ELECTROMAGNETIC FIELD (EMF) STRENGTH MEASUREMENTS
SITE: ROHRERSTOWN ELEMENTARY SCHOOL
OCTOBER 16, 2017

Rohrerstown Elementary School – Hempfield School District
2200 Noll Drive
Lancaster, PA 17603

Millennium Engineering, P.C.
132 Jaffrey Road
Malvern, PA 19355

Cell: 610.220.3820
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E-mail: pdugan@millenniumeng.com
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October 16, 2017

Attn: Dr. Christopher S. Adams, Ed.D. – Superintendent of Schools
Hempfield School District
200 Church Street
Landisville, PA 17538

Re: Electromagnetic Field (EMF) Measurements at Rohrerstown Elementary School
2200 Noll Drive, Lancaster, PA 17603 (East Hempfield Township, Lancaster County)

Dear Dr. Adams,

Our firm, Millennium Engineering, P.C., routinely provides independent determinations and certifications that communications facilities (existing and proposed) comply with Federal Communications Commission (FCC) exposure limits and guidelines for human exposure to radiofrequency electromagnetic fields (Code of Federal Regulation 47 CFR 1.1307 and 1.1310). As a registered professional engineer I am under the jurisdiction of the State Registration Boards in which I am licensed to hold paramount the safety, health, and welfare of the public and to issue all public statements in an objective and truthful manner.

Verizon Wireless is planning to construct a wireless communications facility on Hempfield School District property behind Rohrerstown Elementary School. It was requested that electromagnetic field (EMF) measurements be performed inside the elementary school, on the roof of the elementary school and on the grounds surrounding the elementary school to certify compliance with FCC standards. These measurements will be used as a baseline and repeated once the facility is constructed and activated.

The proposed Verizon Wireless communications facility consists of a proposed 100’ monopole (105’ overall). The proposed Verizon Wireless antenna configuration from the information furnished to me consists of (1) 700/2100 MHz (LTE) dual-band antenna (JMA MX06FRO860-02 or equivalent) and (1) 850/1900 MHz (LTE) dual-band antenna (JMA MX06FRO860-02 or equivalent) on each of three faces (total of 6 antennas) spaced with azimuths of 0/120/240 degrees on the horizontal plane with a centerline of approximately 100’ above ground level and mechanical downtilt of 3 degrees on each face. Transmitting from these antennas will be (1) 700 MHz LTE wideband channel (4x30 watt remote radio head), (1) 850 MHz LTE wideband channel (4x40 watt remote radio head), (1) 1900 MHz LTE wideband channel (4x30 watt remote radio head) and up to (2) 2100 MHz LTE wideband channels (4x45 watt remote radio head) per face.

Verizon Wireless is licensed by the FCC to transmit in the 700 MHz “Upper C Block” (746-757 MHz), the 850 MHz (cellular) “B Band” (880-894 MHz), the 1900 MHz (PCS) “E Block” (1965-1970 MHz) and the 2100 MHz (AWS) “A Block”, “B Block” and “J Block” (2110-2120, 2120-2130, 2170-2180 MHz).

On 10/16/2017, Hempfield School District personnel provided access for us to perform EMF strength measurements at locations throughout the inside of the elementary school, on the roof of the elementary school and on the grounds surrounding the building. **The attached measurement data log shows that all whole body spatial average measurements were well below 1 % of the FCC general population exposure limits at all**

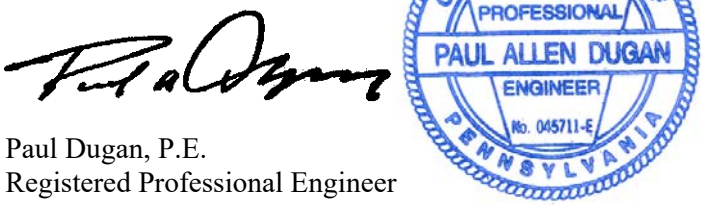
measured locations. See the attached measurement location map and data logs (*pages 5-11*) for the field strength measurement locations and corresponding readings. Please note that, for example, a reading of 0.01 in the data logs represents 0.01%, or 1/1000th (0.0001) of the exposure limits.

All field strength measurements were performed with a calibrated Narda meter (Model #8718B – Serial #7054) and probe (Model #A8722D – Serial #15002) last calibrated on 9/25/2017 (expires 9/25/2018). This particular meter measures all transmitting frequencies in the environment in the 300 kHz to 50 GHz frequency range (which includes all licensed operating frequencies of Verizon Wireless).

As shown from our field measurements, the exposure levels at all locations inside the building, on the roof of the building and at ground level anywhere around the building are well below 1 % of the FCC general population exposure limits. Keep in mind that continuous exposure at 100 % of standard is considered by the scientific community as just as safe as 1 % of standard since the exposure limits themselves contain a large margin of safety.

In summary, electromagnetic field strength measurements were taken throughout the Rohrerstown Elementary School property. All measurements were well below 1 % of the FCC general population exposure limits. These field measurements confirm that the current radiofrequency exposure levels at locations inside of, on the roof of, and around the Rohrerstown Elementary School building are in compliance with all applicable standards by a substantial margin prior to the Verizon Wireless communications facility being installed and activated.

Respectfully,



Paul Dugan, P.E.
Registered Professional Engineer
Pennsylvania License Number PE-045711-E

MEASUREMENT LOCATION MAP

Rohrerstown Elementary School Property

Location #1: 1st Floor Hallways/Cafeteria (inside)
Location #2: Upper Rooftop (outside)
Location #3: Lower Rooftop (outside)
Location #4: 2nd Floor Hallways (inside)
Location #5: Ground Level Outside Surrounding Building/Fields/Proposed Monopole Location

Rohrerstown Elementary School Electromagnetic (EMF) Field Strength Measurements
% FCC General Population/Uncontrolled Maximum Permissible Exposure (MPE)
Location #1: 1st Floor - Inside

Date: 09/27/17 Start Time: 11:35

Model: 8718 S/N: 7054 Cal Date: 09/25/17 Due: 09/25/18

Probe: A8722D S/N: 15002 Cal Date: 09/25/17 Due: 09/25/18

Ref#	% General Population MPE
1	0.04
2	0.04
3	0.06
4	0.06
5	0.06
6	0.06
7	0.06
8	0.06
9	0.06
10	0.06
11	0.06
12	0.02
13	0.01
14	0.01
15	0.04
16	0.06
17	0.06
18	0.04
19	0.03
20	0.06
21	0.08
22	0.10
23	0.10
24	0.06
25	0.08
26	0.08
27	0.08
28	0.08
29	0.08
30	0.08

Ref#	% General Population MPE
31	0.01
32	0.02
33	0.08
34	0.08
35	0.08
36	0.08
37	0.06
38	0.08
39	0.08
40	0.08
41	0.01
42	0.01
43	0.02
44	0.01
45	0.02
46	0.06
47	0.01
48	0.01
49	0.01
50	0.02
51	0.02
52	0.01
53	0.02
54	0.01
55	0.01
56	0.01
57	0.01
58	0.01
59	0.02
60	0.01

Rohrerstown Elementary School Electromagnetic (EMF) Field Strength Measurements
% FCC General Population/Uncontrolled Maximum Permissible Exposure (MPE)
Location #2: Upper Roof - Outside

Date: 09/27/17 Start Time: 11:35

Model: 8718 S/N: 7054 Cal Date: 09/25/17 Due: 09/25/18

Probe: A8722D S/N: 15002 Cal Date: 09/25/17 Due: 09/25/18

Ref#	% General Population MPE
61	0.01
62	0.01
63	0.01
64	0.08
65	0.13
66	0.16
67	0.24
68	0.24
69	0.23
70	0.26
71	0.32
72	0.33
73	0.36
74	0.43
75	0.44
76	0.48
77	0.49
78	0.48
79	0.42
80	0.44

Rohrerstown Elementary School Electromagnetic (EMF) Field Strength Measurements
% FCC General Population/Uncontrolled Maximum Permissible Exposure (MPE)
Location #3: Lower Roof - Outside

Date: 09/27/17 Start Time: 11:35

Model: 8718 S/N: 7054 Cal Date: 09/25/17 Due: 09/25/18

Probe: A8722D S/N: 15002 Cal Date: 09/25/17 Due: 09/25/18

Ref#	% General Population MPE
81	0.01
82	0.01
83	0.08
84	0.16
85	0.23
86	0.31
87	0.34
88	0.38
89	0.44
90	0.44
91	0.43
92	0.40
93	0.39
94	0.38
95	0.41
96	0.40
97	0.41
98	0.39
99	0.39
100	0.38

Rohrerstown Elementary School Electromagnetic (EMF) Field Strength Measurements
% FCC General Population/Uncontrolled Maximum Permissible Exposure (MPE)
Location #4: 2nd Floor - Inside

Date: 09/27/17 Start Time: 11:35

Model: 8718 S/N: 7054 Cal Date: 09/25/17 Due: 09/25/18

Probe: A8722D S/N: 15002 Cal Date: 09/25/17 Due: 09/25/18

Ref#	% General Population MPE
101	0.14
102	0.06
103	0.06
104	0.04
105	0.03
106	0.01
107	0.02
108	0.01
109	0.01
110	0.01
111	0.01
112	0.01
113	0.01
114	0.02
115	0.06
116	0.01
117	0.02
118	0.01
119	0.01
120	0.01
121	0.02
122	0.02
123	0.01
124	0.01
125	0.01

Ref#	% General Population MPE
126	0.01
127	0.01
128	0.01
129	0.02
130	0.02
131	0.02
132	0.01
133	0.02
134	0.02
135	0.01
136	0.01
137	0.02
138	0.02
139	0.01
140	0.01
141	0.01
142	0.01
143	0.02
144	0.01
145	0.02
146	0.01
147	0.01
148	0.01
149	0.01
150	0.01

Rohrerstown Elementary School Electromagnetic (EMF) Field Strength Measurements
% FCC General Population/Uncontrolled Maximum Permissible Exposure (MPE)
Location #5: Ground Level Outside Surrounding Building/Fields/Proposed Monopole Location

Date: 09/27/17 Start Time: 11:35

Model: 8718 S/N: 7054 Cal Date: 09/25/17 Due: 09/25/18

Probe: A8722D S/N: 15002 Cal Date: 09/25/17 Due: 09/25/18

Ref#	% General Population MPE
151	0.02
152	0.01
153	0.01
154	0.02
155	0.01
156	0.02
157	0.01
158	0.01
159	0.04
160	0.06
161	0.08
162	0.08
163	0.12
164	0.10
165	0.13
166	0.11
167	0.10
168	0.08
169	0.08
170	0.09
171	0.15
172	0.16
173	0.18
174	0.21
175	0.19
176	0.17
177	0.21
178	0.18
179	0.21
180	0.19

Ref#	% General Population MPE
181	0.23
182	0.23
183	0.26
184	0.27
185	0.30
186	0.29
187	0.26
188	0.23
189	0.27
190	0.26
191	0.24
192	0.25
193	0.28
194	0.26
195	0.24
196	0.34
197	0.29
198	0.26
199	0.27
200	0.25
201	0.26
202	0.26
203	0.28
204	0.28
205	0.27
206	0.29
207	0.27
208	0.27
209	0.26
210	0.28

Ref#	% General Population MPE
211	0.27
212	0.26
213	0.25
214	0.25
215	0.24
216	0.23
217	0.23
218	0.21
219	0.23
220	0.19
221	0.21
222	0.24
223	0.19
224	0.19
225	0.18
226	0.17
227	0.14
228	0.16
229	0.16
230	0.17
231	0.18
232	0.21
233	0.19
234	0.18
235	0.19
236	0.19
237	0.19
238	0.18
239	0.17
240	0.17

Rohrerstown Elementary School Electromagnetic (EMF) Field Strength Measurements
% FCC General Population/Uncontrolled Maximum Permissible Exposure (MPE)
Location #5: Ground Level Outside Surrounding Building/Fields/Proposed Monopole Location

Date: 09/27/17 Start Time: 11:35

Model: 8718 S/N: 7054 Cal Date: 09/25/17 Due: 09/25/18

Probe: A8722D S/N: 15002 Cal Date: 09/25/17 Due: 09/25/18

Ref#	% General Population MPE
241	0.15
242	0.17
243	0.15
244	0.14
245	0.14
246	0.13
247	0.11
248	0.12
249	0.09
250	0.09
251	0.11
252	0.13
253	0.12
254	0.12
255	0.10
256	0.12
257	0.14
258	0.15
259	0.16
260	0.15
261	0.03
262	0.01
263	0.08
264	0.09
265	0.09
266	0.08
267	0.09
268	0.08
269	0.08
270	0.08

Ref#	% General Population MPE
271	0.08
272	0.08
273	0.09
274	0.10
275	0.08
276	0.09
277	0.11
278	0.11
279	0.11
280	0.09
281	0.09
282	0.09
283	0.08
284	0.09
285	0.09
286	0.08
287	0.09
288	0.09
289	0.10
290	0.08
291	0.11
292	0.08
293	0.10
294	0.12
295	0.09
296	0.08
297	0.09
298	0.08
299	0.08
300	0.08

Certificate of Calibration

L-3 Communications, Narda Microwave-East, hereby certifies that the referenced instrument has been calibrated by qualified personnel to Narda's approved test procedures.

Furthermore, the instrument meets, or exceeds, all published specifications and the calibration has been performed with test instrumentation that, where applicable, is traceable to the National Institute of Standards and Technology.

Narda's calibration measurements are traceable to the National Institute of Standards and Technology to the extent allowed by the bureau's calibration facilities.

Customer: MILLENNIUM ENGINEERING, P.C.
MALVERN, PA 19355

Certificate #: 168905 1

Model #: 8718B

Serial #: 7054

Description: METER

PO #: 9052017

Date Calibrated: 25/Sep/2017

R.O. #: 168905

Hugh Saunders
Hugh Saunders
Test

Ralph Curcio
Ralph Curcio
Quality Assurance

L-3 COMMUNICATIONS, NARDA MICROWAVE-EAST, 435 MORELAND ROAD, HAUPPAUGE, NEW YORK 11788, TEL: 631-231-1700, FAX: 631-231-1711

Certificate of Calibration

L-3 Communications, Narda Microwave-East, hereby certifies that the referenced instrument has been calibrated by qualified personnel to Narda's approved test procedures.

Furthermore, the instrument meets, or exceeds, all published specifications and the calibration has been performed with test instrumentation that, where applicable, is traceable to the National Institute of Standards and Technology.

Narda's calibration measurements are traceable to the National Institute of Standards and Technology to the extent allowed by the bureau's calibration facilities.

Customer: MILLENNIUM ENGINEERING, P.C.
MALVERN, PA 19355

Certificate #: 168905 2

Model #: A8722D

Serial #: 15002

Description: PROBE

PO #: 9052017

Date Calibrated: 25/Sep/2017

R.O. #: 168905

Hugh Saunders
Hugh Saunders
Test

Ralph Curcio
Ralph Curcio
Quality Assurance

L-3 COMMUNICATIONS, NARDA MICROWAVE-EAST, 435 MORELAND ROAD, HAUPPAUGE, NEW YORK 11788, TEL: 631-231-1700, FAX: 631-231-1711

PROPOSED VERIZON WIRELESS MONOPOLE LOCATION

DECLARATION OF ENGINEER

Paul Dugan, P.E., declares and states that he is a graduate telecommunications consulting engineer (BSE/ME Widener University 1984/1988), whose qualifications are a matter of record with the Federal Communications Commission (FCC). His firm, Millennium Engineering, P.C., has been retained by Hempfield School District to perform power density measurements or calculations for an existing or proposed communications facility and analyze the data for compliance with FCC exposure limits and guidelines for human exposure to radiofrequency electromagnetic fields.

Mr. Dugan also states that the calculations or measurements made in the evaluation were made by himself or his technical associates under his direct supervision, and the summary letter certification of FCC compliance associated with the foregoing document was made or prepared by him personally. Mr. Dugan is a registered professional engineer in the Jurisdictions of Pennsylvania, New Jersey, Delaware, Maryland, Virginia, New York, Connecticut, District of Columbia, West Virginia and Puerto Rico with over 30 years of engineering experience. Mr. Dugan is also an active member of the Association of Federal Communications Consulting Engineers, the National Council of Examiners for Engineering, the National Society of Professionals Engineers, the Pennsylvania Society of Professional Engineers, and the Radio Club of America. Mr. Dugan further states that all facts and statements contained herein are true and accurate to the best of his own knowledge, except where stated to be in information or belief, and, as to those facts, he believes them to be true. He believes under penalty of perjury the foregoing is true and correct.

Paul Dugan, P.E.

Executed this the 16th day of October, 2017.

PAUL DUGAN, P.E.
132 Jaffrey Road
Malvern, Pennsylvania 19355

Cell: 610-220-3820
Fax: 610-644-4355
Email: pdugan@millenniumeng.com
Web Page: www.millenniumeng.com

EDUCATION:

Widener University, Chester, Pennsylvania
Master of Business Administration, July 1991
Master of Science, Electrical Engineering, December 1988
Bachelor of Science, Electrical Engineering, May 1984

PROFESSIONAL ASSOCIATIONS:

Registered Professional Engineer in the following jurisdictions:

Pennsylvania, License Number PE-045711-E
New Jersey, License Number GE41731
Maryland, License Number 24211
Delaware, License Number 11797
Virginia, License Number 36239
Connecticut, License Number 22566
New York, License Number 079144
District of Columbia, License Number PE-900355
West Virginia, License Number 20258
Puerto Rico, License Number 18946

Full member of **The Association of Federal Communications Consulting Engineers** (www.afcce.org) January 1999 to Present
Elected to serve on the Board of Directors for 2006-2007

Full member of **The National Society of Professional Engineers** (www.nspe.org) and the **Pennsylvania Society of Professional Engineers** (www.pspe.org) June 2003 to Present
Currently serving on the Board of Directors of the Valley Forge Chapter and as South East Region Vice-Chair for the "Professional Engineers in Private Practice" Executive Committee

Actively participate in **Chester County ARES/RACES** (CCAR www.w3eoc.org) which prepares and provides emergency backup communications for Chester County Department of Emergency Services, March 2005 to Present

Full member of **The National Council of Examiners for Engineering** (www.ncees.org) May 2001 to Present

Full Member of **The Radio Club of America** (www.radio-club-of-america.org) December 2003 to present

PROFESSIONAL EXPERIENCE:

Millennium Engineering, P.C., Malvern, Pennsylvania
Position: **President**, August 1999 to Present (www.millenniumeng.com)

Verizon Wireless, Plymouth Meeting, Pennsylvania
Position: **Cellular RF System Design/Performance Engineer**, April 1990 to August 1999

Communications Test Design, Inc., West Chester, Pennsylvania
Position: **Electrical Engineer,** May 1984 to April 1990