

# PLAPC

PARISI LAW ASSOCIATES, P.C.

**APPLICATION FOR REVIEW OF  
DEVELOPMENT OF REGIONAL IMPACT  
(Cape Cod Commission)  
FOR WIRELESS COMMUNICATIONS FACILITY**

**SUPPLEMENT No. 1**

**Applicant:** Vertex Towers, LLC  
**Site Id:** VT-MA-3155D  
**Property Address:** 737 Gifford Street, Falmouth, MA02540  
**Tax Assessor:** 27-01-007  
**Property Owner:** G. Howard Hayes, Trustee of the Falmouth Self Storage Nominee Trust  
**Date:** May 23, 2024

1. Supplemental Project Narrative
2. Wetland Delineation Field Data Form
3. Drainage Analysis

Respectfully submitted,



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**1**



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DEVELOPMENT OF REGIONAL IMPACT  
(Cape Cod Commission)  
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**SUPPLEMENTAL PROJECT NARRATIVE**

This Supplemental Project Narrative supplements the Project Narrative dated May 15, 2023 provided by Vertex Towers, LLC in connection with its Application for Review of Development of Regional Impact dated May 13, 2024 with respect to the above referenced property.

**COMPLIANCE WITH ENABLING REGULATIONS**

**Section 6(c)(viii) Findings for Approval.** The Commission shall review proposed DRIs for their consistency with the Act, the RPP, Districts of Critical Planning Concern (DCPC), municipal development bylaws and Local Comprehensive Plans. The Commission shall approve, or approve with conditions, a DRI and shall permit a Municipal Agency to grant a development permit for a proposed DRI if the Commission finds after a public hearing that:

[1] the probable benefit from the proposed development is greater than the probable detriment;

**The construction of the Applicant's Facility will enhance service coverage in the Town of Falmouth and surrounding communities. The enhancement of service coverage in the Town of Falmouth is desirable to the public convenience for personal use of wireless services and for community safety in times of public crisis and natural disaster. Wireless communications service also provides a convenience to residents and is an attractive feature and service to businesses. In addition, the requested use at this location will not result in a change in the appearance of the surrounding neighborhoods. The use is passive in nature and will not generate any traffic, smoke, dust, heat, glare, discharge of noxious substances, nor will it pollute waterways or groundwater. Once constructed, the facility will comply with all applicable local, state and federal safety regulations. See also, Project Narrative, pp. 3- 4**

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[2] the proposed development is consistent with the RPP and the Local Comprehensive Plan of the Municipality(ies) in which the proposed development is located if the municipality has adopted an LCP which has been certified by the Cape Cod Commission as consistent with the RPP.

**As set forth below, the proposed development is consistent with the Regional Policy Plan, and also consistent with the LCP. The Town of Falmouth has approved several similar facilities throughout Falmouth, recognizing the need for enhanced wireless communications as a means of improving public safety.**

[3] the proposed development is consistent with municipal development bylaws, or, if it is inconsistent, the inconsistency is necessary to enable a substantial segment of the population to secure adequate opportunities for housing, conservation, environmental protection, education, recreation or balanced economic growth;

**The Property is a large, approximately 11.6 acre substantially undeveloped parcel in the Agricultural B (AGB) Zoning District currently used for outdoor self-storage and on which is an existing substantial powerline easement. Article 6 USE TABLES in the Town's Zoning Ordinance Section 240-6.1B provides that a Television or Radio antenna not exceeding 50 feet above ground is a permitted use by right; however, the proposed antennas will be more than 50' above ground level, and therefore, a dimensional variance will be required. Section 240-6.1B also provides that a Television or radio antenna subject to G.L.409A § 3 (emphasis added) is a permitted use subject to a Special Permit from the Zoning Board of Appeals, which does not appear to apply to the proposed Facility. Accordingly, the Applicant has respectfully requested that the ZONING BOARD OF APPEALS grant a dimensional VARIANCE from the Section 240.6.1B Use Table and or a SPECIAL PERMIT if applicable to permit use of the Property as proposed.**

**We note that the Town of Falmouth has approved several similar facilities throughout Falmouth, recognizing the need for enhanced wireless communications as a means of improving public safety**

[4] if the proposed development is located in whole or in part within a designated DCPC, it is consistent with the regulations approved or adopted by the Commission pursuant to Section 11 of the Act.

**The Site is not located within a designated DCPC.**

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## **COMPLIANCE WITH REGIONAL POLICY PLAN**

### WATER RESOURCES

Goal: To maintain a sustainable supply of high quality untreated drinking water and protect, preserve, or restore the ecological integrity of Cape Cod's fresh and marine surface water resources

**The proposed Facility will not adversely impact any water resources and will not introduce any nitrogen loading. Crown Castle respectfully asserts that this section of the Regional Policy Plan is not applicable in this instance.**

### OCEAN RESOURCES

Goal: To protect, preserve, or restore the quality and natural values and functions of ocean resources.

**The proposed Facility will not have any adverse impact on ocean resources and the Applicant respectfully asserts that this section of the Regional Policy Plan is not applicable in this instance.**

### WETLAND RESOURCES

Goal: To protect, preserve, or restore the quality and natural values and functions of inland and coastal wetlands and their buffers.

**The proposed Facility will not have any adverse impact on inland or coastal resources and the Applicant respectfully asserts that this section of the Regional Policy Plan is not applicable in this instance.**

### WILDLIFE AND PLANT HABITAT

Goal: To protect, preserve, or restore wildlife and plant habitat to maintain the region's natural diversity.

**The proposed Facility will have a minimal impact upon existing vegetation on the Site. The Facility will only impact 5500 square feet, a significant portion of which has previously been disturbed a small and insignificant portion of which is in a Biomap Core Habitat. The proposed Facility will not have any adverse impact upon wildlife, and will not produce smoke, odor, waste, unreasonable noise or vibrations.**

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## OPEN SPACE

Goal: To conserve, preserve, or enhance a network of open space that contributes to the region's natural and community resources and systems

**The installation of the proposed Facility requires minimal disturbance of the land and adds very little impervious surface to the Site, other than the concrete pads for the carriers' equipment.**

**We note that the proposed Facility will be located on a small portion of a large, approximately 11.6 acre parcel used for outdoor self-storage and on which is an existing substantial powerline easement. As such, the proposed Facility will not involve the development of open space that contributes to the region's natural resources, but does in fact improve community resources through enhanced wireless communications. There is no nearby open space on which the land underneath the proposed Facility could be connected, nor will the proposed Facility have any impact on nearby open space. It is unlikely that a conservation agency would be interested in a donation, restriction or restoration of such a small equivalent of open space on-site, especially given the proximity to the existing powerline easement, nor would they be interested in in a donation or restoration of such a small equivalent of open space off-site.**

**Given the lack of impact on open space and the fulfillment of the goal to promote economic development providing employment opportunities to a diverse workforce, the Applicant respectfully requests a WAIVER of the requirement to contribute a payment in lieu to meet the open space objective.**

## COMMUNITY DESIGN

Goal: To protect and enhance the unique character of the region's built and natural environment based on the local context.

**The Property is a large, approximately 11.6 acre substantially undeveloped parcel in the Agricultural B (AGB) Zoning District currently used for outdoor self-storage and on which is an existing substantial powerline easement. The Facility will be screened by existing trees and vegetation on the Property, and no additional landscaping is proposed or required.**

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## COASTAL RESILIENCY

Goal: To prevent or minimize human suffering and loss of life and property or environmental damage resulting from storms, flooding, erosion, and relative sea level rise.

**The installation of the proposed Facility will not be a threat to public health, safety and welfare. Rather, the proposed Facility will aid in public safety by maintaining wireless communication services to the residents, businesses, commuters, and emergency personnel utilizing wireless communications in the immediate vicinity and along the nearby roads. These services further the public interest of health and safety as they provide wireless 911 services to the community and communication services for the public. According to published reports, approximately 80% of all 911 calls are made from wireless devices. The proposed Facility will allow for improved access to these reliable and robust networks in this area of the Town of Falmouth. Today, wireless infrastructure is required to assist with public safety needs. The proposed Facility will not result in, or cause any, flooding or erosion.**

## CAPITAL FACILITIES AND INFRASTRUCTURE

Goal: To guide the development of capital facilities and infrastructure necessary to meet the region's needs while protecting regional resources.

**Development of the proposed Facility will allow Verizon Wireless and other wireless communication services providers to improve wireless communication services coverage to this area of the Town of Falmouth.**

## TRANSPORTATION

Goal: To provide and promote a safe, reliable, and multi-modal transportation system.

**The Facility will not have any adverse impact on transportation systems. The proposed Facility will generate insignificant traffic to and from the Site. On average, only one or two visits per month will be required for maintenance purposes. Access to the Facility will be via the existing access way.**

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## ENERGY

Goal: To provide an adequate, reliable, and diverse supply of energy to serve the communities and economies of Cape Cod.

**The proposed Facility will not have any adverse impact on energy supplies and the Applicant respectfully asserts that this section of the Regional Policy Plan is not applicable in this instance. The Facility will function using standard telephone and electric services.**

## WASTE MANAGEMENT

Goal: To promote a sustainable solid waste management system for the region that protects public health, safety, and the environment and supports the economy.

**There will be no hazardous materials introduced or discharged at the proposed Facility. All construction waste will be transported off site and disposed of in compliance with applicable regulations. Once constructed, the proposed Facility will not generate any solid waste.**

## CULTURAL HERITAGE

Goal: To protect and preserve the significant cultural, historic, and archeological values and resources of Cape Cod.

**The Applicant will not demolish or impact any cultural, historic or archeological resources as a part of this Facility.**

## ECONOMY

Goal: To promote a sustainable regional economy comprised of a broad range of businesses providing employment opportunities to a diverse workforce.

**The proposed Facility will enable Verizon and other wireless carriers to provide improved w communications services to the residents, businesses, public safety personnel and travelers in this area of Falmouth, supporting a broad range of economic development. Likewise, other wireless carriers will be able to collocate at the proposed Facility, fostering competition and economic development.**



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## HOUSING

Goal: To promote the production of an adequate supply of ownership and rental housing that is safe, healthy, and attainable for people with different income levels and diverse needs.

**The Facility will not have any adverse impact on housing and the Applicant respectfully asserts that this section of the Regional Policy Plan is not applicable in this instance.**

## **THE TELECOMMUNICATIONS ACT OF 1996**

In 1996, the U.S. Congress enacted the Telecommunications Act of 1996, Pub. L. No. 104-104, § 704; 110 Stat. 56 (1996) (the "TCA"). The TCA provides that: no laws or actions by any local government or planning or zoning board may prohibit, or have the effect of prohibiting, the placement, construction, or modification of communications towers, antennas, or other wireless facilities in any particular geographic area, see 47 U.S.C. §332(c)(7)(B)(i); local government or planning or zoning boards may not unreasonably discriminate among providers of functionally equivalent services, see 47 U.S.C. §332(c)(7)(B)(i); health concerns may not be considered so long as the emissions comply with the applicable standards of the FCC, see 47 U.S.C. §332(c)(7)(B)(iv); and, decisions must be rendered within a reasonable period of time, see 47 U.S.C. §332(c)(7)(B)(ii) and the FCC's Declaratory Ruling commonly referred to as the "Shot Clock", in this instance 150 days.

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## **CONCLUSION**

As evidenced by the materials submitted with the Application and as will be further demonstrated by the Applicant through any additional evidence submitted and testimony at public hearing(s), the Facility satisfies the intent and objectives of the Technical Bulletin, the RPP and applicable regulations. The Facility will not be dangerous to the public health or safety as it is designed to comply with all applicable FCC requirements relating to radio frequency emissions and will comply with all applicable requirements of the Massachusetts building code. Indeed, the maximum radio frequency output per channel for the wireless communications facilities collocating on the proposed Facility will be well below the maximum radio frequency exposure levels established by the FCC. The proposed Facility is a passive use and will not cause any nuisance such as unreasonable noise, vibration, smoke, odor or dust. Further, the proposed Facility will maintain wireless communication coverage to residents, businesses, commercial establishments, public safety personnel and travelers through this area of the Town of Falmouth. Police and fire personnel often utilize commercial wireless services, and the proposed Facility will reduce the number and frequency of dropped and incomplete calls due to weak signals and add an additional layer of communication to traditional landlines. In fact, published reports have highlighted the fact that during and after adverse major weather events, including ice storms, wireless telecommunications have been the only form of reliable communication.

Based upon the limited impacts and review of specific findings required, and where the proposed Facility is the minimum height necessary to close a significant gap in wireless coverage at this location, the Applicant hereby requests that the Commission finds that the proposed Facility satisfies the criteria for approval by the Commission as a Development of Regional Impact. The Applicant respectfully requests that the DRI be approved so that the Applicant may seek local approval to install and operate the Facility as well as to satisfy the mandate of the federal government to facilitate competition in the telecommunications industry as set forth in the TCA. We respectfully submit that the standards for review must be interpreted and applied such that the decision issued by the Commission is in conformance with the TCA.

Respectfully submitted,



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**2**

## MassDEP Bordering Vegetated Wetland (310 CMR 10.55) Delineation Field Data Form

Applicant:

Prepared by: **Ecosystem Solutions Inc.**

Project Location: **481 Quaker Road, Falmouth**

DEP File #:

Check all that apply:

- Vegetation alone presumed adequate to delineate BVW boundary: fill out Section I only
- Vegetation and other indicators of hydrology used to delineate BVW boundary: fill out Sections I and II
- Method other than dominance test used (attach additional information)

### Section I.

Observation Plot Number: **U**

Transect #: **A4**

Date: **1/27/2023**

	Common Name	Scientific Name	Percent Cover	Percent Dominance	Dominant Plant?	Wetland Indicator Plant?	Wetland Indicator Category
Ground	Unidentified fern	<i>Unidentified fern</i>	38	100	YES	NO	NI
Shrub	Coast pepper-bush*	<i>Clethra alnifolia</i>	38	100	YES	YES	FAC+
Tree	Eastern white pine	<i>Pinus strobus</i>	38	81	YES	NO	FACU
	Red maple*	<i>Acer rubrum</i>	3	6	NO	YES	FAC
	White oak	<i>Quercus alba</i>	3	6	NO	NO	FACU-
	Northern red oak	<i>Quercus rubra</i>	3	6	NO	NO	FACU-

FAC, FAC+, FACW-, FACW, FACW+, or OBL; or plants with physiological or morphological adaptations. If any plants are identified as wetland indicator plants due to physiological or morphological adaptations, describe the adaptation next to the asterisk

### Vegetation conclusion:

Number of dominant wetland indicator plants: **1**

Number of dominant non-wetland indicator plants: **2**

Is the number of dominant wetland plants equal to or greater than the number of dominant non-wetland plants?

**NO**

If vegetation alone is presumed adequate to delineate the BVW boundary, submit this form with the Request for Determination of Applicability or Notice of Intent

Upland @ A4

## Section II. Indicators of Hydrology

### Hydric Soil Interpretation

#### 1. Soil Survey

Is there a published soil survey for this site?

**YES**

Title/date:

**Barnstable, County**

Map number:

**Accessed via Web Soil Survey**

Soil type mapped:

**435E- Plymouth lcos, 15-35%**

Hydric soil inclusions:

**none**

Are field observations consistent with soil survey? Yes

Remarks:

#### 2. Soil Description

Horizon	Depth	Color	Redox
<b>A</b>	<b>0-2</b>	<b>10YR 2/2 (sil)</b>	-
<b>Bw</b>	<b>2-10</b>	<b>10YR 3/2 (sil)</b>	-
<b>C</b>	<b>10-20</b>	<b>7.5Y 4/2 (sl)</b>	-

Remarks:

#### 3. Other:

Area located in a draw/ Start of small valley

Conclusion: Is soil hydric? **No**

### Other Indicators of Hydrology: (check all that apply & describe)

- Site Inundated:
- Depth to free water in observation hole:
- Depth to soil saturation in observation hole: **2"**  
Observed outside growing season
- Water marks:
- Drift lines:
- Sediment Deposits:
- Drainage patterns in BVW:
- Oxidized rhizospheres:
- Water-stained leaves:
- Recorded Data (streams, lake, or tidal gauge; aerial photo):
- Other:

### Vegetation & Hydrology Conclusion

	YES	NO
Number of wetland indicator plants ≥ # of non-wetland indicator plants	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Wetland hydrology present		
Hydric soil	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Other indicators of hydrology	<input checked="" type="checkbox"/>	<input type="checkbox"/>

**Sample location is in a BVW**

**NO**

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Prepared by: **Ecosystem Solutions Inc.**

Project Location: **481 Quaker Road, Falmouth**

DEP File #:

Check all that apply:

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- Method other than dominance test used (attach additional information)

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Transect #: **A4**

Date: **1/27/2023**

	Common Name	Scientific Name	Percent Cover	Percent Dominance	Dominant Plant?	Wetland Indicator Plant?	Wetland Indicator Category
Ground	Unidentified fern	<i>Unidentified fern</i>	38	100	YES	NO	NI
Shrub	Coast pepper-bush*	<i>Clethra alnifolia</i>	38	100	YES	YES	FAC+
Tree	Eastern white pine	<i>Pinus strobus</i>	38	81	YES	NO	FACU
	Red maple*	<i>Acer rubrum</i>	3	6	NO	YES	FAC
	White oak	<i>Quercus alba</i>	3	6	NO	NO	FACU-
	Northern red oak	<i>Quercus rubra</i>	3	6	NO	NO	FACU-

*FAC, FAC+, FACW-, FACW, FACW+, or OBL; or plants with physiological or morphological adaptations. If any plants are identified as wetland indicator plants due to physiological or morphological adaptations, describe the adaptation next to the asterisk*

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Is the number of dominant wetland plants equal to or greater than the number of dominant non-wetland plants?

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Soil type mapped:

**435E- Plymouth lcos, 15-35%**

Hydric soil inclusions:

**none**

Are field observations consistent with soil survey? Yes

Remarks:

#### 2. Soil Description

Horizon	Depth	Color	Redox
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<b>Bw</b>	<b>2-10</b>	<b>10YR 3/2 (sil)</b>	-
<b>C</b>	<b>10-20</b>	<b>7.5Y 4/2 (sl)</b>	-

Remarks:

#### 3. Other:

Area located in a draw/ Start of small valley

Conclusion: Is soil hydric? **No**

### Other Indicators of Hydrology: (check all that apply & describe)

- Site Inundated:
- Depth to free water in observation hole:
- Depth to soil saturation in observation hole: **2"**  
Observed outside growing season
- Water marks:
- Drift lines:
- Sediment Deposits:
- Drainage patterns in BVW:
- Oxidized rhizospheres:
- Water-stained leaves:
- Recorded Data (streams, lake, or tidal gauge; aerial photo):
- Other:

### Vegetation & Hydrology Conclusion

	YES	NO
Number of wetland indicator plants ≥ # of non-wetland indicator plants	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Wetland hydrology present		
Hydric soil	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Other indicators of hydrology	<input checked="" type="checkbox"/>	<input type="checkbox"/>

**Sample location is in a BVW**

**NO**

3





500 North Broadway  
East Providence, RI 02914  
Phone: (401) 354-2403

May 20, 2024

Cape Cod Commission  
3225 Main Street  
Barnstable, Massachusetts 02630

Site Name: VT-MA-0433A  
737 Gifford Street  
Falmouth, MA 02540

RE: Drainage Analysis and Design for Proposed Telecommunications Facility

To Whom It May Concern:

### **Overview**

Advanced Engineering Group, P.C. (AEG) has prepared a drainage analysis study for the above referenced site. The analysis is based on the Rational Method for Peak Discharge. The watershed areas were estimated using existing USGS quad maps, Massachusetts GIS Orthophotos, and topographical field survey information provided.

The above referenced project, as per the site plan, proposes to install a wireless telecommunications facility at the above referenced location. The 45'x60' compound is to be placed on the easterly side of the lot near the existing power company easement, approximately 300 feet from Gifford Street. The excavation limits proposed will be confined to the proposed compound area (2,700 sf) and access road (400 sf). The overall limit of work is approximately 11,700 sf. The facility will consist of level-graded crushed stone within the fenced in area and extending beyond the fence line by 1 foot. Graded areas outside of the compound will be loam and seeded as required. Equipment will consist of a 130-foot A.G.L. Monopole with antennas connecting to radio cabinets, mounted on a concrete pad, via coax cables.

Access to the site will be through an existing 300' long, 12' wide, gravel drive, then from a proposed gravel drive approximately 30' feet in length that will tie into existing gravel. The proposed compound area will not lie or be in the vicinity of any BVW resource area. Utilities (power and telco) will connect overhead to an existing power and telco line on the access road which has an existing connection to the overhead utility line on Gifford Street. This will require the placement of utility poles as shown on the CDs (per power company's requirement).

## Drainage Computations: Rational Method

$Q=CIA$ , where

$Q$  = Flow Volume (ft<sup>3</sup>/s)

$C$  = Runoff Coefficient

$I$  = Rainfall Intensity (in/hr, constant for both pre- and post-development)

$A$  = Drainage area (acres, also constant for pre- and post-development)

With area and intensity remaining constant in both pre- and post-development, only the Runoff Coefficient will change. The change in surface type will be the proposed location for the compound and its relationship to the watershed.

### Existing Conditions

The proposed area within the limit of work consists of approximately 50% native wooded vegetation area and 50% currently cleared gravel/sandy soil with minimal ground cover.

The breakdown of the various land types and associated land areas are as follows:

#### *Drainage Area*

Area: acres

Wooded Area:                      0.14 acres                       $C = 0.25$

Gravel Area:                        0.13 acres                         $C = 0.75$

#### Weighted Runoff Coefficient

$$C_w = (0.25)(0.52) + (0.75)(0.48)$$

$$C_w = 0.49$$

### Proposed Conditions

The proposed facility consists of a 45'x60' stone compound area that will be used to capture part of the runoff, a 2'x2' infiltration trench, 400 sf proposed access road and a 10' wide section of trees along the edge of the road. No other area within the watershed area will be altered.

#### *Drainage Area*

Grass Area                            0.10 acres                             $C = 0.25$

Gravel Area:                        0.17 acres                         $C = 0.75$

$$C_w = (0.25)(0.37) + (0.75)(0.63) = .60$$

### **Additional Runoff Calculation**

25 year return period 24 hour rainfall total 6.5 inches (NOAA AT-14)

#### **Existing**

$$(.49)*(6.5)*(.27)/(12)*(43,560)= 3,185\text{cf}$$

#### **Proposed**

$$(.56)*(6.5)*(.27)/(12)*(43,560)= 3,568 \text{ cf}$$

$$\text{Change}=382 \text{ cf}$$

Storage Provided in Compound

$$45*60*(4)*(.40)/(12) =360 \text{ cf}$$

Storage Provided in Infiltration Trench

$$166*2*(.40) =133 \text{ cf}$$

Total Proposed Storage

$$360 +133 = 493 \text{ cf}$$

Storage provided by the compound and pea gravel diaphragm will be greater than the additional runoff generated by the site. Flow will exit the compound and pea gravel diaphragm areas as sheet flow and will not cause erosion. It should be noted that the actual runoff coefficient percentages for the components within the compound area are lower than applied. The percentages were rounded up to 3 significant figures for comparison purposes.

#### **Conclusion**

It can be seen in the provided that the water storage in the compound and pea gravel diaphragm will provide storage greater than the additional runoff generated by the site modifications. Also, the additional runoff flow rate will be mitigated via the storm water infiltration trench.

The compound enclosure is surfaced with crushed stone underlain by a weed-block synthetic filter fabric. Drainage patterns, runoff volumes, and peak flow rates will not be altered by the proposed construction. Material removed for the compound grading will be temporarily stockpiled on-site in the designated area. Material will be re-used off-site as determined by the contractor. Flat slopes maintained within the equipment compound and the crushed stone surface will promote infiltration. The voids in the crushed stone within the compound will add additional stormwater storage volume. Runoff from the compound will be diffused, non-point source sheet flow. No new stormwater conveyances are created by the intended site alterations.

Based on the findings and information provided above, it is my professional opinion that the proposed scope of work, as shown in the Zoning Drawings and information provided, will have no increase over existing.

If you need further assistance, information, or have comments, please do not hesitate to contact our office at 401-354-2403.

Sincerely,

Scott N. Adams, P.E.  
Advanced Engineering Group, P.C.





500 North Broadway  
East Providence, RI 02914  
Phone: (401) 354-2403

# **NITROGEN LOADING CALCULATIONS**

## **APPENDIX - A**

**NITROGEN LOADING CALCULATIONS  
EXISTING AND PROPOSED DEVELOPMENT**

Description: This calculation addresses estimated nitrogen-loading associated with the proposed communications compound and associated access roadway to be developed at 737 Gifford Street Falmouth, MA for Vertex Towers, LLC.

These calculations are based on the Town of Falmouth, MA Nitrogen Loading Calculations and MEP Nitrogen Threshold Loads

Conversions: 1 year = 365 days, d; 1 C.F. = 28.31685 liters, L; 1lbs = 0.454 kilograms, kg; 1 gallon = 3.7854 liters; 1 kg = 1,000,000 mg

Total Site Area = 504,100 sq ft  
Existing Gravel Driveway = 5,700 sq ft  
New Gravel Driveway = 400 sq ft  
New Compound Area= 2,700 sq ft

**1. Impervious Surface**

Recharge Rate, Ri (For Impervious) = 40 in/yr  
Roadway Nitrogen Concentration (SNC) = 1.5 mg/liter  
Roof Nitrogen Concentration (SNC)= 0.75 mg/liter

Surface	Area (sf)	SRR		SNC
		c.f./d	L/d	mg/d
<b>Proposed Area</b>	3,100 sf	28.31	801.7	1,202.5
<b>Existing Road</b>	5,700 sf	52.054	1,474.0	2,211.0

Surface Recharge Rate, SRR (L/d) = SA x Recharge Rate

Surface Nitrogen Content, SNC = SRR x Nitrogen Concentration

**2. Natural Surface**

Recharge Rate, Rn (Natural Areas – Falmouth) = 21 in/yr

Surface	Area	SRR (l/d)
<b>Natural Condition Areas</b>	495,300 sf	67,251.5

**3. Summary of Estimated Nitrogen Content & Loading**

1. Combined Recharge Rate, RR = WRR+ $\sum$ SRR = 69,527.2 L/d
2. Total Nitrogen Content, NC = WNC+ $\sum$  SRR+FNC = 3,413.5 mg/d

**Final Nitrogen Loading, NL = NC/RR = 0.049 mg/L (ppm)**

**Yearly Nitrogen Load= NCX365 day/year= 1.24 kg /yr**