTEM EQUIPPED WITH RAPID SHUTDOWN

TURN RAPID SHUTDOWN SWITCH TO THE "OFF" POSITION TO SHUTDOWN PV SYSTEM AND REDUCE SHOCK HAZARD IN ARRAY



NEC 690.56(C):
(1) LOCATED AT RAPID SHUTDOWN SERVICE DISCONNECT

⚠ WARNING
ELECTRICAL SHOCK HAZARD
DO NOT TOUCH TERMINALS. TERMINALS ON BOTH LINE AND LOAD SIDES MAY BE ENERGIZED IN THE OPEN POSITION.

NEC 690.13(B):
(1) LOCATED AT DC DISCONNECT

WARNING
THIS EQUIPMENT FED BY MULTIPLE SOURCES. TOTAL RATING OF ALL OVERCURRENT DEVICES EXCLUDING MAIN SUPPLY OVERCURRENT DEVICE SHALL NOT EXCEED AMPACITY OF BUSBAR

NEC 705.12(B)(3)(3):
(1) LOCATED AT PV AC COMBINER PANEL OR PROTECTED LOADS PANEL

SERVICE DISCONNECT
1 OF 2

(1) LOCATED AT MAIN SERVICE DISCONNECT

SERVICE DISCONNECT
2 OF 2

(1) LOCATED AT FUSED PV AC DISCONNECT

ALL PLACARDING TO COMPLY WITH THE 2023 NATIONAL ELECTRICAL CODE

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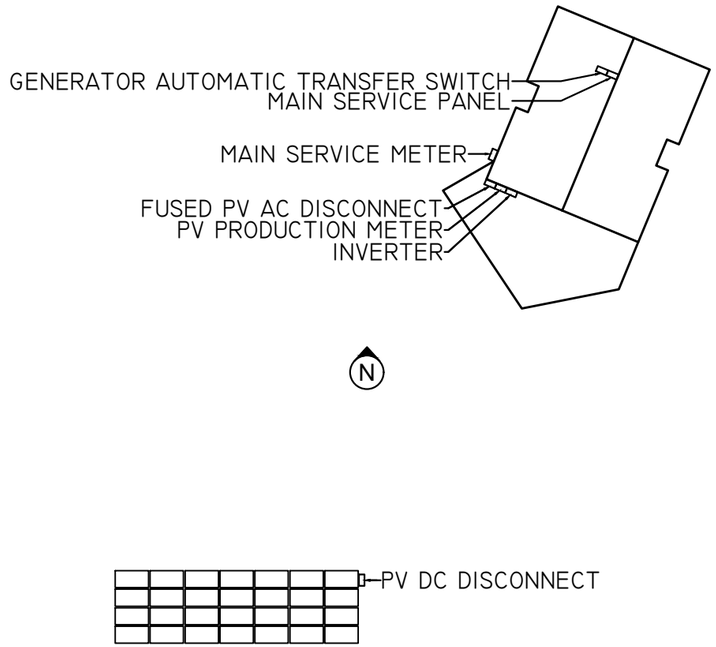
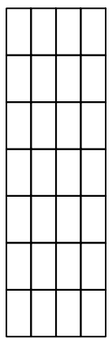
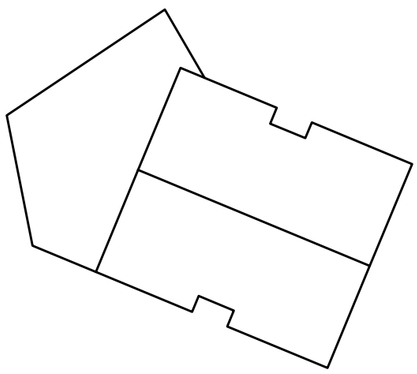
PLACARDS
NOT TO SCALE
PV-P.1

CAUTION

MULTIPLE SOURCES OF POWER







SAFETY PLAN

NOT TO SCALE

PV-N.1

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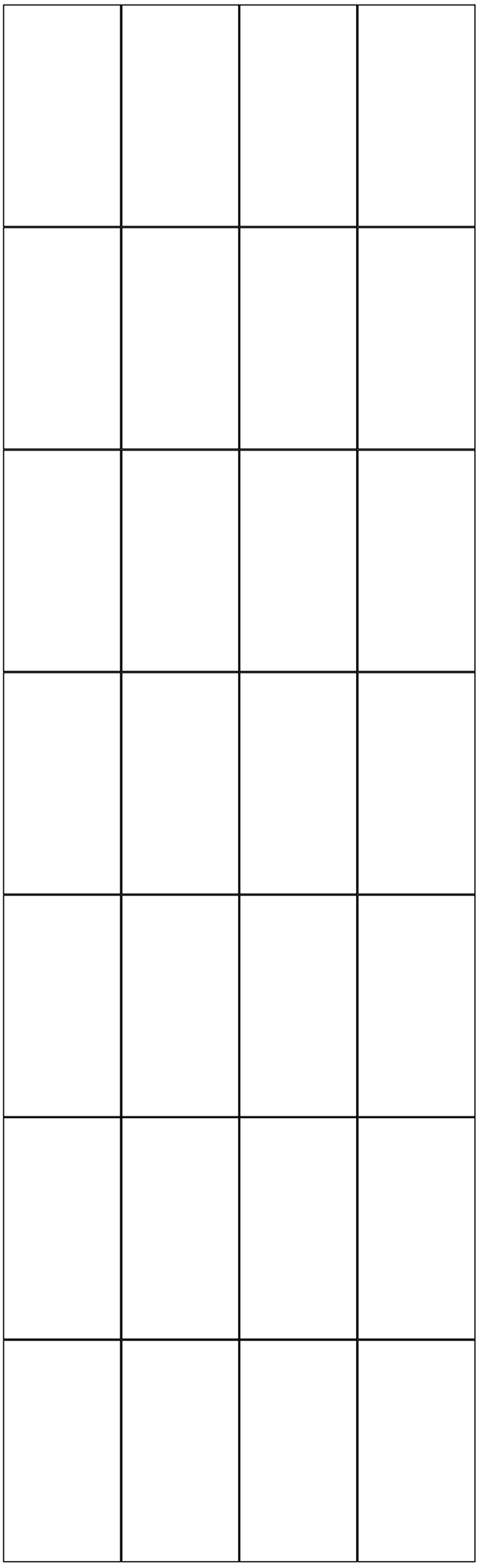

STRING PLAN

NOT TO SCALE

PV-N.2

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