

April 20, 2023

Mr. Michael King, Chair
Town of Wareham Planning Board
54 Marion Road
Wareham, MA 02571

Womble Bond Dickinson (US) LLP

Independence Wharf
470 Atlantic Avenue
Suite 600
Boston, MA 02210

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**Re: Case No. 9-20 – 150 Tihonet Road
Case No. 7-20 – 27 Charge Pond Road**

Gregory Sampson, Esq.
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E-mail: gregory.sampson@wbd-us.com

Dear Chairman King and Members of the Planning Board:

This letter is provided in connection with the extension requests for the above-referenced projects filed by New Leaf Energy (successor-in-interest to Borrego Solar Systems, Inc. and referred to herein as the “Proponent”).

In furtherance of the discussions held by the Planning Board at the March 27, 2023 meeting and then at the April 3, 2023 workshop, the Proponent would like to clarify its position relative to the review of the battery energy storage systems (BESS) associated with the projects.

1. The BESSs have been included as part of the projects from the initial filing. Energy storage information and labels appear on the cover page of the drawings that were initially submitted and approved by the Planning Board, in numerous places throughout the project narrative, and in required components of the submission such as the utility information and single line diagrams (SLDs). Additionally, energy storage is accounted for as a line item in the initial decommissioning calculations that were approved by the Planning Board and in each revision of the decommissioning amount that has been submitted since the acknowledgment of good cause delays was requested in September of 2022.
2. The Wareham Fire Department’s review of the projects was not limited to access roads. The information about the BESSs was included in the materials submitted to the Fire Department for its review. The department’s letter dated June 18, 2020 simply states that the Fire Department did not have comments about the projects.

The Proponent has been meeting with the Planning Board regularly since October of 2022, and it has responded to questions on energy storage at several of those meetings in connection with the discussions on the decommissioning estimates. Notwithstanding, as demonstrated by the Proponent’s willingness to cooperate with the Planning Board’s requests related to the decommissioning estimates, we also remain willing to provide information to the Planning Board regarding the BESSs to help the Board (and/or other applicable Town departments, such as the Fire Department) appreciate the safety aspects of the projects and the technology used for these systems.



Based on the Planning Board's discussion at the April 3, 2023 workshop, the Proponent understands the key concern of the Board is the possibility of some failure of the BESS. The 2019 Arizona Public Service's (APS) McMicken BESS facility incident was discussed by the Planning Board as an example of such failure. This incident has been widely studied and much of the technology and design brought forward in new installations comes in response to these studies. In particular, research has documented that the following countermeasures will significantly reduce the likelihood of similar incidents happening in the future:

1. Use of battery cells that can be monitored during testing, commissioning, and operation;
2. Barriers between cells to limit cascading;
3. Use of a suppression system designed to stop the spread of the thermal event;
4. Proper ventilation to prevent gas buildup; and
5. Use and deployment of a robust emergency response system that includes detection of gasses, ventilation practices, extinguishing methods, and information to gather before entry, with such procedures being documented, available outside the BESS container or building, and demonstrated through training that is refreshed and updated periodically.

Many of these items have been incorporated into current fire and electrical codes, or UL listings (e.g. UL9540 and UL9540a), applicable to the products that are used for these projects. Further, the Proponent's designs and O&M program accounts for each of the above items, and use a fundamentally different battery chemistry (lithium iron phosphate) that is more thermally stable than the APS McMicken batteries which used nickel, manganese, cobalt (NMC) cathode chemistry. If there are reasonable concerns of the Planning Board that remain unaddressed by these requirements and best practices, the Proponent would be willing to discuss additional measures with the Planning Board or Fire Department.

Lastly, the Proponent understands based on comments made at the April 2, 2023 workshop that several Board members would like to incorporate some refinements into the projects, such as a specification for pollinator seeding plants, and revisions to the O&M plan to include the recycling of PV modules using best available practices. Should the Board acknowledge the good cause delays these projects have encountered and grant a two-year extension to the lapse period, the Proponent is willing to incorporate these items into the plans and conditions of approval for the projects.

If you have any questions or wish to discuss, please contact me.

Best regards,

Womble Bond Dickinson (US) LLP



Gregory Sampson

Attachments

1. Excerpted Plans and Narrative from prior submittals (BESS information highlighted)
2. Fire Department letter dated June 18, 2020

ATTACHMENT 1

Excerpted Plans and Narrative (BESS information highlighted)

- 150 Tihonet Road

APPLICATION FOR SITE PLAN REVIEW

150 Tihonet Road PV+ES Project

**150 Tihonet Road (aka 0 & 169 Tihonet Road)
Wareham, Massachusetts**



Prepared for:

**Borrego Solar Systems, Inc.
55 Technology Dr. #102
Lowell, MA 01851**

Prepared by:



*Submitted in Compliance with the Zoning By-laws of the
Town of Wareham, Massachusetts*

June 8, 2020

June 8, 2020

Mr. George Barrett, Chair
Wareham Planning Board
c/o Mr. Kenneth Buckland, Town Planner
54 Marion Road
Wareham, Massachusetts 02571

Via: FedEx and Email to sraposo@wareham.ma.us

Reference: Application for Site Plan Review
150 Tihonet Road PV+ES Project
Wareham, Massachusetts
B+T Project No. 1833.112

Dear Planning Board Members:

On behalf of the Applicant, Borrego Solar Systems, Inc. (BSSI), Beals and Thomas, Inc. (B+T) respectfully submits this Application for Site Plan Review for the construction, installation, and operation of a proposed large ground-mounted solar energy facility at 150 Tihonet Road in Wareham, Massachusetts (the Project). The Project is designed to comply with applicable zoning criteria including Section 590: Solar Energy Generation Facilities of the October 2019 revision to the Zoning By-laws of the Town of Wareham, Massachusetts (the Zoning By-laws).

The proposed Project consists of an approximately ± 5 megawatt (MW) AC/ ± 20 MW DC solar array and energy storage system including site access and interconnection to the electrical grid. The Project is proposed within a ± 67 -acre area (the Site) on a portion of a larger area of land (the Property) owned by A D Makepeace Co (aka A.D. Makepeace Company, ADM). The Property can be further identified as Wareham Map 111 Lot 1000-C, Map 111 Lot 1000-F, and Map 111 Parcel R-1 (address indicated as 0 Tihonet Road in Assessors' database). More specifically, the Site is located to the southwest of the previously-approved 160 Tihonet Road Wareham PV+ES (aka Tihonet East Solar) Project, immediately north of an existing electrical easement, and east of Tihonet Pond and Tihonet Road.

B+T is pleased to participate in the approval process for another renewable/sustainable energy project in the Town of Wareham, following the successful review of multiple other BSSI solar projects on ADM land in recent years. BSSI is currently also proposing a separate solar project south across the electric easement, as well as one off Charge Pond Road, which have been submitted to the Planning Board for review.

2.0 PROJECT NARRATIVE

2.1 Introduction

The proposed 150 Tihonet Road PV+ES Project (the Project) is located off Tihonet Road proximate to and northeasterly of the corporate offices of the landowner, A D Makepeace Co (aka A.D. Makepeace Company, ADM). The Site can be further identified as a ±67-acre portion of Map 111 Lot 1000-C, Map 111 Lot 1000-F, and Map 111 Parcel R-1. These assessor's parcels are collectively referred to herein as the Property. More specifically, the Site is located to the southwest of the previously-approved 160 Tihonet Road Wareham PV+ES (aka Tihonet East Solar) Project, immediately north of an existing electrical easement, and east of Tihonet Pond and Tihonet Road. Refer to the Locus and Aerial Maps enclosed in Section 6.0.

The Site is located in the R-60 District as indicated on the Town of Wareham Zoning Map. According to Section 320: Table of Principal Use Regulations, large ground mounted solar energy projects are allowed by Site Plan Review from the Permit Granting Authority. Accordingly, Site Plan Approval from the Planning Board is requested pursuant to Section 590 of the Zoning By-laws.



Aerial Photograph. The proposed solar array will be located north of the existing utility easement and south and west of existing cranberry bogs, as depicted in the above aerial photograph. Also refer to the Locus and Aerial Maps included in Section 6.0.

As defined in Article 16 of the Zoning By-laws, Large Ground-Mounted Solar Photovoltaic Installations (LGMSPV) are arrays that generate a minimum capacity of 250 kW and are structurally mounted on the ground. The proposed system size is a ± 5 MW AC (± 20 MW DC) facility with panels installed on a racking system within existing upland areas at 150 Tihonet Road. Laydown areas and supporting utility structures (inverters, batteries, etc.) also are located within existing upland areas.

2.2 Existing Conditions

The overall Property is part of the land holdings of ADM, and contains wooded areas, active cranberry bogs and associated sand track agricultural roads. The Property is bisected by a utility easement held by New Bedford Gas and Edison Light Co. This electric easement lies immediately south of the area of the proposed array (the Site), which lies east of Tihonet Pond and Tihonet Road and consists of forested pine uplands typical of this region. The Property and Site can be accessed via Tihonet Road, an existing sand track agricultural road. Utility poles are present along Tihonet Road.

A Notice of Intent (NOI) is being filed with the Wareham Conservation Commission for work proposed within the 100-foot buffer zone to wetland resource areas.

The Project Site is not located within Priority Habitat of Rare Species or Estimated Habitat of Rare Wildlife as designated by the Natural Heritage and Endangered Species Program (NHESP) Atlas; however, a portion of the Site is located within acknowledged habitat for various pine barren species and as such permitting with NHESP will be undertaken.



A typical view of the upland at the Site. May 30, 2019.



Decommissioning Estimate

150 Tihonet Road
Wareham, MA

Date: 04/09/20

This Decommissioning Estimate has been prepared by Borrego Solar in an attempt to predict the cost associated with the removal of the proposed solar facility. Key assumptions used include the fact that the fencing, electrical cabinetry, solar racks, solar panels, wiring and all other equipment are all one hundred percent recyclable, therefore, the primary cost of decommissioning is the labor to dismantle and load as well as the cost of trucking. No salvage values have been assumed in these calculations. The concrete pads will be broken up at the site and hauled to the nearest transfer station where it will be accepted without a charge.

The following values were used in this Decommissioning Estimate:

System Specifications		Equipment & Material Removal Rates	
Number of Modules	49,356	Module Removal Rate (min/module)	1
Number of Racks	2,057	Rack Wiring Rem. Rate (min/mod)	0.5
Number of Inverters	2	Racking Dismantling Rate (min/rack)	30
Number of Transformers	5	Inverter Removal Rate (units/hr)	1
Electrical Wiring Length (ft)	6,388	Transformer Removal Rate (units/hr)	0.5
Number of Foundation Screws	8,226	Rack Loading Rate (min/Rack)	15
Length of Perimeter Fence (ft)	7,019	Elect. Wiring Removal Rate (min/LF)	0.5
Number of Power Poles	4	Screw Rem. Rate (screws/day)	500
Access Rd Material Volume (YD)	4,667	Fence Removal Rate (min/LF)	0.5
Total Disturbed Area (SF)	130,496	Days req. to break up concrete pads	4
Total Fence Weight (lbs)	4,983	Days req. with Rough Grader	2
Total Racking Weight (lbs)	1,748,025	Days req. with Fine Grader	3
Total Foundation Screw Weight (lbs)	329,040	Total Truckloads Required	129
		Round-Trip Dist. to Trans. Sta.(miles)	10.6
		Round-Trip Time to Trans. Sta. (hr)	0.5
Labor and Equipment Costs			
Labor Rate (\$/hr)	\$ 25.00		
Bobcat Cost (\$/hr)	\$ 50.00		
Front End Loader Cost (\$/Day)	\$ 1,000.00		
Excavator Cost (\$/Day)	\$ 1,000.00		
Trucking Cost (\$/hr)	\$ 120.00		
Backhoe Cost (\$/hr)	\$ 245.00		
Power Pole Removal Cost (\$/pole)	\$ 1,500.00		
Grader Cost (\$/day)	\$ 1,800.00		
Gravel Export Cost (\$/YD)	\$ 10.00		
Loam Import Cost (\$/YD)	\$ 25.00		
Seeding Cost (\$/SF)	\$ 0.08		
Fuel Cost (\$/mile)	\$ 0.25		
		Energy Storage Decommissioning	
		Number of Energy Storage Units	5
		Battery Disposal Fee	\$ 2,000.00
		Battery Loading Prep Time (hr)	32
		Battery Loading Time (hr)	8



11. Seed Disturbed Areas

Seeding cost includes labor and materials for reseeding all disturbed areas including the reclaimed gravel road area, former electrical areas, and areas disturbed by racking foundation removal.

$$\text{Seeding Cost} \cdot \text{Disturbed Area} = \text{Total Seeding Cost}$$

Total = \$ 10,439.67

12. Truck to Transfer Station

All material will be trucked to the nearest Transfer station that accepts construction material. The nearest transfer station is Wareham Town Recycling

$$(\text{Total Truckloads} \cdot \text{Roundtrip Distance} \cdot \text{Fuel Cost}) + (\text{Total Truckloads} \cdot \text{Round Trip Time} \cdot \text{Trucking Cost}) = \text{Total Trucking Cost to Transfer Station}$$

Total = \$ 8,081.85

13. Remove and Dispose of Energy Storage Equipment

The battery units will be prepared for shipment and loaded onto a truck. A disposal fee will also be required for the disposal company to accept the batteries.

$$\text{Number of Battery Units} \cdot ((\text{Loading Prep Time} \cdot \text{Labor Cost}) + \text{Loading Time} \cdot (\text{Labor Rate} + \text{Bobcat Cost} + \text{Trucking Cost}) + \text{Disposal Fee}) = \text{Total Energy Storage Removal and Disposal Cost}$$

Total = \$ 21,800.00



Summary of Decommissioning Costs

Line Item	Task	Cost
1	Module Removal	\$ 20,565.00
2	Rack Wiring Removal	\$ 10,282.50
3	Rack Dismantling	\$ 25,706.25
4	Electrical Equipment Loading and Removal	\$ 337.50
5	Break Up Concrete Pads	\$ 4,800.00
6	Load Racks	\$ 100,254.38
7	Electrical Wiring Removal	\$ 14,373.00
8	Foundation Screw Removal	\$ 19,742.40
9	Fence Removal	\$ 11,405.88
10	Power Pole Removal	\$ 6,000.00
11	Seed Disturbed Areas	\$ 10,439.67
12	Trucking to Transfer Station	\$ 8,081.85
13	Energy Storage System Removal	\$ 21,800.00
		Subtotal = \$ 253,788.42

Present Value Total = \$ 253,788.42

Total after 20 years @ 1.5% Inflation

$$\text{Present Value} \cdot (1 + \text{Inflation Rate})^{\text{Number of Years}} = \text{Future Value}$$

Grand Total = \$341,816.21



System Design Capacity: Nominal 5000 (kW) 5000 (kVA)

Maximum 5000 (kW) 5000 (kVA)

For Solar PV provide the DC-STC rating: 12474.0 (kW_{DC})

Type of Generating Unit: Synchronous _____ Induction _____ Inverter x

Manufacturer: Power Electronics Model: HEMK3000

Prime Mover: Fuel Cell Reciprocating Engine Gas Turbine Steam Turbine

Microturbine Photovoltaic Other Energy Storage

Energy Source: Solar Wind Hydro Diesel Natural Gas Fuel Oil

Other Li-ion (Please Specify)

For Solar PV provide the DC-STC rating: 12474.0 (kW)

IEEE 1547.1 (UL 1741) Listed? Yes No

1) Generating Unit Type 1

Manufacturer: Power Electronics Model Name and Number: HEMK3000 Quantity: 2

Single or Three Phase

AC Rating: Nominal: 2500 (kW) 2500 (kVA) 600 (AC Volts)

Maximum: 2500 (kW) 2500 (kVA) 600 (AC Volts)

2) Generating Unit Type 2 (if applicable)

Manufacturer: _____ Model Name and Number: _____ Quantity: _____

Single or Three Phase

AC Rating: Nominal: _____ (kW) _____ (kVA) _____ (AC Volts)

Maximum: _____ (kW) _____ (kVA) _____ (AC Volts)



STATE OF MASSACHUSETTS
 COMMONWEALTH OF MASSACHUSETTS
 BOARD OF ELECTRICAL REGULATION
 REGISTRATION NO. 44113
 03/30/2020

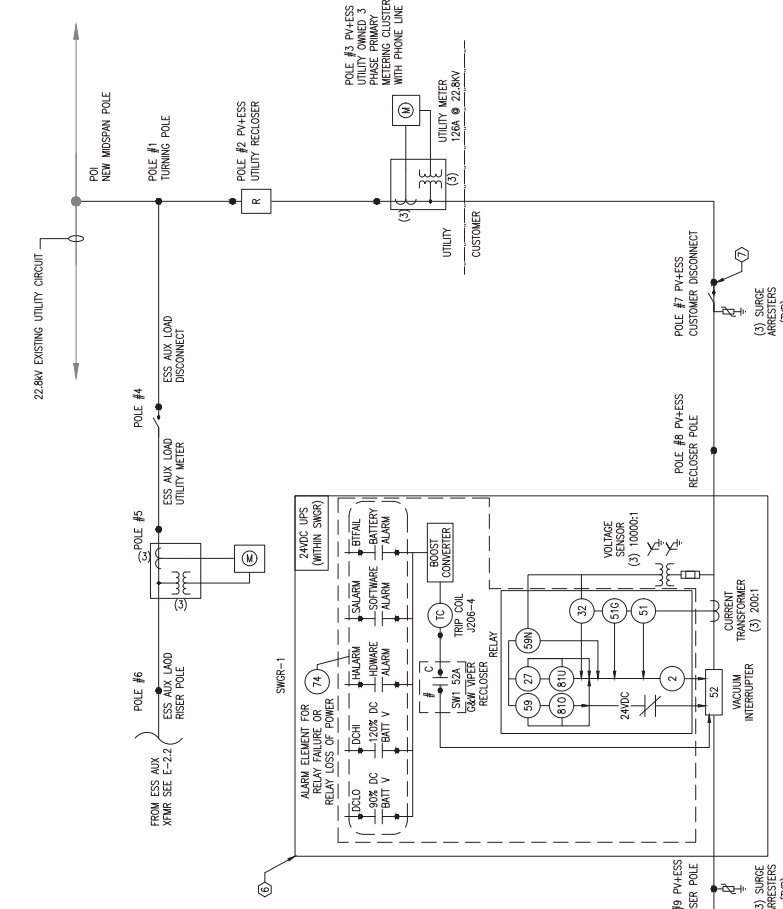
NOT FOR CONSTRUCTION

UTILITY SUBMISSION
 150 THONET ROAD, WAREHAM, MA 02571

PROJECT NUMBER:
 900-2710

DATE	03/26/20	DESCRIPTION
DATE	03/25/20	DESIGN SET CREATION
DATE	03/25/20	UTILITY SUBMISSION
DATE		RELEASE LOGS
DATE		AM
DATE		DLT

AC SINGLE LINE DIAGRAM
 E-2.1



PROPOSED RELAY SETTINGS

DEVICE	SECONDARY PICKUP	PRIMARY PICKUP	UNIT	TIME DELAY	TOTAL CLEARING TIME	DESCRIPTION
27-1	24.68	6.92	V	1.05 SEC	1.1 SEC	UNDER VOLTAGE
27-2	43.44	11.94	V	1.95 SEC	2 SEC	UNDER VOLTAGE
59-1	54.30	14.80	V	1.95 SEC	2 SEC	OVER VOLTAGE
59-2	59.24	15.97	V	0.11 SEC	0.16 SEC	UNDER FREQUENCY
810-1	56.5	15.79	HZ	0.11 SEC	0.16 SEC	UNDER FREQUENCY
810-2	58.5	15.79	HZ	299.95 SEC	300 SEC	OVER FREQUENCY
810-1	62	15.79	HZ	299.95 SEC	300 SEC	OVER FREQUENCY
810-2	100	15.79	V	1.95 SEC	2 SEC	DIRECTIONAL POWER
32	<3000	<3000	MM	4.95 SEC	3 SEC	GROUND OVER VOLTAGE
51	0.950	190	A	TD: 2.0	CURVE U4	EXTREMELY INVERSE OVER
516	0.475	95	A	TD: 1.5	CURVE U4	EXTREMELY INVERSE GROUND
2	0.95	1.05	MIN/MAX VOLT FU	300 S	RELAY	EQUALIZED 2 - HEALTHY
	59.50	60.50	MIN/MAX			UTILITY RESTORATION DELAY

EQUIVALENT 74- SEE DETAILS IN SCHEMATICS

ELECTRICAL EQUIPMENT SCHEDULE

REF #	TOTAL	DESCRIPTION
(1)	3	DC RECOMBINER
(2)	3	INVERTER STEP UP TRANSFORMER, 1000 KVA, Z=6%, Y/R=5
(3)	3	INVERTER
(4)	3	ENERGY STORAGE UNIT, 1000WH/4000WH
(5)	3	DC RECOMBINER
(6)	3	INVERTER STEP UP TRANSFORMER, 1000 KVA, Z=6%, Y/R=5
(7)	3	INVERTER
(8)	3	ENERGY STORAGE UNIT, 1000WH/4000WH
(9)	3	DC RECOMBINER
(10)	3	INVERTER STEP UP TRANSFORMER, 1000 KVA, Z=6%, Y/R=5
(11)	3	INVERTER
(12)	3	ENERGY STORAGE UNIT, 1000WH/4000WH
(13)	3	DC RECOMBINER
(14)	3	INVERTER STEP UP TRANSFORMER, 1000 KVA, Z=6%, Y/R=5
(15)	3	INVERTER
(16)	3	ENERGY STORAGE UNIT, 1000WH/4000WH
(17)	3	DC RECOMBINER
(18)	3	INVERTER STEP UP TRANSFORMER, 1000 KVA, Z=6%, Y/R=5
(19)	3	INVERTER
(20)	3	ENERGY STORAGE UNIT, 1000WH/4000WH

AC SINGLE LINE DIAGRAM
 SCALE: NTS

1. SETTINGS ASSUME 3 CYCLE CONTACTOR/BREAKER TIMING. THE INPUT NOMINAL VOLTAGE EQUAL TO 1.32(13164/10000) TO ADJUST THAT TO 300V BASE MULTIPLY BY 37.5(300V BASE TO 8V BASE). THE VOLT SET IN THE RELAY IS 49.37V WHICH IS WHAT THE RELAY WILL SEE FOR PROTECTION. EFFECTIVE PFR = 1000098/300 = 266.67

THE BOARD OF REGISTERED PROFESSIONAL ENGINEERS AND ARCHITECTS OF THE COMMONWEALTH OF MASSACHUSETTS HAS REVIEWED THIS DOCUMENT AND HAS FOUND IT TO BE IN ACCORDANCE WITH THE REQUIREMENTS OF THE MASSACHUSETTS REGULATION BOARD OF REGISTERED PROFESSIONAL ENGINEERS AND ARCHITECTS.



SEAL OF THE BOARD OF REGISTERED PROFESSIONAL ENGINEERS AND ARCHITECTS OF THE COMMONWEALTH OF MASSACHUSETTS
 JAMES N. JOHNSON
 LICENSE NO. 54113
 STATE OF MASSACHUSETTS

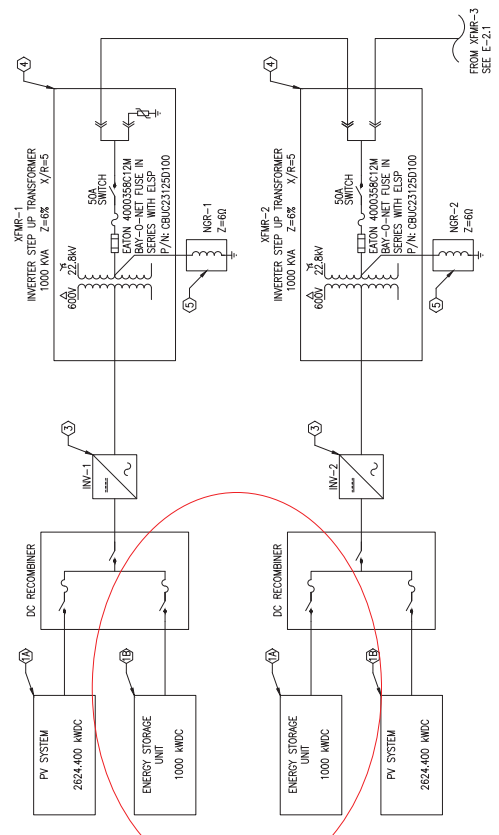
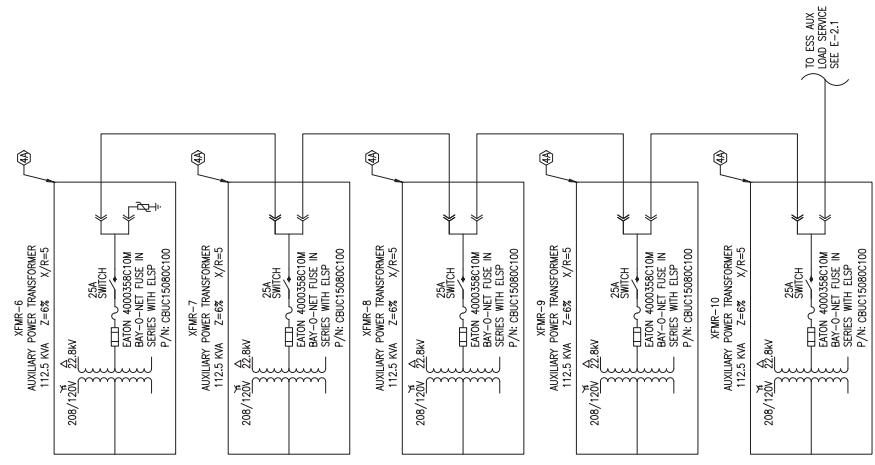
NOT FOR CONSTRUCTION

UTILITY SUBMISSION
 150 THONET ROAD, WAREHAM, MA 02571

PROJECT NUMBER:
 905-2710

REV	DATE	BY	CHKD	DESC
03/26/20	DL	AM		UTILITY SUBMISSION
		MS		SUP SET CREATION
		CS		
		CK		
		RE		

AC SINGLE LINE DIAGRAM
E-22



AC SINGLE LINE DIAGRAM
 SCALE: NTS

SITE USE PLAN SUBMISSION

150 THONET ROAD, WAREHAM, MA 02571

SOLAR PHOTOVOLTAIC AND ENERGY STORAGE ELECTRIC SYSTEM

GENERAL NOTES

- AS CONTAINED HEREIN, "CONTRACTOR" IS ASSUMED TO BE BORREGO SOLAR SYSTEMS, INC. AND "SUBCONTRACTOR" IS BORREGO'S INSTALLATION SUBCONTRACTOR.
- THESE NOTES SET MINIMUM STANDARDS FOR CONSTRUCTION. THE DRAWINGS GOVERN OVER THESE NOTES. ALL WORK SHALL BE DONE IN ACCORDANCE WITH THE MINIMUM STANDARDS OF THE FOLLOWING LOCAL BUILDING CODES: LOCAL ELECTRICAL CODE, ANY OTHER REGULATING AGENCIES WHICH HAVE AUTHORITY OVER ANY PORTION OF THE WORK AND THOSE CODES AND STANDARDS LISTED IN THESE DRAWINGS AND IN THE SUBCONTRACTOR AGREEMENT.
- ALL WORK SHALL BE DONE IN ACCORDANCE WITH THE MINIMUM STANDARDS OF THE FOLLOWING LOCAL BUILDING CODES: LOCAL ELECTRICAL CODE, ANY OTHER REGULATING AGENCIES WHICH HAVE AUTHORITY OVER ANY PORTION OF THE WORK AND THOSE CODES AND STANDARDS LISTED IN THESE DRAWINGS AND IN THE SUBCONTRACTOR AGREEMENT.
- ALL WORK SHALL BE DONE IN ACCORDANCE WITH THE MINIMUM STANDARDS OF THE FOLLOWING LOCAL BUILDING CODES: LOCAL ELECTRICAL CODE, ANY OTHER REGULATING AGENCIES WHICH HAVE AUTHORITY OVER ANY PORTION OF THE WORK AND THOSE CODES AND STANDARDS LISTED IN THESE DRAWINGS AND IN THE SUBCONTRACTOR AGREEMENT.
- COORDINATE THESE DRAWINGS WITH SPECIFICATIONS AND MANUFACTURER INSTALLATION AND OPERATION MANUALS AND NOTIFY BORREGO OF ANY DISCREPANCIES PRIOR TO BEGINNING CONSTRUCTION. BORREGO SHALL BE RESPONSIBLE FOR OBTAINING ALL NECESSARY PERMITS.
- DRAWINGS HAVE BEEN DETAILLED IN COMPLIANCE WITH U.L. LISTING REQUIREMENTS AND THE BUILDING CODE FOR THE MATERIALS SPECIFIED. IF AN ALTERNATE OR SUBSTITUTED MATERIAL IS ACCEPTED AS AN EQUAL BY BORREGO, THE SUBCONTRACTOR WILL ASSUME THE RESPONSIBILITY FOR WHETHER CONSTRUCTION MODIFICATION AND/OR ADDITIONAL COST THAT MAY BE INCURRED BY THE SUBCONTRACTOR AS A RESULT OF SUCH SUBSTITUTION.
- PRIOR TO THE COMMENCEMENT OF ANY WORK, EACH TRADE SHALL VERIFY EXISTING CONDITIONS AND NOTIFY BORREGO OF ANY DISCREPANCIES TO THAT WHICH IS SHOWN IN THESE DRAWINGS, INCLUDING BUT NOT LIMITED TO DIMENSIONS OF THE WORK AREA, OBSTRUCTIONS, ENCLOSURES AND ANY ADDITIONAL SHORT CIRCUITS OR OTHER DAMAGE. METAL SHAKINGS MAY CAUSE RUST, ELECTRICAL SHORT CIRCUITS OR OTHER DAMAGE. NO STRUCTURAL MEMBER SHALL BE DRILLED UNLESS SPECIFICALLY AUTHORIZED BY BORREGO.
- ALL COMPONENTS TO BE INSTALLED TO PROPERLY RESIST WIND LOADS, SUCH AS BALUST, WIND DEFLECTORS, ETC. IT IS THE RESPONSIBILITY OF THE SUBCONTRACTOR TO PROVIDE TEMPORARY MEANS TO RESIST WIND LOADS FOR ALL COMPONENTS NOT YET INSTALLED. COVERING, BALLAST OR ANY OTHER MEANS, DAMAGE TO ANY INSTALLED SYSTEM COMPONENT OR THE EXISTING FACILITY AS A RESULT OF THE UNFINISHED CONDITION NOT ADEQUATELY RESISTING WIND SHALL BE THE RESPONSIBILITY OF THE SUBCONTRACTOR TO REPAIR OR REPLACE AT THE SUBCONTRACTOR'S COST.
- TREES MAY GROW DURING THE LIFE OF THE SYSTEM AND IMPACT THE PRODUCTION.

APPLICABLE CODES AND STANDARDS

- 2018 MASSACHUSETTS ELECTRICAL CODE 507 DM7200
- UL-1000 - SOLAR MODULES
- UL-1703 - SOLAR MODULES
- UL-1741 - INVERTERS, COMBINER BOXES
- UL-2703 - RACKING MOUNTING SYSTEMS AND CLAMPING DEVICES FOR PV MODULES
- UL-1973 - STANDARD FOR BATTERIES FOR USE IN LIGHT ELECTRIC RAIL (LER) APPLICATIONS AND STATIONARY APPLICATION
- UL-9540 - STANDARD FOR ENERGY STORAGE SYSTEM AND EQUIPMENT

PROJECT SCOPE

THIS PROJECT CONSISTS OF THE INSTALLATION OF SOLAR MODULES PER THE SYSTEM DESCRIPTION. THE MODULES WILL BE INSTALLED ON A TOP 2x12 MOUNTED RACKING SYSTEM. THE MODULES WILL BE WIRED IN SERIES STRINGS AND CONNECTED IN PARALLEL TO THE INVERTERS. THE SYSTEM WILL BE INTERCONNECTED WITH THE EXISTING SITE ELECTRICAL SYSTEM IN ACCORDANCE WITH THE APPLICABLE ELECTRIC CODE AND EVERSOURCE REQUIREMENTS.

THIS PROJECT CONSISTS OF THE INSTALLATION OF ENERGY STORAGE EQUIPMENT PER THE SYSTEM DESCRIPTION. BELOW THE LITHIUM-ION ENERGY STORAGE MODULES WILL BE INSTALLED IN A BATTERY ENCLOSURE. THE BATTERIES WILL BE INSTALLED IN A BATTERY ENCLOSURE (BATTERY-CONDITIONING UNITS) AND FIRE SUPPRESSION SYSTEMS. THE ENERGY STORAGE MODULES WILL BE CONNECTED IN SERIES STRINGS AND CONNECTED TO THE POWER CONVERSION SYSTEM, WHICH WILL CONVERT DC TO AC. WHILE THE BATTERIES ARE DISCHARGING AND WILL CONVERT AC TO DC WHILE THE BATTERIES ARE CHARGING.

SYSTEM DESCRIPTION

APPROXIMATE SYSTEM SIZE (DC)	19,989,180 W/DC	SYSTEM SIZE (AC)	4,990 KW/MC
MODULES	(49,386) LG45N0T-45	INVERTER(S)	(5) POWER ELECTRONICS FREEMAN F0500 DC/DC CONVERTER 500KW
MODULES PER STRING	27	TILT ANGLE	25°
# STRINGS	1828	ESTIMATED FOUNDATIONS	8,226
RACKING	TERRASMART TOP	RACKING QUANTITY	2,057
ENERGY STORAGE SYSTEM DESCRIPTION			
SYSTEM POWER CAPACITY	4,990 KW/MC		
USABLE ENERGY CAPACITY	6 HOURS AT RATED POWER CAPACITY		
POWER CONVERSION SYSTEM / INVERTER	SEE INVERTERS ABOVE		
DC / DC CONVERTER	POWER ELECTRONICS FREEMAN F0500 DC/DC CONVERTER 500KW		

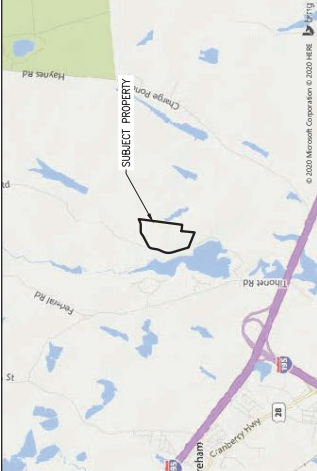
TOTAL SYSTEM DESCRIPTION

TOTAL PHOTO STORAGE POWER CAPACITY	4,990 KW/MC
MAXIMUM EXPORT TO UTILITY	4,990 KW/MC

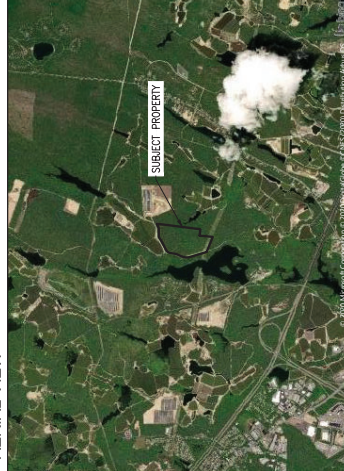
PROJECT DIRECTORY

SYSTEM / PROJECT OWNER	BORREGO SOLAR SYSTEMS, INC.
LAND OWNER / HOST	AMARON HOLDING COMPANY
ADDRESS	150 THONET ROAD WAREHAM, MA 02571
AUTHORITY HAVING JURISDICTION	TOWN OF WAREHAM
ADDRESS	54 MARION ROAD WAREHAM, MA 02571
UTILITY EVERSOURCE	
SOIL ENGINEER	AND THOMAS, INC. CONTRACT: JEFFREY R. MURPHY, P.E. PHONE: (508)-366-0560
FRAME	BORREGO SOLAR SYSTEMS, INC. CONTACT: DEAN SMITH, P.E. PHONE: (978)-221-5105
ELECTRICAL ENGINEER	BORREGO SOLAR SYSTEMS, INC. CONTACT: AMARON WRIGHT, P.E. PHONE: (978)-726-3498
DESIGN ENGINEER	BORREGO SOLAR SYSTEMS, INC. CONTACT: NORMAN HALLSLEY PHONE: (978)-207-3926

LOCATION MAP



AERIAL VIEW



GENERAL ABBREVIATIONS

(E) EXISTING	EXISTING	AL	ALUMINUM	APPROX	APPROXIMATE	BSS	BORREGO SOLAR SYSTEM	CL	CENTERLINE	DATA	DATA ACQUISITION SYSTEM	DI	DITTO	EA	EAST-WEST	FBO	FURNISHED BY OTHERS	FD	FORWARD FACING	GA	GALVANIZED	HVC	HEATING VENTILATION AND AIR CONDITIONING	ID	IDENTIFIER	MFR	MANUFACTURER	MOD	SOLAR MODULE
NS	NORTH-SOUTH	NO	NOT TO SCALE	OAE	OR APPROVED EQUAL	OC	ON CENTER	OD	OUTSIDE DIAMETER	OPCI	OUTSIDE DIAMETER CONTRACTOR INSTALLED	PV	POLY VINYL CHLORIDE	SS	STAINLESS STEEL	SSS	SOLAR SUPPORT STRUCTURE	STC	STANDARD TEST CONDITIONS	TB	TAPER PROOF	UN	UNLESS OTHERWISE NOTED	UP	UPPER	WP	WEATHER PROOF		

DRAWING LIST

SHEET NUMBER	SHEET TITLE	TITLE PAGE
C-1.0	EXISTING CONDITIONS PLAN	
C-2.0	TREE CLEARING PLAN	
C-3.0	OVERALL LAYOUT AND MATERIALS PLAN	
C-3.1	LAYOUT AND MATERIALS PLAN - SOUTH	
C-3.2	LAYOUT AND MATERIALS PLAN - NORTH	
C-4.0	OVERALL GRADING AND EROSION CONTROL PLAN	
C-4.1	GRADING AND EROSION CONTROL PLAN - NORTH	
C-4.2	GRADING AND EROSION CONTROL PLAN - SOUTH	
C-4.3	GRADING AND EROSION CONTROL PLAN - BUSIN 1, 2	
C-4.4	GRADING AND EROSION CONTROL PLAN - BUSIN 3, 4	
C-5.0	CIVIL DETAILS	

NOT FOR CONSTRUCTION



SITE USE PLAN
150 THONET ROAD
WAREHAM, MA 02571

PROJECT NUMBER:
905-2710

DATE	03/25/20	DESIGN SET CREATION
DATE	05/07/20	REVISED PER NEW FIELD DATA
DATE	06/08/20	ISSUED FOR LOCAL PERMITTING
DATE		
DATE		
DATE		
DATE		
DATE		
DATE		
DATE		

T-1
TITLE PAGE

ATTACHMENT 1

Excerpted Plans and Narrative (BESS information highlighted)

- **27 Charge Pond Road**

APPLICATION FOR SITE PLAN REVIEW

27 Charge Pond Road PV+ES Project

**27 Charge Pond Road (aka 67 Tihonet Road)
Wareham, Massachusetts**



Prepared for:

**Borrego Solar Systems, Inc.
55 Technology Dr. #102
Lowell, MA 01851**

Prepared by:



BEALS + THOMAS

BEALS AND THOMAS, INC.
32 Court Street
Plymouth, Massachusetts
02360-3866

*Submitted in Compliance with the Zoning By-laws of the
Town of Wareham, Massachusetts*

May 28, 2020

May 28, 2020

Mr. George Barrett, Chair
Wareham Planning Board
c/o Mr. Kenneth Buckland, Town Planner
54 Marion Road
Wareham, Massachusetts 02571

Via: FedEx and email to sraposo@wareham.ma.us

Reference: Application for Site Plan Review
27 Charge Pond Road PV+ES Project
Wareham, Massachusetts
B+T Project No. 1833.109

Dear Planning Board Members:

On behalf of the Applicant, Borrego Solar Systems, Inc. (BSSI), Beals and Thomas, Inc. (B+T) respectfully submits this Application for Site Plan Review for the construction, installation, and operation of a proposed large ground-mounted solar energy facility at 27 Charge Pond Road (aka 67 Tihonet Road) in Wareham, Massachusetts (the Project). The Project is designed to comply with applicable zoning criteria in the October 2019 revision to the Zoning By-laws of the Town of Wareham, Massachusetts (the Zoning By-laws), including Section 590: Solar Energy Generation Facilities.

The proposed Project consists of an approximately ± 5 megawatt (MW) AC/ ± 12.2 MW DC solar array and energy storage system including site access and interconnection to the electrical grid. The Project is proposed within a ± 44 -acre area (the Site) on a portion of a larger ± 130 acre overall parcel of land (the Property) owned by A D Makepeace Co (aka A.D. Makepeace Company, ADM). The Site can be further identified as a portion of Wareham Assessor's Map 110, Lot 1015 (address indicated as 67 Tihonet Road in Assessors' database). More specifically, the Site is located to the east of Parker Mills Pond and south of Route 25.

B+T is pleased to participate in the approval process for another renewable/sustainable energy project in the Town of Wareham, following the successful review of multiple other BSSI solar projects on ADM land in recent years. BSSI is currently also proposing two separate solar projects off Tihonet Road to the north, which will be submitted to the Planning Board for review.

2.0 PROJECT NARRATIVE

2.1 Introduction

The proposed 27 Charge Pond Road PV+ES Project (the Project) is located off Charge Pond Road and south of Route 25. The Site can be further identified as a ±44-acre portion of Map 110, Lot 1015 owned by A D Makepeace Co (A.D. Makepeace Company, ADM). The ±130 acre overall parcel of land is referred to herein as the Property. More specifically, the Site is located to the east of Parker Mills Pond, to the west of the ballfields constructed atop the capped Wareham Landfill, and to the north of the natural gas storage enclosure owned by Colonial Gas Company, based on available assessor's information. Refer to the Locus and Aerial Maps enclosed in Section 6.0.

The Site is located in the R-60 District as indicated on the Town of Wareham Zoning Map. According to Section 320: Table of Principal Use Regulations, large ground mounted solar energy projects are allowed by Site Plan Review from the Permit Granting Authority. Accordingly, Site Plan Approval from the Planning Board is requested pursuant to Section 590 of the Zoning By-laws.



Aerial Photograph. The proposed solar array will be located east of Parker Mills Pond, south of Route 25, and west of Charge Pond Road, as depicted in the above aerial photograph. Also refer to the Locus and Aerial Maps included in Section 6.0.

A Notice of Intent (NOI) is being filed with the Wareham Conservation Commission concurrent with this application for work proposed within the 100-foot buffer zone to wetland resource areas.

The Site is not located within areas identified by the Natural Heritage and Endangered Species Program (NHESP) as Priority Habitats of Rare Species or Estimated Habitats of Rare Wildlife.

2.3 Proposed Conditions

The Project includes the construction, installation, and operation of a large ground-mounted solar array and **energy storage facility**, including site access and interconnection to the electrical grid. The fenced area surrounding the ± 5 MW AC (± 12.2 MW DC) solar array will occupy approximately ± 39 acres of upland area. The proposed array is comprised of approximately 30,078 solar modules, which is subject to change and will be finalized upon issuance of construction drawings prior to issuance of building and electrical permits. The system will include appurtenant inverters and **battery storage structures**, as described in Section 5.0 and depicted on the plans enclosed in Section 6.0. The Site will be enclosed by a security fence as detailed in the accompanying plan set.

The interconnection to the electrical grid is proposed at an existing utility pole across Charge Pond Road from the Site. Access will be provided from Charge Pond Road, and new access roads will surround the perimeter of the array. The new access roads will be located within the limits of the proposed security fence, which will be secured with knock boxes and gates.

Disturbed areas will be stabilized with herbaceous species following construction. In addition, erosion and sedimentation controls will surround the work area where needed during construction as depicted on the plans in Section 6.0.

The proposed Project will not result in the development impacts generally associated with typical residential, commercial, or industrial development. The Project will not generate water or sewer demands, increase traffic, create greenhouse gas (GHG) emissions, or contribute to acid rain or smog. In fact, the Project will create a source of renewable energy consistent with the Commonwealth's net-zero emissions goal for 2050.

2.4 Compliance with the Zoning By-laws of the Town of Wareham

BSSI proposes this Project in accordance with M.G.L. c. 40A, s. 3 of the Massachusetts Zoning law, which states that no zoning ordinance or by-law shall prohibit or unreasonably regulate solar energy systems except where necessary to protect public health, safety, or welfare. The Project is sited appropriately and complies with applicable zoning criteria and does not endanger public health, safety or welfare. The Project further complies with the local Zoning By-laws as follows:



11. Seed Disturbed Areas

Seeding cost includes labor and materials for reseeding all disturbed areas including the reclaimed gravel road area, former electrical areas, and areas disturbed by racking foundation removal.

$$\text{Seeding Cost} \cdot \text{Disturbed Area} = \text{Total Seeding Cost}$$

Total = \$ 14,055.46

12. Truck to Transfer Station

All material will be trucked to the nearest Transfer station that accepts construction material. The nearest transfer station is Wareham Town Recycling

$$(\text{Total Truckloads} \cdot \text{Roundtrip Distance} \cdot \text{Fuel Cost}) + (\text{Total Truckloads} \cdot \text{Round Trip Time} \cdot \text{Trucking Cost}) = \text{Total Trucking Cost to Transfer Station}$$

Total = \$ 2,508.25

13. Remove and Dispose of Energy Storage Equipment

The battery units will be prepared for shipment and loaded onto a truck. A disposal fee will also be required for the disposal company to accept the batteries.

$$\text{Number of Battery Units} \cdot ((\text{Loading Prep Time} \cdot \text{Labor Cost}) + \text{Loading Time} \cdot (\text{Labor Rate} + \text{Bobcat Cost} + \text{Trucking Cost}) + \text{Disposal Fee}) = \text{Total Energy Storage Removal and Disposal Cost}$$

Total = \$ 8,720.00



Summary of Decommissioning Costs

Line Item	Task	Cost
1	Module Removal	\$ 12,532.50
2	Rack Wiring Removal	\$ 6,266.25
3	Rack Dismantling	\$ 15,665.63
4	Electrical Equipment Loading and Removal	\$ 225.00
5	Break Up Concrete Pads	\$ 3,600.00
6	Load Racks	\$ 61,095.94
7	Electrical Wiring Removal	\$ 14,625.00
8	Foundation Screw Removal	\$ 12,031.20
9	Fence Removal	\$ 13,555.75
10	Power Pole Removal	\$ 18,000.00
11	Seed Disturbed Areas	\$ 14,055.46
12	Trucking to Transfer Station	\$ 2,508.25
13	Energy Storage System Removal	\$ 8,720.00
		Subtotal = \$ 182,880.97

Present Value Total with 1.25% Adder = \$ 228,601.21

<p>Total after 20 years @ 1.5% Inflation</p> <p><i>Present Value • (1+ Inflation Rate)^{Number of Years} = Future Value</i></p> <p>Grand Total = \$307,892.69</p>
--



System Design Capacity: Nominal 5000 (kW) 5000 (kVA)

Maximum 5000 (kW) 5000 (kVA)

For Solar PV provide the DC-STC rating: 7,515.59 (kW_{DC})

Type of Generating Unit: Synchronous _____ Induction _____ Inverter x

Manufacturer: Power Electronics Model: HEMK / PCSK

Prime Mover: Fuel Cell Reciprocating Engine Gas Turbine Steam Turbine

Microturbine Photovoltaic Other Energy Storage

Energy Source: Solar Wind Hydro Diesel Natural Gas Fuel Oil

Other Li-ion (Please Specify)

For Solar PV provide the DC-STC rating: 7,515.59 (kW)

IEEE 1547.1 (UL 1741) Listed? Yes No

1) Generating Unit Type 1

Manufacturer: Power Electronics Model Name and Number: HEMK FS3000 Quantity: 1

Single or Three Phase

AC Rating: Nominal: 3000 (kW) 3000 (kVA) 600 (AC Volts)

Maximum: 3000 (kW) 3000 (kVA) 600 (AC Volts)

2) Generating Unit Type 2 (if applicable)

Manufacturer: Power Electronics Model Name and Number: HEMK FS2000 Quantity: 1

Single or Three Phase

AC Rating: Nominal: 2000 (kW) 2000 (kVA) 600 (AC Volts)

Maximum: 2000 (kW) 2000 (kVA) 600 (AC Volts)

ATTACHMENT 2

Fire Department Letter dated June 18, 2020

Wareham Fire Department

273 Main Street
Wareham, MA 02571

Business Phone: (508) 295-2973 · Fax: (508) 295-1333

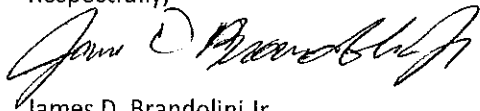
June 18, 2020

Town of Wareham
Planning Board
54 Marion Rd.
Wareham, Ma. 02571

Dear Chairman Barrett,

We have reviewed the three proposed solar sites, 140 Tihonet Road, 150 Tihonet Road and 27 Charge Pond Road. We have no comments or requests at this time.

Respectfully,



James D. Brandolini Jr.
Captain Fire Prevention
Wareham Fire Department
273 Main Street
Wareham, Ma. 02571
508-295-2973