Proposed LFC Approach Regarding the Use of Wireless Networking ("Wi-Fi") at the New School

Disclaimer

- Document is in DRAFT status and is NOT FINAL. Any and all information is subject to change during reviews and validation.
- Statistics regarding EMF levels come from a variety of sources, and a variety of points-in-time, and have not been independently verified. While LFC believes the information contained in this document to be reasonably correct, LFC *absolutely does not warrant the accuracy of this information*.
- Readers are encouraged to independently validate any and all information contained herein.

Document Purpose

The purpose of this document is to:

- Describe LFC's proposed approach regarding the use of wireless networking technologies (aka "Wi-Fi") at the new LFC facility
- Provide basic background information on electromagnetic fields ("EMF"), of which Wi-Fi signals are only one type
- Summarize external viewpoints regarding the use of Wi-Fi in schools
- Encourage parents to further research the issue and make their own determination regarding the safety of Wi-Fi, EMF, and the use of cellular phones and mobile computing devices by children

The document is not intended to be, and is not:

- An authoritative source regarding the safety or dangers of any type of EMF
- A comprehensive review of all available research on the subject

Executive Summary

- The safety of LFC children, teachers, administrative personnel, and guests being paramount, the LFC technology committee has reviewed research regarding EMF exposure, and the safety of Wi-Fi in schools, and has found that:
  - Overall EMF exposure, including the exposure due to Wi-Fi, is a very complex topic, subject to many variables and considerations
  - Research and expert opinions can easily be found in support of, or against, the use of Wi-Fi. Some studies claim that Wi-Fi is perfectly safe, while other studies claim that Wi-Fi is unsafe, or that it is simply unknown whether Wi-Fi is safe. There are valid rebuttals and criticisms to all sides, and reasonable people may disagree.
  - To the extent that EMF exposure may pose risks to children, *mobile device* usage (including cell phones) may be more concerning than Wi-Fi usage, as these devices are commonly placed near one's head or body.
  - State, federal, and international guidelines regarding the use of Wi-Fi in schools are inconsistent and overlapping; there is no single clear, compelling standard to adopt
  - As a result, LFC must determine its own proper course of action
- We believe our course of action must exhibit <u>all</u> of the following
  - Maintain a bias towards an overabundance of caution (the precautionary principle)
  - Where guidelines are inconsistent, generally hold ourselves to the stricter standards
  - Allow for flexibility in response to new information that may emerge
  - Allow for the balancing of costs and benefits when evaluating options
  - Help educate parents on how to minimize overall EMF exposure
- Based on the above, we propose that wireless networking is permitted, subject to the following:
  - LFC will adhere to any and all applicable federal and state regulations regarding EMF exposure in schools; i.e., it will comply with U.S. and Illinois law
  - LFC will adopt a target guideline for maximum total overall EMF exposure (not just Wi-Fi). The exact guideline is still in the process of being determined, and will take into account such things as:

    - External research and data points, including average magnetic field levels in California public schools
    - Pre-existing ambient EMF levels at the new LFC site
    - Design guidelines for minimizing EMF
    - City of Chicago building codes
  - LFC will apply reasonable "common sense" measures when deploying Wi-Fi, to reduce needless EMF exposure - regardless of whether these are necessary to achieve target levels
- Upon adopting a target guideline, LFC cannot and does not "guarantee" that EMF levels never exceed these levels, nor would such a situation necessarily represent a health risk. Rather, LFC will measure EMF and compare the readings to the target guideline, to determine if further action is warranted before moving into the new facility
- Additionally, LFC will consider new research and information as it is brought to our attention, and may adjust the target guideline as warranted in the future
- We ask parents to consider all of this information and make their own determination regarding the safety of the school environment, and we welcome questions, comments, and ideas related to this topic
- We will explore ways to help further educate parents on the topic of EMF, so that they may take steps to lower children's overall EMF exposure outside the school and in the home - most notably, around proper positioning and use of mobile computing devices and cell phones, which are potentially more concerning than Wi-Fi per se.
  - Specifically, the World Health Organization International Agency for Research on Cancer WHO/IARC has classified radio frequency electromagnetic fields as possibly carcinogenic to humans, based on "*an increased risk for glioma… associated with wireless phone use*" noting that "*there could be some risk, and therefore we need to keep a close watch for a link between cell phones and cancer risk"* and "*it is important that additional research be conducted into the long-term, heavy use of mobile phones*."

Background: What is EMF?

- Electromagnetism is a fundamental force of nature, similar to gravity
- Electromagnetic fields have an electric field component, and a magnetic field component. Because they are related, it is generally sufficient to speak in terms of the magnetic field component of the EMF; however, either may be measured
- A magnetic field is created by magnets, or by moving electrical charges - i.e., electricity
- Electromagnetic fields (EMF) exist both naturally, and as a result of human activities, and surround us every day, at varying levels of strength. Sources of EMF include: Sunlight; The earth's magnetic field; Power lines; Home electrical wiring; The human brain (or a dog's brain; or any animal nervous system); Cell phone towers; Radio and television stations; Your home wi-fi; Your neighbor's home wi-fi; Cell phones; Cordless phones; Baby monitors; Hair dryers; Home electronics: Computers, tablets, televisions, etc.; Appliances: Microwave ovens, toasters, refrigerators, etc;
- Fields may be constant (aka "direct current"; e.g. the earth's magnetic field) or fluctuating (aka "alternating current"; e.g. radio waves).
  - For alternating signals, the frequency of the signal is relevant, as impacts may differ by frequency
    - EMF from power lines and electrical wiring are low frequency: in the 50-60 Hz range globally, with 60 Hz the standard in the US
    - Wi-Fi, cell phones, radio, television are much higher frequency. For example, Wi-Fi is in the 2.4 GHz range
- The effect of an electromagnetic field depends on the material placed within the field; different substances respond differently
- Electromagnetic fields dissipate rapidly with distance, according to the "inverse square" law
- Electromagnetic fields are can be measured using an EMF Meter, with the magnetic filed portion typically quoted in milliGauss (mG) or microTeslas (μT)
  - 1 mG = .1 μT; 1 μT = 10mG

Typical EMF levels from individual sources

Below is a sample list of EMF levels typically encountered by humans with commonly used items. This list was compiled from sources which have not been independently verified by LFC. Additionally, the level of the EMF experienced depends on distance from the source of the field along with other factors, so these should be considered representative values only:

- Human Brain Magnetic Field: 0.00001 - 0.0001 mG
- Human Heart Magnetic Field: .005 mG
- Television (@ 3 ft): 0.07 - 1.11 mG
- Vacuum Cleaner (@ 3 ft): 0.51 - 1.28 mG
- Computer Monitors (@ 1 ft): 2mG
- Toaster (@ 1 ft): 0.29 - 4.62 mG
- Garbage Disposal (@ 1 ft): 2.72 - 7.79 mG
- Dishwasher (@ 1 ft): 4.98 - 8.91 mG
- Indoor EMF with poor wiring practices: 3 - 20 mG
- Vacuum Cleaner (@ 1 ft): 7.06 - 22.62 mG
- Directly beneath high voltage lines: 2 - 250 mG
- Earth's Natural (DC) Magnetic Field: 330-670 mG
- Hotspots near breaker boxes or transformers: 20 - 2000 mG
- Refrigerator Magnet: 10,000 mG (10 G)

Sources:

- http://www.ehib.org/emf/shortfactsheet.PDF
- http://www.scantech7.com/forms/RF%20&%20EMF%20Safety%20Levels%20Comparative%20Guide%20REV%20A.pdf

Strict guidelines for overall EMF exposure

We reviewed various guidelines, recommendations, and published values for overall EMF exposure from a number of geographies around the world, with an eye toward the more strict recommendations.

Please note, recommendations are very difficult to validate and compare as they are often not on an "apples to apples" basis. Reasons for this include:

- It is not always clear whether something is a law, official guideline, or just a suggestion
- It is not always clear whether the recommendation is actually in practice or feasible
- It is not always clear whether the recommendation is for the general public or for sensitive populations (schools, hospitals, nursing homes, etc.)
- Recommendations are not always in the same units or for the same EMF frequencies
- Values may be cited by an article which is not the official source, but the official source cannot be found
- Source documents may be in a foreign language

With all that in mind, not all of the reviewed guidelines are listed here; rather, below are the data points we encountered that were most relevant to our recommendation.

This is not intended to be a full list and may contain inaccuracies. If readers are aware of corrections or stricter guidelines we request they bring them to our attention.

- Swedish "median value for homes and day nurseries in major towns or cities": 1 mG
- California magnetic field levels in schools
  - 50% of schools: < .42 mG
  - 79.9% of schools: < 1mG
  - 90% of schools: < 1.58 mG
  - 90% of computer classrooms: < 2.08 mG
  - 90% of home economics classrooms: < 2.87 mG
- Most European Union recommended exposure levels for the general public: 2 mG

Sources:

- http://www.emfs.info/NR/rdonlyres/96AD1550-AEFE-4832-9405-8F9A119363DA/0/standardscompilationv5kJuly2013.pdf
- http://www.ehib.org/emf/pdf/EMFinschools.pdf
- http://ec.europa.eu/health/electromagnetic_fields/docs/emf_comparision_policies_en.pdf

Common Sense Guidelines for Wi-Fi

Independent of a target guideline for overall EMF, there are several "common sense" guidelines which should be followed when deploying a Wi-Fi network:

- When installing access points, (the wireless network itself), don't place access points any nearer to people than necessary. i.e., keep them generally near the ceiling and not directly overhead, as much as is possible (while still allowing the network to function).
- Don't extend the network where it's not needed. If there are zones of the school where it is certain that wireless connectivity will never be needed, do not extend the network there.
- If connectivity will only be needed on occasion in a given area, consider leaving the access point off by default, and enabling it only on an event-by-event basis.
- When in doubt, use and EMF meter to check that the EMF levels are acceptable where people are expected to be. Check EMF levels with the network off, then on, to determine the EMF contribution from the Wi-Fi network
- For device use, leave some amount of space between the devices and the body when feasible
- Consider disabling the wireless radios (e.g. "airplane mode") on devices when they are not in use

So, is Wi-Fi safe?

Because it is very easy to find research and expert opinions both for and against the use of Wi-Fi, individuals must conclude for themselves at what levels Wi-Fi is truly "safe". Below is a summary of some of the principal arguments in support of, and against, the use of Wi-Fi in schools. Please note, this list is not exhaustive, and individuals should consider additional arguments that they may be aware of.

- General arguments against allowing Wi-Fi
  - The precautionary principle: We can't say for sure Wi-Fi is safe - it's only been around about 15 years, not long enough to expose long term issues. Exposing people to Wi-Fi is currently an active experiment with uncertain outcomes
  - Regulations are outdated and/or inadequate; they have not been updated to reflect the modern proliferation of mobile phones, devices, and wireless networks
  - Studies have shown that even low levels of EMF result in various bioeffects (e.g. DNA damage; reduction in free-radical scavengers, etc.) at the cellular level. These studies also propose potential links to a wide variety of illnesses (various cancers, Alzheimer's, autism)
  - There may be a link between heavy cell phone use and increased risk for glioma (a brain cancer)
  - To the extent that Wi-Fi is harmful, children may be even more at risk than adults
  - Electrosensitivity is a genuine health concern that must be taken into consideration; impacted individuals must be protected
- General arguments in support of allowing Wi-Fi:
  - The maximum power levels are limited to safe levels, and the strength dissipates quickly with distance. Typical exposure and absorption levels are hundreds, if not thousands, of times below accepted safety standards, which already incorporate safety margins, and account for continuous exposure to all ages and body sizes.
  - There is no scientific evidence of harm caused by Wi-Fi. Studies claiming to show harm caused by EMF are either not reproducible, have not been independently verified, and/or have used intensities well above levels actually encountered in daily life. Studies showing or claiming to show effects at cellular levels do not imply any actual illnesses, and may or may not be relevant.

- Wi-Fi is already widely and commonly used, and there do not seem to be problems with it. In any case, we are surrounded by neighboring Wi-Fi signals all day anyway; prohibiting Wi-Fi at LFC would do nothing to change this.
- Studies claiming to show a potential link to cancer tend to be much more concerned with heavy *mobile phone* or *device use*, as opposed to the existence of Wi-Fi access points. To the extent such a link may exist, it makes sense that cell phones are more concerning, as they are held near the head (or in a pocket), and a cell phone must transmit across a larger distance (to the cell tower, which is further away than a Wi-Fi access point).
- While we only have ~15 years of experience/exposure with Wi-Fi, we have had longer experiences with other wireless technologies without issue. Bodily absorption of radio and television signals is greater than for Wi-Fi, and they have been around longer.
- Various government and non-government organizations have repeatedly studied the issue and concluded that Wi-Fi is safe
- Wi-Fi use is common in schools. We are not the first to consider the issue, and many others have concluded it is safe.

Proposed Approach

We will adopt a target guideline (level to be determined) for overall EMF exposure in sustained occupancy areas, and allow Wi-Fi within the context of that overall target. We will also:

- Design and construct the new facility with this guideline in mind
- Apply the “common sense” measures to the deployment of the Wi-Fi network and usage of devices
- Measure the resulting total EMF exposure before and after activating the Wi-Fi network, and compare it to our adopted target guideline
- Explore ways to help further educate parents on the topic of EMF
- Continue to monitor and consider other guidelines, research, and recommendations as they come to our attention

Parents concerned about overall EMF exposure should do the following:

- Understand all of the information in this document, and consider performing your own additional research on the topic
- Understand all the ways in which children are exposed to EMF, in the home, in the school, and in the public domain
- Instruct children regarding proper use and positioning of wireless devices. Recognize that LFC cannot “police” proper device usage at all times (e.g., a teacher might not know if a student enabled a wireless radio on a device).
- Inform LFC if your child has been diagnosed with electromagnetic hypersensitivity

Conclusion

We believe this approach represents a pragmatic, balanced approach which best serves the interests of the entire LFC community

- We believe it reasonably protects our children, teachers, and administrative personnel
- It allows the school to use commonly accepted, everyday technologies in support of improved learning outcomes and efficient day-to-day school administration
- We welcome additional comments, questions, and input regarding this approach

For More Information

- The Precautionary Principle
  - http://en.wikipedia.org/wiki/Precautionary_principle
- World Health Organization - EMF Fact Sheets and Backgrounders
  - http://www.who.int/peh-emf/publications/factsheets/en/
- California EMF Program
  - http://www.ehib.org/emf/general.html
- Electric and Magnetic Fields in California Public Schools
  - http://www.ehib.org/emf/pdf/EMFinschools.pdf
- California Short Factsheet of EMF
  - http://www.ehib.org/emf/shortfactsheet.PDF
- EMF Levels and Safety
  - http://www.scantech7.com/forms/RF%20&%20EMF%20Safety%20Levels%20Comparative%20Guide%20REV%20A.pdf
- Power-frequency EMF Exposure Standards applicable in Europe and elsewhere
  - http://www.emfs.info/NR/rdonlyres/96AD1550-AEFE-4832-9405-8F9A119363DA/0/standardscompilationv5kJuly2013.pdf
- Bioinitiative Report
  - http://www.bioinitiative.org/
- ICNIRP Guidelines
  - http://www.icnirp.de/documents/emfgdl.pdf
  - http://www.icnirp.de/documents/mvtgdl_2014.pdf
- Canada Safety Code 6
  - http://www.radiationsafety.ca/wp-content/uploads/2012/06/Safety-Code-6.pdf
- Comparison of International Policies on Electromagnetic Fields
  - http://ec.europa.eu/health/electromagnetic_fields/docs/emf_comparision_policies_en.pdf