

New Business Item 14-05: Analysis of Cell Towers on Public School Property in Maryland

NBI 14-05 Charge: That the MSEA conduct an immediate review of research and provide a report to local boards with regard to construction and operation of cell towers on the grounds of Maryland schools. The report will include, but not be limited to, positive and negative effects.

BACKGROUND

Current Maryland Landscape

Several school systems have entertained agreements to place cell phone towers on their property. In 2012, Anne Arundel County Public Schools (AACPS) entered into an agreement with Milestone Communications to construct cell phone towers on school property. According to the Department of Legislative Services (DLS), one cell phone tower has been built at Broadneck High School; one tower is nearing completion at the Center for Applied Technology – North; one has been issued permits, but construction has not yet begun at Annapolis Middle School; and one has a permit application undergoing review at Magothy/Severn River Middle School. Initial phases of public comment are also beginning at Corkran Middle School.

DLS also reports that several other jurisdictions in the state, including Baltimore City and Montgomery County, have agreements allowing the construction of cell phone towers on school property. In 2013, Baltimore City Public Schools collected nearly \$678,000 from more than a dozen cellphone towers on school property and Montgomery County Public Schools collected approximately \$832,000 from placing cell phone towers on school property. Montgomery County's school board allows for parent approval before towers are constructed.

In 2011, Prince George's County Public Schools signed an agreement with Milestone Communications to build towers on nine school sites, including Benjamin Tasker Middle School in Bowie, Charles Carroll Middle School in New Carrollton, and Oxon Hill Middle School in Oxon Hill. Under the agreement, Milestone can lease the tower space for 10 years with up to a 20-year extension. In return, the school system will receive \$25,000 for each site and 40 percent of revenue generated from the towers. The school system estimates this agreement could bring in \$2.5 million over five years.

Community Concern

In response to these school system agreements, concerned parents and other community members in Anne Arundel, Baltimore, Montgomery, and Prince George's counties started the Maryland State Coalition Against Cell Towers on Schools to stop

construction of cell towers on school property. They fear the towers cause exposure to radiation, reduce property values, and create the possibility of equipment related accidents. They are also concerned about how base stations impact neighborhood aesthetics.

In the 2015 Maryland General Assembly session, concerned parents in Anne Arundel County worked with their delegation to introduce a local bill to place a moratorium on any construction of cell towers until June 30, 2016—after a report had been submitted to the General Assembly on how towers are used on school property. The bill received an unfavorable report in the House Ways and Means Committee.

Cell Towers and Radiofrequency Waves

Cell towers (also commonly referred to as “base stations”) are a combination of antenna towers and electrical equipment that are typically 50-200 feet high. Often the towers are grouped in threes, with one antenna used to transmit signals to mobile phones and the other two to receive signals.

These signals are transmitted through radio frequency (RF) waves—energy in the electromagnetic spectrum between FM radio waves and microwaves. Like FM radio waves and microwaves, RF waves are a form of non-ionizing radiation. According to the American Cancer Society, “this means they cannot cause cancer by directly damaging DNA.” It takes much stronger forms of radiation—like x-rays or UV light—to break bonds in DNA and cause cancer.

Cell towers transmit RF waves at varying levels of power, depending on the number and strength of radio channels at a base station. At high levels, these waves can heat up body tissue. But the power transmitted by cell towers is far lower than levels considered dangerous. The Federal Communications Commission (FCC) permits an effective radiated power (ERP) of up to 500 watts per channel, but the majority of cell towers in urban and suburban areas operate at an ERP of 100 watts per channel.

The FCC notes that the power density rapidly decreases as distance from the tower’s antenna increases, and that “measurements made near typical cellular and PCS cell sites have shown that ground-level power densities are well below the exposure limits recommended by RF/microwave safety standards used by the FCC.”

FCC Guidelines

FCC guidelines, adopted in 1996, are identical to those recommended by the National Council on Radiation Protection and Measurements, a non-profit corporation chartered by Congress. They are also based on guidelines developed by the Institute of Electrical and Electronics Engineers and endorsed by the American National Standards Institute.

The guidelines recommend a maximum exposure level of 580 microwatts per square centimeter. The FCC notes that this limit is many times greater than the level typically

found at the base of a cell tower. According to the American Cancer Society, “at ground level near typical cellular base stations, the amount of RF energy is thousands of times less than the limits for safe exposure set by the FCC.” The possibility of someone walking below the tower being exposed to RF levels above the recommended limit is extremely remote.

The only way one could be exposed to RF waves in excess of this limit is if the person remained within a few feet of the antenna for several minutes or longer. When cell towers are mounted on rooftops (as is the case in many school properties) RF emissions could exceed higher than guideline levels on the rooftop itself if standing directly in front of, or close to, the antenna. In such cases, personnel working on the rooftop should take precautions to limit their time in such proximity to the antenna. That being said, individuals working within the building should not be at risk—largely because wood or cement block greatly reduces the exposure level of RF radiation.

Potential Negative Effects

A. Potential Negative Effect: Radiation’s Impact on Health

One of the more commonly held concerns about cell towers is that the radiation waves they release can cause cancer to people in close proximity. However, according to scientific theory and existing research on radioactive waves, it is extremely unlikely that RF waves from base stations can cause cancer. The American Cancer Society gives three reasons for this conclusion:

- 1. The energy level of RF waves is relatively low compared to the types of radiation known to increase the risk of cancer.** On the electromagnetic spectrum RF waves are too weak to break chemical bonds in DNA molecules, whereas higher energy radiation—like gamma rays, x-rays, and UV light—are strong enough to alter DNA. This effect on DNA molecules is what increases the risk of cancer.
- 2. RF waves have long wavelengths.** The smallest a RF wave can go is an inch or two in size. This is far too big to influence microscopic cells.
- 3. RF waves from cell towers are no more dangerous than radiation waves from radio or television broadcast stations.** Even if RF waves were somehow able to influence DNA despite their large wavelength and low energy, the general public, or even staff and students in a school building, should not face the high level of concentrated exposure needed to be harmed. Cell towers emit RF waves at no significantly different energy level than other common sources of RF radiation in urban areas. According to the World Health Organization, “the body absorbs up to five times more of the signal from FM radio and television than from base stations.”

What do prominent studies say?

Elliott P, Toledano MB, Bennett J, et al. (2010): Researchers conducted a case-control study of early childhood cancers and maternal exposures to radiofrequency during pregnancy due to base stations in Great Britain. After examining nearly 1,400 cases of cancer in children and more than 5,500 control cases from the national birth register, researchers found no association between risk of childhood cancer and close proximity to base stations during the mother's pregnancy.

Röösli M, Frei P, Mohler E, Hug K. (2010): Swiss researchers conducted a meta-analysis of all credible studies on health effects from exposure to cell phone base station RF waves. They identified 17 articles—from both field interventions and randomized trials—and concluded: "our review does not indicate an association between any health outcome and radiofrequency electromagnetic field exposure...at levels typically encountered in people's everyday environment. The evidence that no relationship exists between...exposure and acute symptom development can be considered strong." However, the researchers did note there is a lack of evidence relating to long-term health impact and effects on children and adolescents.

Yildirim MS, Yildirim A, Zamani AG, Okudan N (2010): Researchers tested the hypothesis that RF waves from base stations do not alter DNA material in human cells. Comparing a variable group and test group, they wrote: "our results show that there was not a significant difference of MN frequency and chromosomal aberrations between the two study groups. The results claim that cellular phones and their base stations do not produce important carcinogenic changes."

What do expert organizations say?

World Health Organization (WHO): In 2005, WHO organized an international workshop on base stations and their impact on health consequences. Researchers there noted that "all recent expert reports have concluded, based on laboratory analysis, that there are no adverse health effects from exposure to very-low-level exposure."

International Agency for Research on Cancer (IARC): In 2011, IARC formed a working group of 30 scientists from 14 countries to determine carcinogenicity of radiofrequency electromagnetic fields. The working group concluded that there is "limited evidence in humans" for the carcinogenicity of RF waves, based on studies indicating positive associations between glioma and acoustic neuroma and exposure to RF waves from handheld cell phones. However, a few members of the working group considered the current evidence in humans "inadequate" because of inconsistency in the cited studies. More importantly, the workgroup noted that exposure to the brain from RF waves from cell towers is less than 1/100th the exposure from cell phones—making any risk from base stations far lower.

Environmental Protection Agency (EPA): The EPA advises that “at very high levels, RF energy is dangerous. It can heat the body’s tissues rapidly.” But it notes that at ground level, exposure to RF waves from cell towers is very low.

B. Potential Negative Effect: Lower Property Values in Homes Near Schools

Some have argued that nearby property values decrease when cell towers are built on school property due to the perceived health effects and negative aesthetics. However, there is limited and mixed research on the topic and researchers warn that study results on property values are difficult to apply generally, as each community has different behaviors and attitudes.

In 2004, researchers looked at Orange County in Florida to study property values and how they were influenced by proximity to cell towers. Their study included single-family homes sold between 1990 and 2000, and they found a statistically significant negative relationship between proximity to cell towers and property values. The relationship was minimal, and researchers noted that their findings were inconsistent with previous studies in different communities—a conclusion they explained by differing attitudes toward unsightliness.

In 2011, the *International Journal of Housing Markets and Analysis* published an article by New Zealand researchers who studied housing values and other data in communities with base stations. They wrote, “The study could not establish a relationship between cell towers and house prices with the exception of armed monopole towers located in residential areas due to such towers' acute visual disamenity.”

C. Potential Negative Effect: Cell Tower Equipment Related Accidents

Concerned parents have fears that parts of electric equipment on towers can fall on staff or students at schools and cause injury. According to the Occupational Safety and Health Administration (OSHA), there were 13 cell tower related deaths in 2013 and 12 in 2014. Of the fatalities investigated by the agency and listed on their website, almost all were due to a communication worker falling from a significant height.

OSHA says this represents a significant increase from previous years, causing enough concern to form a workgroup to study how communication companies can better protect workers. In April 2015, they requested comment on new regulations to strengthen worker safety standards.

OSHA does cite two recent instances—in Kansas and West Virginia—in which towers collapsed and caused serious injuries to workers. In Kansas, the accident was caused by poor quality maintenance equipment and OSHA found several violations of existing

safety rules. In West Virginia, a communication company was also cited for violating rules after the collapse occurred during maintenance on the tower.

Any safety risks appear to apply most critically to employees of communication companies and instances of freestanding towers, not antennas placed on buildings.

Potential Positive Effects

A. Potential Positive Effect: Revenue for School Districts

A driving motivation for school districts to form agreements with communication companies to construct cell towers on school property is the need for additional funding. While public sources of funding are preferred to private—due to greater reliability of public funding and the many conflicts private sources of funding can create—adequate funding for public schools is a consistent concern throughout the state.

In the three school districts examined by DLS, actual or estimated annual revenue ranges between \$500,000 in Prince George's County and \$832,000 in Montgomery County. While not insignificant, this level of funding represents a very minimal percentage of district budgets.

B. Potential Positive Effect: Improved Cell Reception in Schools and Surrounding Communities

Much like radio channel signals are stronger closer to where they are transmitted, RF waves from cell towers are stronger in close proximity to antennas. As distance from base stations increases, cell reception decreases. The construction of cell towers on school property will very likely result in improved cell coverage for schools and their surrounding communities, helping students and their families communicate when necessary.

CONCLUSION

Agreements between school districts and communication companies to construct cell towers on school property in Maryland have caused concerns from parents and other community members.

There is significant research showing no clear association between proximity to cell towers and negative health effects, although there is a shortage of evidence relating to long-term impact. While within the realm of possibility, any negative effect on property values can only be applied to individual communities. Safety concerns related to cell tower accidents appear to be rare and isolated to employees of communication companies.

School districts with agreements do receive a minimal amount of revenue, but other funding sources are much more significant and have consequently received more attention from advocates. Schools and their surrounding communities with cell towers likely see improved cell reception at a time when such a benefit is increasingly valued—but to what degree it is improved and how beneficial this is to instruction is an open question.

Local associations should continue to weigh these factors, work with community members to monitor the construction of cell towers on school property, and stay up to date on the latest research on the issue.

REFERENCES

American Cancer Society. Cellular Phone Towers. December 2, 2014. Accessed at www.cancer.org/cancer/cancercauses/othercarcinogens/athome/cellular-phone-towers on May 27, 2015.

Baan R, Grosse Y, Lauby-Secretan B, El Ghissassi F, Bouvard V, Benbrahim-Tallaa L, Guha N, Islami F, Galichet L, Straif K; WHO International Agency for Research on Cancer Monograph Working Group. Carcinogenicity of radiofrequency electromagnetic fields. *Lancet Oncol.* 2011 Jul;12(7):624-626.

Bond, Sandy. The Effect of Distance to Cell Phone Towers on House Prices in Florida. *The Appraisal Journal.* Fall 2007;75(4):362.

Elliott P, Toledano MB, Bennett J, et al. Mobile phone base stations and early childhood cancers: case-control study. *BMJ.* 2010;340:c3077.

Environmental Protection Agency. Radiation: Non-Ionizing and Ionizing. December 23, 2014. Accessed at www.epa.gov/radiation/understand/index.html on May 27, 2015.

Environmental Protection Agency. Non-Ionizing Radiation From Wireless Technology. February 23, 2015. Accessed at <http://www.epa.gov/rpdweb01/wireless-technology.html> on May 27, 2015.

Federal Communications Commission. Human Exposure to Radio Frequency Fields: Guidelines For Cellular and PCS Sites. October 22, 2014. Accessed at www.fcc.gov/guides/human-exposure-rf-fields-guidelines-cellular-and-pcs-sites on May 27, 2015.

Maryland General Assembly, Department of Legislative Services. Fiscal and Policy Note: Anne Arundel County Board of Education - Wireless Telecommunications Towers - Moratorium and Report. March 18, 2015.

Occupational Safety and Health Administration. Communication Towers. Accessed at www.osha.gov/doc/topics/communicationtower/index.html on May 28, 2015.

Olga Filippova, Michael Rehm. The impact of proximity to cell phone towers on residential property values. *International Journal of Housing Markets and Analysis*. 2011;4(3):244-267.

Powers, Lindsay. Coalition forms to oppose cell towers on school ground. *The Gazette*. September 29, 2014.

Repacholi M, van Deventer E, Ravazzani P, eds. Base stations and wireless networks: exposures and health consequences. World Health Organization. Accessed at http://whqlibdoc.who.int/publications/2007/9789241595612_eng.pdf?ua=1 on May 27, 2015.

Röösli M, Frei P, Mohler E, Hug K. Systematic review on the health effects of exposure to radiofrequency electromagnetic fields from mobile phone base stations. *Bull World Health Organ*. 2010 Dec 1;88(12):887-896F.

Wiggins, Ovetta. In Pr. George's County, momentum builds against cellphone towers at school sites. *The Washington Post*. September 3, 2014.

Wiggins, Ovetta. Prince George's the latest school system to face debate over planned cellphone towers. *The Washington Post*. July 7, 2014.

World Health Organization. Electromagnetic fields and public health. May 2006. Accessed at www.who.int/peh-emf/publications/facts/fs304/en/ on May 27, 2015.

Yildirim MS, Yildirim A, Zamani AG, Okudan N. Effect of mobile phone station on micronucleus frequency and chromosomal aberrations in human blood cells. *Genet Couns*. 2010;21(2):243-51.