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March 6, 2019

Via Federal Express and Email

City of Beacon Common Council
1 Municipal Plaza
Beacon, New York 12508

RE: Application of Orange County-Poughkeepsie Limited Partnership d/b/a Verizon Wireless –110 Howland Avenue (Howland Micro Site)

Dear Mayor Casale and Members of the City Council:

The purpose of this letter is to provide responses to the comments of the City of Beacon Telecommunications Consultant, HDR in connection with the above-referenced application, which comments were provided to us on Friday, March 1, 2019. Set forth below are the HDR comments in its entirety followed by our responses.

HDR Comment: Confirm all licensed frequencies proposed for Verizon operation for this small cell, in the immediate-term and as forecasted for 2-3 years out. The RF Emissions Report assumes 1900/2100 MHz (and demonstrates compliance at publicly-accessed areas in the vicinity of the proposed small cell), but does not appear to consider 700 LTE. If any other frequencies are proposed to operate at this facility, the Millennium Engineering Report of 11/6/2018 should be appropriately updated.

Response: Verizon Wireless' Radio Frequency Engineer has confirmed that this site has been designed to use only the 1900/2100 MHz frequencies. Any

potential future licensed use would require new RF Safety Reports to be prepared and evaluated pursuant to existing FCC license requirements.

HDR Comment: Is co-location by another wireless carrier on the proposed 52' pole considered viable by Verizon?

Response: Technically the proposed utility pole could be capable of accommodating collocation but generally, Verizon Wireless designs its small wireless facilities as a single user facility.

HDR Comment: At the 2/26/2019 meeting, the option to move the proposed small cell facility towards Mount Beacon (further back from the parking area; eastward / southeastward) was discussed. In addition to logistical constraints, the RF Engineer provided a verbal description of signal impedance that would result if the facility were located further back / into the denser tree line. A brief written narrative to this point from the RF Engineer is requested.

Response: The possibility of moving the facility back further on the property was considered by Verizon Wireless during the initial design of this site. The site's relocation was denied by construction due to the lack of access associated with relocating the facility further back on the property. Verizon Wireless policy concerning small wireless facility deployment prohibits construction of access roads as part of its small cell program. In addition to construction concerns, there are also radiofrequency concerns with relocating the facility further back on the property relative to the existing tree lines. Specifically the northern tree line which would create additional "shadowing" degrading the capability of the site to unacceptable levels. Lack of an access road but also create significant issues relative to maintenance of the facility.

HDR Comment: The Drawing set (e.g., DWG Z-1) should be updated to show all property lines for the subject site, including the back property line. HDR's site visit noted a drainage swale on the slope behind the parking area with a sign marked "Private Property". It is requested that Verizon confirm if any subgrade utilities or easements may be associated with this feature.

Response: A copy of the revised plans is enclosed.

HDR Comment: Confirm if any variances or waivers from the City's Wireless Code are being requested.

Response: Verizon Wireless is not currently seeking any variances or waivers.

HDR Comment: An alternate height coverage map / capacity statement is requested, evaluating the feasibility of an antenna centerline height of 40 ft agl (vs. the proposed 50 ft antenna centerline height). The same frequencies (2100 MHz) and RF criteria (-95 dBm) as used in the prior Engineering Necessity Case – "Howland Micro" should be used. This supplemental information is requested to justify the proposed pole height, and the differential in coverage + capacity afforded to the area.

Response: A revised Radio Frequency Justification report has been prepared and enclosed, which includes a slide showing the coverage associated with a 40' utility pole.

HDR Comment: In the Engineering Necessity Case – "Howland Micro", please describe the reason for differences between:

- Page 19 – The Green "proposed coverage" on the Map entitled, Proposed (Mt. Beacon Gamma Off) 2100MHz Best Server - 95dBm RSRP and Page 22 – The Yellow "proposed coverage" around the Howland site as depicted on the Map entitled, Proposed 2100 MHz Coverage.

Response: There were some mis-labeled coverage thresholds in the title of the slides in the Radio Frequency Justification. This was an oversight and has been corrected in the revised analysis enclosed herewith.

HDR Comment: Provide dimensions and 'cut sheets' (vender specs) of all proposed pole-mounted and ground-based equipment including the panel antennas, RRH unit, diplexers, and electric meter. These "cut sheets" will supplement the details provided on DWG Z-4. Recommendations on colors of small cell equipment and landscaping / fencing will be provided in the HDR Tech Memo.

Response: Enclosed.

HDR Comment: Provide location and description of FCC-type warning signage and Verizon Contact signage.

Response: FCC warning signs are typically confirmed after an application has been approved. We will place an order for the specific required signs and provide them in advance of the next regular meeting.

HDR Comment:	Confirm no back-up power (e.g., generator) is proposed as part of the application.
Response:	Back up emergency power (i.e. a generator) is not proposed.
HDR Comment:	Maintenance and Inspection Plan. A 1-page document was provided in the application materials (and dated November 19, 2018). As this is a new structure to support a small cell facility, the HDR Tech Memo will provide Recommendations for specific maintenance provisions (including but not limited to fencing and any requirements that are set forth for screening or landscaping around the proposed ground-based equipment).
Response:	No response required other than to note that the application includes a fence to screen the base of the facility. The fence will match the existing fence surrounding the garbage dumpster.

We trust that the above information and that which is enclosed herewith satisfies HDR's concerns and look forward to discussing this with the City Council at its next meeting.

Very truly yours,
YOUNG/SOMMER, LLC

Scott Olson

Cc: Michael Musso, M.S., MPH, PE
Nicholas Ward-Willis, Esq.
Michael R. Crosby (VZW)

verizon

PROJECT NO.: 20161509173

SITE NAME:

HOWLAND MICRO

811 48 HOURS PRIOR TO DIGGING, CONTRACTOR TO NOTIFY ALL UTILITY COMPANIES TO LOCATE ALL UNDERGROUND UTILITIES.

Know what's **below.**
Call before you dig.

DRAWING INDEX

SHEET	DESCRIPTION
T-1	TITLE SHEET
Z-1	SITE PLAN
Z-2	OVERALL SITE PLAN
Z-3	POLE ELEVATION, DETAILS & NOTES
Z-4	DETAILS & NOTES

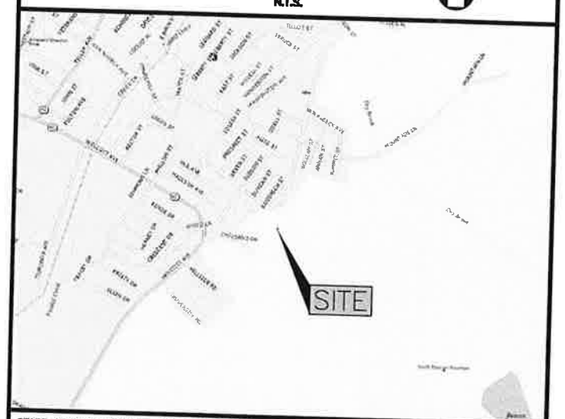
CODE COMPLIANCE

ALL WORK AND MATERIALS SHALL BE PERFORMED AND INSTALLED IN ACCORDANCE WITH THE CURRENT EDITIONS OF THE CODES AS ADOPTED BY THE LOCAL GOVERNING AUTHORITIES. NOTHING IN THESE PLANS IS TO BE CONSTRUED TO PERMIT WORK NOT CONFORMING TO THE LOCAL CODES:

1. IBC2015 WITH LATEST NEW YORK STATE AMENDMENTS
2. NFPA 70-14 (NEC 2014)
3. TIA-222-G-05 WITH LATEST ADDENDA

VICINITY MAP

N.T.S.



START AT 1275 JOHN ST. GO STRAIGHT (NE) ON JOHN ST. IN 0.61 MI TURN RIGHT (E) ON TO BAILEY RD. IN 1.03 MI TURN RIGHT (SSW) ON TO SR 15 (W HENRIETTA RD). IN 1.04 MI TURN LEFT (E) ON TO LEHIGH STATION RD. IN 0.49 MI TURN RIGHT (SSW) ON TO I-390 S RAMP. IN 0.27 MI KEEP RIGHT (SW) ON TO I-90 E (NEW YORK STATE THWY) RAMP 12B. IN 0.57 MI KEEP LEFT (E) ON I-90 E (NEW YORK STATE THWY) RAMP. IN 72.90 MI KEEP RIGHT (N) ON TO I-690 E RAMP 39. IN 0.92 MIKEEP RIGHT (ESE) ON I-690 E RAMP. IN 8.91 MI KEEP RIGHT (SSE) ON TO I-81 S RAMP 13. IN 76.37 MI KEEP LEFT (ESE) ON TO SR 17 RAMP 2E. IN 113.42 MI KEEP RIGHT (ENE) ON TO I-84 E RAMP 121. IN22.57 MI KEEP RIGHT (E) ON TO SR 9D (NORTH RD) RAMP 11. IN 0.21 MI TURN RIGHT (SSW) ON TO SR 9D (NORTH RD). IN 0.48 MI KEEP LEFT (S) ON TO NORTH AVE. IN 0.26 MI KEEP RIGHT (SSW) ON TO SR 9D (WOLCOTT AVE). IN 0.49 MI KEEP LEFT (SE) ON TO BEEKMAN ST 1.57 MI. IN 0.20 MI GO STRAIGHT (ESE) ON TO SR 9D (WOLCOTT AVE). IN 1.11 MI TURN LEFT (ENE) ON TO HOWLAND AVE. IN 0.26 MI FINISH AT 110 HOWLAND AVE, BEACON, NY. 05:22:36 302.11 MI.

PROJECT INFORMATION

SITE TYPE:	UTILITY POLE
SITE NAME:	HOWLAND MICRO
SITE ADDRESS:	110 HOWLAND AVENUE BEACON, NY 12508
COUNTY:	DUTCHESS
ZONING DISTRICT:	R1-40
COORDINATES:	LATITUDE: 41° 29' 40.66" N (NAD 83) LONGITUDE: 73° 57' 19.85" W (NAD 83)
GROUND ELEVATION:	251± A.M.S.L. (NAVD88)
PROPERTY OWNER:	ABILITY BEYOND DISABILITY 4 BERKSHIRE BLVD. BETHEL, CT 06801
APPLICANT:	ORANGE COUNTY POUGHKEEPSIE LIMITED PARTNERSHIP D/B/A VERIZON WIRELESS 1275 JOHN ST. SUITE 100 WEST HENRIETTA NY 14586

APPLICANT:
verizon
275 JOHN ST.
SUITE 100
WEST HENRIETTA NY 14586

PREPARED BY:
EBI ENGINEERING PC
21 B Street | Burlington, MA 01803
Tel: (781) 273-2500 | Fax: (781) 273-3311
www.ebiconsulting.com

STATE OF NEW YORK — KELLY WADE SHANNON — 096107-1 — LICENSED PROFESSIONAL ENGINEER

ENGINEER STAMP/SIGNATURE

SUBMITTALS

NO.	DATE	DESCRIPTION	BY
A	11/12/18	90% ISSUE	SM
B	11/21/18	REVISED PER COMMENTS	SH
C	01/14/19	REVISED PER COMMENTS	SM
D	03/05/19	REVISED SITE PLAN	KS

EBI JOB NO: 8118000249

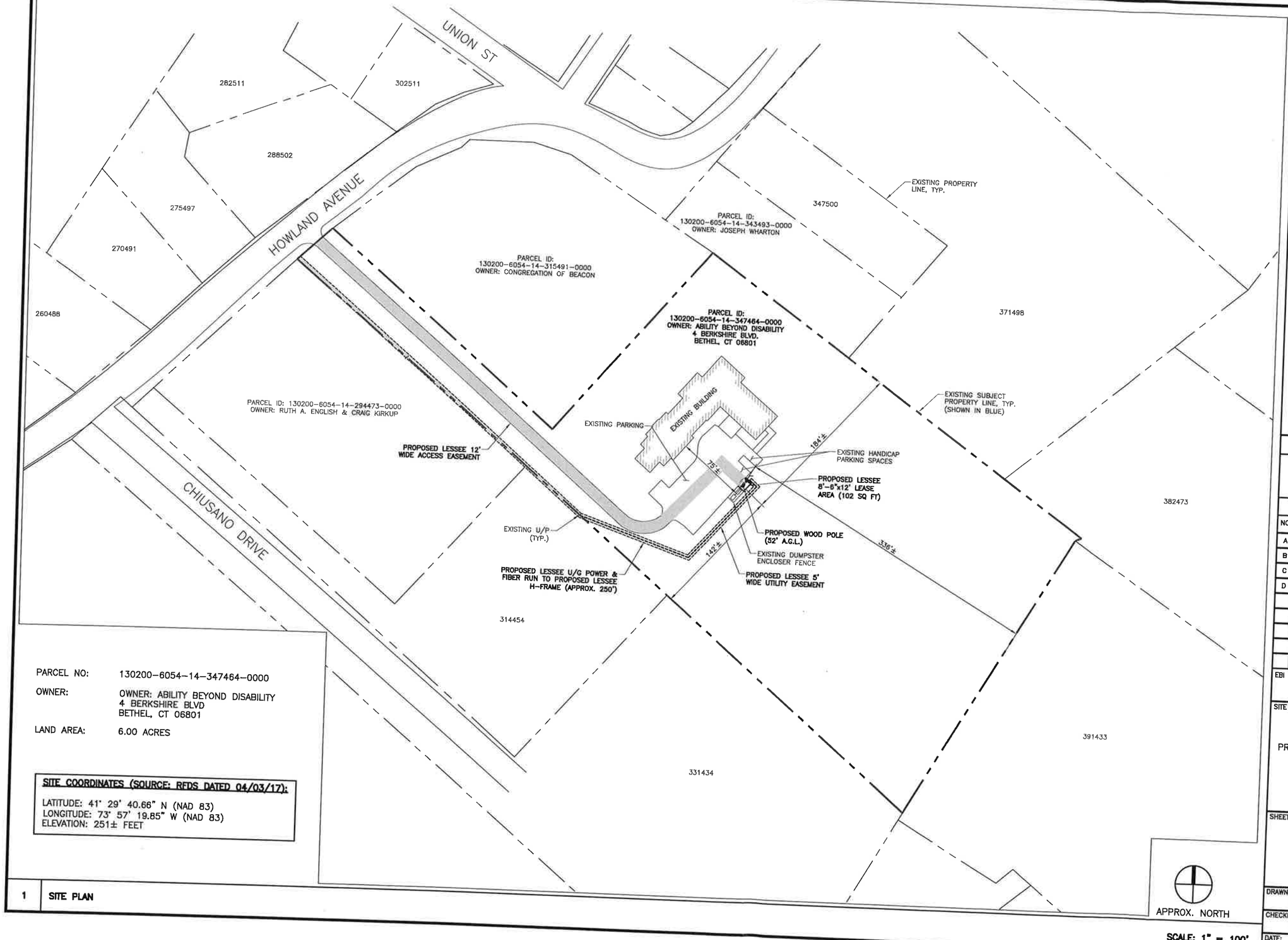
SITE INFO:

HOWLAND MICRO
PROJECT NO.: 20161509173
LOCATION CODE: 432846
110 HOWLAND AVENUE
BEACON, NY 12508
DUTCHESS COUNTY

SHEET TITLE: TITLE SHEET

DRAWN BY: SM
CHECKED BY: AG
DATE: 11/12/18

SHEET NO: T-1



PARCEL NO: 130200-6054-14-347464-0000

OWNER: OWNER: ABILITY BEYOND DISABILITY
4 BERKSHIRE BLVD
BETHEL, CT 06801

LAND AREA: 6.00 ACRES

SITE COORDINATES (SOURCE: RFDS DATED 04/03/17):

LATITUDE: 41° 29' 40.66" N (NAD 83)
LONGITUDE: 73° 57' 19.85" W (NAD 83)
ELEVATION: 251± FEET

1 SITE PLAN

SCALE: 1" = 100'

APPLICANT:

verizon

275 JOHN ST.
SUITE 100
WEST HENRIETTA NY 14586

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STATE OF NEW YORK
KELLY MARK SHANNON
098107-1
LICENSED PROFESSIONAL ENGINEER

Kelly Shannon

ENGINEER STAMP/SIGNATURE

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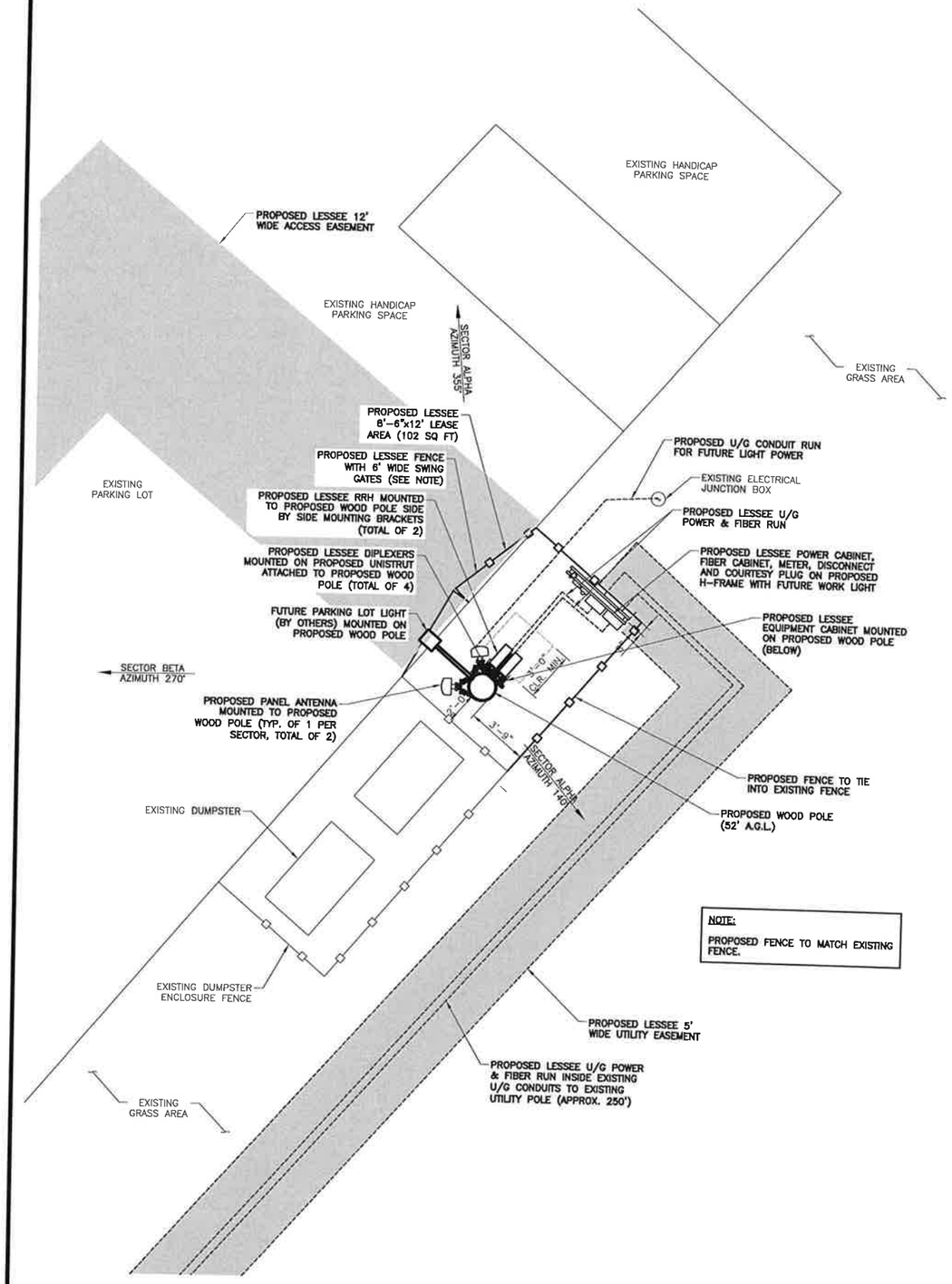
BEACON, NY 12508
DUTCHESS COUNTY

SHEET TITLE: SITE PLAN

DRAWN BY: SM
CHECKED BY: AG
DATE: 11/12/18

SHEET NO: Z-1



NOTE:

PROPOSED FENCE TO MATCH EXISTING FENCE.

SYMBOLS & ABBREVIATIONS

	GROUND WIRE
	ELECTRIC
	TELCO SERVICE
	OVER HEAD UTILITY
	FENCE
(E)	EXISTING
(P)	PROPOSED
A.F.F.	ABOVE FINISHED FLOOR
A.G.L.	ABOVE GROUND LEVEL
A.M.S.L.	ABOVE MEAN SEA LEVEL
E.Q.	EQUAL
GALV.	GALVANIZED
MAX.	MAXIMUM
MIN.	MINIMUN
MGB	MASTER GROUND BAR
EGB	EQUIPMENT GROUND BAR
N.T.S.	NOT TO SCALE
O.C.	ON CENTER
SCH.	SCHEDULE
TYP.	TYPICAL
U/G	UNDERGROUND
U/P	UTILITY POLE
V.I.F.	VERIFY IN FIELD
DET / SHT	DETAIL REFERENCE
DET / SHT	DETAIL SECTION REFERENCE
ELEV. 350'-0"	SURFACE ELEVATION
SECT / SHT	SECTION REFERENCE
SECT / SHT	ELEVATION REFERENCE
	PROPERTY LINE – SUBJECT PARCEL
	PROPERTY LINE – ABUTTERS
	ZONING DISTRICT BOUNDARY LINE
	TOWN BOUNDARY LINE
	EXISTING BUILDINGS

PARCEL NO: 6258-01-081999-0000

OWNER: CROSS COURT ASSOCIATES
204 NEW HACKENSACK RD
WAPPINGERS FALLS, NY 12590

LAND AREA: 6.00 ACRES

APPROX. NORTH

SCALE: 1/8" = 1'-0"

1 OVERALL SITE PLAN

3 SITE NOTES

1. THE PROJECT CONCERNS THE INSTALLATION/OPERATION AND MAINTENANCE OF AN UNMANNED PUBLIC UTILITY/PERSONAL WIRELESS SERVICE FACILITY.
2. THE PROPOSED DEVELOPMENT IS UNMANNED AND DOES NOT REQUIRE A MEANS OF WATER SUPPLY OR SEWAGE DISPOSAL, OR HANDICAPPED ACCESS.
3. THE PROPOSED DEVELOPMENT IS MINIMAL, AND WILL CREATE NEGLIGIBLE ADDITIONAL STORMWATER RUNOFF AND WILL THEREFORE NOT IMPACT THE EXISTING STORMWATER DRAINAGE SYSTEM.
4. THE PROPOSED DEVELOPMENT DOES NOT INCLUDE OUTDOOR STORAGE, ANY SOLID WASTE RECEPTACLES, OR PLUMBING.
5. ADEQUATE PARKING EXISTS FOR ONE VEHICLE FOR MAINTENANCE OR EMERGENCY SERVICE ONCE A MONTH.
6. THERE ARE NO NEW STREETS, CURBS, SIDEWALKS OR WALKWAYS PROPOSED.
7. THERE ARE NO COMMERCIAL SIGNS PROPOSED FOR THIS INSTALLATION.
8. EXISTING UTILITIES (LOCATION, SIZES AND INVERTS) SHOWN ON THE PLANS ARE APPROXIMATE AND ARE NOT CERTIFIED AS TO THE ACCURACY OF THEIR LOCATION OR COMPLETENESS. THE CONTRACTOR SHALL BE RESPONSIBLE FOR DETERMINING THE EXACT LOCATIONS AND DEPTHS OF ALL UTILITIES AND STRUCTURES IN THE PATH OF, OR CLOSELY PARALLEL TO, OR UNDER, THE PROPOSED CONSTRUCTION. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ANY DELAYS OR DAMAGE OCCURRING AS A RESULT OF INCORRECTLY LOCATED UTILITIES. IT IS THE CONTRACTORS RESPONSIBILITY TO NOTIFY THE VARIOUS UTILITY OWNERS IN AMPLE TIME FOR THEM TO LOCATE AND MARK THEIR FACILITIES. THE CONTRACTOR SHALL ALSO NOTIFY UNDERGROUND UTILITY WORK LOCATION SERVICE AT LEAST 48 HOURS IN ADVANCE OF COMMENCING ANY WORK.

2 GENERAL NOTES

1. ALL SITE WORK SHALL BE INDICATED ON THE DRAWING.
2. RUBBISH, STUMPS, DEBRIS, STICKS, STONES, AND OTHER REFUSE SHALL BE REMOVED FROM THE SITE AND DISPOSED OF LEGALLY.
3. THE SITE SHALL BE GRADED TO CAUSE SURFACE WATER TO FLOW WAY FROM THE EQUIPMENT AND TOWER AREAS.
4. NO FILL OR EMBANKMENT MATERIAL SHALL BE PLACED ON FROZEN GROUND. FROZEN MATERIALS, SNOW OR ICE SHALL NOT BE PLACED IN ANY FILL OR EMBANKMENT.
5. THE SUBGRADE SHALL BE COMPACTED AND BROUGHT TO A SMOOTH UNIFORM GRADE PRIOR TO FINISH SURFACE APPLICATION.
6. ALL EXISTING ACTIVE SEWER WATER, GAS, ELECTRIC, AND OTHER UTILITIES WHERE ENCOUNTERED IN THE WORK, SHALL BE PROTECTED AT ALL TIMES, AND WHERE REQUIRED FOR THE PROPER EXECUTION OF THE WORK, SHALL BE RELOCATED AS DIRECTED BY ENGINEERS, EXTREME CAUTION SHOULD BE USED BY THE CONTRACTOR WHEN EXCAVATING OR PIER DRILLING AROUND OR NEAR UTILITIES.
7. ALL EXISTING INACTIVE SEWER, WATER, GAS, ELECTRIC, AND OTHER UTILITIES, WHICH INTERFERE WITH THE EXECUTION OF THE WORK, SHALL BE REMOVED AND/OR CAPPED, PLUGGED OR OTHERWISE DISCONTINUED AT POINTS WHICH WILL NOT INTERFERE WITH EXECUTION OF THE WORK, SUBJECT TO THE APPROVE OF ENGINEERING.
8. THE AREA DISTURBED DUE TO CONSTRUCTION ACTIVITY SHALL BE GRADED TO A UNIFORM SLOPE, FERTILIZED, SEEDED, AND COVERED WITH MULCH.
9. CONTRACTOR SHALL MINIMIZE DISTURBANCE TO EXISTING SITE DURING CONSTRUCTION. EROSION CONTROL MEASURES, IF REQUIRED DURING CONSTRUCTION, SHALL BE IN CONFORMANCE WITH THE NEW YORK STATE GUIDELINES FOR EROSION AND SEDIMENT CONTROL, AND COORDINATED WITH THE TOWN.
10. CONTRACTOR SHALL NOTIFY UNDERGROUND FACILITIES PROTECTIVE ORGANIZATION AT TELEPHONE NUMBER 1-800-962-7962 PRIOR TO EXCAVATION AT SITE.
11. ALL EXCAVATION WORK WITHIN 36" OF EITHER SIDE OF UNDERGROUND UTILITIES MUST BE DONE BY HAND EXCAVATION METHODS.

APPLICANT:

verizon

275 JOHN ST.
SUITE 100
WEST HENRIETTA NY 14586

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STATE OF NEW YORK
KELLY MARK SHEARN
098107-1
LICENSED PROFESSIONAL ENGINEER

ENGINEER STAMP/SIGNATURE

SUBMITTALS

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D	03/05/19	REVISED SITE PLAN	KS

EBI JOB NO: 8118000249

SITE INFO:

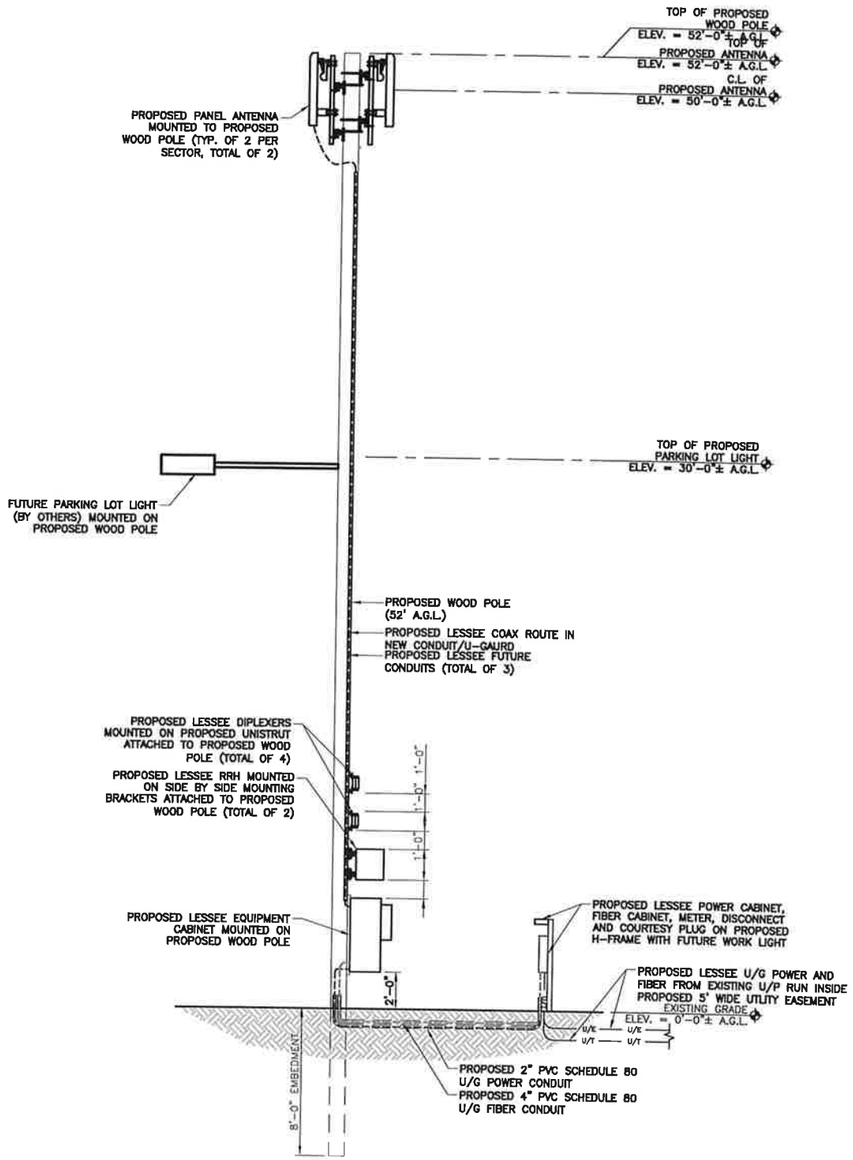
HOWLAND MICRO
PROJECT NO.: 20161509173
LOCATION CODE: 432846
110 HOWLAND AVENUE
BEACON, NY 12508
DUTCHESS COUNTY

SHEET TITLE:

OVERALL SITE PLAN

DRAWN BY: SM
CHECKED BY: AG
DATE: 11/12/18

SHEET NO: Z-2



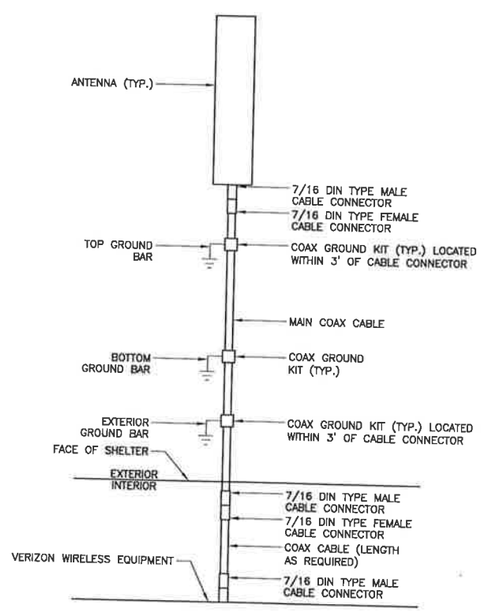
1 **POLE ELEVATION** — SCALE: 1/8" = 1'-0"

1. DESIGN AND CONSTRUCTION OF ANTENNA SUPPORTS SHALL CONFIRM TO ANSI/TIA/EIA-222-G-05 WITH LATEST ADDENDA "STRUCTURAL STANDARDS FOR STEEL ANTENNA TOWERS AND ANTENNA SUPPORTING STRUCTURES". NOTE: SEE CODE FOR COUNTY SPECIFIC DESIGN WIND SPEEDS.
2. ALL STEEL MATERIALS SHALL BE GALVANIZED AFTER FABRICATION IN ACCORDANCE WITH ASTM A123 "ZINC (HOT-DIP GALVANIZED) COATINGS ON IRON AND STEEL PRODUCTS", UNLESS OTHERWISE NOTED.
3. ALL BOLTS, ANCHORS AND MISCELLANEOUS HARDWARE SHALL BE GALVANIZED IN ACCORDANCE WITH ASTM A153 "ZINC-CAOTING (HOT DIP) ON IRON AND STEEL HARDWARE', UNLESS OTHERWISE NOTED.
4. DAMAGE GALVANIZE SURFACES SHALL BE REPAIRED BY COLD GALVANIZING IN ACCORDANCE WITH ASTM A780.
5. ALL ANTENNA MOUNTS SHALL BE INSTALLED WITH DOUBLE NUTS AND SHALL BE INSTALLED SNUG TIGHT.
6. DESIGN RESPONSIBILITY OF ANTENNA MOUNTING BRACKETS, SUPPORTS AND ALL COMPONENTS THEREOF AND ATTACHMENT THERETO SHALL BE THE RESPONSIBILITY OF THE MANUFACTURER. MFR SHALL PROVIDE THE THE OWNER DRAWINGS DETAILING ALL COMPONENTS OF THE ASSEMBLY, INCLUDING CONNECTIONS, DESIGN LOADS, AND ALL OTHER PERTINENT DATA. MFR SHALL ALSO PROVIDE THE OWNER WITH A STATEMENT OF COMPLIANCE INDICATING THAT THE ANTENNA SUPPORTS HAVE BEEN DESIGNED IN ACCORDANCE WITH TIA/EIA-222-G STANDARDS. ALL SUBMISSIONS SHALL BEAR THE STAMP AND SIGNATURE OF A PROFESSIONAL ENGINEER REGISTERED IN THE STAT THE WORK IS BEING PERFORMED.

2 **ANTENNA MOUNTING NOTES**

1. VERIZON WILL COLOR CODE AND TAG THE COAX AT BOTH THE TOP OF THE TOWER AND INSIDE THE CELL SITE BUILDING AT THE CABLE ENTRY PART. THE MARKING SYSTEM WILL COMPRISE OF COLOR TAPE WITH A MINIMUM WIDTH OF 3/4 INCHES, 7 MIL. VINYL PLASTIC TAPE, SCOTCH 35 OR EQUIVALENT.
2. THE TAGGING WILL BE DONE WITH METAL "DOG" TAGS. A TAG WILL BE PLACED ON THE COAX AT THE ANTENNA AND ON THE COAX IN THE CELL SITE BUILDING. THE TAG WILL IDENTIFY THE ANTENNA NUMBER AND FUNCTION; TX, RX ETC.
3. THE ENTRY PORT ASSIGNMENT SHOULD BE FOLLOWED WHERE POSSIBLE. THIS STANDARD ASSUMES THAT THE ENTRY PORT CONSISTS OF THREE ROWS OF FOUR PORTS. WITH THE FIRST ROW BEING NUMBERED FROM 1-6 FROM LEFT TO RIGHT. THE SECOND ROW IS NUMBERED 7-12 (LEFT TO RIGHT) AND THE THIRD ROW IS 13-18 (LEFT TO RIGHT).
4. A SITE SPECIFIC COAX COLOR SHEET TO BE PROVIDED BY CELLULAR EQUIPMENT ENGINEER.

3 **STANDARD ANTENNA COLOR CODES**



4 **ANTENNA CABLE SCHEMATIC**

APPLICANT:

verizon

275 JOHN ST.
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WEST HENRIETTA NY 14586

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ENGINEER STAMP/SIGNATURE

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EBI JOB NO: 8118000249

SITE INFO:

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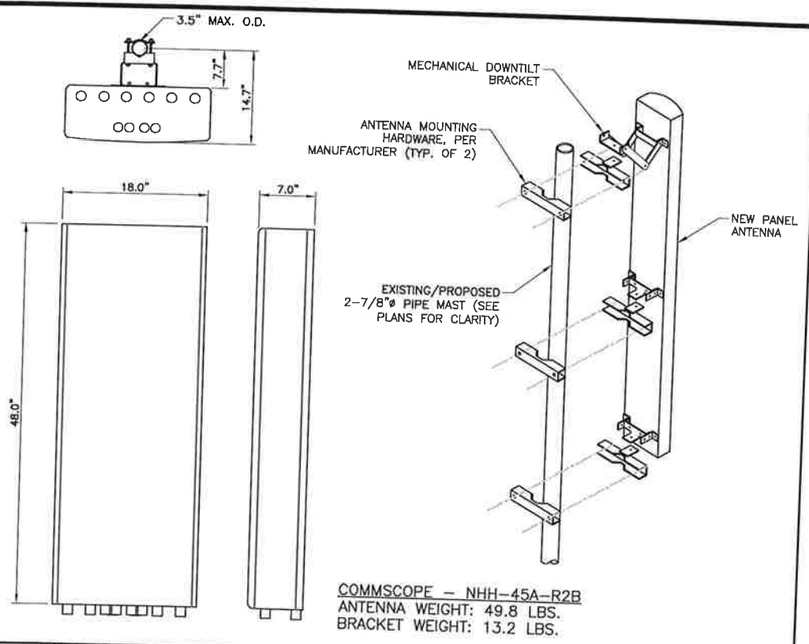
PROJECT NO.: 20161509173
LOCATION CODE: 432846
110 HOWLAND AVENUE
BEACON, NY 12508
DUTCHESS COUNTY

SHEET TITLE:

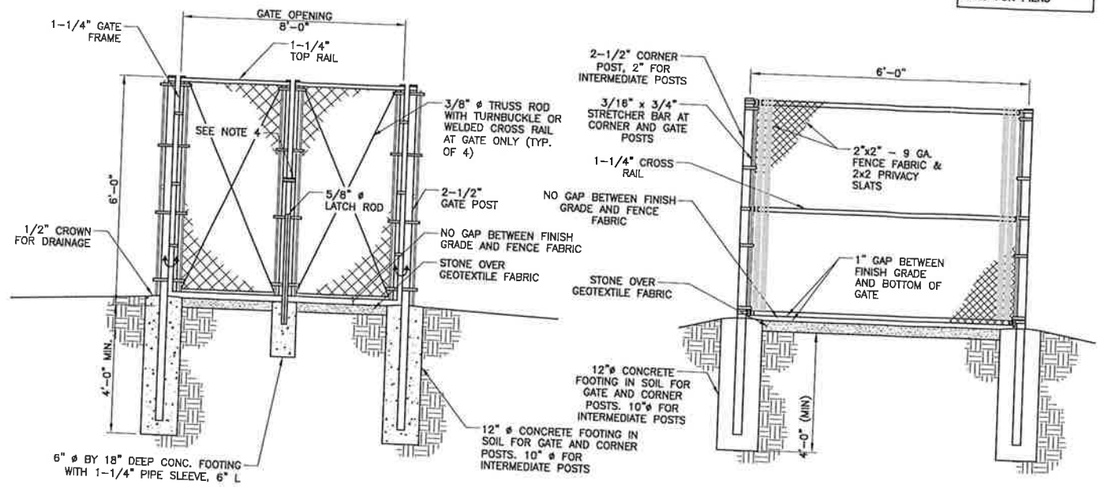
POLE ELEVATION, DETAILS & NOTES

DRAWN BY: SM
CHECKED BY: AG
DATE: 11/12/18

SHEET NO: Z-3



1 **ANTENNA SPECIFICATION & ATTACHMENT DETAIL**

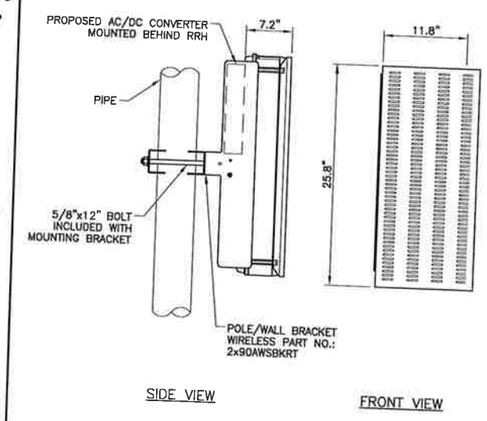


2 **NON-PENETRATING BALLAST MOUNT DETAILS** N.T.S.

GENERAL NOTES:

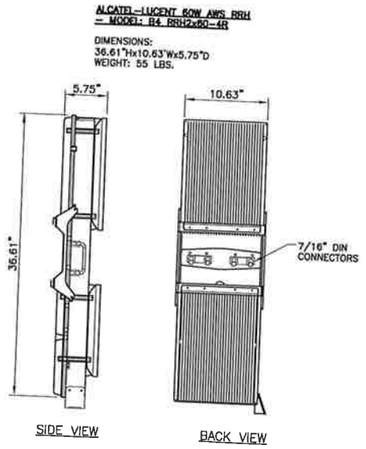
1. ALL WORK PRESENTED ON THESE DRAWINGS MUST BE COMPLETED BY THE CONTRACTOR UNLESS NOTED OTHERWISE. THE CONTRACTOR MUST HAVE CONSIDERABLE EXPERIENCE IN PERFORMANCE OF WORK SIMILAR TO THAT DESCRIBED HEREIN. BY ACCEPTANCE OF THIS ASSIGNMENT, THE CONTRACTOR IS ATTESTING THAT HE DOES HAVE SUFFICIENT EXPERIENCE AND ABILITY, THAT HE IS KNOWLEDGEABLE OF THE WORK TO BE PERFORMED AND THAT HE IS PROPERLY LICENSED, REGISTERED AND INSURED TO DO THIS WORK IN THE STATE AND/OR COUNTY IN WHICH IT IS TO BE PERFORMED.
2. ALL MATERIALS AND EQUIPMENT FURNISHED SHALL BE NEW AND OF GOOD QUALITY, FREE FROM FAULTS AND DEFECTS AND IN CONFORMANCE WITH THE CONTRACT DOCUMENTS. ANY AND ALL SUBSTITUTIONS MUST BE PROPERLY APPROVED AND AUTHORIZED IN WRITING BY VERIZON WIRELESS AND THE ENGINEER PRIOR TO INSTALLATION. THE CONTRACTOR SHALL FURNISH SATISFACTORY EVIDENCE AS TO THE KIND AND QUALITY OF THE MATERIALS AND EQUIPMENT BEING SUBSTITUTED.
3. THE CONTRACTOR SHALL BE RESPONSIBLE FOR INITIATING, MAINTAINING, AND SUPERVISING ALL SAFETY PRECAUTIONS AND PROGRAMS IN CONNECTION WITH THE WORK. THE CONTRACTOR IS RESPONSIBLE FOR INSURING THAT THIS PROJECT AND RELATED WORK COMPLIES WITH ALL APPLICABLE LOCAL, STATE AND FEDERAL SAFETY CODES AND REGULATIONS GOVERNING THIS WORK.
4. ALL DIMENSIONS SHALL BE VERIFIED WITH THE PLANS (LATEST REVISION) PRIOR TO COMMENCING CONSTRUCTION. NOTIFY VERIZON WIRELESS IMMEDIATELY IF DISCREPANCIES ARE DISCOVERED.
5. ALL MATERIALS AND WORKMANSHIP SHALL BE WARRANTED FOR ONE (1) YEAR FROM DATE OF ACCEPTANCE.

3 **GENERAL NOTES**

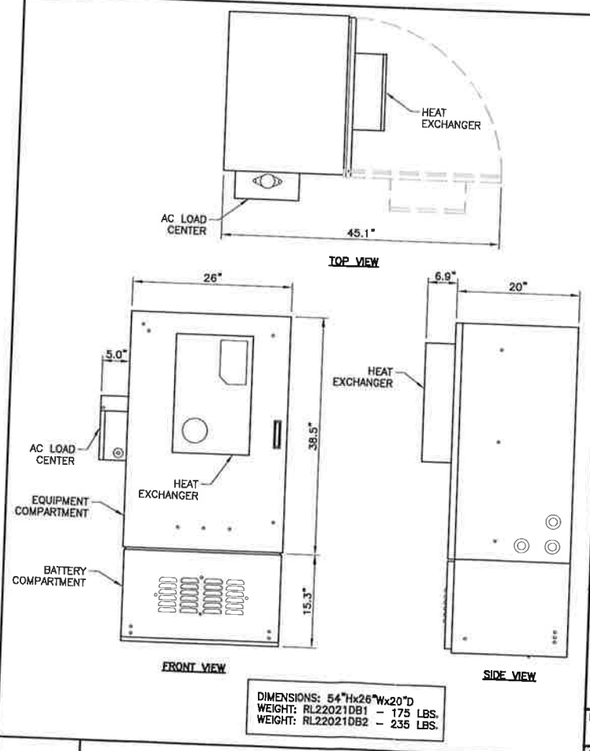


B66A RRH2x90-AWS
DIMENSIONS: 25.8"Hx11.8"Wx7.2"D
WEIGHT: 56.8 LBS. (WITH SOLAR SHIED)

4 **RRH SPECIFICATION & ATTACHMENT DETAIL** N.T.S.



5 **RRH SPECIFICATION & ATTACHMENT DETAIL** N.T.S.



6 **SMALL SITE SUPPORT CABINET DETAIL** N.T.S.

APPLICANT:
verizon
275 JOHN ST.
SUITE 100
WEST HENRIETTA NY 14586

PREPARED BY:
EBI ENGINEERING PC
21 B Street | Burlington, MA 01803
Tel: (781) 273-2500 | Fax: (781) 273-3311
www.ebiconsulting.com

STATE OF NEW YORK KELLY M. SHARPE LICENSED PROFESSIONAL ENGINEER 098107-1

ENGINEER STAMP/SIGNATURE

SUBMITTALS

NO.	DATE	DESCRIPTION	BY
A	11/12/18	90% ISSUE	SM
B	11/21/18	REVISED PER COMMENTS	SH
C	01/14/19	REVISED PER COMMENTS	SM
D	03/05/19	REVISED SITE PLAN	KS

EBI JOB NO: 8118000249

SITE INFO:
HOWLAND MICRO
PROJECT NO.: 20161509173
LOCATION CODE: 432846
110 HOWLAND AVENUE
BEACON, NY 12508
DUTCHESS COUNTY

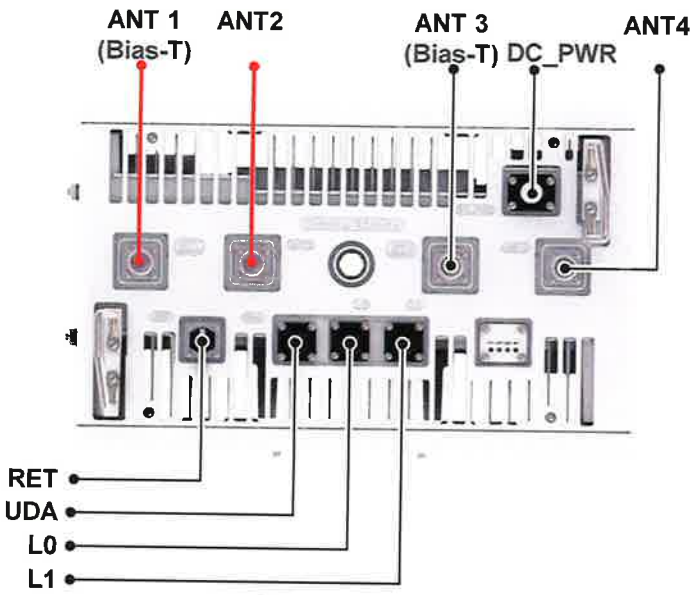
SHEET TITLE:
DETAILS & NOTES

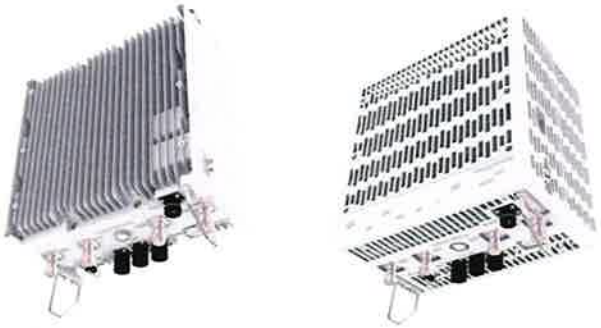
DRAWN BY: SM
CHECKED BY: AG
DATE: 11/12/18

SHEET NO: Z-4

700/850MHz Dual-Band RRH (B13+B5)

700/850MHz Dual-Band RRH (B13+B5)





w/o Finger Guard

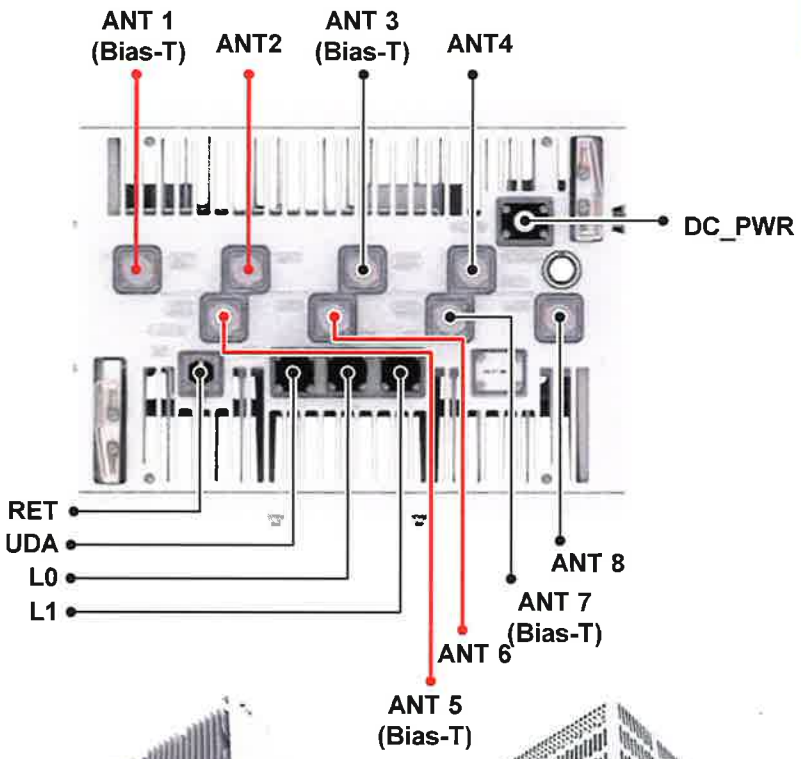
w/ Finger Guard

Category		Specification	
RF	Band	Band13 (700MHz)	Band5 (850MHz)
	Frequency	DL : 746 ~ 756MHz UL : 777 ~ 787MHz	DL : 869 ~ 894MHz UL : 824 ~ 849MHz
	IBW/OBW	10MHz/10MHz	25MHz/25MHz
	# of Carriers	1 Carriers	3 Carriers
	Total # of Carriers	4 Carriers	
	RF power	Total 320W 40W x 4 or 60W x 2	40W x 4 or 60W x 2
	Ant. configuration	4T4R/2T4R/2T2R, SW configurable	
Electrical	Input Power	-48VDC (-38VDC to -57VDC)	
	Power consumption	About 1106 Watt @ 100% RF load, typical conditions + TMA/RET	
Mechanical	Size (W × H× D)	15" x 15" x 8.1" (380 x 380 x 207 mm)	
	Volume	29.9L	
	Weight	70.3lb (31.9kg), w/o solar shield	
Environmental	Operating temperature	-40°C ~ 55°C w/o solar load	
Feature	Modulation	256 QAM support	
	Spectrum Analyzer	Support for TX/RX	
	PIM Cancellation	Support	
	NB-IoT	Support	
	CPRI Cascade	Not supported	
	Optic Interface	20km, 2 ports (9.8Gbps x 2), SFP, single mode, Duplex / BiDi	
	RET & TMA	AISG 2.2	
	Bias-T	2 ports (Max. 49W)	
	External Alarm	4	

Note : 2T supported in ANT1 and ANT2

PCS/AWS Dual-Band RRH (B2+B66)

PCS/AWS Dual-Band RRH (B2+B66)



w/o Finger Guard

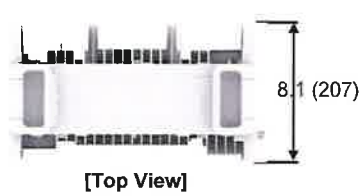
w/ Finger Guard

Note : 2T supported in ANT1 and ANT2 for B66
2T supported in ANT5 and ANT6 for B2

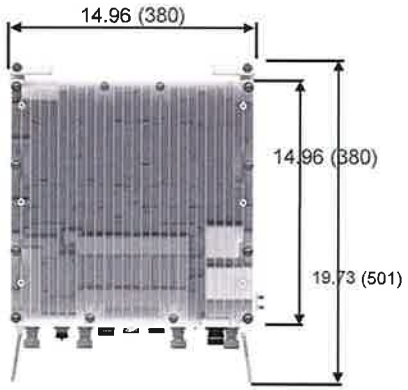
Category		Specification	
RF	Band	Band2 (PCS)	Band66 (AWS)
	Frequency	DL : 1930 ~ 1990MHz UL : 1850 ~ 1910MHz	DL : 2110 ~ 2180MHz UL : 1710 ~ 1780MHz
	IBW/OBW	60MHz/20MHz	70MHz/30MHz
	# of Carriers	2 Carriers	3 Carriers
	Total # of Carriers	4 Carriers	
	RF power	Total 320W (for OBW 40MHz) 40W x 4 or 60W x 2	60W x 4 or 90W x 2
	Ant. configuration	4T4R/2T4R/2T2R, SW configurable	
Electrical	Input Power	-48VDC (-38VDC to -57VDC)	
	Power consumption	About 1270 Watt @ 100% RF load, typical con ditions (w/ BAS Filter)+ TMA/RET	
Mechanical	Size (W × H× D)	15” x 15” x 10” (380 x 380 x 255 mm), w/ BAS	
	Volume	36.8L	
	Weight	84.4lb (38kg), w/o solar shield	
Environmental	Operating temperature	-40°C ~ 55°C w/o solar load	
Feature	Modulation	256 QAM support	
	Spectrum Analyzer	Support for TX/RX	
	PIM Cancellation	Support	
	NB-IoT	Support	
	CPRI Cascade	Not supported	
	Optic Interface	20km, 2 ports (9.8Gbps x 2), SFP, single mode, Duplex / BiDi	
	RET & TMA	AISG 2.2	
	Bias-T	4 ports, 2 ports per Band (Max. 49W)	
	External Alarm	4	

Mechanical/Electrical specifications comparison

Category		700/850 Dual-Band RRH	PCS/AWS Dual-Band RRH
Electrical	Power consumption	About 1106 Watt @ 100% RF load, typical conditions + TMA/RET	About 1270 Watt @ 100% RF load, typical conditions (w/ BAS Filter)+ TMA/RET
Mechanical	Size (W × H× D) w/o Finger Guard	15" x 15" x 8.1" (380 x 380 x 207 mm)	15" x 15" x 10" (380 x 380 x 255 mm)
	Volume	29.9L	36.8L
	Weight (w/o solar shield)	70.3 lb (31.9 kg)	84.4lb (38kg)

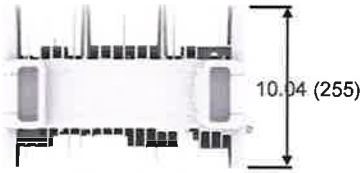


[Top View]

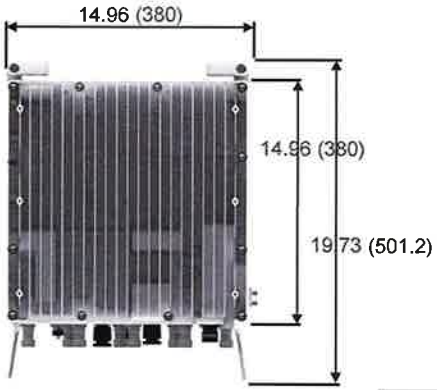


[Front View]

[700/850MHz Dual-Band RRH]



[Top View]



[Front View]

Unit: in. (mm)

[PCS/AWS Dual-Band RRH]

NHH-45A-R2B

6-port sector antenna, 2x 698–896 and 4x 1695–2360 MHz, 45° HPBW, 2x RETs and 2x SBTs. Both high bands share the same electrical tilt.

- Narrow beamwidth capacity antenna for higher level of densification and enhanced data throughput
- Internal SBT on low and high band allow remote RET control from the radio over the RF jumper cable
- Separate RS-485 RET input/output for low and high band
- One LB RET and one HB RET. Both high bands are controlled by one RET to ensure same tilt level for 4x Rx or 4x MIMO

Electrical Specifications

Frequency Band, MHz	**698–806**	**806–896**	**1695–1880**	**1850–1990**	**1920–2200**	**2300–2360**
Gain, dBi	15.5	16.2	18.3	19.0	19.2	20.0
Beamwidth, Horizontal, degrees	48	44	44	44	43	39
Beamwidth, Vertical, degrees	18.5	16.8	7.9	7.3	6.8	6.0
Beam Tilt, degrees	2–18	2–18	1–9	1–9	1–9	1–9
USLS (First Lobe), dB	16	17	17	16	15	15
Front-to-Back Ratio at 180°, dB	32	33	36	36	36	35
Isolation, dB	25	25	25	25	25	25
Isolation, Intersystem, dB	25	25	25	25	25	25
VSWR | Return Loss, dB	1.5 | 14.0	1.5 | 14.0	1.5 | 14.0	1.5 | 14.0	1.5 | 14.0	1.5 | 14.0
PIM, 3rd Order, 2 x 20 W, dBc	-153	-153	-153	-153	-153	-153
Input Power per Port, maximum, watts	350	350	350	350	350	350
Polarization	±45°	±45°	±45°	±45°	±45°	±45°
Impedance	50 ohm	50 ohm	50 ohm	50 ohm	50 ohm	50 ohm

Electrical Specifications, BASTA*

Frequency Band, MHz	**698–806**	**806–896**	**1695–1880**	**1850–1990**	**1920–2200**	**2300–2360**
Gain by all Beam Tilts, average, dBi	15.1	15.9	17.9	18.7	19.0	19.8
Gain by all Beam Tilts Tolerance, dB	±0.5	±0.4	±0.6	±0.4	±0.3	±0.4
Gain by Beam Tilt, average, dBi	2 ° | 15.2 10 ° | 15.1 18 ° | 14.9	2 ° | 16.1 10 ° | 16.0 18 ° | 15.6	1 ° | 17.9 5 ° | 17.9 9 ° | 17.8	1 ° | 18.8 5 ° | 18.8 9 ° | 18.6	1 ° | 19.1 5 ° | 19.1 9 ° | 18.8	1 ° | 19.9 5 ° | 19.9 9 ° | 19.5
Beamwidth, Horizontal Tolerance, degrees	±1.8	±3	±1.9	±1.3	±2.1	±1.6
Beamwidth, Vertical Tolerance, degrees	±1	±0.9	±0.3	±0.3	±0.5	±0.2
USLS, beampeak to 20° above beampeak, dB	17	22	12	13	14	15
Front-to-Back Total Power at 180° ± 30°, dB	24	24	27	29	30	30
CPR at Boresight, dB	24	25	15	18	19	20
CPR at Sector, dB	18	17	11	13	15	16

* CommScope® supports NGMN recommendations on Base Station Antenna Standards (BASTA). To learn more about the benefits of BASTA, download the whitepaper Time to Raise the Bar on BSAs.

NHH-45A-R2B

Array Layout

(Sizes of colored boxes are not true depictions of array sizes)

Array	Freq (MHz)	Conns	RET (SRET)	AISG RET UID
R1	698-896	1-2	1	ANxxxxxxxxxxxxxxx1
Y1	1695-2360	3-4	2	ANxxxxxxxxxxxxxxx2
Y2	1695-2360	5-6		

General Specifications

Operating Frequency Band	1695 – 2360 MHz | 698 – 896 MHz
Antenna Type	Sector
Band	Multiband
Performance Note	Outdoor usage

Mechanical Specifications

RF Connector Quantity, total	6
RF Connector Quantity, low band	2
RF Connector Quantity, high band	4
RF Connector Interface	7-16 DIN Female
Color	Light gray
Grounding Type	RF connector body grounded to reflector and mounting bracket
Radiator Material	Aluminum | Low loss circuit board
Radome Material	Fiberglass, UV resistant
Reflector Material	Aluminum
RF Connector Location	Bottom
Wind Loading, frontal	693.0 N @ 150 km/h 155.8 lbf @ 150 km/h
Wind Loading, lateral	145.0 N @ 150 km/h 32.6 lbf @ 150 km/h
Wind Speed, maximum	241 km/h | 150 mph

NHH-45A-R2B

Dimensions

Length	1220.0 mm | 48.0 in
Width	457.0 mm | 18.0 in
Depth	178.0 mm | 7.0 in
Net Weight, without mounting kit	22.6 kg | 49.8 lb

Remote Electrical Tilt (RET) Information

Input Voltage	10–30 Vdc
Internal Bias Tee	Port 1 | Port 3
Internal RET	High band (1) | Low band (1)
Power Consumption, idle state, maximum	1 W
Power Consumption, normal conditions, maximum	10 W
Protocol	3GPP/AISG 2.0 (Single RET)
RET Interface	8-pin DIN Female | 8-pin DIN Male
RET Interface, quantity	2 female | 2 male

Packed Dimensions

Length	1342.0 mm | 52.8 in
Width	567.0 mm | 22.3 in
Depth	311.0 mm | 12.2 in
Shipping Weight	34.3 kg | 75.6 lb

Regulatory Compliance/Certifications

Agency	**Classification**
RoHS 2011/65/EU	Compliant by Exemption
ISO 9001:2015	Designed, manufactured and/or distributed under this quality management system
China RoHS SJ/T 11364-2014	Above Maximum Concentration Value (MCV)

Included Products

BSAMNT-3 — Wide Profile Antenna Downtilt Mounting Kit for 2.4 - 4.5 in (60 - 115 mm) OD round members. Kit contains one scissor top bracket set and one bottom bracket set.

* Footnotes

Performance Note	Severe environmental conditions may degrade optimum performance

CBC1923T-DS-43 | E14F05P33

Twin Diplexer PCS/AWS+WCS, dc Sense, 4.3-10

- BTS-to-feeder and feeder-to-antenna application
- New 4.3-10 connectors for improved PIM performance and size reduction
- Automatic dc switching with dc sense
- Convertible mounting brackets

General Specifications

Product Family	CBC1923
Modularity	2-Twin
Includes	Mounting hardware

Electrical Specifications

Sub-module	1 | 2	1 | 2
Branch	1	2
Port Designation	PCS	AWS-WCS
License Band	PCS 1900	AWS 1700 WCS 2300

Electrical Specifications, Band Pass

Frequency Range	1850-1995 MHz	1695–1780 MHz 2110–2200 MHz 2305–2360 MHz
Insertion Loss, typical	0.20 dB	0.20 dB
Total Group Delay, typical	13 ns	12 ns
Return Loss, typical	22 dB	22 dB
Isolation, typical	58 dB	53 dB
Input Power, RMS, maximum	200 W	200 W
Input Power, PEP, maximum	2 kW	2 kW
3rd Order PIM, minimum	-161 dBc	
3rd Order PIM Test Method	2 x 20 W CW tones	
Higher Order PIM, minimum		-161 dBc
Higher Order PIM Test Method		2 x 20 W CW tones

Product Classification

Product Type	Diplexer

Common Port Electrical Specifications

Composite Power, RMS	250 W

COMMSCOPE®

AISG Electrical Specifications

AISG Carrier	2176 KHz ± 100 ppm
Insertion Loss, maximum	1.00 dB
Return Loss, minimum	15 dB

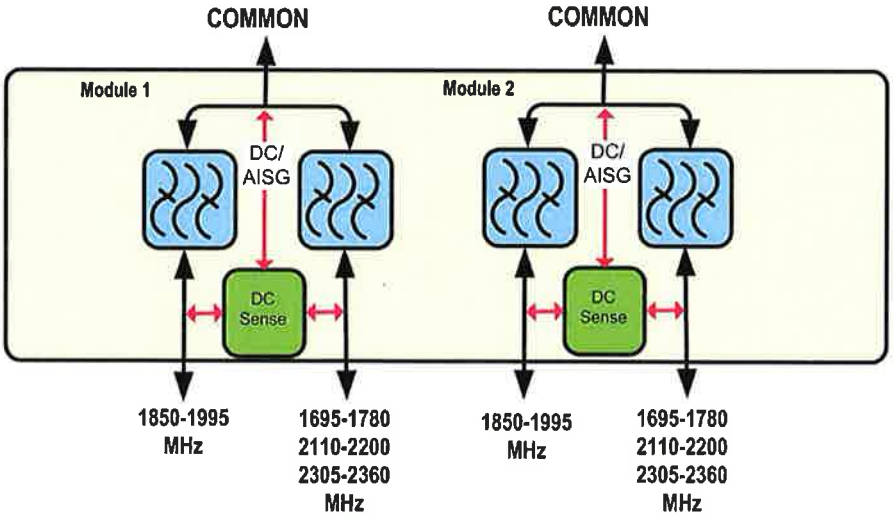
dc Power/Alarm Electrical Specifications

Voltage	7–30 Vdc
dc/AISG Pass-through Method	Auto sensing
dc/AISG Pass-through Path	See logic table
Lightning Surge Current	10 kA
Lightning Surge Current Waveform	8/20 waveform

Electrical Specifications

Impedance	50 ohm

Block Diagram



Logic Table

Combining Mode Operation (Ground Based)			
RF Ports Input DC Voltage			
PCS	AWS/WCS	COMMON	DC/AISG Path Selection
7 ≤ V ≤ 30	<7	<7	PCS to COMMON "ON"
<7	7 ≤ V ≤ 30	<7	AWS/WCS to COMMON "ON"
7 ≤ V ≤ 30	7 ≤ V ≤ 30	<7	AWS/WCS to COMMON "ON"

Splitting Mode Operation (Tower Top)			
RF Ports Impedance DC (Load sensing)			
PCS	AWS/WCS	COMMON	DC/AISG Path Selection
open/load	short	7 ≤ V ≤ 30	COMMON to PCS "ON"
short	open/load	7 ≤ V ≤ 30	COMMON to AWS/WCS "ON"
open/load	open/load	7 ≤ V ≤ 30	ALL ports ON
short	short	7 ≤ V ≤ 30	ALL ports OFF

Mechanical Specifications

RF Connector Interface	4.3-10 Female
RF Connector Interface Body Style	Long neck
Ground Screw Diameter	6.00 mm
Color	Gray
Finish	Painted
Wind Loading, frontal	33.0 N @ 150 km/h 7.4 lbf @ 150 km/h
Wind Loading, lateral	13.0 N @ 150 km/h 2.9 lbf @ 150 km/h

Dimensions

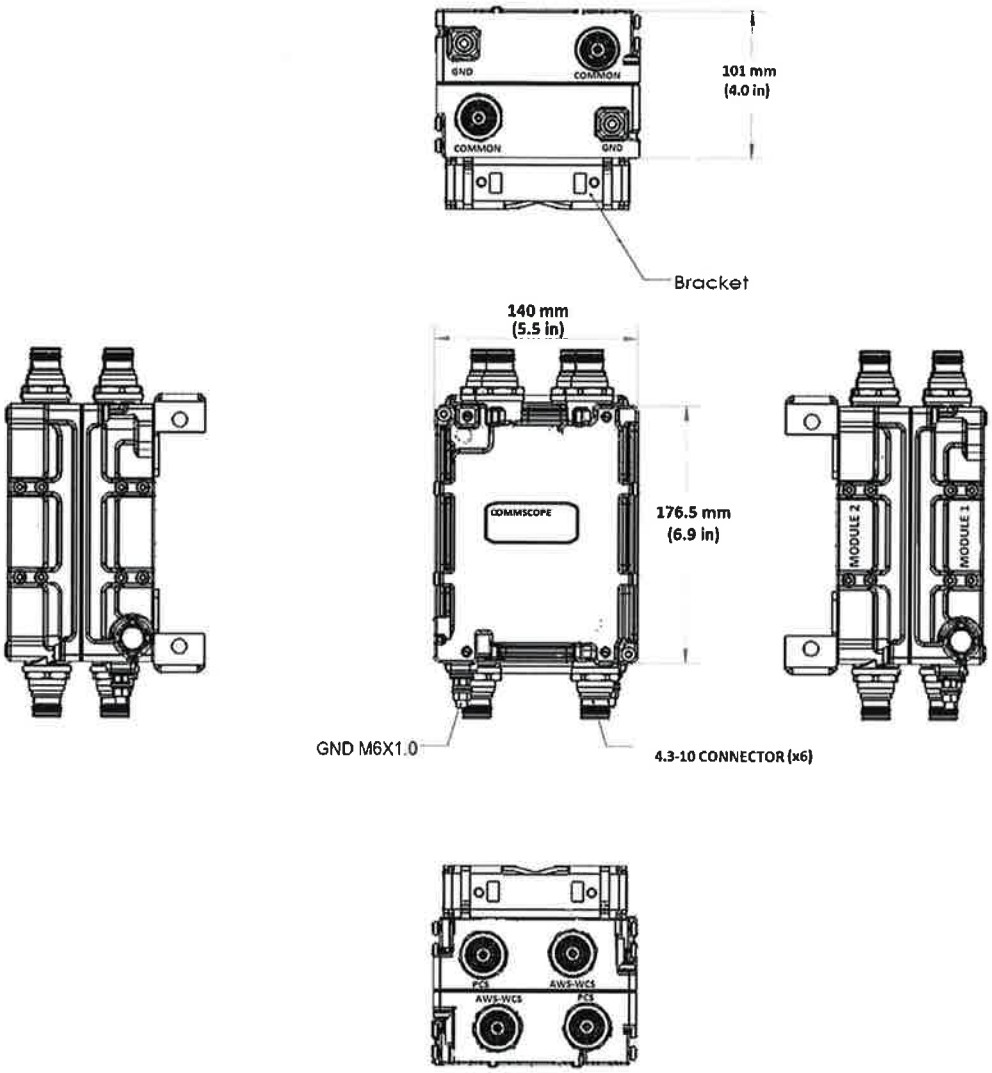
Height	176.5 mm | 6.9 in
Width	140.0 mm | 5.5 in
Depth	101.0 mm | 4.0 in
Volume	2.5 L
Weight, without mounting hardware	3.8 kg | 8.4 lb
Mounting Hardware Weight	0.5 kg | 1.1 lb

Environmental Specifications

Operating Temperature	-40 °C to +65 °C (-40 °F to +149 °F)
Relative Humidity	Up to 100%
Ingress Protection Test Method	IEC 60529:2001, IP67

COMMSCOPE®

Outline Drawing



Verizon Wireless Communications Facility

Engineering Necessity Case – "Howland Micro"

City of Beacon
Beacon DT site
Project Location "Howland Micro"
Town of Fishkill
Mt. Beacon Existing Site

Prepared by: Michael R. Crosby

Project: The project is the installation and operation of a telephone pole mounted wireless telecommunications site in the City of Beacon (the "Project Facility").

verizon

Introduction

he purpose of this subsequent analysis is to summarize and communicate the technical radio frequency (RF) information used the justification of this new site.

overage and/or capacity deficiencies are the two main drivers that prompt the need for a new wireless communications acility/site. All sites provide a mixture of both capacity and coverage for the benefit of the end user.

overage can be defined as the existence of signal of usable strength and quality in an area, including but not limited to in-ehicles or in-buildings.

he need for improved coverage is identified by RF Engineers that are responsible for developing and maintaining the network. F Engineers utilize both theoretical and empirical data sets (propagation maps and real world coverage measurements). istorically, coverage improvements have been the primary justification of new sites.

apacity can be defined as the amount of traffic (voice and data) a given site can process before significant performance egradation occurs.

hen traffic volume exceeds the capacity limits of a site serving a given area, network reliability and user experience degrades. ltimately this prevents customers from making/receiving calls, applications cease functioning, internet connections time out nd data speeds fail. This critical condition is more important than just a simple nuisance for some users. Degradation of etwork reliability and user experience can affect emergency responders and to persons in a real emergency situation can erally mean life or death.

Project Need Overview

The project area, located within the City of Beacon is currently served by two sites. These sites are overloaded requiring capacity relief. Additionally the project area is impacted by the significant terrain difference between these two serving sites relative to the project area. This excessive difference in terrain combined with distance and area morphology prevents effective capacity and coverage capability of Verizon's RF signals in this area.

The primary serving site is **Mt. Beacon** located in the neighboring town of Fishkill, which is approximately six tenths of a mile south east (of the project location) situated on a mountain top tower located off Mt. Beacon Monument Rd (near Breakneck Ridge Trail). While this site provides coverage (on low band 700MHz) throughout the project area, it does so from such a great difference in elevation (1,200'+ difference) that the site is not capable of efficiently or effectively providing the necessary capacity due to Mt. Beacon itself causing excessive interference in and around the project area. This site also provides high band (AWS) service to portions of the project area but again due to the excessive difference in elevation combined with distance to objectives Mt. Beacon is not capable of efficiently or effectively providing the necessary capacity relief and actually degrades area performance and capacity capabilities due to excessive interference in and around the project area (caused by overlapping/overshooting footprint). In order to mitigate the overlapping footprint and improve interference and capacity conditions, Mt. Beacon requires deactivation as it can no longer function properly as an LTE serving site for this area. Regardless of the need to deactivate Mt. Beacon (LTE), additional capacity is currently required even with Mt. Beacon on the air.

The second serving site is **Beacon DT** which is co-located on the roof of a multi-story apartment building off Rt. 9D near South Ave. This site is also requiring capacity relief. While this site is more appropriate for the area than Mt. Beacon, by itself it can not provide the necessary coverage and capacity required to serve the project area.

There are other Verizon sites in this general area but due to distance and terrain they also do not provide any significant overlapping coverage in the area in question that could allow for increased capacity and improved coverage from other sources.

The primary objectives for this project are to increase capacity and improve high band coverage in the Howland Ave, Rt. 9D area including but not limited to portions of Howland, Wolcott Ave, Tioronda Ave, Union St, Depuyster Ave, East Main Street as well as the surrounding residential and commercial areas. In order to offload capacity from Mt. Beacon and Beacon DT a new dominant server must be created. This new dominant coverage will effectively offload the existing overloaded sites as well as provide improved high band in building coverage.

Following the search for co-locatable structures to resolve the aforementioned challenges none were found. As a result, Verizon proposes the current application to attach it's antennas to a new 52' tall telephone pole located on Verizon property. Verizon's antennas will utilize 50' for the ACL (Antenna Center Line) with a top of antenna height of 52'. This solution will provide the necessary coverage and capacity improvements needed.

verizon

Wireless LTE (Voice and Data) Growth

Each year Verizon experiences substantial increases in data volume including VoLTE (Voice over LTE) that its customers utilize. Data traffic grew 65% between Q3 2016 and Q3 2017 (Ericsson Mobility Report, November 2017)

Machine to Machine communications will also increase the data burden on wireless networks. During the next five years increasingly more services that improve our safety and make our lives easier will become available via the wireless infrastructure, such as:

- Autonomous vehicular communications including automatic 911 notification when airbag deploys.
- Medical monitors that alert caretakers of patient related issues.
- Home alarms that notify people when their child arrives home from school.
- Smart street lights that notify the city when they are not working.
- City garbage cans that let people know when they need to be emptied.
- Tracking watches that can aid in finding lost Alzheimer patients, children, etc.

Explanation of Wireless Capacity

Capacity in this analysis is evaluated with up to three metrics further explained below. These metrics assist in determining actual usage for a given site as well as are used to project when a site is expected to run out of capacity (i.e. reach a point of exhaustion where it can no longer process the volume of voice and data requested by local wireless devices, thus no longer providing adequate service).

- Forward Data Volume ("**FDV**"), is a measurement of usage (data throughput) on a particular site over a given period of time.
- Average Schedule Eligible User ("**ASEU**"), is a measurement of the loading of the control channels and systems of a given site.
- Average Active Connections ("**AvgAC**") is a measurement of the number of devices actively connected to a site in any given time slot.

Verizon Wireless uses proprietary algorithms developed by a task force of engineers and computer programmers to monitor each site in the network and accurately project and identify when sites will approach their capacity limits. Using a rolling two-year window for projected exhaustion dates allows enough time, in most cases, to develop and activate a new site. It is critical that these capacity approaching sectors are identified early and the process gets started and completed in time for new solutions (sites) to be on air before network issues impact the customers.

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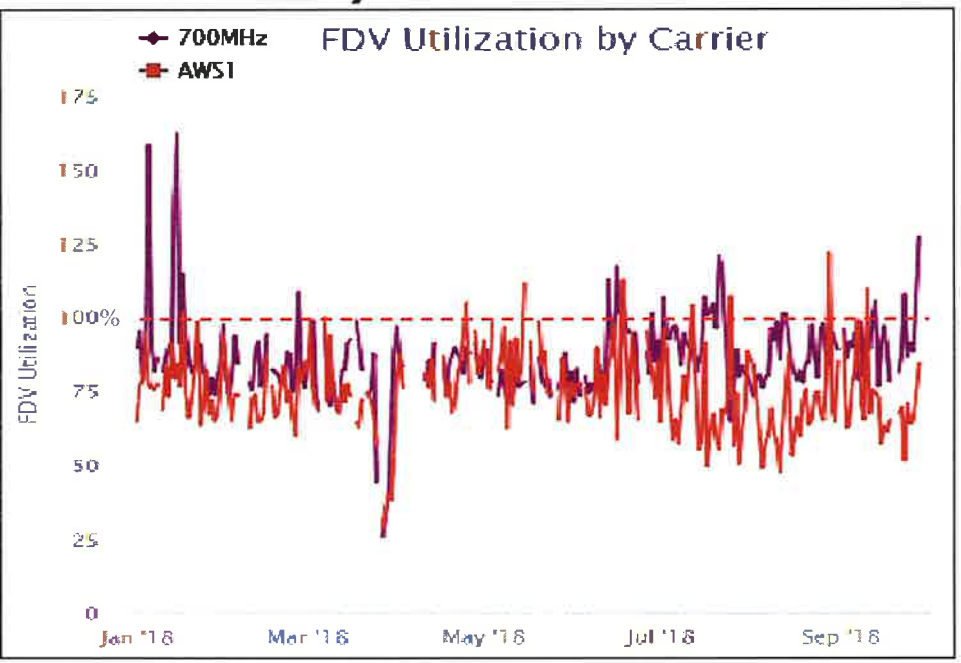
Capacity Utilization FDV (Mt. Beacon Gamma)



Summary: This graph shows FDV (**F**orward **D**ata **V**olume) which is a measurement of the customer data usage that this sector currently serves. As this limit is approached, data rates slow to unacceptable levels, potentially causing unreliable service for Verizon Wireless customers.

The purple line represents the daily max busy hour 700MHz utilization on the **Gamma** sector of the **Mt. Beacon** site. The dark red line represents the daily max busy hour 2100MHz (AWS) utilization on the **Gamma** sector of the **Mt. Beacon** site. The red dashed line is the limit where the sector reaches exhaustion and service starts to significantly degrade. The point in time where we see the purple or dark red lines reach or exceed the red dashed line is when service quickly degrades as usage continues to increase.

Displaying the FDV separately by carrier reveals the inability of high band (AWS) to resolve the capacity issues from existing sites described in this case. High band (AWS/PCS propagation characteristics prevent proper FDV utilization between carriers in coverage challenged areas like the **Electric Blanket** project area. Network densification is required.

Detail: The existing **Mt. Beacon Gamma** sector shown above has exceeded it's capability of supporting FDV requirements as shown by the purple line exceeding the max utilization threshold (red dashed line). While customers served by AWS (high band – dark red line) are not as likely to experience this issue they have recently been subject to this condition as shown by the dark red line exceeding max utilization threshold as well. Keep in mind those customers in weaker RF areas which are more dependent on the low band (700MHz – purple line) continue to experience this issue. Cell edge (weak/variable) conditions create the disparity between high and low bands due to propagation challenges which are more impacted by high band (AWS). FDV is one of three metrics used in this presentation to evaluate capacity capability in this area.

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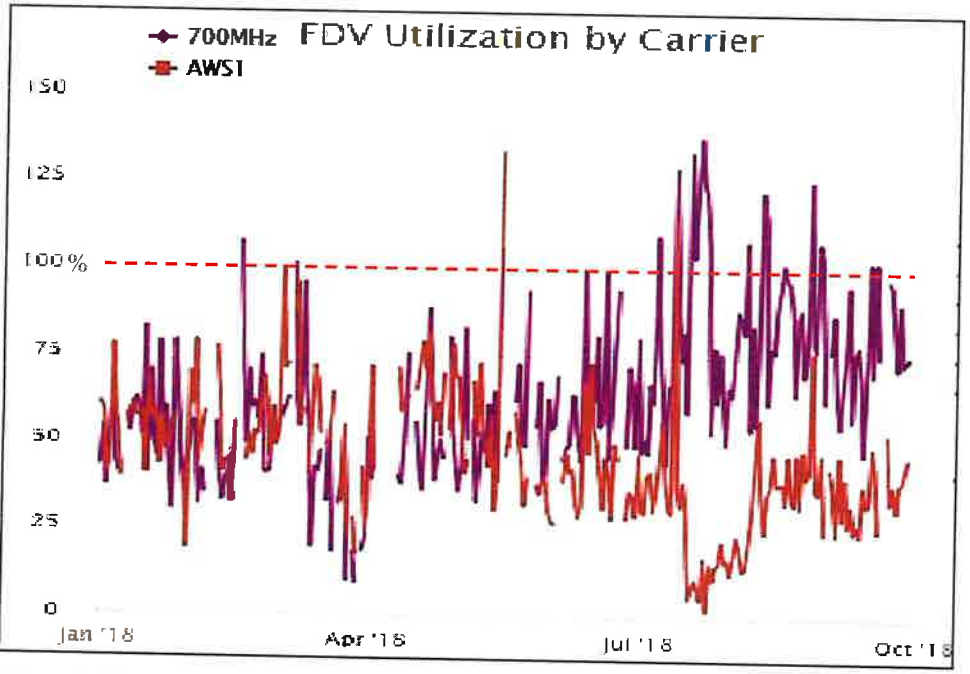
Capacity Utilization
FDV (Beacon DT Beta)



Summary: This graph shows FDV (**F**orward **D**ata **V**olume) which is a measurement of the customer data usage that this sector currently serves. As this limit is approached, data rates slow to unacceptable levels, potentially causing unreliable service for Verizon Wireless customers.

The purple line represents the daily max busy hour 700MHz utilization on the **Alpha** sector of the **Beacon DT** site. The dark red line represents the daily max busy hour 2100MHz (AWS) utilization on the **Beta** sector of the **Beacon DT** site. The red dashed line is the limit where the sector reaches exhaustion and service starts to significantly degrade. The point in time where we see the purple or dark red lines reach or exceed the red dashed line is when service quickly degrades as usage continues to increase.

Displaying the FDV separately by carrier reveals the inability of high band (AWS) to resolve the capacity issues from existing sites described in this case. High band (AWS/PCS propagation characteristics prevent proper FDV utilization between carriers in coverage challenged areas like the **Howland Micro** project area. Network densification is required.

Detail: The existing **Beacon DT Beta** sector shown above has recently exceeded it's capability of supporting FDV requirements as shown by the purple and dark red lines exceeding the max utilization threshold (red dashed line). FDV is one of three metrics used in this presentation to evaluate capacity capability in this area.

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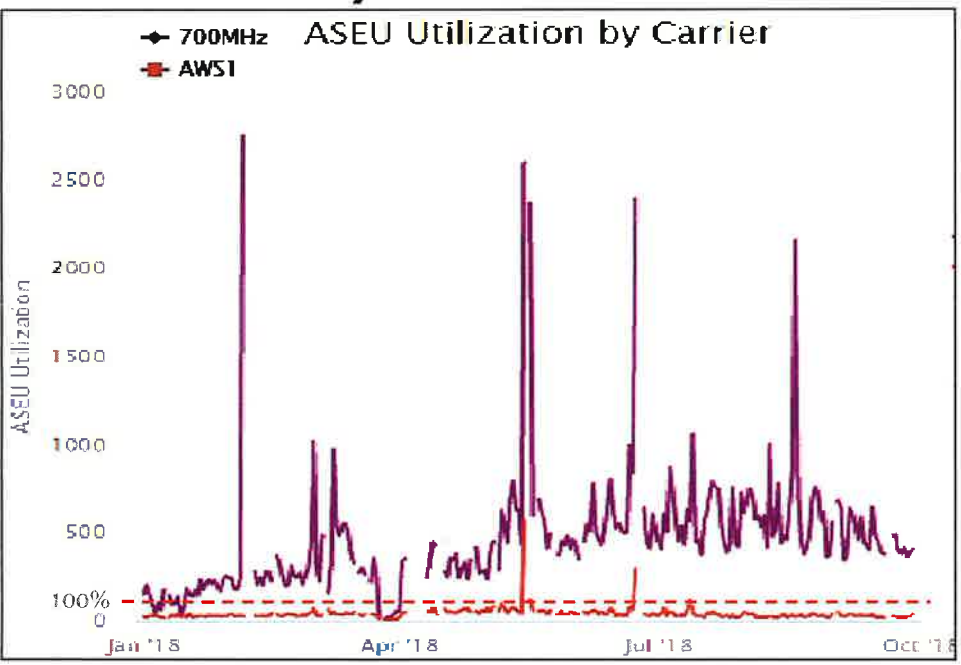
Capacity Utilization ASEU (Mt. Beacon Gamma)



Summary: This graph shows ASEU (**A**verage **S**chedule **E**ligible **U**ser). ASEU is a measurement of the loading of the control channels and systems of a given site. The ASEU load is heavily impacted by distant users or those in poor RF conditions.

The purple line represents the daily max busy hour 700MHz utilization on the **Gamma** sector of the **Mt. Beacon** site. The dark red line represents the daily max busy hour 2100MHz (AWS) utilization on the **Gamma** sector of the **Mt. Beacon** site. The red dashed line is the limit where the sector reaches exhaustion and service starts to significantly degrade. The point in time where we see the purple or dark red lines reach or exceed the red dashed line is when service quickly degrades as usage continues to increase.

Displaying the ASEU separately by carrier reveals the inability of high band (AWS) to resolve the capacity issues from existing sites described in this case. High band (AWS/PCS propagation characteristics prevent proper ASEU utilization between carriers in coverage challenged areas like the **Electric Blanket** project area. Network densification is required.

Detail: The existing **Mt. Beacon Gamma** sector cannot support the data traffic demand throughout the extents of the excessively large area it covers. **Mt. Beacon Gamma** is already overloaded, as shown by the purple actual use line exceeding the red dashed exhaustion threshold line. Cell edge (weak/variable) conditions create the disparity between high and low bands due to propagation challenges which more significantly impact high band (AWS). The **Mt. Beacon** site is too far away to effectively serve this portion of the City of Beacon.

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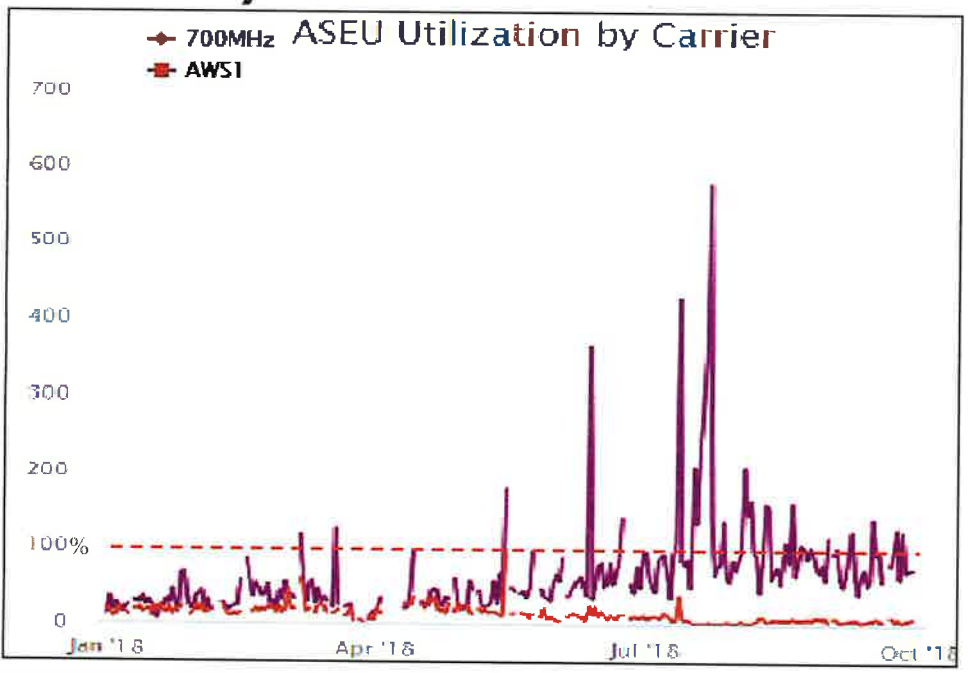
Capacity Utilization ASEU (Beacon DT Beta)



Summary: This graph shows ASEU (**A**verage **S**chedule **E**ligible **U**ser). ASEU is a measurement of the loading of the control channels and systems of a given site. The ASEU load is heavily impacted by distant users or those in poor RF conditions.

The purple line represents the daily max busy hour 700MHz utilization on the **Beta** sector of the **Beacon DT** site. The dark red line represents the daily max busy hour 2100MHz (AWS) utilization on the **Beta** sector of the **Beacon DT** site. The red dashed line is the limit where the sector reaches exhaustion and service starts to significantly degrade. The point in time where we see the purple or dark red lines reach or exceed the red dashed line is when service quickly degrades as usage continues to increase.

Displaying the ASEU separately by carrier reveals the inability of high band (AWS) to resolve the capacity issues from existing sites described in this case. High band (AWS/PCS propagation characteristics prevent proper ASEU utilization between carriers in coverage challenged areas like the **Howland Micro** project area. Network densification is required.

Detail: The existing **Beacon DT Beta** sector cannot support the data traffic demand throughout the extents of the area it covers. **Beacon DT Beta** is already overloaded, as shown by the purple actual use line exceeding the red dashed exhaustion threshold line. Cell edge (weak/variable) conditions create the disparity between high and low bands due to propagation challenges which more significantly impact high band (AWS). The **Beacon DT** site requires network densification throughout it's serving footprint.

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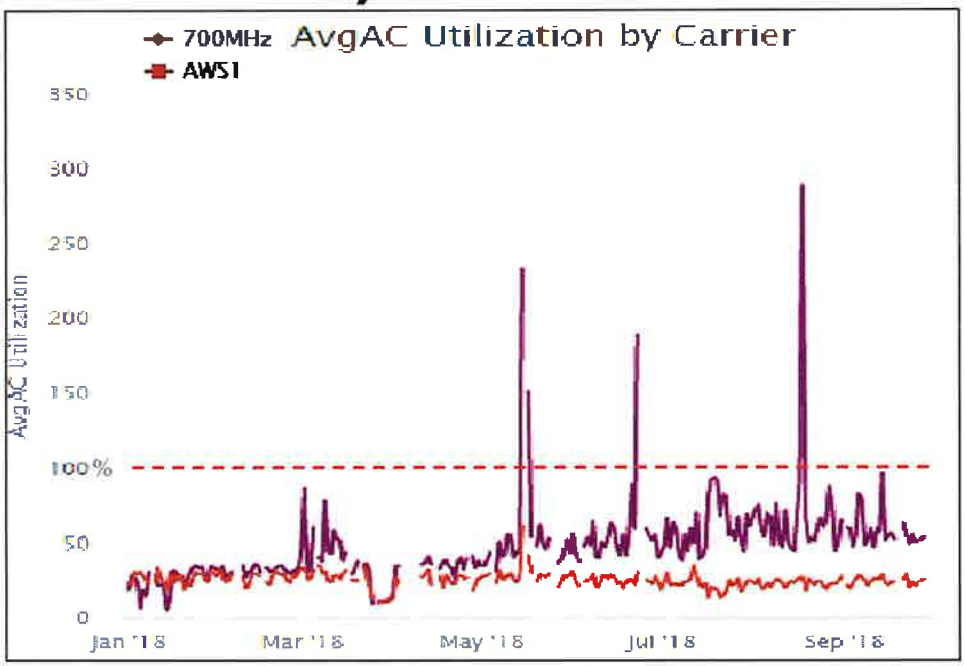
Capacity Utilization AvgAC (Mt. Beacon Gamma)



Summary: This graph shows AvgAC (**A**verage **A**ctive **C**onnections). AvgAC utilization by carrier is a measurement of max active connection capacity per sector in any given time slot. When this limit is reached, no additional devices will be able to connect to the site, resulting in connection failures and dropped calls.

The purple line represents the daily max busy hour 700MHz utilization on the **Gamma** sector of the **Mt. Beacon** site. The dark red line represents the daily max busy hour 2100MHz (AWS) utilization on the **Gamma** sector of the **Mt. Beacon** site. The red dashed line is the limit where the sector reaches exhaustion and service starts to significantly degrade. The point in time where we see the purple or dark red lines reach or exceed the red dashed line is when service quickly degrades as usage continues to increase.

This graph helps to reveal foliage impact affecting variable coverage areas which result with a decline in AWS utilization while 700MHz utilization increases at the time of increased springtime foliage. This further complicates capacity offload capability for high band carriers. Network densification is required.

Detail: The existing **Mt. Beacon Gamma** sector cannot support the number of users in the excessively large area it covers and has already reached overloaded conditions recently, as shown by the daily max busy hour utilization line peaking above the red dashed exhaustion threshold line.

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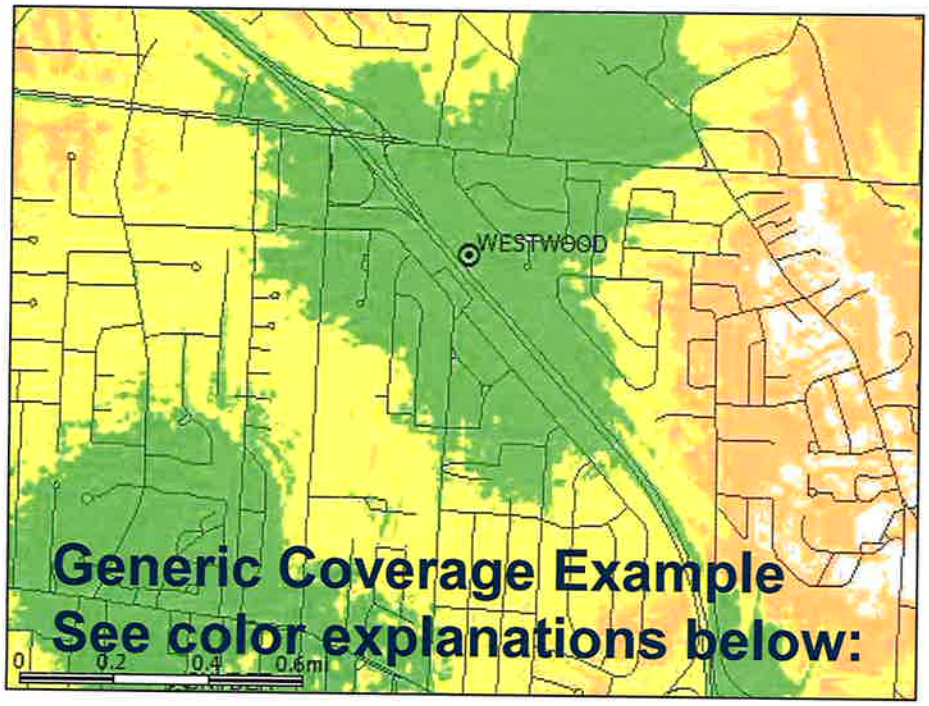
Explanation of Wireless Coverage



Generic Coverage Example
See color explanations below:

Coverage is best shown via coverage maps. RF engineers use computer simulation tools that take into account terrain, vegetation, building types, and site specifics to model the RF environment. This model is used to simulate the real world network and assist engineers to evaluate the impact of a proposed site (along with industry experience and other tools).

Most Verizon Wireless sites provide 3G CDMA at 850 MHz and 4G LTE at 700 MHz. As capacity requirements increase, higher frequency PCS (1900 MHz) and AWS (2100 MHz) carriers are added. In some mountaintop situations the high band AWS and PCS carriers are not effective due to excessive distance from the user population.

Coverage provided by a given site is affected by the frequencies used. Lower frequencies propagate further distances, and are less attenuated by clutter than higher frequencies. To provide similar coverage levels at higher frequencies, a denser network of sites is required (network densification).

Note the affect of clutter on the predicted coverage footprint above
Green = -85dBm RSRP, typically serves suburban residential and light commercial buildings (stronger coverage levels may be needed for proper evaluation in urban applications or where more substantial building construction exists)
Yellow = -95dBm RSRP, typically serves most rural/suburban-residential and in car applications
Orange = -105dBm RSRP, rural highway coverage, subject to variable conditions including fading and seasonality gaps
White = <-105dBm RSRP, variable to no reliable coverage gap area

More detailed, site-specific coverage slides are later in the presentation
*Signal strength requirements vary as dictated by specific market conditions

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Explanation of this Search Area

Howland micro Search Area

A **Search Area** is the geographical area within which a new site is targeted to solve a coverage or capacity deficiency. Three of the factors taken into consideration when defining a search area are topography, user density, and the existing network.

- **Topography** must be considered to minimize the obstacles between the proposed site and the target coverage area. For example, a site at the bottom of a ridge will not be able to cover the other side from a certain height.
- In general, the farther from a site the **User Population** is, the weaker the RF conditions are and the worse their experience is likely to be. These distant users also have an increased impact on the serving site's capacity. In the case of a multi sector site, centralized proximity is essential to allow users to be evenly distributed and allow efficient utilization of the site's resources.
- The existing **Network Conditions** also guide the design of a new site. Sites placed too close together create interference due to overlap and are an inefficient use of resources. Sites that are too tall or not properly integrated with existing sites cause interference and degrade service for existing users.
- Existing co-locatable structures inside the search area as well as within a reasonable distance of the search area are submitted by site acquisition and reviewed by RF Engineering. If possible RF will make use of existing or nearby structures before proposing to build new towers.

To resolve the coverage and capacity deficiencies previously detailed, Verizon Wireless is seeking to add one new 'micro' cell facility within or as near as possible to this centrally and strategically located area to improve wireless service capacity and coverage. By offloading Beacon DT and displacing traffic from Mt. Beacon with the proposed site, adequate and reliable service will be provided. The new **Howland micro** site will provide dominant and dedicated signal to portions of Beacon helping to improve not only the area roads but also adjacent populated areas.

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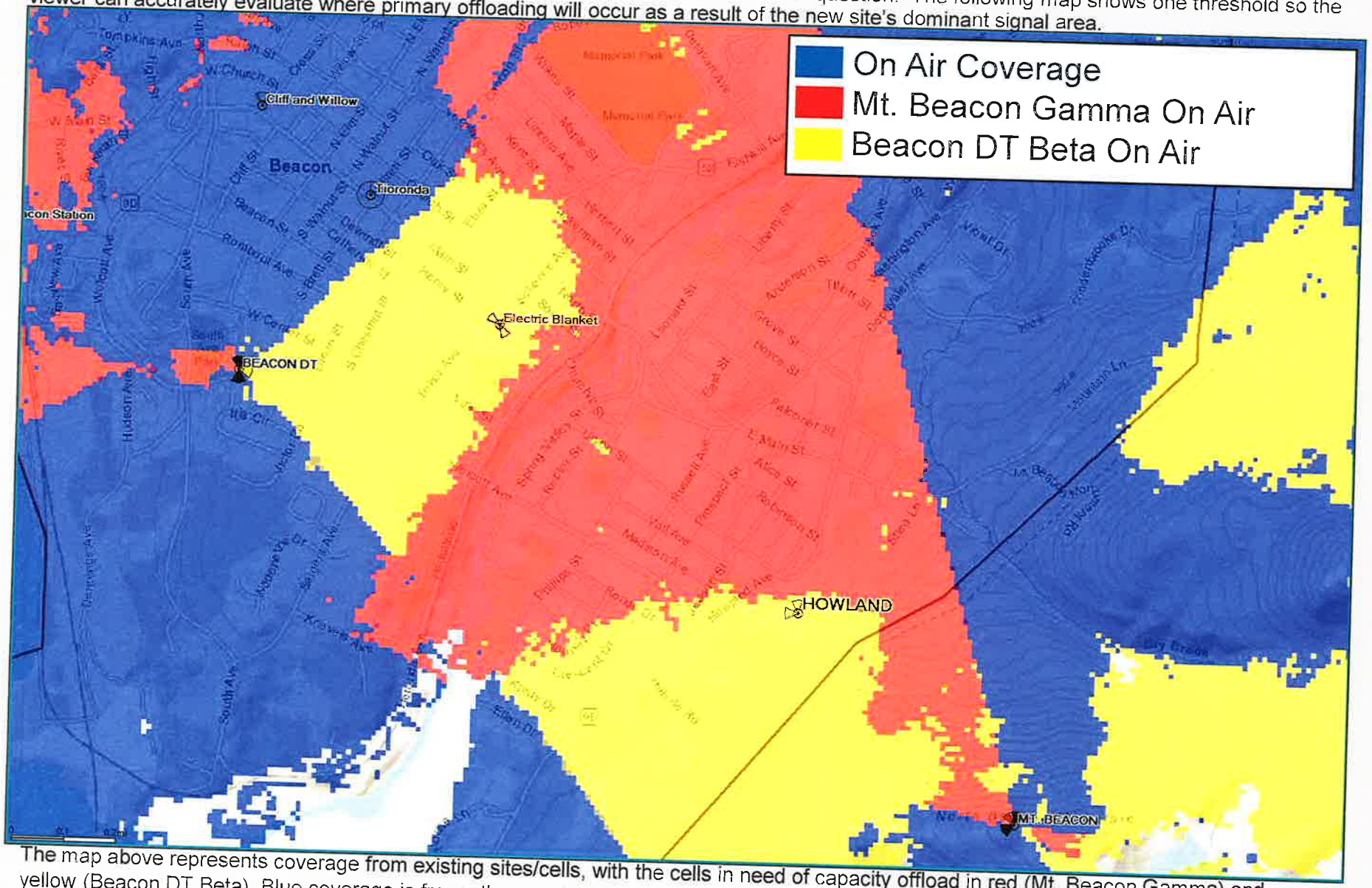
Existing 700MHz Best Server -95dBm RSRP

Best Server plots depict the actual best server or dominant footprint of each sector in question. The following map shows one threshold so the viewer can accurately evaluate where primary offloading will occur as a result of the new site's dominant signal area.



The map above represents coverage from existing sites/cells, with the cells in need of capacity offload in red (Mt. Beacon Gamma) and yellow (Beacon DT Beta). Blue coverage is from other on air sites/sectors.

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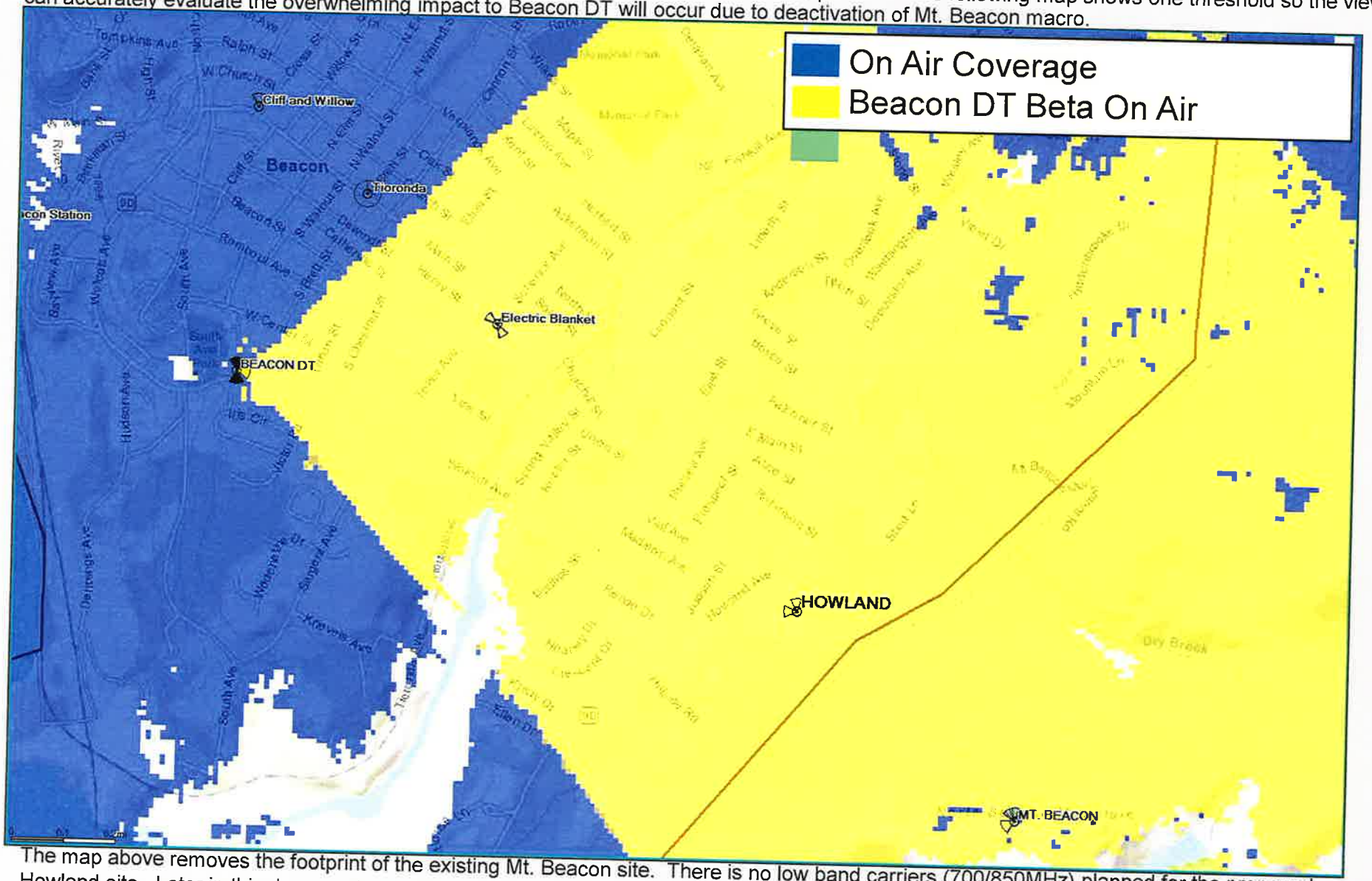
Mt. Beacon LTE OFF 700MHz Best Server -95dBm RSRP

Best Server plots depict the actual best server or dominant footprint of each sector in question. The following map shows one threshold so the viewer can accurately evaluate the overwhelming impact to Beacon DT will occur due to deactivation of Mt. Beacon macro.



The map above removes the footprint of the existing Mt. Beacon site. There is no low band carriers (700/850MHz) planned for the proposed Howland site. Later in this document are slides showing where the proposed high band carriers (AWS/PCS) will provide offload.

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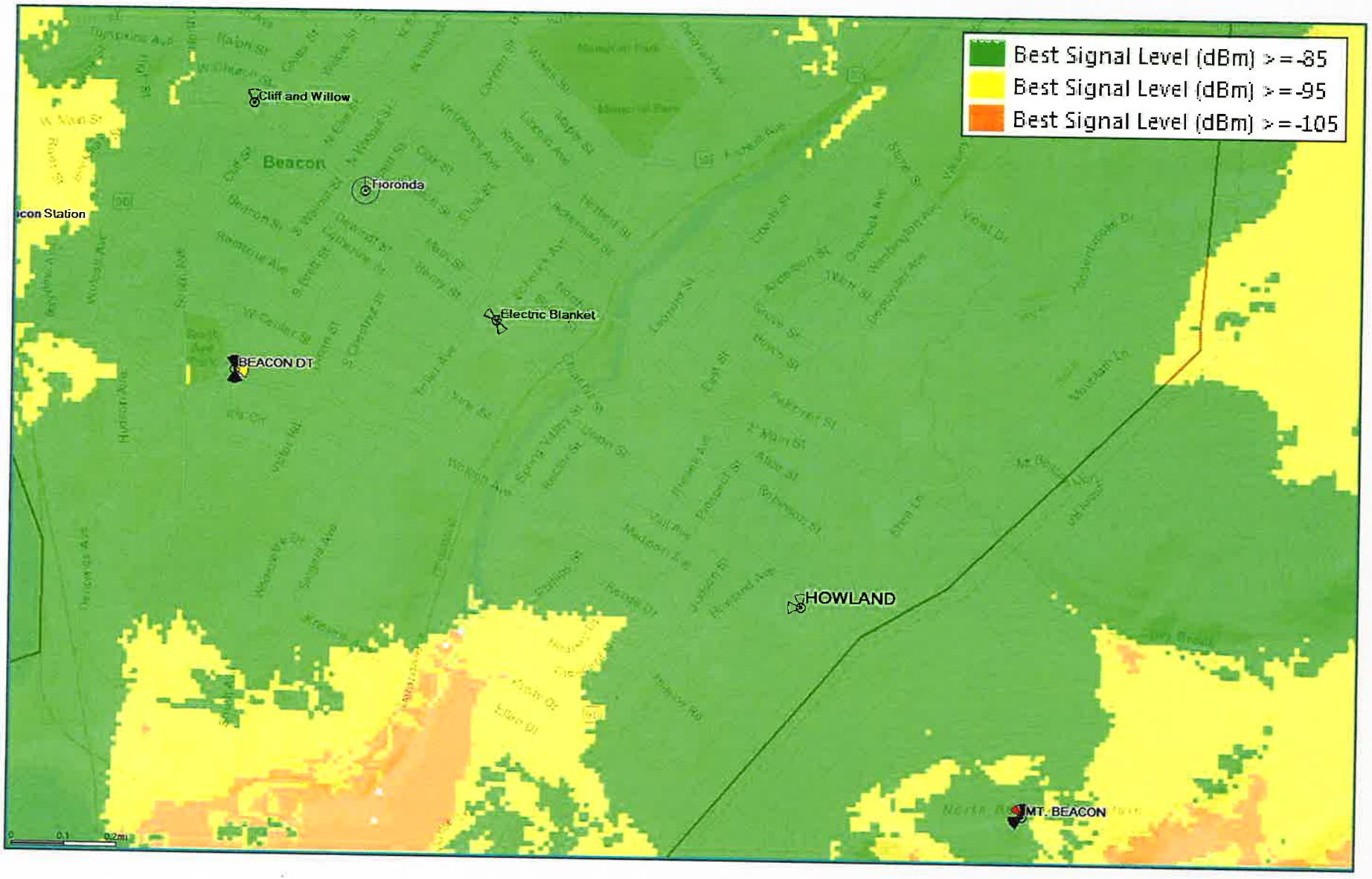
Existing 700MHz Coverage

This coverage map shows existing low band RF conditions in and around the Howland Micro site area.



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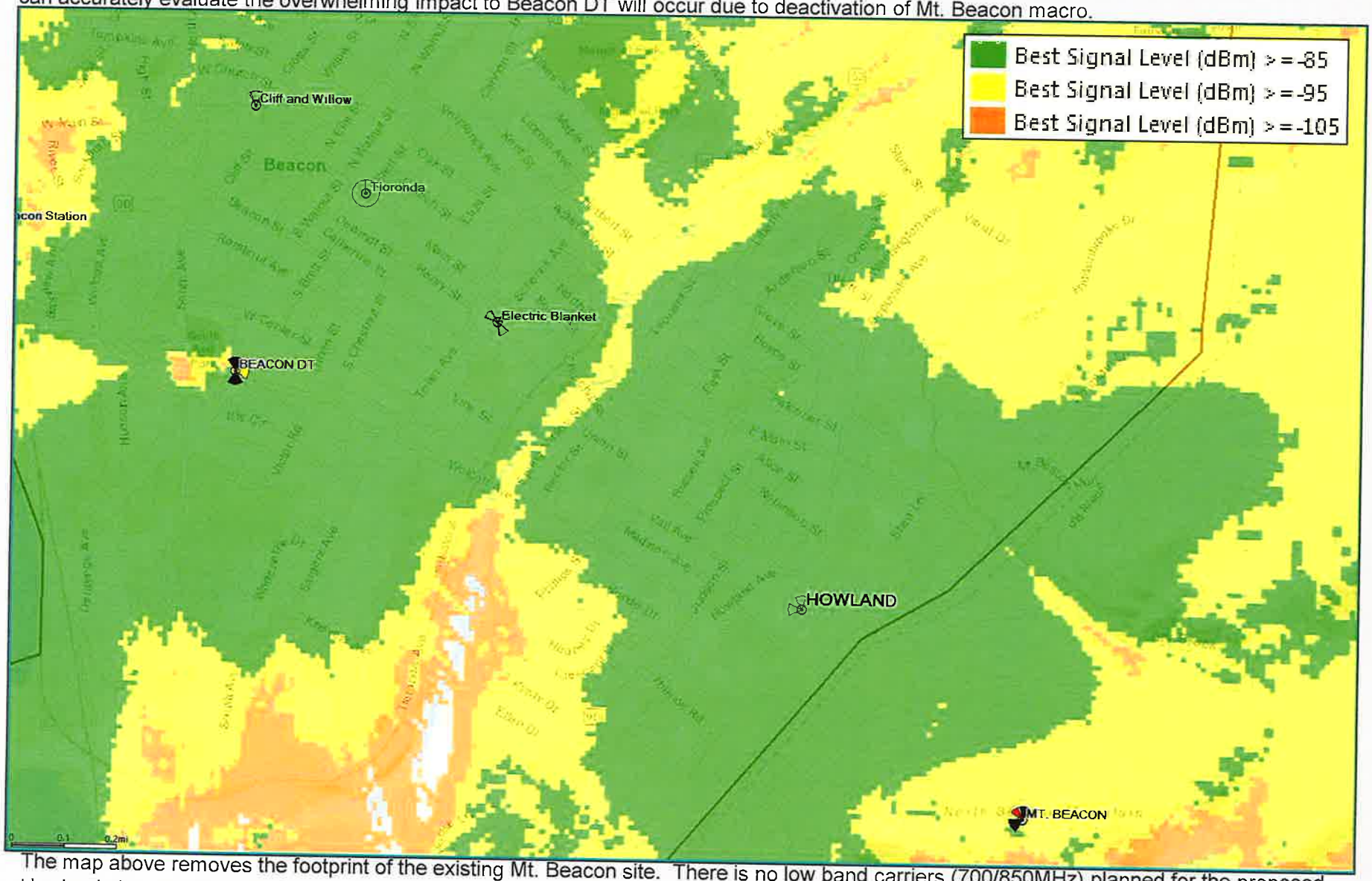
Mt. Beacon LTE OFF 700MHz Best Server -105dBm RSRP

Best Server plots depict the actual best server or dominant footprint of each sector in question. The following map shows one threshold so the viewer can accurately evaluate the overwhelming impact to Beacon DT will occur due to deactivation of Mt. Beacon macro.



The map above removes the footprint of the existing Mt. Beacon site. There is no low band carriers (700/850MHz) planned for the proposed Howland site. Later in this document are slides showing where the proposed high band carriers (AWS/PCS) will provide offload.

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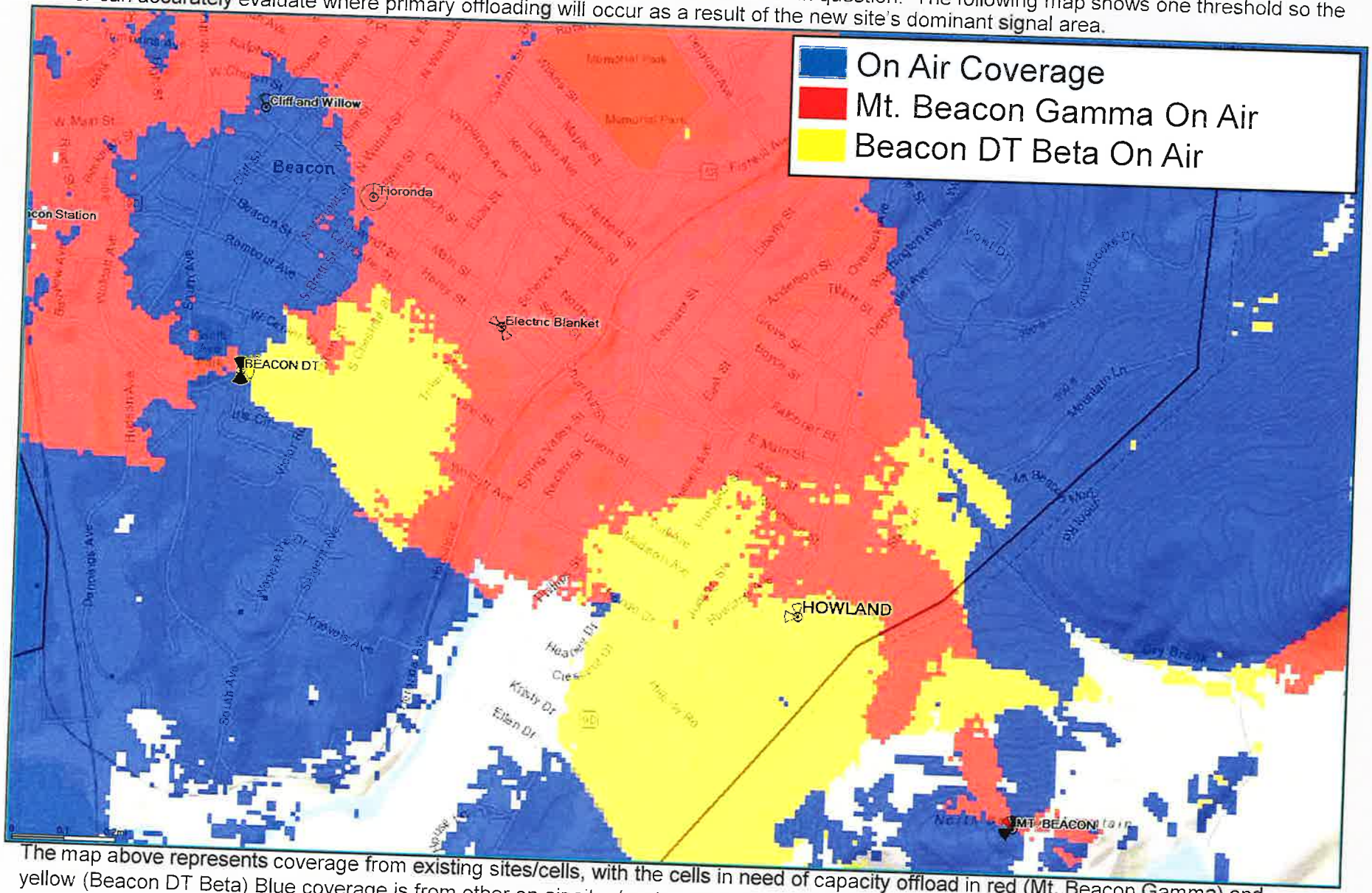
Existing 2100MHz Best Server -105dBm RSRP

Best Server plots depict the actual best server or dominant footprint of each sector in question. The following map shows one threshold so the viewer can accurately evaluate where primary offloading will occur as a result of the new site's dominant signal area.



The map above represents coverage from existing sites/cells, with the cells in need of capacity offload in red (Mt. Beacon Gamma) and yellow (Beacon DT Beta) Blue coverage is from other on air sites/sectors.

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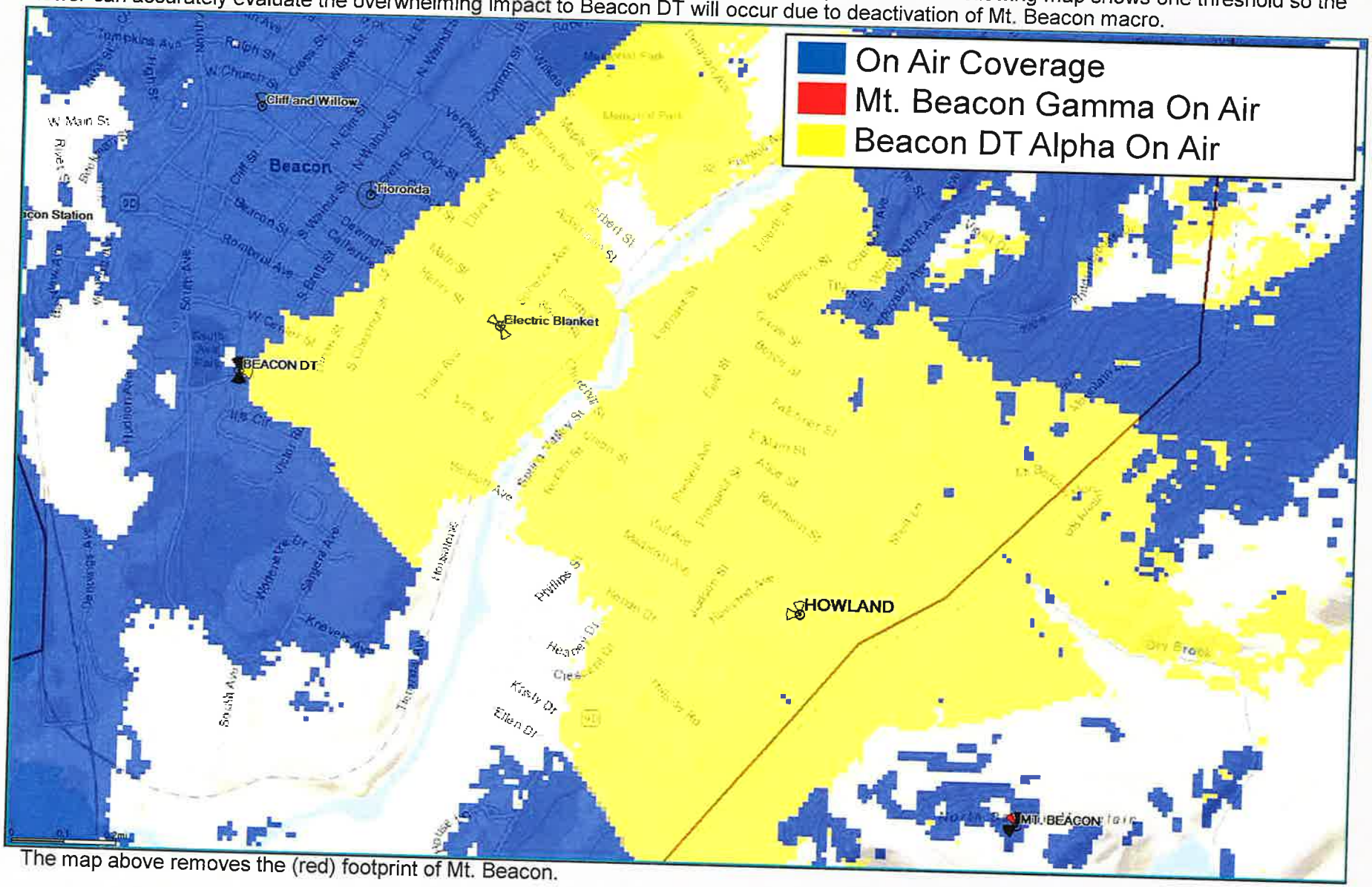
Proposed 2100MHz Best Server -105dBm RSRP

Best Server plots depict the actual best server or dominant footprint of each sector in question. The following map shows one threshold so the viewer can accurately evaluate the overwhelming impact to Beacon DT will occur due to deactivation of Mt. Beacon macro.



The map above removes the (red) footprint of Mt. Beacon.

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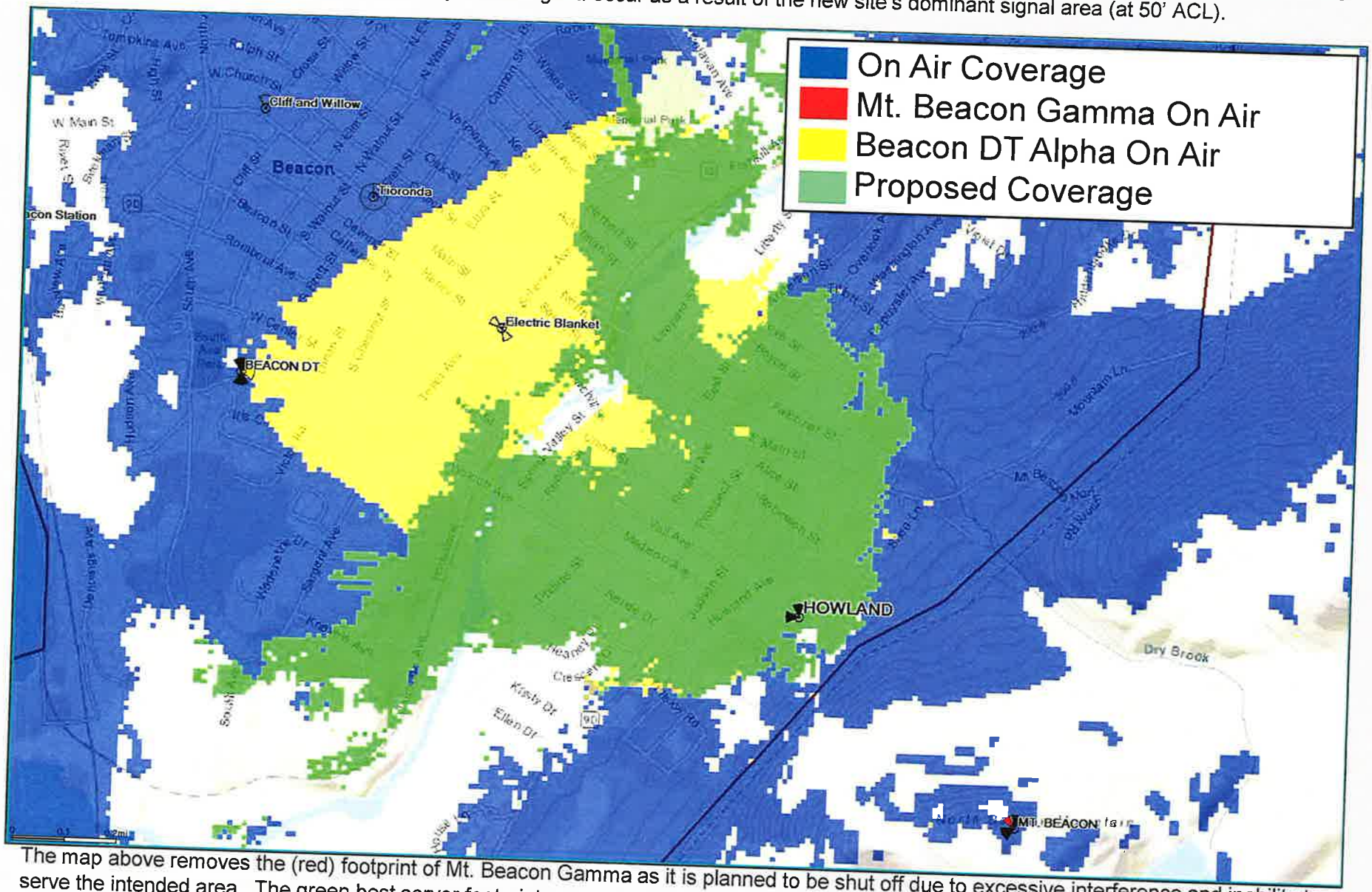
Proposed (Mt. Beacon Gamma Off) 2100MHz Best Server -105dBm RSRP

Best Server plots depict the actual best server or dominant footprint of each sector in question. The following map shows one threshold so the viewer can accurately evaluate where primary offloading will occur as a result of the new site's dominant signal area (at 50' ACL).



The map above removes the (red) footprint of Mt. Beacon Gamma as it is planned to be shut off due to excessive interference and inability to serve the intended area. The green best server footprint represents the proposed Howland coverage area. Activation of Howland will be a coordinated event along with additional containment of Beacon DT in order to maintain sector dominance and proper network performance.

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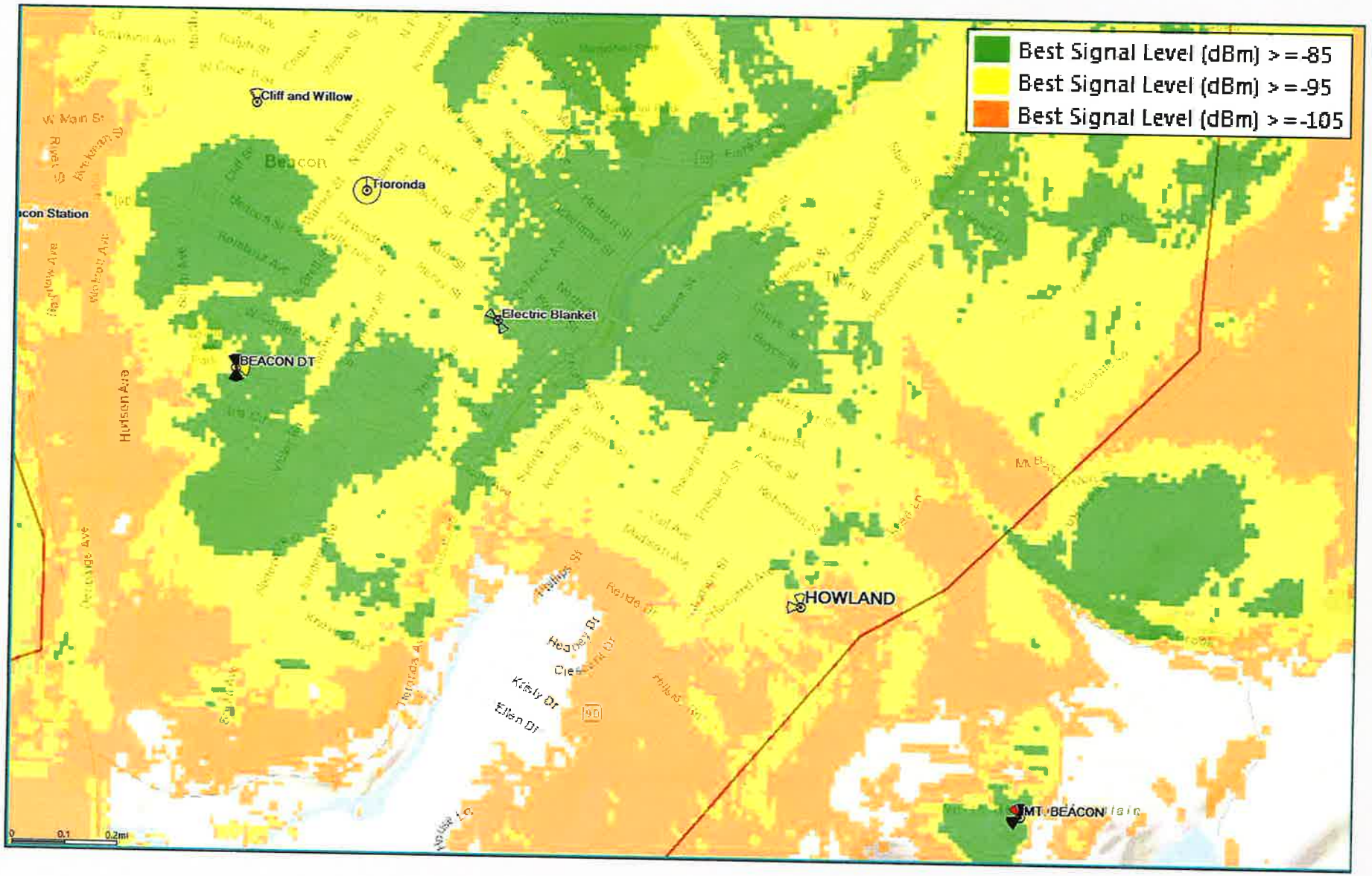
Existing 2100MHz Coverage

This coverage map shows existing high band RF conditions in and around the Electric Blanket site area.



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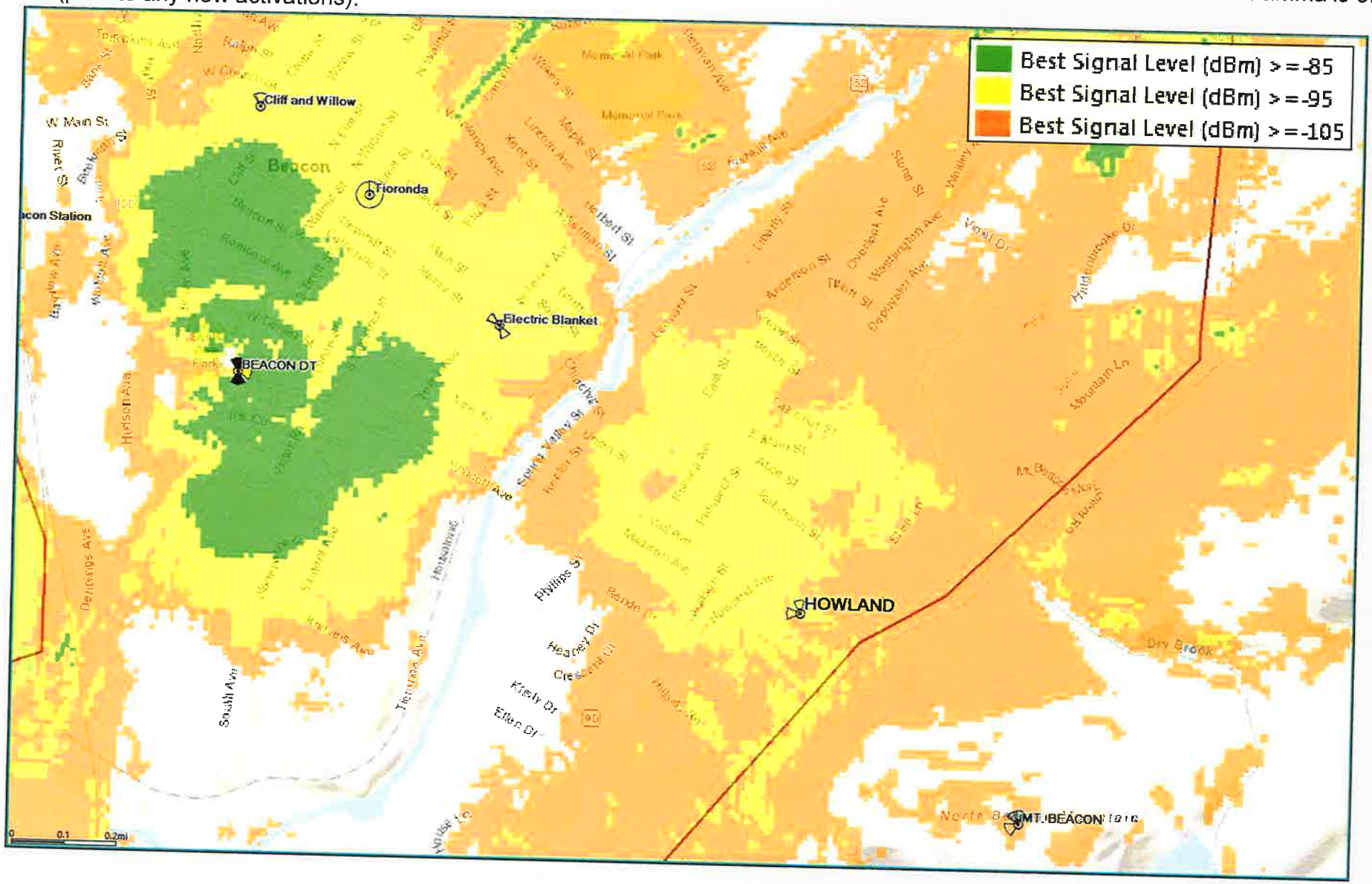
Existing 2100MHz Coverage (Mt. Beacon Gamma Off Air)

This coverage map shows future high band RF conditions in and around the Howland Micro site area after Mt. Beacon Gamma is off air (prior to any new activations).



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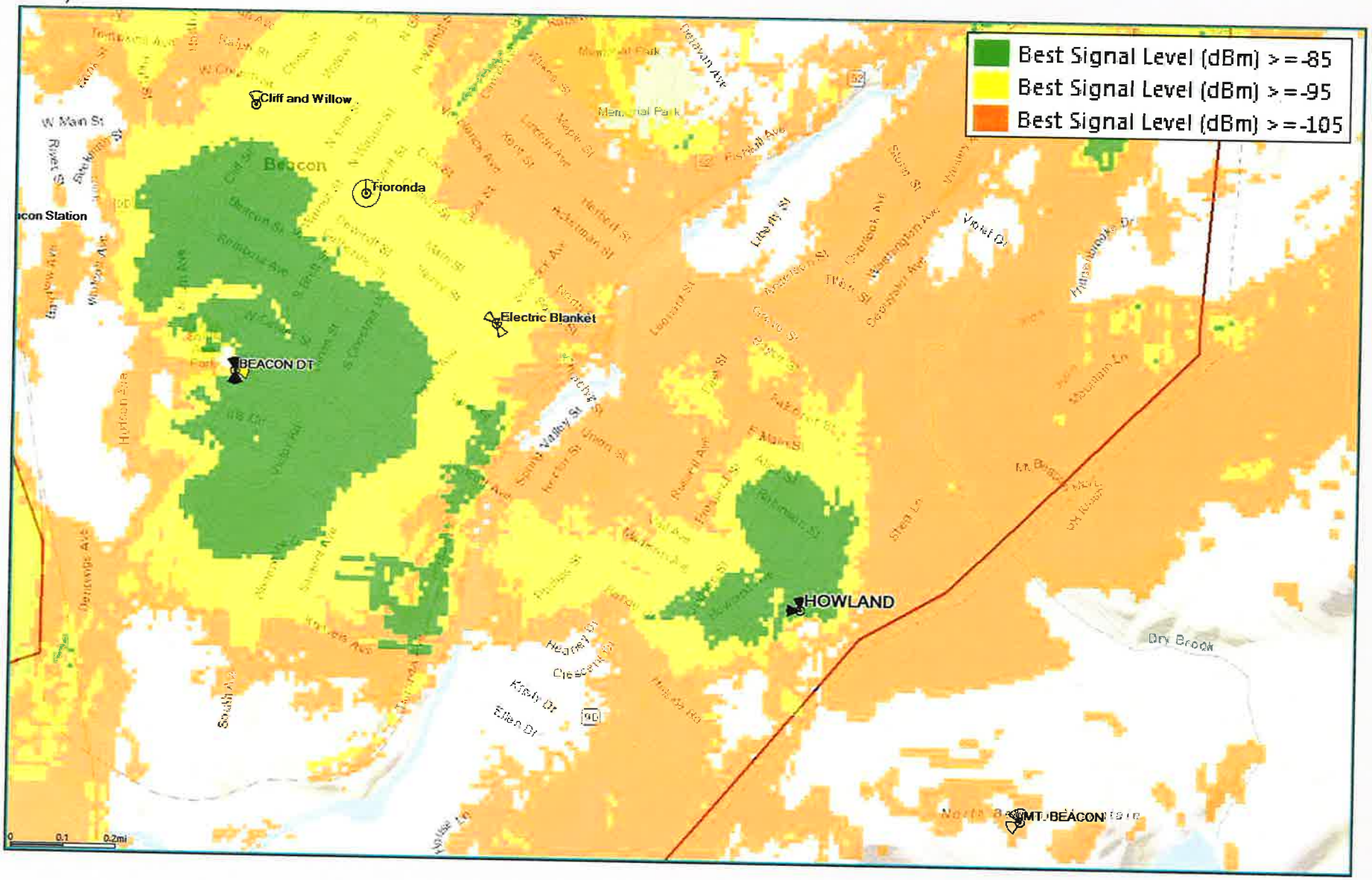
Proposed 2100MHz Coverage

This coverage map shows proposed high band RF conditions (Mt. Beacon off air) in and around the Howland Micro site area (at 50' ACL).



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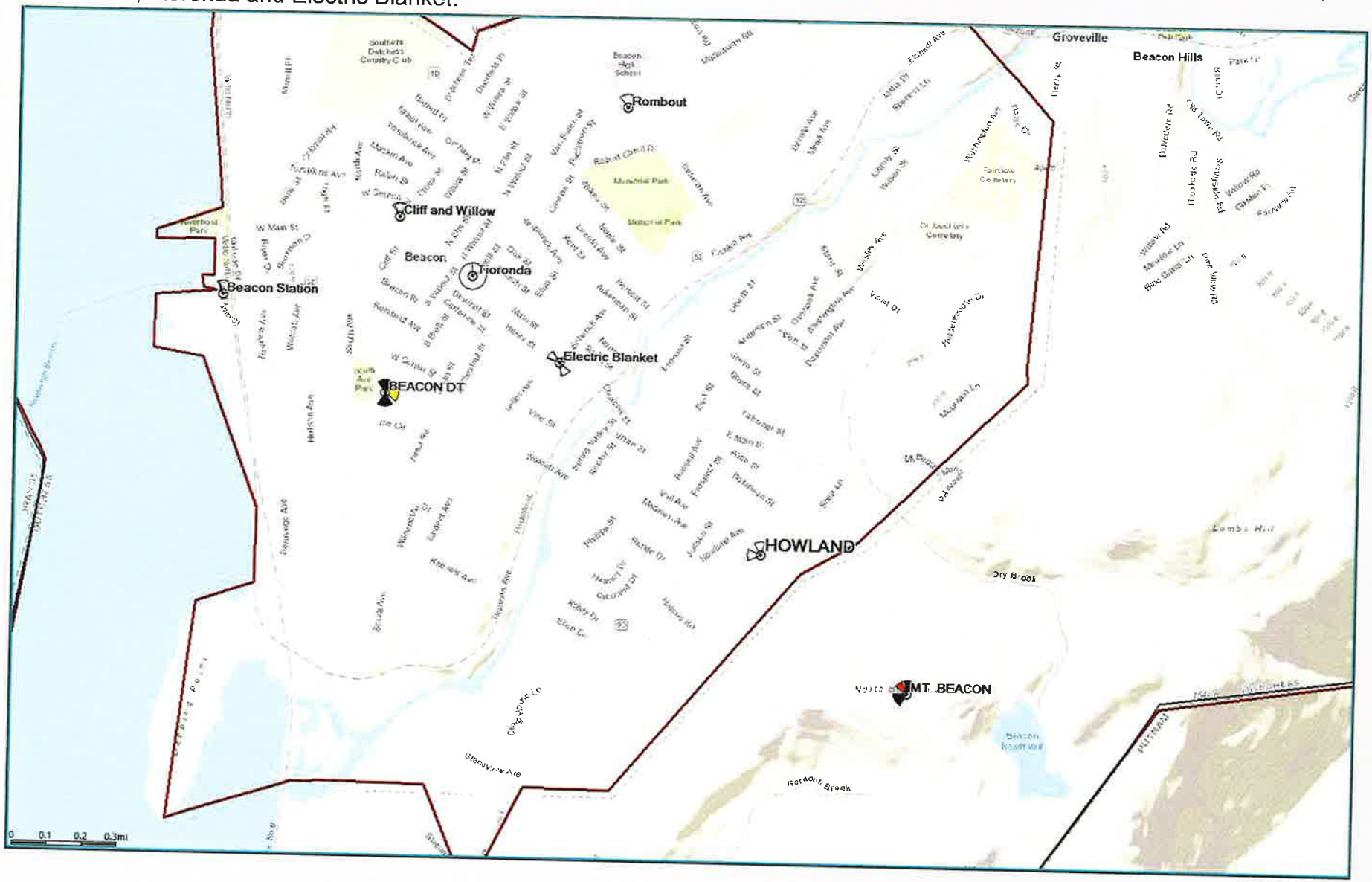
Other sites in development

This map shows the approximate locations of other sites at various stages of development including Beacon Station, Rombout, Cliff and Willow, Tioronda and Electric Blanket.



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Site Selection Analysis and Steath Design

The following candidates were considered throughout the process of developing the Howland ring:

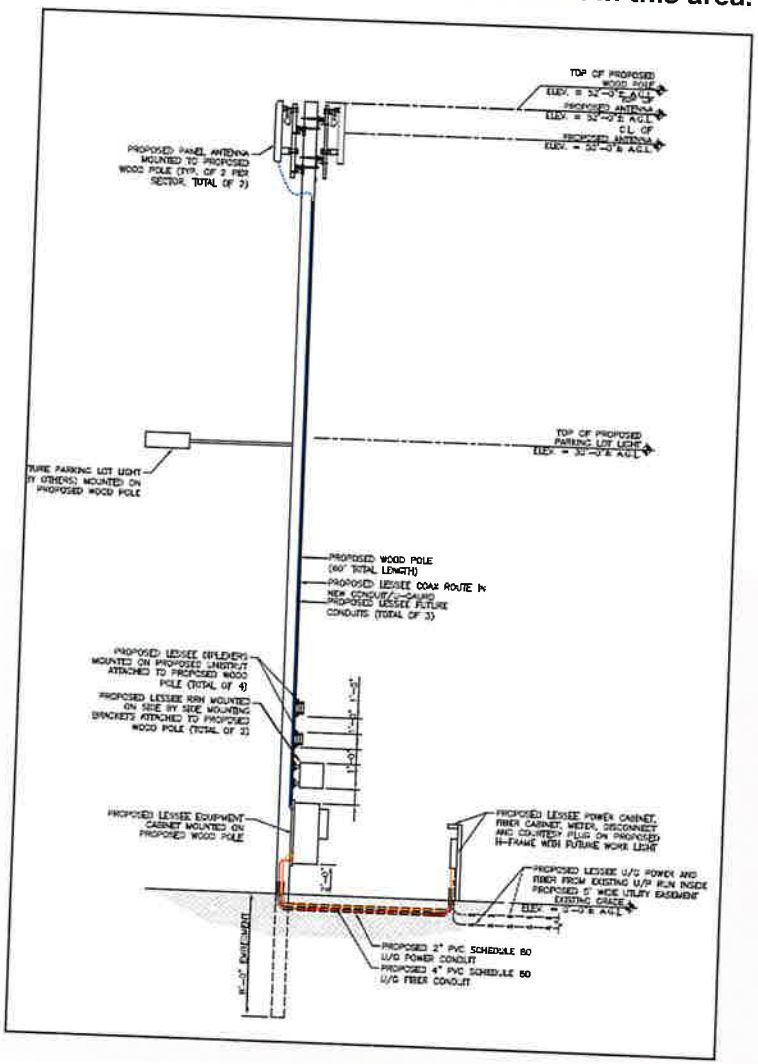
A. 41.494749°, -73.955751°(Ability Beyond Disability Roof Co-Lo) RF Rejected, ACL too low, obscured by local clutter
B. 41.494518°, -73.955562°, (Ability Beyond Disability Telephone Pole) RF Approved at 50' ACL

As is the case with other micro sites the search area provided to Site Acquisition (SACQ) by RF Engineering is relatively limited in size which in turn limits the number of potential candidates, in this case there were two. Due to the small nature of the target area, coordination with other sites in design, interest in maximizing site capabilities while limiting the number of solutions required limits the areas where this site will work as identified below.

The new town code was reviewed and there were no city owned or higher priority potential sites available to co-locate on in this area.

Search Area

The proposed use of a wooden telephone pole to mount the required antennas is a stealth proposal. The antennas are flush mounted to the pole limiting the size of the antenna array. This pole can also be utilized as a parking lot light structure as shown in the elevation view. Telephone poles are commonly utilized in this area of the city and by use of a wooden telephone pole versus a steel monopole, self support or other lattice type tower allows the proposed application to blend into the surroundings. Additionally since it is located between the adjacent building and the unpopulated hillside it is out of the way with no skyline profile. It will blend into the hillside by design achieving stealth.



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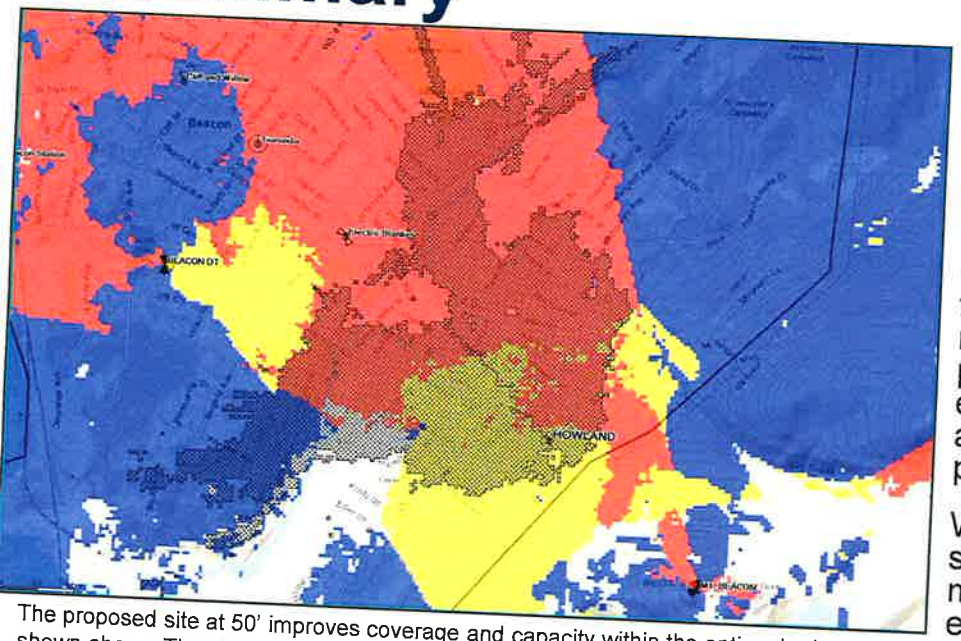
RF Justification Summary



The proposed site at 50' improves coverage and capacity within the entire shaded area shown above. The significant gaps within these areas which currently result with overburdened low band conditions as shown on slides 8&9 will be significantly improved and are expected to be resolved in conjunction with other area activations planned which will allow for deactivation of Mt. Beacon Gamma sector.

The network was analyzed to determine whether there is sufficient **RF coverage and capacity** in the City of Beacon. It was determined that there are significant gaps in adequate LTE service for Verizon Wireless in the 700 and 2100MHz frequency bands. In addition to the coverage deficiencies, Verizon Wireless' network does not have sufficient capacity (low band or high band) to handle the existing and projected LTE voice and data traffic in the area near and neighboring the proposed Howland micro facility ("targeted service improvement area"). Based on the need for additional coverage and capacity while considering the topography and wide area requiring service, any further addition of capacity to long distance existing sites does not remedy Verizon's significant gap in reliable service. Therefore, the proposed facility is also needed to provide "**capacity relief**" to the existing nearby Verizon Wireless sites, allowing the proposed facility and those neighboring sites to adequately serve the existing and projected capacity demand in this area.

With the existing network configuration there are significant gaps in service which restricts Verizon Wireless customers from originating, maintaining or receiving reliable calls and network access. It is our expert opinion that the proposed height will satisfy the coverage and capacity needs of Verizon Wireless and its subscribers in this portion of Beacon and the Howland micro project area. The proposed location depicted herein satisfies the identified service gaps and is proposed at the minimum height necessary for adequate service.

Michael R. Crosby

Michael R. Crosby
Engineer IV – RF Design
Verizon Wireless

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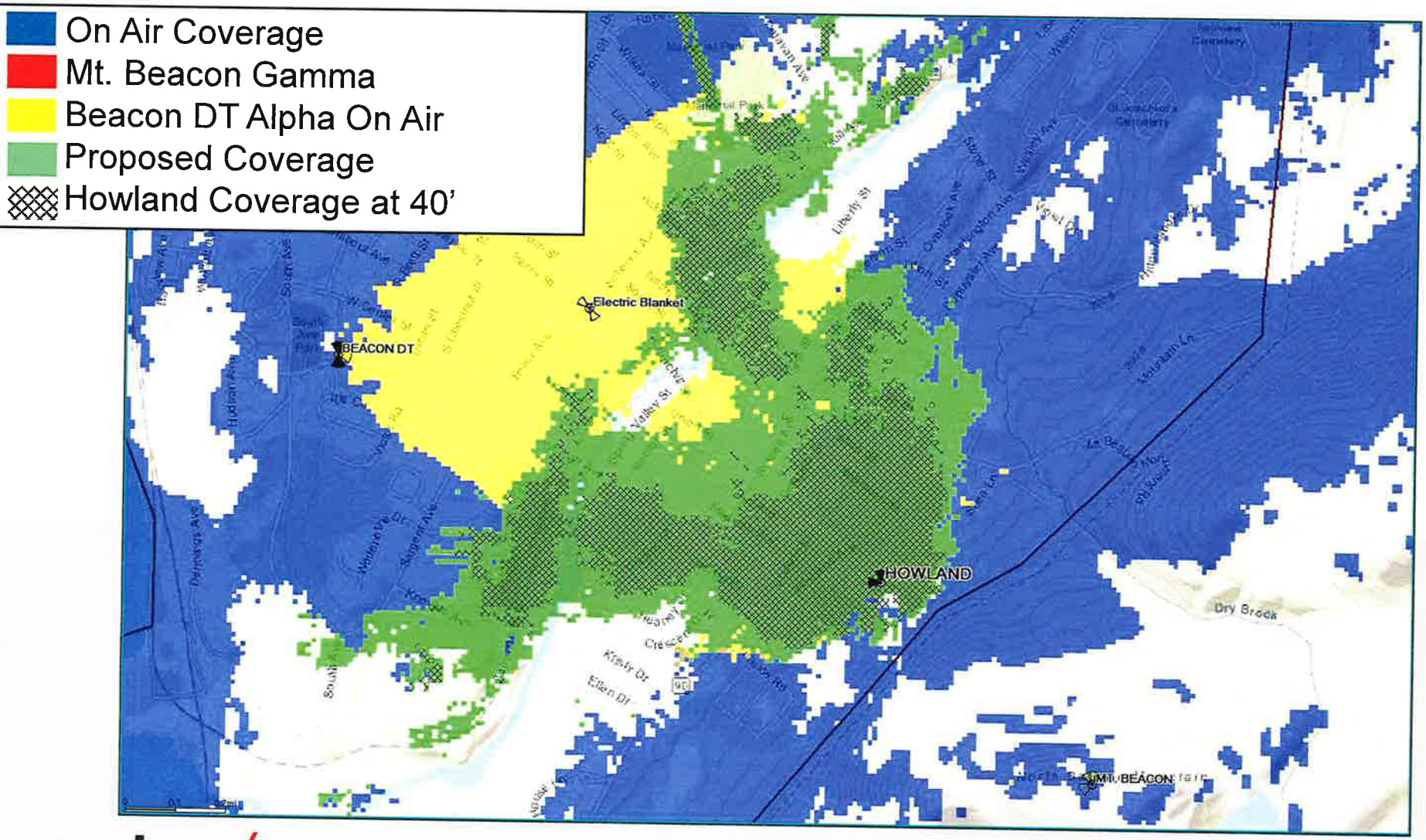
Supplemental: Height Justification

Lowering the antenna centerline from 50' to 40' causes unacceptable loss of sector dominance as well as weaker signal strength throughout the intended coverage area which would result with compromised offload and coverage capabilities. The comparison of expected dominant sector footprints is shown below.



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