

# ENGINEERING EXHIBIT

## Application for Construction Permit

prepared for

**WGBH EDUCATIONAL FOUNDATION, INC.**

WNAN(FM) Nantucket, Massachusetts

Facility ID 8600

Ch. 216A 2.3 kW 64 m

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*This material supplies a "hard copy" of the engineering portions of this application as entered March 18, 2003 for filing electronically. Since the FCC's electronic filing system may be accessed by anyone with the applicant's name and password, and electronic data may otherwise be altered in an unauthorized fashion, we cannot be responsible for changes made subsequent to our entry of this data and related attachments.*

**Section VII Preparer's Certification**

I certify that I have prepared Section VII (Engineering Data) on behalf of the applicant, and that after such preparation, I have examined and found it to be accurate and true to the best of my knowledge and belief.

Name ROBERT J. CLINTON		Relationship to Applicant (e.g., Consulting Engineer) CONSULTANT	
Signature		Date 3/18/2003	
Mailing Address CAVELL, MERTZ, AND DAVIS, INC. 7839 ASHTON AVENUE			
City MANASSAS		State or Country (if foreign address) VA	Zip Code 20109-
Telephone Number (include area code) 7033929090		E-Mail Address (if available) BCLINTON@CMDCONSULTING.COM	

WILLFUL FALSE STATEMENTS ON THIS FORM ARE PUNISHABLE BY FINE AND/OR IMPRISONMENT (U.S. CODE, TITLE 18, SECTION 1001), AND/OR REVOCATION OF ANY STATION LICENSE OR CONSTRUCTION PERMIT (U.S. CODE, TITLE 47, SECTION 312(a)(1)), AND/OR FORFEITURE (U.S. CODE, TITLE 47, SECTION 503).

<b>Section VII - FM Engineering on Channels 200-220</b>												
<b>TECHNICAL SPECIFICATIONS</b>												
Ensure that the specifications below are accurate. Contradicting data found elsewhere in this application will be disregarded. All items must be completed. The response "on file" is not acceptable.												
<b>TECH BOX</b>												
1.	Channel Number: 216											
2.	Class (select one): <input type="radio"/> D <input checked="" type="radio"/> A <input type="radio"/> B1 <input type="radio"/> B <input type="radio"/> C3 <input type="radio"/> C2 <input type="radio"/> C1 <input type="radio"/> C0 <input type="radio"/> C											
3.	Antenna Location Coordinates: (NAD 27) Latitude: Degrees 41 Minutes 17 Seconds 6 <input checked="" type="radio"/> North <input type="radio"/> South  Longitude: Degrees 70 Minutes 8 Seconds 39 <input checked="" type="radio"/> West <input type="radio"/> East											
4.	Antenna Structure Registration Number: 1006317 <input type="checkbox"/> Not Applicable <input type="checkbox"/> Notification filed with FAA											
5.	Antenna Location Site Elevation Above Mean Sea Level:										11 meters	
6.	Overall Tower Height Above Ground Level:										68 meters	
7.	Height of Radiation Center Above Ground Level:										meters(H) 56 meters(V)	
8.	Height of Radiation Center Above Average Terrain:										meters(H) 64 meters(V)	
9.	Effective Radiated Power:										kW(H) 2.3 kW(V)	
10.	Maximum Effective Radiated Power: (Beam-Tilt Antenna ONLY)										<input checked="" type="checkbox"/> Not Applicable kW(H) kW(V)	
11.	Directional Antenna Relative Field Values: <input checked="" type="checkbox"/> Not applicable (Nondirectional) Rotation (Degrees): <input type="checkbox"/> No Rotation											
	Degrees	Value	Degrees	Value	Degrees	Value	Degrees	Value	Degrees	Value	Degrees	Value
	0		10		20		30		40		50	
	60		70		80		90		100		110	
	120		130		140		150		160		170	

180	190	200	210	220	230
240	250	260	270	280	290
300	310	320	330	340	350
Additional Azimuths					

Relative Field Polar Plot

**NOTE: In addition to the information called for in this section, an explanatory exhibit providing full particulars must be submitted for each question for which a "No" response is provided.**

**CERTIFICATION**

**AUXILIARY ANTENNA APPLICANTS ARE NOT REQUIRED TO RESPOND TO ITEMS 12-16.**

12. **Main Studio Location.** The proposed main studio location complies with 47 C.F.R. Section 73.1125.  Yes  No  
See Explanation in [Exhibit 13]

13. **Interference.** The proposed facility complies with all of the following applicable rule sections. Check all that apply:  Yes  No  
See Explanation in [Exhibit 14]

**Contour Overlap Requirements.**  
a.  47 C.F.R. Section 73.509  
**Exhibit Required.** [Exhibit 15]

**Spacing Requirements.**  
b.  47 C.F.R. Section 73.207 with respect to station(s)

**Grandfathered Short-Spaced.**  
c.  47 C.F.R. Section 73.213(a) with respect to station(s)  
**Exhibit Required.** [Exhibit 16]

**Contour Protection.**  
d.  47 C.F.R. Section 73.215(a) with respect to station(s)  
**Exhibit Required.** [Exhibit 17]

**Television Channel 6 Protection.**  
e.  47 C.F.R. Section 73.525 with respect to station(s)  
**Exhibit Required.** [Exhibit 18]

14. **Reserved Channels Above 220.**  
  
a. **Allotment.** The proposed facility complies with the allotment requirements of 47 C.F.R. Section 73.203.  Yes  No  
See Explanation in [Exhibit 19]  
b. **Community Coverage.** The proposed facility complies with 47 C.F.R. Section 73.315.  Yes  No  
See Explanation in [Exhibit 20]

15. **International Borders.** The proposed antenna location is not within 320 kilometers of the common border between the United States and Canada or Mexico.  Yes  No  
 Canada  
 Mexico  
If "No," specify the country and provide an exhibit of compliance with all provisions of the relevant International Agreement. [Exhibit 21]

<p>16. <b>Environmental Protection Act.</b> The proposed facility is excluded from environmental processing under 47. C.F.R. Section 1.1306 (i.e., The facility will not have a significant environmental impact and complies with the maximum permissible radiofrequency electromagnetic exposure limits for controlled and uncontrolled environments). Unless the applicant can determine compliance through the use of the RF worksheets in Worksheet #7, an <b>Exhibit is required.</b></p> <p>By checking "Yes" above, the applicant also certifies that it, in coordination with other users of the site, will reduce power or cease operation as necessary to protect persons having access to the site, tower or antenna from radiofrequency electromagnetic exposure in excess of FCC guidelines.</p>	<p style="text-align: right;"> <input checked="" type="radio"/> Yes   <input type="radio"/> No                 </p> <p style="text-align: right;">See Explanation in [Exhibit 22]</p>
<p><b>PREPARER'S CERTIFICATION ON PAGE 8 MUST BE COMPLETED AND SIGNED.</b></p>	

**Exhibits**

**Exhibit 13**

**Description:** EXHIBIT 13 - MAIN STUDIO LOCATION

AS REFLECTED ON IT'S LICENSE (BLED-20000302AAD), WNAN HAS BEEN GRANTED A WAIVER OF THE MAIN STUDIO LOCATION RULE, SECTION 73.1125, AND IS AUTHORIZED TO OPERATE FROM THE STUDIO OF FM STATION WCAI, WOODS HOLE, MASSACHUSETTS (FACILITY ID 8566).

**Attachment 13**

**Exhibit 14**

**Description:** EXHIBIT 14 - STATEMENT A

EXHIBIT 14 - STATEMENT A - ALLOCATION

**Attachment 14**

Description
<a href="#">Exhibit 14 - Statement A - Allocation</a>

**Exhibit 15**

**Description:** EXHIBIT 15

SEE EXHIBIT 14 - STATEMENT A

**Attachment 15**

**Exhibit 18**

**Description:** EXHIBIT 18

SEE EXHIBIT 14 - STATEMENT A

**Attachment 18**

**Attachment 21**

**Exhibit 22**

**Description:** EXHIBIT 22 - STATEMENT B

EXHIBIT 22 - STATEMENT B - ENVIRONMENTAL

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**Attachment 22**

<b>Description</b>
Exhibit 22 - Statement B - Environmental

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Exhibit 22 - Statement B  
**ENVIRONMENTAL CONSIDERATIONS**  
prepared for  
**WGBH EDUCATIONAL FOUNDATION, INC.**  
WNAN(FM) Nantucket, Massachusetts  
Facility ID 8600  
Ch. 216A 2.3 kW 64 m

The instant proposal is not believed to have a significant environmental impact as defined under Section 1.1306 of the Commission's Rules. Consequently, preparation of an Environmental Assessment is not required.

### **Nature of The Proposal**

*WGBH Educational Foundation, Inc.* ("WGBH") herein seeks a Construction Permit for WNAN(FM), Nantucket, Massachusetts, Channel 216A (file number BLED-20000302AAD). The proposed operation will correct the antenna height above ground to reflect "as built" conditions, and increase the effective radiated power ("ERP"). The existing antenna supporting structure will be employed (Antenna Structure Registration number 1006317).

The use of existing transmitting locations has been characterized as being environmentally preferable by the Commission, according to Note 1 of §1.1306 of the FCC Rules. Since no change in overall structure height is proposed, no change in current structure marking and lighting requirements is anticipated. Therefore, it is believed that this application may be categorically excluded from environmental processing pursuant to §1.1306 of the Commission's rules.

### **Human Exposure to Radiofrequency Radiation**

The proposed operation was evaluated for human exposure to radiofrequency energy using the procedures outlined in the Commission's OET Bulletin No. 65 ("OET 65"). OET 65 describes a means of determining whether a proposed facility exceeds the radiofrequency exposure guidelines adopted in §1.1310. Under present Commission policy, a facility may be presumed to comply with the limits specified in §1.1310 if it satisfies the exposure criteria set forth in OET 65. Based upon that

Exhibit 22 - Statement B  
**ENVIRONMENTAL CONSIDERATIONS**  
(Page 2 of 3)

methodology, and as demonstrated in the following, the proposed transmitting system will comply with the cited adopted guidelines.

The WNAN(FM) transmitting antenna is configured such that its center of radiation is 56 meters above ground level. A three-bay half-wave spaced non-directional antenna with an effective radiated power (“ERP”) of 2.3 kilowatts, vertically polarized, will be employed. The “uncontrolled/general population” limit specified in §1.1310 for Channel 216 (91.9 MHz) is 200  $\mu\text{W}/\text{cm}^2$ .

Calculations were made per OET 65 to predict power density attributable to the proposed facility at location points two meters above ground level in the immediate vicinity of the tower. The vertical plane (elevation) pattern for the WNAN Shively 6513-3-1/2SS 3-bay half-wave spaced antenna was used to calculate the exposure at radials around the tower. **Exhibit 22 - Figure 1** and accompanying **Exhibit 22 - Table 1** provide the elevation pattern for a three-bay half-wave spaced antenna. A “worst case” terrain elevation was used, with a slope from the tower base of 11 meters AMSL, and rising to 21.3 meters AMSL at 164 meters distant.

Using equation (9) in OET-65, calculations were made to predict power density at points two meters above ground level locations. Considering terrain elevations near the site and the directivity of the proposed antenna system in the vertical plane (elevation), RF density levels attributable to the proposed WNAN(FM) facility will be less than 1.0 percent of the general public / uncontrolled MPE.

§1.1307(b)(3) states that facilities contributing less than five percent of the exposure limit at locations with multiple transmitters (such as the case at hand) are categorically excluded from responsibility for taking any corrective action in the areas where their contribution is less than five percent. Since the instant situation meets the five percent exclusion test at all ground level areas, the impact of any other facilities using this site or at a nearby site may be considered independently from this proposal. Accordingly, it is believed that the impact of the proposed operation should not be considered to be a factor at or near ground level as defined under §1.1307(b).

Exhibit 22 - Statement B  
**ENVIRONMENTAL CONSIDERATIONS**  
(Page 3 of 3)

**Safety of Tower Workers and the General Public**

As demonstrated herein, excessive levels of RF energy will not be caused at publicly accessible areas at ground level near the antenna supporting structure. Consequently, members of the general public will not be exposed to RF levels in excess of the Commission's guidelines. Nevertheless, tower access will continue to be restricted and controlled through the use of a locked fence. Additionally, appropriate RF exposure warning signs will continue to be posted.

With respect to worker safety, it is believed that based on the preceding analysis, excessive exposure would not occur in areas at ground level. A site exposure policy will continue to be employed protecting maintenance workers from excessive exposure when work must be performed on the tower (or on nearby towers) in areas where high RF levels may be present. Such protective measures may include, but will not be limited to, restriction of access to areas where levels in excess of the guidelines may be expected, power reduction, or the complete shutdown of facilities when work or inspections must be performed in areas where the exposure guidelines will be exceeded. On-site RF exposure measurements may also be undertaken to establish the bounds of safe working areas. The applicant will coordinate exposure procedures with all pertinent stations.

**Conclusion**

Based on the preceding, it is believed that the instant proposal may be categorically excluded from environmental processing under Section 1.1306 of the Rules, hence preparation of an Environmental Assessment is not required.

**STATEMENT 22 - FIGURE 1  
ANTENNA VERTICAL (ELEVATION) PLANE  
RADIATION PATTERN**

prepared March 2003 for  
**WGBH Educational Foundation, Inc.**  
WNAN(FM) Nantucket, Massachusetts  
Facility ID: 8600  
Ch. 216A 2.3 kW 64 m

**Cavell, Mertz & Davis, Inc.**  
Manassas, Virginia

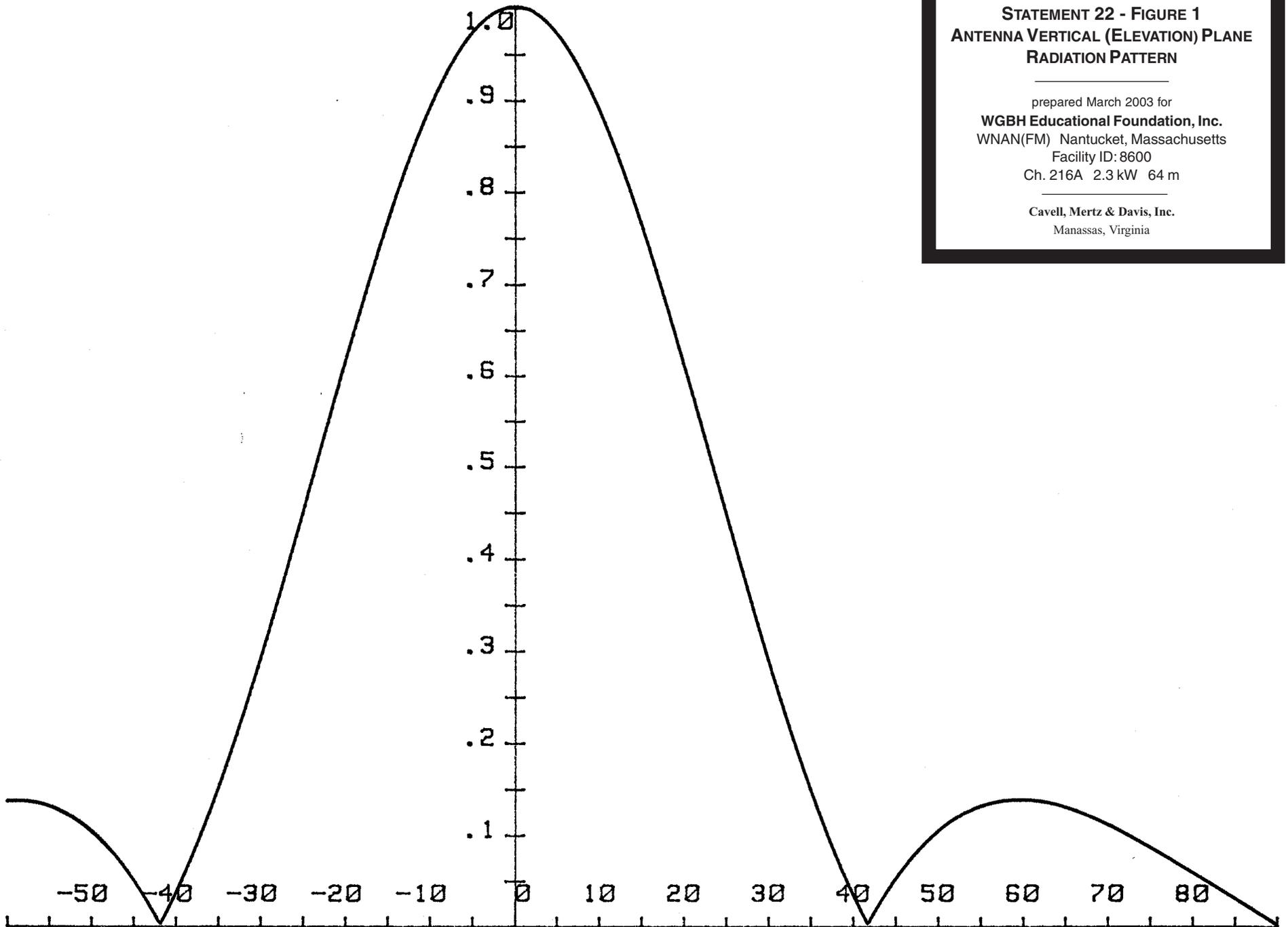


Exhibit 22 - Table 1  
**ANTENNA VERTICAL (ELEVATION) PLANE TABULATION**  
 prepared for  
**WGBH EDUCATIONAL FOUNDATION, INC.**  
 WNAN(FM) Nantucket, Massachusetts  
 Facility ID 8600  
 Ch. 216A 2.3 kW 64 m

<b>Elevation<sup>1</sup></b> <b>(deg)</b>	<b>Relative</b> <b>Field</b>	<b>Elevation</b> <b>(deg)</b>	<b>Relative</b> <b>Field</b>	<b>Elevation</b> <b>(deg)</b>	<b>Relative</b> <b>Field</b>
0	1.000	30	0.289	60	0.138
1	0.999	31	0.259	61	0.137
2	0.995	32	0.230	62	0.136
3	0.990	33	0.201	63	0.134
4	0.982	34	0.174	64	0.131
5	0.971	35	0.148	65	0.129
6	0.959	36	0.123	66	0.126
7	0.944	37	0.099	67	0.122
8	0.928	38	0.076	68	0.118
9	0.910	39	0.054	69	0.114
10	0.890	40	0.034	70	0.110
11	0.867	41	0.015	71	0.105
12	0.844	42	0.003	72	0.101
13	0.819	43	0.020	73	0.096
14	0.792	44	0.036	74	0.091
15	0.764	45	0.050	75	0.085
16	0.738	46	0.063	76	0.080
17	0.706	47	0.075	77	0.074
18	0.675	48	0.086	78	0.069
19	0.643	49	0.095	79	0.063
20	0.612	50	0.104	80	0.058
21	0.579	51	0.111	81	0.052
22	0.546	52	0.118	82	0.046
23	0.513	53	0.123	83	0.041
24	0.480	54	0.127	84	0.035
25	0.447	55	0.131	85	0.029
26	0.415	56	0.134	86	0.023
27	0.383	57	0.136	87	0.017
28	0.351	58	0.137	88	0.012
29	0.319	59	0.138	89	0.006
				90	0.000

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<sup>1</sup>Relative field values for depression angle from horizontal