102 Roadrunner Drive
Sedona, Arizona 86336
www.SedonaAZ.gov

Date: November 7, 2017

To: Planning and Zoning Commission

From: Karen Daines Osburn, Assistant City Manager

RE: Wireless Ordinance and Master Plan (PZ17-00005 & PZ17-00006)

During the August 1, 2017 Planning and Zoning Commission meeting, the Commission requested additional staff research on several items and provided preliminary consensus comments relative to the Land Development Code (LDC) Article 17 draft ordinance and the draft Wireless Master Plan. The following is Staff's disposition of those items.

Comments on Draft Sedona Land Development Code, Article 17 amendments

Commission request:
Require a report from a Radio Frequency Emissions (RF) engineer which certifies that a wireless facility is compliant with Federal Communications Commission (FCC) regulations AND require retesting at some appropriate interval to ensure RF emissions are FCC compliant.

Staff Response:
These requirements have been added to Section 1708 of the draft Ordinance - Post Construction Inspections.

A. Wireless communication facility owners (other than amateur facility owners) shall submit a report to the Department of Community Development certifying structural and electrical integrity, as well as continued compliance with RF exposure standards specified in OET-65, upon activation of the facility and thereafter once every two (2) years on the anniversary of the certificate of completion.

B. Inspections shall be conducted by an engineer licensed to practice in the State of Arizona. Based upon the results of an inspection, the Director of the Department of Community Development may require repair or removal of a wireless communication facility.

Commission request:
Ensure that noise limitations are properly addressed in the ordinance.

Staff Response:
Proposed language is included under Section 1705 General development and design standards and processes for all wireless facilities. Language has been added as follows:

D. Sounds. No unusual sound emissions such as alarms, bells, buzzers, or the like are permitted and shall be consistent with City Code. Sounds shall not exceed 65 dba at any exterior line of a property in a commercial district and 55 dba at any exterior line of a property in a residential district.

Commission request:
Faux trees may not be taller than 40 feet

Staff Response:
The draft ordinance contemplates height restrictions based on category/type of facility. Small cell facilities cannot exceed 30 feet. Macro facilities cannot exceed 70 feet.

Staff is concerned about restricting one specific concealment treatment to a height limit without understanding the context of the specific environment being contemplated. There may be areas where a faux tree taller than 40 feet may be appropriate.

In response, staff is proposing the following language in Section 1705.04 A.4 b. Aesthetics:

a. Concealed wireless communication facilities shall be placed and constructed in such a manner as to be compatible with the existing structure or surrounding natural terrain. There shall be as little contrast as possible between the communications equipment and the structure or natural terrain.

Based on this language the prescribed height for a faux tree concealment will consider the height of adjacent trees and be determined on a case by case basis to best fit in with the surrounding natural environment. This gives the Director and/or the Planning and Zoning Commission maximum flexibility to impose appropriate height restrictions on a case by case basis.

Commission request:
Change the color requirements to be earth tones rather than matching the background.

Staff Response:
Staff has concerns about "earth tones" in general. If the intent is to conceal through color, earth tone, such as red or green against a blue sky backdrop may actually produce an end result with a contrast that draws more attention to the facility. Therefore the draft ordinance contemplates colors that are compatible with existing structures and/or the surrounding natural terrain. The proposed language for *Concealed Macro or Replacement Towers* is in Section 1705.04.A.4.b Aesthetics, and for *New Non-Concealed Macro Towers* in Section 1705.05.A.5 Color.

Section 1705.04.A.4.b Language for *Concealed Macro or Replacement Towers* Aesthetics is as follows:

> Concealed wireless communication facilities shall be placed and constructed in such a manner as to be compatible with the existing structure or surrounding natural terrain. There shall be as little contrast as possible between the communications equipment and the structure or natural terrain.

Section 1705.05 A.5 Language for *New Non-Concealed Macro Towers* in as follows:

> Color.
>
> b. New non-concealed towers shall be painted to match the background or other accepted contextual or compatible color in accordance with the requirements of Article 9 SLDC, except as required by federal rules or regulations.
>
> c. If permitted, non-concealed antenna and related service equipment attached to towers and base stations shall be of a color compatible with the color of the supporting structure so as to make the antenna and **related service equipment visually unobtrusive** in accordance with the provisions of Article 9 SLDC.

Because color preferences may not be the same for all sites, the above language gives the Director, Commission, and/or City Council maximum latitude to regulate colors on a case by case basis based on what fits best within the immediate surroundings.

Comments on Draft Wireless Master Plan

Commission request:
Limit tower placement on City-owned sites identified in the Wireless Master Plan to at least 100 ft. from the boundary of a residential lot.

Staff Response:
Per CityScape, with the new technology being deployed, the coverage areas are getting smaller and eventually providers will need to have infrastructure in residential areas to serve customers. They have cited a long line of case law that says prohibiting in residential zones violates the 1996 Telecommunications Act if it has the effect of "prohibiting the deployment and distribution of wireless services." Due to this changing technology and methods of deployment of wireless infrastructure, the draft Wireless Ordinance permits wireless facilities within residential zones under certain circumstances, even contemplating wireless facilities siting on single family residential structures or multifamily structures (using those structures as base stations through faux chimneys or louvers, etc.).

Arizona Revised Statutes (ARS) Section 9-591 (2017 HB2365) also now allows small cell wireless facilities to be located in City rights of way (ROW), most of which are located within residential neighborhoods.

Establishing a minimum 100 ft. distance from a residential parcel for City-owned sites would be possible, but incompatible with the regulations for the rest of the community.

Further, it would eliminate up to seven of nineteen properties from the Master Plan and potentially limit opportunities for siting of even small wireless facilities.

Instead of having a blanket 100 ft. distance requirement for all City sites and all wireless facilities, regardless of size, the draft ordinance contemplates setback distances as follows:

1705.04 Concealed Macro or Replacement Tower.

A. The following additional standards and processes apply to new or replacement concealed wireless communication facilities:

1. Setbacks. Concealed facilities shall meet the greater of either:

a. The minimum setback requirements for the zoning district; or

b. Away from single family residential use properties by a minimum distance of 100% of the tower height.

c. Notwithstanding the foregoing requirements, if the antenna-supporting structure has been constructed using “breakpoint” design technology, the minimum setback distance shall be equal to 110% of the distance from the top of the structure to the “breakpoint” level of the structure. For example, on a

100-foot-tall monopole with a "breakpoint" at 80 feet, the minimum setback distance would be 22 feet (110% of 20 feet, the distance from the top of the monopole to the "breakpoint"). Certification by an Arizona professional engineer of the "breakpoint" design and the design's fall radius shall be provided together with the other information required in SLDC 1704.05.

1705.05 New Non-Concealed Macro Towers.

A. The following additional standards and processes apply to new non-concealed towers:

1. Setbacks. New towers shall be located as follows:

a. For new wireless communication facilities, the setback shall be away from public ROW by a minimum distance of 1 foot for each 1 foot of tower height.

b. Away from single family residential use properties by a minimum distance of 100% of the tower height;

c. Notwithstanding the above requirements, if the antenna-supporting structure has been constructed using "breakpoint" design technology, the minimum setback distance shall be equal to 110% of the distance from the top of the structure to the "breakpoint" level of the structure. For example, on a 100-foot-tall monopole with a "breakpoint" at 80 feet, the minimum setback distance would be 22 feet (110% of 20 feet, the distance from the top of the monopole to the "breakpoint"). Certification by an Arizona professional engineer of the "breakpoint" design and the design's fall radius shall be provided together with the other information required in SLDC 1704.05

This language again allows each site to be considered on a case-by-case basis, but with a minimum distance from single family residential of 100% of the tower height. Additionally, each City site would require a contractual agreement to be negotiated between the City and the provider. At that time further distance requirements and/or other restrictions could be imposed based on the specific site conditions and consideration of impacts to surrounding properties.

Commission request:

During the last meeting several Commissioners discussed omitting the following from the list of city-owned sites to be considered for future wireless facilities:

- M (11 New Castle Lane) – due to its residential single family zoning
- O (160 Panorama Blvd) – due to its residential single family zoning
- A1 and A2 (2050 & 2070 Buena Vista Drive) – for their proximity to National Forest
- P (515 Back O Beyond Road) - for its proximity to National Forest.

Staff Response:

A1 (2070 Buena Vista Drive) - Concur with the suggestion to remove A1 from the list of City-owned sites identified in the Master Plan. There is another City-owned parcel adjacent to this one already developed with a trailhead and paved parking lot. To incorporate a concealed light stanchion or another concealed small cell facility into a parking lot seems preferable to siting new infrastructure on an undeveloped parcel.

A2 (2050 Buena Vista Drive) and **P (515 Back O Beyond Road)** – Concur with the suggestion that sites A2 and P are not suitable for macro towers. However, these sites may be suitable under

certain circumstances for concealed small cell facilities of some type, and may be *better suited* than public rights of way. Both locations include public parking lots which may be preferred locations for a small cell site, rather than in the public right of way on a residential street immediately adjacent to single family homes and directly in the streetscape. As was noted previously, each City site would require a contractual agreement to be negotiated between the City and the provider. At that time further restrictions on size and type of facility could be imposed based on the specific site conditions and consideration of impacts to surrounding properties.

M (11 New Castle Lane) and **O (160 Panorama Blvd)** – Concur with the suggestion that sites M and O are not suitable for macro towers. However, these sites may still be suitable under certain circumstances for concealed small cell facilities of some type, and may be *better suited* than public rights of way in some cases. Both locations have wastewater lift stations sited on them which may be preferred locations for a small cell sites, rather than in the public right of way on a residential street immediately adjacent to single family homes and directly in the streetscape. While these sites do have residential single family zoning, they are non-residential uses. The current and proposed ordinances both have provisions to allow wireless on single family residentially zoned properties if they are being used for non-residential purposes. Due to the changing technology and industry needs, the revised ordinance will now permit wireless facilities siting on single family residential structures or multifamily structures (using those structures as base stations through faux chimneys or louvers, etc.) in order to comply with the 1996 Telecommunications Act by not prohibiting the deployment and distribution of wireless services.

As was noted previously, each City site would require a contractual agreement to be negotiated between the City and the provider. At that time further restrictions on size and type of facility could be imposed based on the specific site conditions and consideration of impacts to surrounding properties.

Additional Updates

- Because the siting of small cell wireless facilities within the City's rights of way is now governed by ARS Section 9-591 (2017 HB2365), this category of wireless siting has been removed from the LDC Article 17. LDC Article 17 provides the criteria by which all other wireless facilities will be regulated. Small cell wireless within the City's rights of way will be regulated through the Sedona City Code Chapter 12 in accordance with ARS 9-591. Those code changes are in the process of being made.

- The previous draft of LDC Article 17 identified the siting of wireless facilities on National Forest as being prohibited. The US Forest Service is exempted from the City's Land Development Code so the City does not have the authority to impose this prohibition. It has since been removed. However, per the latest draft of LDC Article 17, wireless facilities will be prohibited in Open Space Zoning Districts.

Please direct any questions to Karen Daines, Assistant City Manager at (928) 204-7127 or kdaines@sedonaaz.gov

Attachments

1. Revised Wireless Ordinance (LDC Article 17)
2. Public Comments Recevied as of October 30, 2017

Packets from previous public hearings are not included as attachments but can be accessed online at the following links:

- June 1, 2017 Public Hearing: http://www.sedonaaz.gov/Home/ShowDocument?id=31222
- August 1, 2017 Public Hearing: http://www.sedonaaz.gov/Home/ShowDocument?id=31611

Community Development Department
102 Roadrunner Drive Sedona, AZ 86336
(928) 282-1154 · www.sedonaaz.gov/cd

Staff Recommendations

PZ17-00005 (LDC) Wireless Communications

Staff recommends approval of case number PZ17-00005 (LDC), updating Article 17 (Wireless Communications) of the Sedona Land Development Code, subject to all applicable ordinance requirements.

PZ17-00006 (MP) Wireless Master Plan

Staff recommends approval of case number PZ17-00006 (MP), adopting the Wireless Master Plan, subject to all applicable ordinance requirements

Sample Motions for Commission Use

(Please note that the below motions are offered as samples only and that the Commission may make other motions as appropriate.)

Recommended Motions for Approval

PZ17-00005 (LDC) Wireless Communications

I move to recommend to City Council approval of case number PZ17-00005 (LDC), updating Article 17 (Wireless Communications) of the Sedona Land Development Code.

PZ17-00006 (MP) Wireless Master Plan

I move to recommend to City Council approval of case number PZ17-00006 (MP), adopting the Wireless Master plan, including the modifications as noted: (please specify modifications the Commission is recommending to City Council).

Alternative Motions for Denial

PZ17-00005 (LDC) Wireless Communications

I move to recommend to City Council denial of case number PZ17-00005 (LDC). (Please specify findings)

PZ17-00006 (MP) Wireless Master Plan.

I move to recommend to City Council denial of case number PZ17-00006 (MP). (Please specify findings)

Article 17 **WIRELESS COMMUNICATION FAC**

Sections:

1701 Title.

This article shall be known as the Sedona Wireless Communication Facilities Ordinance.

1702 Purpose.

The purpose of this article is to promote the following:

A. The City Council has adopted a Wireless Master Plan to provide long-term planning for an efficient and capable wireless telecommunications network throughout the City that promotes collocation and optimal new tower and base station locations to meet the current and future wireless telecommunications needs of the City's residents, businesses, industry and visitors. The Wireless Master Plan minimizes negative visual impacts so as to preserve the character and viewsheds of the community and its natural surroundings.

B. Protection of the unique natural beauty and small-town character of the city as specified in the Sedona Community Plan while meeting the needs of its citizens to enjoy the benefits of wireless communication services;

C. Promote the health, safety and general welfare of the public by regulating the siting of wireless communication facilities, including satellite earth stations;

D. Consideration of historical and environmentally sensitive areas as well as consideration of potential impacts on adjacent properties;

E. Minimize the impacts of wireless communication facilities on surrounding areas by establishing standards for location, structural integrity and compatibility;

F. Encourage the location and collocation of wireless communication equipment on existing structures thereby minimizing new visual, aesthetic and public safety impacts, effects upon the natural environment and wildlife, and to reduce the need for additional towers;

G. Antenna configurations, which minimize additional visual impact through careful and innovative siting, design, landscape and camouflage techniques;

H. Accommodate the growing need and demand for wireless communication services;

I. Encourage coordination between suppliers of wireless communication services in the city;

J. Respond to the policies embodied in the Telecommunications Act of 1996 and the 2012 Spectrum Act in such a manner as not to unreasonably discriminate between providers of functionally equivalent personal wireless service or to prohibit or have the effect of prohibiting personal wireless service in the city;

K. Establish predictable and balanced regulations governing the construction and location of wireless communication facilities, within the confines of permissible local regulation for locations outside of public rights of way. Wireless Communication Facilities within a public right of way shall be regulated in accordance with the provisions of Sedona City Code Chapter 12 and the provisions of Arizona Revised Statutes Section 9-591 et seq.;

L. Establish review procedures to ensure that applications for wireless communication facilities are reviewed and acted upon within a reasonable period of time.

1703 Definitions

Amateur Radio Tower - A tower used for non-commercial amateur radio transmissions consistent with the "Complete FCC U.S. Amateur Part 97 Rules and Regulations" for amateur radio towers.

Ancillary Structure - For the purposes of this Section, any form of development associated with a telecommunications facility, including foundations, concrete slabs on grade, guy anchors, generators, and transmission cable supports, but excluding equipment cabinets.

Antenna - Any apparatus designed for the transmitting and/or receiving of electromagnetic waves, including telephonic, radio or television communications. Types of elements include omni-directional (whip) antennas, sectionalized (panel) antennas, multi or single bay (FM & TV), yagi, or parabolic (dish) antennas.

Antenna Array - A single or group of antenna elements and associated mounting hardware, transmission lines, or other appurtenances which share a common attachment device such as a mounting frame or mounting support structure for the sole purpose of transmitting or receiving electromagnetic waves.

Antenna Element - Any antenna or antenna array.

ASR - The Antenna Structure Registration Number as required by the FAA and FCC.

Base Station - Equipment and non-tower supporting structure at a fixed location that enable wireless telecommunications between user equipment and a communications network. Examples include transmission equipment mounted on a rooftop, water tank, silo or other above ground structure other than a tower. The term does not encompass a tower as defined herein or any equipment associated with a tower. "Base Station" includes, but is not limited to:

- equipment associated with wireless telecommunications services such as private, broadcast, and public safety services, as well as unlicensed wireless services and fixed wireless services such as microwave backhaul;
- radio transceivers, antennas, coaxial or fiber optic cable, regular and backup power supplies, and comparable equipment, regardless of technological configuration (including Distributed Antenna Systems and small-cell networks);
- any structure other than a tower that, at the time the application is filed under this Section, supports or houses equipment described in this definition that has been reviewed and approved under the applicable zoning or siting process, or under

another City regulatory review process, even if the structure was not built for the sole or primary purpose of providing such support.

"Base station" does not include any structure that, at the time the application is filed under this Section, does not support or house any wireless communication equipment.

Breakpoint Technology - The engineering design of a monopole, or any applicable support structure, wherein a specified point on the monopole is designed to have stresses concentrated so that the point is at least five percent (5%) more susceptible to failure than any other point along the monopole so that in the event of a structural failure of the monopole, the failure will occur at the breakpoint rather than at the base plate, anchor bolts, or any other point on the monopole.

Broadband Facility - any infrastructure used to deliver broadband services or for the provision of broadband service.

Broadband Service - any technology identified by the US Secretary of Agriculture as having the capacity to transmit data to enable a subscriber to the service to originate and receive high-quality voice, data, graphics, and video. Broadband service includes:

- *Cable Service* - the one-way transmission to subscribers of video programming or other programming services and subscriber interaction required for the selection or use of such video programming or other programming service.
- *Telecommunications Service* - the offering of telecommunications for a fee directly to the public, or to such classes of users as to be effectively available directly to the public, regardless of the facilities used.
- *Wireless Service* - data and telecommunications services, including commercial mobile services, commercial mobile data services, unlicensed wireless service and common carrier wireless exchange access services, as all of these terms are defined by federal law and regulations.

Collocation - The mounting or installation of transmission equipment on an eligible support structure for the purposes of transmitting and/or receiving radio frequency signals for communications purposes so that installation of a new support structure will not be required.

Concealed - A tower, base station, ancillary structure, or equipment compound that is not readily identifiable as a wireless communication facility and that is designed to be aesthetically compatible with existing and proposed building(s) and uses on a site or in the neighborhood or area. There are two types of concealed facilities:

1) Base stations, including faux parapets, windows, dormers or other architectural features that blend with an existing or proposed building or structure and;

2) A freestanding concealed tower which looks like something else that is common in the geographic region such as a church steeple, windmill, bell tower, clock tower, light standard, flagpole with a flag that is proportional in size to the height and girth of the tower, or tree that grows naturally or is commonly found in the area.

DAS – Distributed Antenna System – A system consisting of: (1) a number of remote communications nodes deployed throughout the desired coverage area, each including at least one antenna for transmission and reception; (2) a high capacity signal transport medium (typically fiber optic cable) connecting each node to a central communications hub site; and (3) radio transceivers located at the hub site (rather than at each individual node as is the case for small cells) to process or control the communications signals transmitted and received through the antennas.

DAS Hub - Ancillary equipment usually contained in a shelter or other enclosure which does not have any wireless transmission or receive equipment contained therein but is utilized in the deployment and operation of wireless DAS receive/transmit infrastructure that is located elsewhere.

Development Area - The area occupied by a telecommunications facility including areas inside or under an antenna-support structure's framework, equipment cabinets, ancillary structures, and/or access ways.

Dual Purpose Facility – A banner pole, light stanchion, support tower for overhead electric lines, or other similar utility structure onto which one or more antenna(s) are or can be mounted or attached.

Eligible Facilities Request - Any request for modification of an existing tower or base station involving collocation of new transmission equipment; removal of transmission equipment; or replacement of transmission equipment that does not Substantially Change the physical dimensions of such tower or base station.

Eligible Facility - Existing tower or base station that has been approved through a local government land use review process prescribed for the tower or base station.

Eligible Support Structure - Any tower or base station existing at the time the application is filed with the City.

Existing - A constructed tower or base station is "existing" for purposes of this Section if it has been reviewed and approved under an applicable City land use review process. "Existing" also includes a tower that was lawfully constructed but not reviewed because it was not in a zoned area when it was built.

Equipment Compound- The fenced-in area surrounding, inside or under a ground-based wireless communication facility containing ancillary structures and equipment (such as cabinets, shelters, and pedestals) necessary to operate an antenna that is above the base flood elevation.

Equipment Cabinet- Any structure used exclusively to contain equipment necessary for the transmission or reception of communication signals.

Equipment Shelter – A self-contained building housing ancillary electronic equipment typically including a generator.

FAA – the Federal Aviation Administration.

FCC – the Federal Communications Commission.

Feed Lines- Cables or fiber optic lines used as the interconnecting media between the base station and the antenna.

Geographic Search Ring- An area designated by a wireless provider or operator for a new base station and/or tower produced in accordance with generally accepted principles of wireless engineering.

Handoff Candidate - A wireless communication facility that receives call transference from another wireless facility, usually located in an adjacent first "tier" surrounding the initial wireless facility.

Node – A single location as part of a larger antenna array which can consist of one or multiple antennas, such as part of a DAS network antenna array.

Non-concealed- A telecommunication facility that is readily identifiable as such (whether freestanding or attached).

OTARD – Over The Air Reception Devices, which are limited to either a "dish" antenna one meter (39.37 inches) or less in diameter designed to receive direct broadcast satellite service, including direct-to-home satellite service, or to receive or transmit fixed wireless signals via satellite, or an antenna that is one meter or less in diameter and is designed to receive video programming services via broadband radio service (wireless cable), or to receive or transmit fixed wireless signals other than via satellite or an antenna that is designed to receive local television broadcast signals.

PWSF - Personal Wireless Service Facility - Any staffed or unstaffed location for the transmission and/or reception of radio frequency signals or other personal wireless communications, including commercial mobile services, unlicensed wireless services, wireless broadband services, and common carrier wireless exchange access services as defined in the Telecommunications Act of 1996, and usually consisting of an antenna or group of antennas, transmission cables, feed lines, equipment cabinets or shelters, and may include a tower. Facilities may include new, replacement, or existing towers, replacement towers, collocation on existing towers, base station attached concealed and non-concealed antenna, dual purpose facilities, concealed towers, and non-concealed towers (monopoles, lattice and guyed), so long as those facilities are used in the provision of personal wireless services as that term is defined in the Telecommunications Act.

Qualified Collocation Request – collocation of PWSF on a tower or base station that creates a Substantial Change in the facility but is entitled to processing within 90 days under 47 U.S.C. §332(c)(7).

Radio Frequency Emissions- Any electromagnetic radiation or other communications signal emitted from an antenna or antenna-related equipment.

Radio Frequency Interference ("RFI") – Any electromagnetic radiation or other communications signal that causes reception or transmission interference with another electromagnetic radiation or communications signal.

Replacement- A modification of an existing tower to increase the height, or to improve its integrity, by replacing or removing one (1) or several tower(s) located in proximity to a proposed new tower in order to encourage compliance with this Section, or improve aesthetics or functionality of the overall wireless network.

Right of Way ("ROW") - means the area on, below or above a public roadway, highway, street, sidewalk, alley or utility easement. Right of Way does not include a federal interstate highway, a state highway or state route under the jurisdiction of the Arizona Department of Transportation, a private easement, property that is owned by a special taxing district, or a utility easement that does not specifically authorize deployment of wireless infrastructure.

Satellite Earth Station- A single or group of parabolic or dish antennas mounted to a support device that may be a pole or truss assembly attached to a foundation in the ground, or in some other configuration, including the associated separate equipment cabinets necessary for the transmission or reception of wireless communication signals with satellites.

Site - For towers other than towers in the public rights-of-way, the boundaries of the leased or owned property on which the Facilities are or are proposed to be situated.

SLDC – Sedona Land Development Code.

Small Cell Facility - means a wireless communication facility outside of a public ROW that meets all of the following qualifications:

1. Each antenna is located inside an enclosure of no more than three (3) cubic feet in volume, or, in the case of an antenna that has exposed elements, the antenna and all its exposed elements could fit within an enclosure of no more than three (3) cubic feet;
2. New poles for new small cells are no larger than 8 inches (8") in diameter as measured thirty-six inches (36") above ground level; and
3. Primary equipment enclosures are no larger than seventeen (17) cubic feet in volume. The following associated equipment may be located outside of the primary equipment enclosure and, if so located, is not included in the calculation of equipment volume: Electric meter, concealment, telecommunications demarcation box, ground-based enclosures, back-up power systems, grounding equipment, power transfer switch, vertical cable runs and cut-off switch.

Small Cell Network - a collection of interrelated small cell facilities designed to deliver wireless service.

Stanchion - A vertical support structure generally utilized to support exterior lighting elements.

Streamlined Processing- Expedited review process for collocations required by the federal government (Congress and/or the FCC) for PWSF.

Substantial Change - A modification or collocation constitutes a "substantial change" of an eligible support structure if it meets any of the following criteria:

1. A PWSF collocation or modification of an existing antenna-supporting structure not in a public right of way increases the overall height of the antenna-supporting structure, antenna and/or antenna array more than 10% or 20 feet, whichever is greater or, if a base station, by more than 10% or 10 feet, whichever is greater. A PWSF collocation on an existing antenna-supporting structure within a public right of way increases the overall height of the antenna-supporting structure, antenna and/or antenna array more than 10% or 10 feet, whichever is greater.
2. A PWSF collocation for towers not in a public right of way protrudes from the antenna-supporting structure more than 20 feet or the width of the structure at the elevation of the collocation, and for towers within a public right of way, protrudes from the antenna-supporting structure more than 6 feet.
3. A PWSF collocation on an existing antenna-supporting structure fails to meet current building code requirements (including windloading).
4. A PWSF collocation adds more than 4 additional equipment cabinets or 1 additional equipment shelter.
5. A PWSF collocation requires excavation outside of existing leased or owned parcel or existing easements.
6. A PWSF collocation defeats any existing concealment elements of the antenna-supporting structure.
7. A PWSF collocation fails to comply with all conditions associated with the prior approval of the antenna-supporting structure except for modification of parameters as permitted in this section.

Support Structure - Anything constructed or erected, the use of which requires permanent location on the ground, or attachment to something having a permanent location on the ground.

Temporary PWSF – A temporary tower or other structure that provides interim short-term telecommunications needed to meet an immediate demand for service in the event of an emergency or a public event where a permanent wireless network is unavailable or insufficient to

satisfy the temporary increase in demand or when permanent PWSF equipment is temporarily unavailable or offline.

Transmission Equipment- Equipment that facilitates transmission of communication service (whether commercial, private, broadcast, microwave, public, public safety, licensed or unlicensed, fixed or wireless), such as radio transceivers, antennas, coaxial or fiber-optic cable, and regular and backup power supply.

Tower- Any support structure built for the primary purpose of supporting any antennas and associated facilities for commercial, private, broadcast, microwave, public, public safety, licensed or unlicensed, and/or fixed or wireless services. A tower may be concealed or non-concealed. Non-concealed towers include:

Guyed - A style of tower consisting of a single truss assembly composed of sections with bracing incorporated. The sections are attached to each other, and the assembly is attached to a foundation and supported by a series of wires that are connected to anchors placed in the ground or on a building.

Lattice - A self-supporting tapered style of tower that consists of vertical and horizontal supports with multiple legs and cross bracing, and metal crossed strips or bars to support antennas.

Monopole - A style of freestanding tower consisting of a single shaft usually composed of two (2) or more hollow sections that are in turn attached to a foundation. This type of tower is designed to support itself without the use of guy wires or other stabilization devices. These facilities are mounted to a foundation that rests on or in the ground or on a building's roof. All feed lines shall be installed within the shaft of the structure.

Tower Base- The foundation, usually concrete, on which the tower and other support equipment are situated. For measurement calculations, the tower base is that point on the foundation reached by dropping a perpendicular from the geometric center of the tower.

Tower Height- The vertical distance measured from the grade line to the highest point of the tower, including any antenna, lighting or other equipment affixed thereto.

Tower Site- The land area that contains, or will contain, a proposed tower, equipment compound, support structures and other related buildings and improvements.

Wireless Communication Facility – At a specific physical location, one or more antenna, tower, base station, mechanical and/or electronic equipment, conduit, cable, and associated structures, enclosures, assemblages, devices and supporting elements that generate or transmit nonionizing electromagnetic radiation or light operating to produce a signal used for communication, including but not limited to all types of transmission equipment defined further herein. Wireless communication facilities include Amateur Radio Tower, Base Stations, DAS, OTARD, PWSF, Satellite Earth Station, Small Cell Facility and Temporary PWSF.

1704 Administration.

1704.01 Applicability.

A. Except as provided for in subsection 1704.01(B) of this section, this section shall apply to development activities including installation, construction, or modification to all the following wireless

communication facilities:

1. Existing towers, concealed and non-concealed; publicly and privately owned;

2. Proposed towers, concealed and non-concealed; publicly and privately owned;

3. Replacement of any existing tower

4. Collocation on any existing tower or base station;

5. Existing concealed and non-concealed base stations, publicly and privately owned;

6. Proposed concealed and non-concealed base stations, publicly and privately owned;

7. Proposed base stations and towers in public right-of-way and utility easements.

8. AM/FM/DTV broadcasting facilities.

9. Amateur Radio Facilities

B. The following items are exempt from the provisions of this section, notwithstanding any other regulations established in the Land Development Code of the city:

1. Noncommercial, amateur radio towers or antennas which are less than 65 feet in height and attached to the rear or side of residential or commercial structures or freestanding in an area directly behind the rear structural wall of a residential or commercial structure. Noncommercial, amateur, ham radio or citizen's band towers, antennas or antenna arrays with heights greater than 65 feet or not located directly behind the rear structural wall of a residential or commercial structure, or attached to the rear or side of residential or commercial structures shall be regulated in accordance with SLDC 1705;

2. Regular maintenance of any existing wireless communication facility that does not include an increase in the size or number of antenna; the addition of radio heads or other similar structures; the addition of coaxial cable; or the addition of equipment shelters, cabinets or generators;

3. The replacement of existing antennas, antenna panels, antenna elements or other equipment on an existing tower or base station by the same owner or wireless communication facility provider; provided, that the replaced antennas, antenna elements or equipment meet Building Code requirements (including wind loading) and provided such replacement does not increase the overall height or width of the structure;

4. A government-owned wireless communication facility, upon the declaration of a state of emergency by federal, state, or local government, and a written determination of public necessity by the Fire Chief or Chief of Police; except that such facility must comply with all federal and state requirements. No wireless communication facility shall be exempt from the provisions of this section beyond the duration of the state of emergency;

5. Data, video or information transmission as part of the day-to-day operations of a commercial business, including, for example, processing of credit card sales, automatic inventory control, and the like which are mounted on and do not extend more than 2 meters (6.5 feet) above the roof surface of any building. Where technologically feasible, such antennas shall not be mounted on an exterior parapet wall facing a public or private right-of-way;

6. All users (such as both commercial and residential) of a wireless Internet service for which a send/receive antenna is required to be located at the point of use. Where technologically feasible, such antennas shall not be mounted on an exterior parapet wall facing a public or private ROW;

7. Over-the-air reception devices (OTARD), including satellite earth stations, so long as the device does not require construction of a tower or other structure exceeding 12 feet above the home or building and the device is no more than one meter in diameter in a residential zone or two meters in any other zone district. Where technologically feasible, such antennas shall not be mounted on an exterior parapet wall facing a public or private right-of-way;

8. Any antenna-supporting structure that is damaged or destroyed by fire, flood, explosion, earthquake, war, riot, or act of God may be reconstructed and used as before if done within 12 months of such calamity; provided, that there is no increase in structure height, width or number of antennas. If a new larger antenna-supporting structure is proposed as a replacement structure, then the requirements of subsection 1704.02 of this section shall be satisfied.

9. A Temporary PWSF, utilized for not more than 60 calendar days, which does not require FAA lighting or marking and does not require any kind of excavation.

10. A wireless communication facility located within a public right of way, which shall be regulated in accordance with Chapter 12 of the Sedona City Code, and the provisions of Arizona Revised Statutes Section 9-591 et seq.

C. Siting Preferences for New Telecommunications Facilities.

Siting of new PWSF of any type shall be in accordance with the Siting Preferences below and with the Use Table in Section 1704.04. Where a lower ranked alternative is proposed, the applicant must demonstrate through relevant information including, but not limited to, an affidavit by a radio frequency engineer demonstrating that despite diligent efforts to adhere to the established preferences within the geographic search area, higher ranked options are not technically feasible, practical or justified given the location of the proposed facilities, by clear and convincing evidence. The applicant must provide such evidence in its application in order for the application to be considered complete.

The Siting Preferences are, in order:

1. Concealed base station (macro, small cell, DAS, or node)

   a. City-owned property identified in the MP

   b. City-owned property not identified in the MP

   c. Other public property

   d. Private owned property zoned non-residential

   e. On private owned property which is;

      i. Non-residential use in RS or RM districts;

      ii. Residential multi-family structures;

      iii. Residential single family structures

2. Concealed collocation on an existing concealed tower or concealed base station

   a. City-owned property identified in the MP

b. City-owned property not identified in the MP

c. Other public property

d. Private owned property

3. Replacement of existing non-concealed tower with a concealed tower

4. Concealed tower for small cell, DAS or node (not macro)

a. City-owned property identified in the MP

b. City-owned property not identified in the MP

c. Other public property

d. Private owned property

5. Concealed macro tower

a. City-owned property identified in the MP

b. City-owned property not identified in the MP

c. Other public property

d. Private owned property

6. Collocation on existing non-concealed tower

a. Public property

b. Private owned property

7. Non-concealed macro tower

a. Public property

i. Monopole

ii. Lattice

iii. Guyed

b. Private property

i. Monopole

ii. Lattice

iii. Guyed

D. The preferred order of alternative ranking, from highest to lowest, shall be 1, 2, 3, 4, 5, 6, and 7 (and within each ranking a, b, c, etc). Where a lower ranked alternative is proposed, the applicant shall file an affidavit demonstrating that despite diligent efforts to adhere to the established preferences within the geographic search ring, as determined by a qualified radio frequency engineer, higher ranked options are not technologically feasible.

1704.02 Approvals Required.

A. All applications for PWSF shall be considered by the Commission at a public hearing as set forth in SLDC 402, Conditional Uses, based on potential location, aesthetic or visually related impacts as a result of the proposed antenna's height, color, size, and the like, except as set forth below;

B. All applications for (i) either new concealed base station facilities, new concealed towers or collocations as listed in the Master Plan; (ii) concealed replacement tower collocations that do not constitute a "substantial change" on an existing tower or base station that has been designed and approved to accommodate multiple wireless collocations; or (iii) replacements of existing non-concealed towers with concealed towers; shall each be subject to review and approval by the Director, relative to the review criteria provided in subsection 1704.03 of this section. The Director may require any application outside of a public City right-of-way to be considered by the Commission at a public hearing as set forth in SLDC 402, Conditional Uses, based on potential location, aesthetic or visually related impacts.

C. All new non-concealed towers on lands outside of the properties listed in the Master Plan and non-concealed replacement towers intended for commercial use shall obtain a conditional use permit from the City Council following recommendation from the Commission (as indicated in the Use Table in Section 1704.04(C) below), as set forth in SLDC 402, Conditional Uses, after consideration of the review criteria provided in subsection 1704.03 of this section, prior to submittal for building permit approval and the initiation of construction related impacts as a result of the proposed concealed antenna's height, color, size, and the like.

D. All applications for any wireless communication facilities within a public right of way that meet the eligibility criteria for "small cell facilities" in A.R.S. §9-591 et seq. shall be subject to review and approval by the Director in accordance with the provisions of application processes and approval criteria are set forth in Chapter 12, Sedona City Code and A.R.S. §9-591.

1704.03 Approval Criteria. In considering any application for a conditional use permit for the establishment of a tower or base station, the Director, Commission or City Council's decision shall be guided by the application of the following criteria:

A. Use of suitable existing towers or base stations is preferred over placement of new towers;

B. New base stations that do not exceed height limitations for the zoning district;.

C. Concealed communication facilities are preferred over non-concealed; non-concealed that cannot be readily observable by pedestrians on adjacent streets to such facility are preferred over non-concealed that are readily observable by pedestrians on adjacent streets;

D. Collocation of multiple uses on a single wireless communication facility will have significant favorable weight in evaluating the application;

E. Network development plans that achieve the fewest number of wireless communication facilities of all users reasonably necessary for commercial coverage;

F. Location in the least restrictive zoning district;

G. Suitability of the location for collocation of governmental public service wireless service facilities.

1704.04 Location by Zoning District.

A. Generally. No wireless communication facilities shall be allowed in any Open Space Districts.

Wireless communication facilities may be permitted in the following districts subject to approval by the Director or Commission or Council as set forth in subsection 1704.02 of this section:

B. Definitions of Zoning Districts:

OP	Office Professional District
C-1	General Commercial District
C-2	General Commercial District
C-3	Heavy Commercial/Light Manufacturing District
RC	Resort Commercial District
PD	Planned Development District
CF	Community Facilities District
L	Lodging District
P	Parking District
RS	Single Family Residential
RM	Multi-Family Residential
OS	Open Space

C. Use Table

	RS		RM		OP	GC	C-3	L/RC	PD	CF	P	OS
	R	NR	R	NR								
Concealed base station (macro, small cell, DAS or node)												
City-owned property identified in the MP	A – See Master Plan for Site Specific Details											N
Other City-owned property	C	C	C	C	C	C	C	C	C	C	C	N
Other public property	C	C	C	C	C	C	C	C	C	C	C	N
Private property	C	C	C	C	C	C	C	C	C	C	C	N
Concealed collocation on existing concealed tower or base station												
City-owned property identified in the MP	A – See Master Plan for Site Specific Details											N
Other City-owned property	C	C	C	C	C	C	C	C	C	C	C	N
Other public property	C	C	C	C	C	C	C	C	C	C	C	N
Private property	C	C	C	C	C	C	C	C	C	C	C	N
Replacement of existing non-concealed tower with a new concealed tower												
City-owned property	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	N
Public property	A	A	A	A	A	A	A	A	A	A	A	N
Private property	A	A	A	A	A	A	A	A	A	A	A	N
Concealed small cell tower, DAS or node (not macro)												
City-owned property identified in the MP	A – See Master Plan for Site Specific Details											
Other City-owned property	N	C	C	C	C	C	C	C	C	C	C	N
Other public property	N	C	C	C	C	C	C	C	C	C	C	N
Private property	N	C	C	C	C	C	C	C	C	C	C	N
Concealed macro tower												
City-owned property listed in MP	A – See Master Plan for Site Specific Details											
Other City-owned property	N	C	N	C	C	C	C	C	C	C	C	N
Other public property	N	C	N	C	C	C	C	C	C	C	C	N
Private property	N	C	N	C	C	C	C	C	C	C	C	N
Collocation on eligible facility												
Non substantial change	A	A	A	A	A	A	A	A	A	A	A	N
Collocation on eligible facility with substantial change or on a non-eligible facility												
City-owned property	C	C	C	C	C	C	C	C	C	C	C	N
City-owned property listed in MP	A	A	A	A	A	A	A	A	A	A	A	N
Public property	C	C	C	C	C	C	C	C	C	C	C	N
Private property	C	C	C	C	C	C	C	C	C	C	C	N
Non-concealed tower on												
Public property												
Monopole, Lattice, Guy	N	N	N	N	C-2	C-2	C-2	C-2	C-2	C-2	C-2	N
Private property												
Monopole, Lattice, Guy	N	N	N	N	C-2	C-2	C-2	C-2	C-2	C-2	C-2	N

Key A = Administrative Permit; C = Conditional Use Permit from Planning & Zoning Commission; C-2 = Conditional Use Permit from City Council, following recommendation from Planning & Zoning Commission; N= Not Permitted; NA = Not Applicable

D. City Parks. Concealed wireless communication facilities may be permitted within city park areas. Consideration will be given to locating wireless communication facilities on athletic field lighting standards, provided the equipment does not interfere with the primary purpose of the lights and does not detract from the overall aesthetics of the facility.

1704.05 Application Submittal Requirements.

A. Application. An application for any type of wireless communications facility shall include the following information:

1. A completed application form and any appropriate fees.

2. An accurate inventory of applicant's existing wireless communication facilities, which are existing or for which application for approval or permit has been submitted for zoning or construction, which are within the jurisdiction of this article or within 1 mile of the city limits. The inventory shall include the location, height, type, ownership and all tenants of each facility.

3. A map of all locations owned, leased or operated by the applicant and their coverage which are located within the jurisdiction of this article or within 1 mile of the city limits of the proposed site or which are capable of service with the proposed site by wireless means.

4. An accurate Site Plan of the proposed wireless communication facility showing the means of access, all adjacent roadways, and a complete landscape plan.

5. A scaled drawing of the exterior of the proposed wireless communication facility, clearly showing the method of fencing; coloration; materials; illumination; and camouflage.

6. Photo-simulated pre and post-construction renderings of the proposed wireless service facilities, equipment enclosures, and ancillary structures as they would look after construction from locations to be determined at the time of application submittal (but shall, at a minimum, include renderings from the vantage point of any adjacent roadways and occupied commercial or residential structures), as well as photo-simulations of the antenna-supporting structure after it has been fully developed with antenna structures (applicant may assume for the purpose of the simulation that other antenna structures on the facility will resemble their proposed structure in size and design).

7. Exterior paint or finish samples of the colors to be used in the construction of the wireless communication facility.

8. Proof of ownership or a letter of authorization from the property owner stating that the applicant may install a wireless communication facility on their property.

9. A signed statement from the wireless communication facility owner or owner's agent stating that the radio frequency emissions comply with FCC standards for such emissions as set forth in 47 CFR 1.1307, 1.310, 2.091 or 2.093, as applicable (*Report and Order*, ET Docket 93-62 (Guidelines for Evaluating the Environmental Effects of Radiofrequency Radiation), 11 FCC Rcd 15123 (1996); *Second Memorandum Opinion and Order and Notice of Proposed Rule Making,* ET Docket 93-62 (WT Docket 97-192), 12 FCC Rcd 13494 (1997). In particular, the statement shall demonstrate the proposed facility, individually and cumulatively, will not exceed the maximum permissible exposure level to the general public of approximately 580 microwatts per square centimeter. In addition, any collocation application shall contain an analytical report which confirms that following installation, the composite facility will remain in compliance with FCC standards as stated in OET-65.

10. Proof of an FCC license to transmit and/or receive radio signals in the city prior to commencement of operations.

11. Prior to issuance of a building permit, a stamped or sealed structural analysis of the proposed antenna-supporting structure prepared by a licensed Arizona engineer indicating the proposed and future loading capacity of the antenna-supporting structure.

12. Prior to issuance of a building permit, proof of FAA compliance with Subpart C of the Federal Aviation Regulations Part 77, Objects Affecting Navigable Airspace.

13. A signed statement from the wireless communication facility owner agreeing to allow the collocation of other wireless equipment on the proposed antenna-supporting structure.

14. When conditional use permit is required, an ownership map of property owners within 300 feet of the exterior boundaries of the subject property as shown on the last assessment of the property. A list of these property owners shall also be provided on mailing labels and keyed to a map showing the location of the identified properties.

15. Cover letter describing the overall project and addressing in writing how the proposed wireless communication facility satisfies the requirements of this article.

16. All other documentation, evidence, or materials necessary to demonstrate compliance with the applicable approval criteria set forth in this article, including where applicable:

a. Existing wireless communication facilities to which the proposed facility will be a handoff candidate, including latitude, longitude, and power levels of each;

b. A radio frequency plot indicating the coverage of existing wireless service sites, and that of the proposed site sufficient to demonstrate radio frequency search area, coverage prediction with legend and signal levels, and design radius, together with a certification from the applicant's radio frequency engineer that the proposed facility's coverage or capacity potential cannot be achieved by any higher ranked alternative such as collocation, attached facility, replacement facility or concealed facility;

c. Prior to issuance of a building permit, a statement by a qualified professional engineer specifying the design structural failure modes of the proposed facility;

d. Antenna heights and power levels of the proposed facility and all other facilities on the subject property; and

e. A statement from the applicant that demonstrates that alternative locations, configurations, and facility types have been examined; and addresses in narrative form the feasibility of any alternatives that may have fewer adverse effects on adjacent properties than the facility, configuration, and location proposed including but not limited to:

i. Height;

ii. Mass and scale;

iii. Materials and color;

iv. Illumination;

v. Information addressing the following items:

(A) The extent of any commercial development within the geographic search ring of the proposed facility;

(B) The proximity of the structure to any residential dwellings;

(C) The proximity of the structure to any public buildings or facilities;

(D) The existence of tall and like structures within the geographic search ring of the proposed structure.

17. Citizen Participation Plan and Report as set forth in SLDC 408 when a conditional use permit is required.

18. A statement that the proposed facility conforms with state of the art, as defined herein, or alternatively, that state of the art technology is unsuitable for the proposed facility. Costs of state of the art technology that exceed facility development costs shall not be presumed to render the technology unsuitable.

19. Any other materials and data as may be required by the Director.

1704.06 Expert Review.

A. Where due to the complexity of the methodology or analysis required to review an application for a wireless communication facility requiring a conditional use permit, the Director may require a technical review by a third-party expert. The costs of this review shall be payable in advance by the applicant, in accordance with the Fee Schedule of the City of Sedona and shall be in addition to applicable conditional use permit and building permit fees.

B. The expert review may address any or all the following:

1. The accuracy and completeness of submissions;

2. The applicability of analysis techniques and methodologies;

3. The validity of conclusions reached;

4. Whether the proposed wireless communication facility complies with the applicable approval criteria set forth in these regulations;

5. Other matters deemed by the Director to be relevant to determining whether a proposed wireless communication facility complies with the provisions of these regulations.

C. Based on the results of the expert review, the Director may require changes to the applicant's application or submittals.

1704.07 Essential Public Services.

A. Wireless communication facilities shall be regulated and permitted pursuant to this article and shall not be regulated or permitted as essential services, public utilities, or private utilities.

B. Applicant agrees that their service is subordinate to essential public service services, and agrees to suspend use of any site, which may conflict with such services, regardless of the reason for such conflict, until such conflict is resolved.

1704.08 Enforcement. Wireless communication facilities that are not in compliance with all portions of this article shall be removed at the owner's expense if not brought into compliance within thirty (30) days after written demand by the city.

1705 General development and design standards and processes.

1705.00 All wireless communication facilities regulated under this Section shall meet the following general development and design standards and processes at a minimum:

A. Radio Frequency Emissions - The radio frequency emissions shall comply with FCC standards for such emissions, as set forth in 47 CFR 1.1307, 1.310, 2.091 or 2.093, as applicable (*Report and Order*, ET Docket 93-62 (Guidelines for Evaluating the Environmental Effects of Radio frequency

Radiation), 11 FCC Rcd 15123 (1996); *Second Memorandum Opinion and Order and Notice of Proposed Rule Making,* ET Docket 93-62 (WT Docket 97-192), 12 FCC Rcd 13494 (1997), and shall not, individually or cumulatively, exceed the maximum permissible exposure level to the general public of approximately 580 microwatts per square centimeter. In addition, each collocation application shall contain an analytical report which confirms that following installation, the composite facility will remain in compliance with FCC standards as stated in OET-65.

B. Impact Fee Calculation

1. For the purposes of impact fee calculation, the floor area for a wireless communication facility shall be considered a commercial use and shall include the total square footage of all equipment enclosures and the areas of the antenna- supporting structure foundation at or above grade.

2. The following shall be considered as development area and shall be required to meet the setbacks and open space ratio requirements for the land use district where they are located:

a. The area beneath all equipment enclosures;

b. The area of the antenna-supporting structure foundation at or above grade;

c. The area beneath ancillary structures;

d. The area inside the antenna-supporting structure framework

C. Signage.

1. Identification signage for each wireless communication facility shall be required for the purpose of identifying the owner as well as the tenants, party responsible for the operation and maintenance of the facility, its current address and telephone number, ASR registration number, site name, security or safety signs, and property manager information (if applicable). Identification signage on wireless communication facilities shall not exceed 4 square feet.

2. If more than 220 voltage is necessary for the operation of the facility and is present in a ground grid or in the structure, signs located every 20 feet and attached to an enclosing fence or wall shall display in large, bold, high contrast letters (minimum height of each letter: 4 inches) the following: “HIGH VOLTAGE – DANGER.”

D. Sounds. No unusual sound emissions such as alarms, bells, buzzers, or the like are permitted and shall be consistent with City Code. Sounds shall not exceed 65 dba at any exterior line of a property in a commercial district and 55 dba at any exterior line of a property in a residential district.

E. Antenna Mounting. Antennas and related service equipment mounted on a service tower shall be mounted as close to the tower as possible.

F. Equipment cabinets.

1. Vaulting underground freestanding equipment cabinet or shelter and/or power meter not attached to an existing structure is preferred. However, if the applicant can demonstrate that underground water table or floodplain issues prevent vaulting the supporting ground equipment then it may be placed on the ground. In no instance shall supporting group equipment be located farther than 2 feet from the base of the structure and it shall not interfere with pedestrian or vehicular traffic.
2. Equipment shelters or cabinets not vaulted shall be consistent with the general character of the neighborhood and historic character if applicable. Equipment shelters or cabinets shall be screened from the public view by using landscaping, or materials and colors consistent with the surrounding backdrop.

3. Screening enclosures shall be allowed when the design is architecturally compatible with the building.

4. Screening materials shall consist of materials and colors consistent with the surrounding backdrop and/or textured to match the existing structure.

The use of foliage and vegetation around ground equipment may be required based on conditions of the specific area where the ground equipment is to be located.

G. Maintenance. Wireless communication facilities shall be maintained in compliance with standards contained in applicable state or local Building Codes and the applicable health and safety standards established by the FCC or other bodies having jurisdiction, as amended from time to time.

H. Structural Integrity. The entire tower or base station and all appurtenances shall be designed pursuant to the design requirements of the most current edition of the IBC adopted by the City of Sedona. In addition, the entire tower or base station and all appurtenances shall be designed pursuant to the design requirements of ASCE 7, including wind speed design requirements, and tower loading/wind design requirements of EIA/TIA 222-G, Series II, including any subsequent modification to those specifications.

I. Lighting. New towers shall be illuminated only when required and in accordance with FAA requirements to provide aircraft obstruction lighting. All other on-site lighting required for security or emergency purposes shall be in accordance with SLDC 911 and be activated by timers or motion detectors.

J. Grading and Drainage. Applicants shall furnish evidence that the proposed facility does not violate requirements in SLDC Article 8.

K. Historical/Environmental Review Compliance. Applicants shall furnish evidence that the proposed facility has completed any applicable federal/state/tribal historical review or environmental review processes.

In addition to the foregoing general development and design standards, the following additional development and design standards apply to the specific type of wireless communication facility identified below:

1705.01 New Concealed Base Station Facilities for Macro, Small cell, DAS or Nodes. The following additional standards and processes apply to all new concealed base station facilities:

A. Height.

1. The overall height of any new base station facility on a rooftop shall not exceed more than ten (10) feet above the rooftop or parapet whichever is greater. “Height” for all purposes in this section shall mean the linear distance from the rooftop where the antenna is attached to the highest physical point on the wireless communication facility.

2. The overall height of any new base station facility on an existing utility or light pole shall not exceed five (5) feet above the existing pole.

B. Color, Screening and Placement

1. Buildings

a Where feasible, antennas shall be placed directly above, below or incorporated with vertical design elements of a building or structure to maximize concealment.

b Base station facilities shall be concealed in some fashion; e.g. screened by a parapet or other device to minimize its visual impact as measured from the boundary line of the subject property in accordance with the provisions of Article 9 SLDC.

c Base stations shall be designed in such a manner as to be compatible with the existing structure. The base station facility shall be constructed to integrate with the existing architecture. There shall be as little contrast as possible between the communications equipment and the structure.

2. Poles

a All cables shall be installed internally; but where internal mounting is not possible, surface mounted wires shall be enclosed within conduit or a similar cable cover which shall be painted to match the structure or building on which that DAS is mounted.

b Attached Equipment box and power meter is discouraged; however, if attachment is justified, equipment box and meter shall be located on the pole at a height that does not interfere with pedestrian or vehicular traffic or visibility and where applicable shall not interfere with street name signs or traffic lighting standards.

C. Approval Process – if the proposed facility under this Section is within the Master Plan, approvals shall be pursuant to 1704.02 (B), if not, then pursuant to 1704.02 (A).

D. Timing for Review of New Concealed Base Station Facilities for Macro, Small cell, DAS or Nodes. A new concealed base station facility shall be reviewed and a decision rendered within one hundred and fifty (150) days of receipt of the application, subject to any applicable tolling for application deficiencies and resubmissions, so long as the applicant demonstrates that the facilities will be used, immediately upon completion of construction, to provide personal wireless services, or within such other mutually agreed upon time. ("Spec" base stations are not entitled to review and decision within 150 days, or to any of the other protections of the Telecommunications Act.) Construction permits issued for new concealed base stations shall be valid for a term of one hundred eighty (180) days and shall lapse and be void if construction of the contemplated concealed base station is not completed within that time.

1705.02 Collocations on Existing Towers or Base Stations. The following additional standards and processes apply to all collocation facilities:

A. On Eligible Facility; Non-substantial Change

1. Collocations on existing eligible towers and existing eligible base stations shall meet and shall not exceed the definition of substantial change.

2. Approval Process

a. Applicants shall complete a wireless infrastructure application and building permit application and submit applicable filing fees.

b. The Director shall review application and decide if the application meets the non-substantial change definitions and notify applicant in writing within thirty (30) days of submission if the application is incomplete or complete. If incomplete, the City shall specifically delineate the missing information. The applicant shall resubmit the

missing information. The timeframe for review will begin running again when the applicant makes a supplemental submission. The City shall review and provide written notice to the applicant within ten (10) days if the application is approved or remains incomplete. If incomplete the City shall provide in writing specifically delineating the missing information.

c. City shall complete review process within sixty (60) days, accounting for any tolling, including any review to determine whether an application is complete unless there is a mutual agreement to an extension of time. The request will be deemed granted is not approved within the 60-day period, accounting for any tolling or mutually agreed upon extension of time.

B. Collocation on Non-Eligible Facility or A Substantial Change

1. Approval Process. Any and all collocations that exceed the parameters set forth in the Substantial Change definition or are on a non-eligible facility are subject to discretionary approval on a case by case and site-specific basis through the Conditional Use Process as set forth in Section 1704.02(A), except for collocations on City owned property in the Master Plan, which will be administratively approved. Applicants shall minimize substantial changes as much as possible.

2. Antenna Mounting. Antennas and related service equipment mounted on a service tower shall be mounted as close to the tower as possible.

3. Timing for Review of Substantial Change Collocations. A substantial change collocation shall be reviewed and a decision rendered within ninety (90) days of receipt of the application, subject to any applicable tolling for application deficiencies and resubmissions, so long as the applicant demonstrates that the facilities will be used, immediately upon completion of construction, to provide personal wireless services, or within such other mutually agreed upon time. ("Spec" collocations are not entitled to review and decision within 90 days, or to any of the other protections of the Telecommunications Act.)

1705.03 Concealed Towers, DAS, Small Cell or Nodes

A. New Freestanding Concealed DAS, Node & Concealed Small Cell Tower Development Standards. The following additional standards and processes apply to all new concealed freestanding DAS, Node and Small Cell tower facilities:

1. Height.

   The total height of a DAS/Small Cell facility including antenna shall not exceed thirty (30) feet.

2. Setbacks for DAS/Small Cell facility shall meet the same setbacks of the underlying zoning district.

3. The use of foliage and vegetation around ground equipment may be required by the City based on conditions of the specific area where the ground equipment is to be located. In order to avoid the clustering of multiple items of ground equipment in a single area, a maximum of two ground equipment boxes may be grouped together in any single location. Individual ground equipment boxes shall not exceed the dimensions provided for in Section 1703 above.

4. Visibility of new DAS/Small Cell structures.

   a. New DAS/Small Cell structures shall be configured and located in a manner that minimizes adverse effects on the landscape and adjacent properties, with specific design considerations as to height, scale, color, texture, and architectural design of the buildings on the same and adjacent zoned lots. Concealment

design is required to minimize the visual impact of wireless communication facilities.

b. All cables, conduits, electronics and wires shall be enclosed within the structure.

c. Small Cell facilities shall be no larger in size than what is specified in the Section 1703 Definitions

5. Timing for Review of New Concealed DAS, Node & Concealed Small Cell Tower Applications. A new concealed DAS, Node & Concealed Small Cell Tower shall be reviewed and a decision rendered within one hundred and fifty (150) days of receipt of the application, subject to any applicable tolling for application deficiencies and resubmissions, so long as the applicant demonstrates that the facilities will be used, immediately upon completion of construction, to provide personal wireless services, or within such other mutually agreed upon time. ("Spec" towers are not entitled to review and decision within 150 days, or to any of the other protections of the Telecommunications Act.) Construction permits issued for new concealed PWSF towers shall be valid for a term of one hundred eighty (180) days and shall lapse and be void if construction of the contemplated concealed PWSF tower is not completed within that time.

B. DAS Hub Development Standards. Setbacks for DAS hubs shall meet the setback standards of the underlying zoning district.

1. DAS Hub. Equipment shelters or cabinets shall be consistent with the general character of the neighborhood and historic character if applicable. Equipment shelters or cabinets shall be screened from the public view by using landscaping, or materials and colors consistent with the surrounding backdrop.

a. Screening enclosures shall be allowed when the design is architecturally compatible with the building

b. Screening materials shall consist of materials and colors consistent with the surrounding backdrop and/or textured to match the existing structure.

c. The use of foliage and vegetation around ground equipment may be required based on conditions of the specific area where the ground equipment is to be located.

1705.04 Concealed Macro or Replacement Tower.

A. The following additional standards and processes apply to new or replacement concealed wireless communication facilities:

1. Setbacks. Concealed facilities shall meet the greater of either:

a. The minimum setback requirements for the zoning district; or

b. Away from single family residential use properties by a minimum distance of 100% of the tower height; Notwithstanding the foregoing requirements, if the antenna-supporting structure has been constructed using "breakpoint" design technology, the minimum setback distance shall be equal to 110% of the distance from the top of the structure to the "breakpoint" level of the structure. For example, on a 100-foot-tall monopole with a "breakpoint" at 80 feet, the minimum setback distance would be 22 feet (110% of 20 feet, the distance from the top of the monopole to the "breakpoint"). Certification by an Arizona professional engineer of the "breakpoint" design and the design's fall radius shall be provided together with the other information required in SLDC 1704.05.

c. Either the Director (for Master Plan sites) or the Planning and Zoning Commission (for all other sites) shall have the authority to waive any applicable setback requirements where the City favors a more desirable location within the applicable parcel for the concealed facility.

2. Collocation Feasibility

   a. No new concealed tower shall be permitted unless the applicant demonstrates that no existing base station or tower can accommodate the applicant's proposed facility; or that use of such existing facilities would prohibit personal wireless services in the area of the city to be served by the proposed antenna-supporting structure. The new tower shall be designed to accommodate the maximum amount of wireless communication equipment, including that of other wireless communication providers. In all cases, the minimum number of collocated facilities on a new tower between 60 and 70 feet shall be 3.

   b. Evidence submitted to demonstrate that no existing wireless communications facility could accommodate the applicant's proposed facility may consist of any of the following:

      i. No existing wireless communication facilities located within the geographic search ring or a ½ mile around the geographic search ring meet the applicant's engineering requirements.

      ii. Existing wireless communication facilities are not of sufficient height to meet the applicant's engineering requirements.

      iii. Existing wireless communication facilities do not have sufficient structural strength to support the applicant's proposed wireless communication facilities and related equipment.

      iv. The applicant demonstrates that there are other limiting factors that render existing wireless communication facilities unsuitable.

3. Construction. No new or replacement concealed wireless communication facility shall be guyed or have a lattice type construction.

4. Aesthetics.

   a. No concealed facility, whether fully enclosed within a building or otherwise, shall have antennas, antenna arrays, transmission lines, equipment enclosures or other ancillary equipment that is readily identifiable from the public domain as wireless communication equipment. Examples of concealed facilities include, but are not limited to, flagpoles, light standards, utility poles, church steeples, bell towers, clock towers, and artificial trees.

   b. Concealed wireless communication facilities shall be placed and constructed in such a manner as to be compatible with the existing structure or surrounding natural terrain. There shall be as little contrast as possible between the communications equipment and the structure or natural terrain.

5. Placement of Equipment for Pole-Mounted Antennas. Any ground-mounted equipment and equipment shelters shall be located outside of the public right-of-way. Such ground-mounted equipment and equipment shelters shall be painted to comply with the color requirements of SLDC 904, and shall be screened from public view with appropriate landscaping. In the alternative, equipment may be mounted on the pole; provided, that access to the pole and to any other services or equipment above it is not impeded. Pole-mounted equipment shall also be designed and placed to be aesthetically compatible with existing and proposed uses and as visually inconspicuous as possible.

6. Security. An opaque fence or masonry wall no greater than 8 feet in height from finished grade shall be provided around the perimeter of all development areas for ground-mounted wireless communication facilities. The decision to provide either a fence or a wall shall rest with the Commission. If a fence is used to enclose the site, the fence shall be constructed of wire mesh, metal picket, or an alternative material as recommended by the Director and approved by Commission. If a wall is used to enclose the site, the wall shall have a decorative finish of native stone, stucco, split-faced block, brick, or an alternative material as approved by the Director for administrative approvals; and as recommended by the Director and approved by the Commission for conditional use permits. Access to the development area shall be through a locked gate.

7. Landscaping. Landscaping and buffering shall be required around the perimeter of development areas, except that the Director Planning and Zoning Commission, as applicable, may waive the any applicable landscaping requirements as outlined in SLDC on 1 or more sides of the development areas or allow the placement of required landscaping elsewhere on the development area when the required landscape area is located adjacent to undevelopable lands or lands not in public view. Landscaping shall be installed on the outside of the perimeter fence or wall. Existing vegetation shall be preserved to the maximum extent practicable and may be used as a substitute for or in supplement towards meeting the landscaping requirements, subject to approval by the Director (for administrative approvals) or Planning and Zoning Commission for conditional use permits. Landscaping shall be placed in a manner so as to maximize the screening between residential areas and the wireless communication facility and minimize the view of the facility from any residential areas.

8. Control Buildings and Ground Mounted Equipment

   a. The control buildings shall be designed to be architecturally compatible with adjacent buildings and shall comply with the provisions of Articles 9 and 10 SLDC. The control buildings shall not be placed in minimum setback areas as required in Article 6 SLDC, nor shall they encroach into required landscape areas.

   b. Ground-mounted equipment shall not be visible from beyond the boundaries of the site and shall be screened by a solid wall or fence and dense landscaping materials as described in subsection 1705.04(6) and (7) of this section.

9. Height. The overall height of any concealed tower, antenna and/or base station shall not be exceed the greater of (a) 70 feet or (b) 20 feet above the average height of native trees within a 500 foot radius of the proposed facility. “Height” for all purposes in this section shall mean the linear distance from the ground to the highest physical point on the antenna-supporting structure, including all antennas and antenna arrays.

10. Adverse Effects on Properties.

    a. New concealed towers shall be configured and located in a manner that shall minimize adverse effects including visual impacts on adjacent properties. The applicant shall demonstrate that alternative locations, configurations, and facility types have been examined and shall address in narrative and graphic form the feasibility of any alternatives that may have fewer adverse effects on adjacent properties than the facility, configuration, and location proposed.

    b. An applicant shall demonstrate through the photo-simulation requirements under SLDC 1704.05 that the project design employs each of these attributes in a manner that minimizes adverse effects to the greatest extent feasible.

    c. The following attributes shall be considered from vantage points at adjacent properties, roadways and occupied structures:

       i. Height and location;

ii. Mass and scale;

iii. Materials and color;

iv. Illumination;

v. Existing and proposed vegetation and intervening structures.

11. Timing for Review of New Concealed Tower Applications. A new concealed PWSF tower, shall be reviewed and a decision rendered within one hundred and fifty (150) days of receipt of the application, subject to any applicable tolling for application deficiencies and resubmissions, so long as the applicant demonstrates that the facilities will be used, immediately upon completion of construction, to provide personal wireless services, or within such other mutually agreed upon time. ("Spec" towers are not entitled to review and decision within 150 days, or to any of the other protections of the Telecommunications Act.) Construction permits issued for new concealed PWSF towers shall be valid for a term of one hundred eighty (180) days and shall lapse and be void if construction of the contemplated concealed PWSF tower is not completed within that time.

1705.05 New Non-Concealed Macro Towers.

A. The following additional standards and processes apply to new non-concealed towers:

1. Setbacks. New towers shall be located as follows:

   a For new wireless communication facilities, the setback shall be away from public ROW by a minimum distance of 1 foot for each 1 foot of tower height.

   b Away from single family residential use properties by a minimum distance of 100% of the tower height;

   c Notwithstanding the above requirements, if the antenna-supporting structure has been constructed using "breakpoint" design technology, the minimum setback distance shall be equal to 110% of the distance from the top of the structure to the "breakpoint" level of the structure. For example, on a 100-foot-tall monopole with a "breakpoint" at 80 feet, the minimum setback distance would be 22 feet (110% of 20 feet, the distance from the top of the monopole to the "breakpoint"). Certification by an Arizona professional engineer of the "breakpoint" design and the design's fall radius shall be provided together with the other information required in SLDC 1704.05

2. Height. The overall height of any tower, antenna and/or base station outside of the ROW shall not be exceed the greater of (a) 70 feet or (b) 20 feet above the average height of native trees within a 500 foot radius of the proposed facility. "Height" for all purposes in this section shall mean the linear distance from the ground to the highest physical point on the antenna-supporting structure, including all antennas and antenna arrays.

3. Construction. New towers and base stations shall be in accordance with the prescribed preferences in SLDC1704.01 (C)

4. Collocation Feasibility

   a. No new tower or new base station shall be permitted unless the applicant demonstrates that no existing base station or tower can accommodate the applicant's proposed facility; or that use of such existing facilities would prohibit personal wireless services in the area of the city to be served by the proposed antenna-supporting structure. The new tower shall be designed to accommodate the maximum amount of wireless communication equipment, including that of other wireless communication providers. In all cases, the minimum number of collocated facilities on a new tower between 60 and 70 feet shall be 3.

b. Evidence submitted to demonstrate that no existing wireless communications facility could accommodate the applicant's proposed facility may consist of any of the following:

i. No existing wireless communication facilities located within the geographic search ring or a ½ mile around the geographic search ring meet the applicant's engineering requirements.

ii. Existing wireless communication facilities are not of sufficient height to meet the applicant's engineering requirements.

iii. Existing wireless communication facilities do not have sufficient structural strength to support the applicant's proposed wireless communication facilities and related equipment.

iv. The applicant demonstrates that there are other limiting factors that render existing wireless communication facilities unsuitable.

5. Color.

a. New non-concealed towers shall be painted to match the background or other accepted contextual or compatible color in accordance with the requirements of Article 9 SLDC, except as required by federal rules or regulations

b. If permitted, non-concealed antenna and related service equipment attached to towers and base stations shall be of a color compatible with the color of the supporting structure so as to make the antenna and related service equipment visually unobtrusive in accordance with the provisions of Article 9 SLDC.

6. Security. An opaque fence or masonry wall no greater than 8 feet in height from finished grade shall be provided around the perimeter of all development areas for ground-mounted wireless communication facilities. The decision to provide either a fence or a wall shall rest with the Commission or Council, as applicable. If a fence is used to enclose the site, the fence shall be constructed of wire mesh, metal picket, or an alternative material as recommended by the Director and approved by Commission or Council for conditional use permits. If a wall is used to enclose the site, the wall shall have a decorative finish of native stone, stucco, split-faced block, brick, or an alternative material as recommended by the Director and approved by Commission or Council. Access to the development area shall be through a locked gate.

7. Landscaping. Landscaping and buffering shall be required around the perimeter of development areas, except that the Planning and Zoning Commission or City Council may waive the any applicable landscaping requirements as outlined in SLDC on 1 or more sides of the development areas or allow the placement of required landscaping elsewhere on the development area when the required landscape area is located adjacent to undevelopable lands or lands not in public view. Landscaping shall be installed on the outside of the perimeter fence or wall. Existing vegetation shall be preserved to the maximum extent practicable and may be used as a substitute for or in supplement towards meeting the landscaping requirements, subject to approval by the Planning and Zoning Commission or City Council, as applicable. Landscaping shall be placed in a manner so as to maximize the screening between residential areas and the wireless communication facility and minimize the view of the facility from any residential areas.

8. Control Buildings and Ground Mounted Equipment

a. The control buildings shall be designed to be architecturally compatible with adjacent buildings and shall comply with the provisions of Articles 9 and 10 SLDC. The control buildings shall not be placed in minimum setback areas as

required in Article 6 SLDC, nor shall they encroach into required landscape areas.

b. Ground-mounted equipment shall not be visible from beyond the boundaries of the site and shall be screened by a solid wall or fence and dense landscaping materials as described in subsections 1705.05(6) and (7) of this section.

9. Maintenance. Wireless communication facilities shall be maintained in compliance with standards contained in applicable state or local Building Codes and the applicable health and safety standards established by the FCC or other bodies having jurisdiction, as amended from time to time.

10. Adverse Effects on Properties.

a. New towers and base stations shall be configured and located in a manner that shall minimize adverse effects including visual impacts on adjacent properties. The applicant shall demonstrate that alternative locations, configurations, and facility types have been examined and shall address in narrative and graphic form the feasibility of any alternatives that may have fewer adverse effects on adjacent properties than the facility, configuration, and location proposed.

b. An applicant shall demonstrate through the photo-simulation requirements under SLDC 1704.05 that the project design employs each of these attributes in a manner that minimizes adverse effects to the greatest extent feasible.

c. The following attributes shall be considered from vantage points at adjacent properties, roadways and occupied structures:

i. Height and location;

ii. Mass and scale;

iii. Materials and color;

iv. Illumination;

v. Existing and proposed vegetation and intervening structures.

11. Timing for Review of New Tower Applications. A new non-concealed PWSF tower shall be reviewed and a decision rendered within one hundred and fifty (150) days of receipt of the application, subject to any applicable tolling for application deficiencies and resubmissions, so long as the applicant demonstrates that the facilities will be used, immediately upon completion of construction, to provide personal wireless services, or within such other mutually agreed upon time. ("Spec" towers are not entitled to review and decision within 150 days, or to any of the other protections of the Telecommunications Act.) Construction permits issued for new PWSF towers shall be valid for a term of one hundred eighty (180) days and shall lapse and be void if construction of the contemplated PWSF tower is not completed within that time.

1705.06 AM/FM/TV/DTV Broadcasting Facilities. The following standards apply to new AM/FM/DTV broadcasting facilities:

A. An antenna, antenna array and/or antenna-supporting structure for AM/FM/TV/DTV facilities licensed by the Federal Communications Commission shall only be permitted in zoning districts C-1, C-2 or C-3 in the city.

B. Any applicant for the construction or installation of any antenna, antenna array and/or antenna-supporting structure for use as an AM, FM, TV, or DTV broadcasting facility must demonstrate, prior to submitting an application, a valid FCC construction permit for the proposed location (showing NAD 27 coordinates and appropriate conversion to NAD 83 coordinates) together with an FAA Determination of No Hazard to Air Navigation (Form 7460) for the same coordinates.

C. An antenna, antenna array and/or antenna-supporting structure for use as an AM, FM, TV or DTV broadcasting facility shall, in no event, exceed 250 feet in height.

D. Any antenna-supporting structure, equipment enclosures and ancillary structures shall meet the minimum setback requirements for the land use district where they are located, except that where the minimum setback distance for an antenna-supporting structure from any property line or public right-of-way is less than the height of the proposed antenna-supporting structure, the minimum setback distance shall be increased to equal the height of the proposed antenna-supporting structure. However, in all instances, the minimum setback distance from the setback line of any residentially zoned property, with a constructed residence or potential residence, shall be at least 200% of the height of the entire proposed structure.

E. The entire antenna-supporting structure and all appurtenances shall be designed pursuant to the wind speed design requirements of ASCE 7-95, including any subsequent modification to those specifications.

F. Any facility shall be illuminated in accordance with FAA requirements to provide aircraft obstruction lighting, where required. Any lighting required by the FAA must be of the minimum intensity and number of flashes per minute (such as the longest duration between flashes) allowable by the FAA. No strobes or other lighting shall be permitted unless required by the FAA.

G. New towers shall maintain a galvanized gray finish or other accepted contextual or compatible color, except as required by federal rules or regulations.

H. The radio frequency emissions shall comply with FCC standards for such emissions on an individual and cumulative basis with any adjacent facilities. The applicant shall certify that any and all new services shall cause no harmful interference to the existing City of Sedona Public Safety Communications equipment.

I. Applicants shall provide for a fence or wall around the proposed facility that meets the requirements of subsection 1705.01(K) of this section.

J. Landscaping and buffering shall be required around the perimeter of development areas, as required by SLDC 910, except that the Planning and Zoning Commission may waive the required landscaping otherwise required under SLDC 910 on 1 or more sides of the development areas or allow the placement of required landscaping elsewhere on the development area when the required landscape area is located adjacent to undevelopable lands or lands not in public view. Alternative landscaping may be approved by the Planning and Zoning Commission. Landscaping shall be installed on the outside of the perimeter fence or wall.

K. The only signage that is permitted upon an antenna-supporting structure, equipment enclosures, or fence (if applicable) shall be informational, and for the purpose of identifying the tower (such as ASR registration number), as well as the party responsible for the operation and maintenance of the facility, its current address and telephone number, security or safety signs, and property manager signs (if applicable). If more than 220 voltage is necessary for the operation of the facility and is present in a ground grid or in the tower, signs located every 20 feet and attached to the fence or wall shall display in large, bold, high contrast letters (minimum height of each letter: 4 inches) the following: “HIGH VOLTAGE – DANGER.”

L. Grading and Drainage - Applicant shall furnish evidence that the proposed facility does not violate requirements in SLDC Article 8.

M. Adverse Effects on Adjacent Properties.

1. New towers shall be configured and located in a manner that shall minimize adverse effects including visual impacts on adjacent properties. The applicant shall demonstrate that alternative locations, configurations, and facility types have been examined and shall address in narrative

and graphic form the feasibility of any alternatives that may have fewer adverse effects on adjacent properties than the facility, configuration, and location proposed.

2. The following attributes shall be considered from vantage points at adjacent properties, roadways and occupied structures:

a. Height and location;

b. Mass and scale;

c. Materials and color;

d. Illumination;

e. Existing and proposed vegetation and intervening structures; and

f. Overall aesthetics of the proposed structure.

1706 Noncommercial amateur wireless facility or Oversized Satellite Earth Station.

An applicant proposing either (i) a satellite earth station larger than the parameters set forth in Section 1704.01 (B)(7) above or (ii) an amateur wireless facility which is 65 feet or greater in all zoning districts or is not located either directly behind the rear structural wall of a residential or commercial structure, or is attached to the rear or side of a residential or commercial structure, shall obtain a conditional use permit as set forth in SLDC 402, Conditional uses, relative to the review criteria provided in SLDC 1704.03, prior to submittal for building permit approval and the initiation of construction.

A. Application Requirements.

1. Site Plan application in accordance with the Site Plan requirements of the codes of the city.

2. Applicant's copy of current, valid FCC license for amateur radio operation (not applicable for satellite earth station applicants).

3. Site Plan sketch showing all proposed structures (such as support structures, anchorage) and setbacks from such structures to property boundaries.

B. Approval Standards. Approval standards for amateur wireless facility in excess of 65 feet in all zoning districts:

1. The facility shall be accessory to a legal, principal use on site (such as a residence).

2. Structures, including towers, shall meet the setback requirements for primary structures for the zoning district in which the proposed facility shall be located.

3. Applicant shall commit in writing that the facility will be erected in accordance with manufacturer's recommendations.

4. If more than 220 voltage is present in the ground grid or in the tower, a sign shall be attached to the tower and shall display in large bold letters the following: "HIGH VOLTAGE – DANGER."

5. Applicant shall certify that the proposed facility meets or exceeds FCC guidelines for radio frequency radiation exposure.

6. Applicant shall furnish evidence that the proposed facility does not violate requirements in SLDC Article 8.C. Collocation Prohibited. Collocation of any antenna, antenna arrays, microwave or similar type equipment not used for the purposes of either a satellite earth station or an amateur wireless

facility is prohibited.

1707 Interference with public safety communications.

In order to ensure that the city's public safety radio services will be free from objectionable technical interference, all applicants requesting a permit for a wireless communication facility or an AM/FM/TV/DTV facility shall agree, in addition to any other requirements:

A. To demonstrate compliance with good engineering practices;

B. To provide the city a copy of all inter-modulation studies submitted to the FCC;

C. Not to induce objectionable technical interference to the city's public safety radio services;

D. To comply with FCC regulations regarding susceptibility to radio frequency interference, frequency coordination requirements, general technical standards for power, antenna, bandwidth limitations, frequency stability, transmitter measurements, operating requirements, and any and all other federal statutory and regulatory requirements relating to radio frequency interference (RFI);

E. In the case of collocation of telecommunications facilities either in the same location or on the same tower as the city's, to not cause or permit to be caused by its transmissions or other activities on the premises, objectionable technical interference of any kind whatsoever to the broadcasting transmissions, reception, or electromagnetic communications of the city; and

F. To pay for any studies requested by the City's Director to determine if the applicant's telecommunications facilities are causing objectionable technical interference; and

G. Upon notification by the Director, if the operations of the applicant are causing objectionable technical interference, to immediately undertake all steps necessary to determine the cause of and eliminate such interference utilizing the procedures set forth in the joint wireless industry-public safety "Enhanced Best Practices Guide," released by the FCC in Appendix D of FCC 04-168 (released August 6, 2004), including the "Good Engineering Practices," as may be amended or revised by the FCC from time to time in any successor regulations, at the cost of the applicant. If said interference continues for a period in excess of 48 hours after notice from the Director, the city shall have the right to cause the applicant to cease operating the equipment that is causing the objectionable technical interference or to reduce the power sufficiently to ameliorate the objectionable technical interference until the condition causing said interference has abated.

1708 Post Construction Inspections.

A. Wireless communication facility owners (other than amateur facility owners) shall submit a report to the Department of Community Development certifying structural and electrical integrity, as well as continued compliance with RF exposure standards specified in OET-65, upon activation of the facility and thereafter once every two (2) years on the anniversary of the certificate of completion.

B. Inspections shall be conducted by an engineer licensed to practice in the State of Arizona Based upon the results of an inspection, the Director of the Department of Community Development may require repair or removal of a wireless communication facility.

C. The City may conduct periodic inspections with the cost of such inspection paid by the owner of the wireless communication facility as provided in the Fee Schedule of the City of Sedona to

ensure structural and electrical integrity. The owner of the wireless communication facility may be required by the City to have more frequent inspections if there is evidence that the wireless communication facility has a safety problem or is exposed to extraordinary conditions.

1709 Abandonment and removal.

A. Towers and base stations shall be removed, at the owner's expense, within 180 days of cessation of use.

B. An owner wishing to extend the time for removal or reactivation shall submit an application stating the reason for such extension. The Director may extend the time for removal or reactivation up to sixty (60) additional days upon a showing of good and unique cause. If the tower or base station is not removed within this time, the city may give notice that it will contract for removal within thirty (30) days following written notice to the owner. Thereafter, the city may cause removal at the cost of the owner.

C. Upon removal of the tower or base station, the site shall be returned to its natural state and topography and vegetation consistent with the natural surroundings or consistent with the current uses of the surrounding or adjacent land at the time of removal, excluding the foundation, which does not have to be removed. The Director may extend the time for returning the site to its natural state, topography and vegetation up to sixty (60) additional days upon a showing of good and unique cause. If the site improvements are not made, the city may give notice that it will contract for the improvements within thirty (30) days following written notice to the owner. Thereafter, the city may contract the improvements at the cost of the owner.

John and Gail West
2045 Buena Vista Dr.
Sedona, AZ 86336

October 17th 2017

City of Sedona
Sedona AZ 102 Roadrunner Dr. 86336
Attention Planning and Zoning Commissioners:
Re: Cell Phone Tower Approval of Site Locations
Marty Losoff –Chairman
Kathy Levin- Vice Chair
Randy Barcus
Eric Brandt
Avrum Cohen
Larry Klein
Gerhard Mayer

Commissioners,
As a resident of Sedona, representing the views of many residents who reside surrounding the Sugarloaf Trail head residential neighborhood, we implore you to stand firm in your recommendation to EXCLUDE the Sugarloaf Trailhead as a chosen site location for ANY Cell phone tower locations. This specifically includes site locations 2050 and 2070 Buena Vista Dr. – Sugarloaf Trailhead parking lot.

I have attended both preliminary meetings of the Planning and Zoning Commission, along with many concerned residents who testified and provided signed petitions urging you to EXCLUDE this location from the City designated available site locations for possible Cell tower locations.

It appeared that you heard the residents loud and clear, and agreed to remove BOTH 2050 and 2070 Buena Vista Dr. from the list of available sites and directed staff to return with the final recommendation to include these omissions. Planning and Zoning Commission is scheduled to meet on November 7th at 5:30 to sign off on this recommendation, to then be presented to the City Council for adoption.

However, I have just inquired of City Staff regarding the disposition of this recommendation, and to my surprise, have learned they are MODIFYING this recommendation to INCLUDE 2070 Buena Vista Dr. as a chosen site for a small cell facility of some type at this site.

The logic behind this reasoning is flawed. If the City APPROVES this location as an available site for a cell tower, it will surely be a clear sanction and invitation to put a tower in this location.

Keeping this lot on the list due to the potential the ROW's (Right of Ways) in front of the lots being desirable is hard to grasp as the entire purpose for the City proposing alternative locations to the ROW's was to steer cell companies away from the ROW areas. If you go into a restaurant to order from the menu, that option IS AVAILABLE to choose from.

Please honor your initial commitment to represent what is best for Sedona as an entire Community and present your final proposal to include removal of BOTH 2050 and 2070 Buena Vista Dr. from the available building sites for this city ordinance change. I thought it was the P&Z Commission that makes recommendations from staff and public input, not staff being the moving party on recommendations. This is why a P&Z commission exists, right?

It is so frustration to think we have the support of the P&Z Commission and to then find out that your final recommendation will also include an end run from staff to manipulate this recommendation to suit the staff's illogical desires.

I also understand that the new AZ legislation that permits wireless facilities in the City rights of way (ROW) has delayed this item as the City works through revising this ordinance to comply with state law. Tell the CELL TOWER COMPANIES where to put the towers is a great solution to having some say in their locations. So, the list of available alternative locations to the ROW should not include Trailhead locations! Please stand firm in your initial commitment to the citizens of Sedona.

Sincerely,

Gail West- owner 2045 Buena Vista Dr.
cc. Karen Osburn – city staff, WHPOA, Residents surrounding Trailhead

Feedback Received - Wireless Master Plan												
Date	Rcvd by	**Site**	Phone	Walk In	Email	Mail	Name	Address	Description	Yes	No	Neutral
5/4/17	Karen	O	X				Gary Muise		Owner of one of properties adjacent to Panorama Blvd. lift station. Opposed to any wireless structure adjacent to his property. The lot is currently vacant, but it's a residential lot and he intends to build a house there in the future. The lift station is between 2 residential parcels & even a small cell, depending on size, may be too obtrusive.		X	
5/4/17	Karen	F2, F3		X			Sal DiGiovanni		Supportive of city's efforts to be proactive in this area and to protect the scenic beauty by controlling location and aesthetic.	X		
5/4/17	Karen				X		Stephen Stobinski		Would like to participate in P&Z meetings to improve reception in city	X		
5/3/17	Karen				X		Mike Ulissey	[redacted] Sedona	I'm glad you guys are being proactive and would be happy to lend my support in any way I can.	X		
5/3/17	Karen	A1, A2			X		John West	[redacted] Sedona	Erect as far away as possible from residents homes. **Parcel 408-04-[redacted]: A2 option bad & remove**; A1 option put back away from houses. **Parcel 408-25[redacted]: Option 1 bad & remove**; Option 2 put tower away from houses and out of view	X		
5/15/17	Karen				X		Thomas Brennan		My understanding of this proposed project is that it would be a 75 foot tall plastic tree…it will be completely out of place. The location is at one of the busiest trailheads in Sedona. It would detract from our natural beauty resource… The detrimental health effects of resideing in proximity to an RF/MW transmitting antenna are well established.		X	
5/15/17	Karen	A1, A2	X				Jana West	[redacted], Sedona	Concerned about RF, but also concerned about the visual impact of any new towers and having them so close to residential and having to look at them vs. their unobstructed views now. Especially site A2.		X	
5/14/17	Audree	A1, A2			X		John O'Brien	[redacted], Sedona	Concern about concealment & aesthetics. Would like to know timing, whether currently adequate coverage in Sedona, if possible to use softball field lights at Posse Grounds Park instead, what the height would be.			X
5/13/17	Council	A2			X		Casey & Marcee Osmonovich	[redacted], Sedona	We strongly oppose any kind of cell phone tower being erected ANYWHERE near our home.		X	
5/17/17	CommDev				X		Joyce Towfighia		Via Comm Dev Help Desk: As a visitor, previous part time resident of Sedona and still a resident of Arizona that frequently visits Sedona, I would like to say I am opposed to the cell phone tower proposed for Sugar Loaf. Don't chase people away from what draws them to your beautiful city...thanks for listening.			
5/18/17	Dianne		X				Lorie McClure	[redacted], Sedona	Does not want a tower near Sugar Loaf trailhead or in nature. Might be o.k. to put tower near water tank since there is already infrastructure there. Basically no metal, electrical, phone line in nature areas. Many of my neighbors feel the same.			
5/25/17	Karen		X				Jana West	[redacted], Sedona	Was unable to attend first P&Z meeting. Calling to find out whether Sugar Loaf/Little Elf sites were removed from the list. Wondering what her neighborhood could do (petitions, lawyers, etc.) to get off the list. She heard that Posse Grounds and Chapel area sites were removed from list and wondering if that is true.			
5/30/17	Karen		X				Patty Popp	[redacted] Lane, Sedona; Permanent mailing address: [redacted]. Tucson, AZ 85715	I am the owner of the property at [redacted] Newcastle Lane, in Sedona, Arizona. I reside part time at this property, and do not receive mail here. I have owned the property since 2009. I wish to protest the fact that I never received a letter about the Sedona Wireless Master Plan. I feel that the pumping station at 11 Newcastle Lane is extremely poor choice of a site for a cell tower location for reasons that may not be obvious to non-residents…Roads: this tower would have to be constructed and maintained through the use of private roads in the area….To sum up: the COS wants to propose a cell tower location that is only accessible by private roads that are NOT maintained by the city, are impassable most times, and for whose maintenance and upkeep the cell company will not be obligated to contribute financially. Physical location: The pumping station is located at the bottom of the large hill…It makes no logical sense to locate a tower in an area where most of us have great difficulty even receiving signals for radio stations. The hill will block at least half of the broadcast ability of a cell tower; instead of it broadcasting in a 360° range, it appears that it would only be able to broadcast in a 180° range. Power lines: The power lines in this part of Sedona are aerial (for the most part), old, and are in a heavily wooded area. They are simply not reliable. APS does what it can to keep the lines clear of branches, but the strong potential exists for power lines and poles to be down after strong winds.		X	
5/30/17	Karen	401-03-001K	X				Tim Cummings		My residence + a vacant lot (I own) is adjacent to the Historical Society parking lot. I would like to object to placement of a tower as it would have severe negative consequences on my property values. Please advise if the June 1 meeting is the correct venue to voice my objection?			
5/31/17	Lauren				X		Gail & John West	[redacted], Sedona	We ask that you REMOVE Buena Vista lots sites as POTENTIAL future sites for following reasons: 1) There are other potential sites available. 2) Opposition is expressed by the residents. 3) Health and noise concerns have not been addressed, putting towers in neighborhoods is a huge concern for the citizens. 4) It has not been established that new towers are needed. The recommendation should include: LIMITING the available sites to locations that: 1) Have no citizen objection. 2) Existing sites used first. 3) Establish policy guidelines that reflect Sedona principles (less is more)…		X	
5/31/17	Lauren				X		Joe and Suzanne Jenniches		Thank you for the rapid response! We have forwarded the document to our Arizona architect, Gary Hassen of KIVA Architect in Prescott. We look to him for advice as we are in Delaware and will not make it to Sedona until the Fall.			

Feedback Received - Wireless Master Plan												
Date	Rcvd by	**Site**	Phone	Walk In	Email	Mail	Name	Address	Description	Yes	No	Neutral
5/31/17	Karen				X		Kimberly Lillyblad	[redacted], Sedona	In regards to the proposed wireless tower site at 11 Newcastle Lane, the neighboring property at 70 Newcastle Lane is a historic property in this historical area….The lift station property the city is proposing for a 20' wireless tower is in a valley on a mountainside in this historical area of Oak Creek…it is next to the historically designated irrigation ditch and is less than 100 feet from my creekside property and home. A historical creekside home with irrigation is a rare and special place in the desert, this must be considered in accordance with Article 17 WIRELESS COMMUNICATIONS FACILITIES, section C, which states "Consideration of historical and environmentally sensitive areas as well as consideration of potential impacts on adjacent properties; ". This article indicates that the City of Sedona is being negligent and has not in any way taken into consideration the impact of the proposed wireless tower on this historical creekside area…The geographical maps that were presented by the city do not represent what the coverage would potentially look like from the proposed sites….			
5/31/17	Karen				X		Lucy Monica George		Please don't build cell tower at Sugarloaf Trailhead			
5/31/17	Karen					X	Fred & Diane Miller	[redacted] Spirit Lake IA 51360	Opposition to the placement of a cell tower on the city-owned site on New Castle Lane. They object to the obstruction of their views that a tower may cause and the subsequent perceived devaluation of their property as a result.		X	
7/17/17	Karen		X				Ann Cunningham	[redacted], Sedona	Against proposed cell tower on El Camino Road.			
7/17/17	Karen		X				Christina Paley	[redacted], Sedona	Against proposed cell tower on El Camino Road. Location is in a valley and would blast people with radiation. 19 out of 21 neighbors against this. Petition circulating with over 100 signatures against.			
5/3/17	Webpage						James Curry		registered on webpage to receive updates			
5/3/17	Webpage						Michael Sanders		registered on webpage to receive updates			
5/3/17	Webpage	A1					Larry & Sharon Turner		registered on webpage to receive updates			
5/4/17	Webpage						Gail & John West		registered on webpage to receive updates			
5/4/17	Webpage						Stephen Stobinski		registered on webpage to receive updates			
5/4/17	Webpage	C6					Mike Ulissey		registered on webpage to receive updates			
5/4/17	Webpage						David ODonnell		registered on webpage to receive updates			
5/5/17	Webpage						Brion Tyler		registered on webpage to receive updates			
5/5/17	Webpage						John Samish		registered on webpage to receive updates			
5/6/17	Webpage						Priscilla		registered on webpage to receive updates			
5/6/17	Webpage						Steve Schliebs		registered on webpage to receive updates			
5/6/17	Webpage	K					Ron Maassen		registered on webpage to receive updates			
5/7/17	Webpage						Dewey Akers		registered on webpage to receive updates			
5/7/17	Webpage						Patricia Steiner		registered on webpage to receive updates			
5/8/17	Webpage						Donna		registered on webpage to receive updates			
5/8/17	Webpage						Audrey Sepe		registered on webpage to receive updates			
5/9/17	Webpage								registered on webpage to receive updates			
5/10/17	Webpage						Barbara Baker		registered on webpage to receive updates			
5/10/17	Webpage						Airen Sapp		registered on webpage to receive updates			
5/11/17	Webpage						M DiPalma		registered on webpage to receive updates			
5/11/17	Webpage	K					John DiBiasi		registered on webpage to receive updates			
5/11/17	Webpage						Kathleen Oconnell		registered on webpage to receive updates			
5/11/17	Webpage								registered on webpage to receive updates			
5/12/17	Webpage								registered on webpage to receive updates			
5/13/17	Webpage						Dean Gain		registered on webpage to receive updates			
5/13/17	Webpage	K					Rebekah Fairlight		registered on webpage to receive updates			
5/13/17	Webpage						Diane Petrusich		registered on webpage to receive updates			

Feedback Received - Wireless Master Plan												
Date	Rcvd by	**Site**	Phone	Walk In	Email	Mail	Name	Address	Description	Yes	No	Neutral
5/13/17	Webpage						Carol Kurimsky		registered on webpage to receive updates			
5/13/17	Webpage						Becky Pearson		registered on webpage to receive updates			
5/14/17	Webpage						Janet Casey		registered on webpage to receive updates			
5/14/17	Webpage						Randy Smith		registered on webpage to receive updates			
5/14/17	Webpage						Barbara Litrell		registered on webpage to receive updates			
5/14/17	Webpage						Sharyn Yuloff		registered on webpage to receive updates			
5/14/17	Webpage						Pamela Delay		registered on webpage to receive updates			
5/14/17	Webpage						Lindhurst		registered on webpage to receive updates			
5/14/17	Webpage						Charles Delay		registered on webpage to receive updates			
5/15/17	Webpage						Jenny Jahraus		registered on webpage to receive updates			
5/15/17	Webpage						Heidi Schroeder		registered on webpage to receive updates			
5/15/17	Webpage	F2					Richard Factor		registered on webpage to receive updates			
5/16/17	Webpage						Mitchell		registered on webpage to receive updates			
6/26/17	Molly				X		Ronald J. Logsdon		I thought you should be very aware of the facts that are so suppressed. The truth is just getting out now. Sedona can EASY market Sedona as "Safe Zone" if it is not destroyed by this technology.. Be aware many came to Sedona because they are "Sensitive" and a good share of Sedona commerce is people coming to meet with them. https://www.youtube.com/watch?v=AEOcB7Svhvw&feature=youtu.be		X	

Cari Meyer - Fwd: Internet Message Sent To: Mayor Sandy Moriarty;

From: Sandy Moriarty <SMoriarty@sedonaaz.gov>
To: Justin Clifton; Karen Osburn
Date: 5/23/2017 4:02 PM
Subject: Fwd: Internet Message Sent To: Mayor Sandy Moriarty;

FYI

Sandy

Please note that comments above are mine alone and do not necessarily reflect the views of the City Council.

Begin forwarded message:

From: "James Curry" <jtcurry@me.com>
Date: May 22, 2017 at 11:20:41 AM MST
To: "D oNotReply" <DoNotReply@sedonaaz.gov>
Subject: Internet Message Sent To: Mayor Sandy Moriarty;

Name:	James Curry
E-Mail Address:	jtcurry@me.com
Phone Number:	954-727-5966
Address:	960 Jordan Road SEDONA, AZ 86336
Message:	Ms. Mayor: After attending the recent Wireless Master Plan meeting, I want to share the following helpful suggestion: A city-wide Mesh Network may both solve citizen concerns and allow the City to effectively control and mange potential wireless infrastructure expansion. A Mesh Network may also allow for the removal of most if not all existing cellular installations. As I am not an expert in this technology area I will only provide a brief background here and encourage the City to seek more insight from those that are. Mesh Networks differ from current cellular networks primarily because they are highly

	decentralized. Where as cellular networks use centralized towers to distribute their signal, Mesh Networks use very small radios distributed throughout an area. Typically these radios are the size of a medium sized shipping box and usually are placed on existing utility poles. If no poles exist in an area a radio can be hung from a building or purpose built pole. They are much smaller than the cellular hardware featured in the meeting and are low power. Using a Mesh Network should solve the citizen concerns of visual blight and perceived health risks. The latest cell phones can send voice via cell systems or wifi systems to the Internet. In fact, major TELCO providers encourage users to use WIFI Calling so that the traffic is carried over the Internet via existing access points (think Starbucks) rather than the cell system. They do this to minimize their cost of building and maintaining cellular infrastructure. Mesh Networks send all traffic over the Internet so they fit in with this behavior. Mesh Networks provide both voice and data access to and via the Internet, not a cell system. So besides providing low impact mobile phone service, a Mesh Network could also provide city-wide wireless Internet service as well. The business model for this could be private or private/public with rents being paid by the TELCO providers or the users or both. While the City's current consultants for this matter have done a fine job to-date, I would encourage the City to also seek comment form others who may be more knowledgeable in this tech area. This perhaps should include presentations from Mesh Network providers. If I can be of any additional help on this matter please do not hesitate to call on me. I will also attend the second, upcoming Wireless Master Plan meeting. I hope you find this useful, James Curry

American Academy of Environmental Medicine

6505 E Central • Ste 296 • Wichita, KS 67206
Tel: (316) 684-5500 • Fax: (316) 684-5709
www.aaemonline.org

Executive Committee

President
A.L. Barrier, M.D., FAAO-HNS
One Hospital Drive
Columbia, MO 65212

President-Elect
Amy Dean, D.O.
1955 Pauline Blvd Ste 100D
Ann Arbor, MI 48103

Secretary
Charles L. Crist, M.D.
3009 Falling Leaf Ctr, Ste 1
Columbia, MO 65201

Treasurer
James W. Willoughby, II, D.O.
24 Main St.
Liberty, MO 64068

Immediate Past President
Robin Bernhoft, M.D., FAAEM

Advisor
Gary R. Oberg, M.D.,FAAEM

Board of Directors
Craig Bass, M.D.
Amy Dean, D.O.
Stephen Genuis, M.D., FAAEM
Martha Grout, M.D., MD(H)
Janette Hope, M.D.
W. Alan Ingram, M.D.
Derek Lang, D.O.
Glenn A. Toth, M.D.
Ty Vincent, M.D.

Continuing Medical Education
Chairman
James W. Willoughby, II, D.O.
24 Main St.
Liberty, MO 64068

Executive Director
De Rodgers Fox

American Academy of Environmental Medicine Recommendations Regarding Electromagnetic and Radiofrequency Exposure

Physicians of the American Academy of Environmental Medicine recognize that patients are being adversely impacted by electromagnetic frequency (EMF) and radiofrequency (RF) fields and are becoming more electromagnetically sensitive.

The AAEM recommends that physicians consider patients' total electromagnetic exposure in their diagnosis and treatment, as well as recognition that electromagnetic and radiofrequency field exposure may be an underlying cause of a patient's disease process.

Based on double-blinded, placebo controlled research in humans,[1] medical conditions and disabilities that would more than likely benefit from avoiding electromagnetic and radiofrequency exposure include, but are not limited to:

- Neurological conditions such as paresthesias, somnolence, cephalgia, dizziness, unconsciousness, depression
- Musculoskeletal effects including pain, muscle tightness, spasm, fibrillation
- Heart disease and vascular effects including arrhythmia, tachycardia, flushing, edema
- Pulmonary conditions including chest tightness, dyspnea, decreased pulmonary function
- Gastrointestinal conditions including nausea, belching
- Ocular (burning)
- Oral (pressure in ears, tooth pain)
- Dermal (itching, burning, pain)
- Autonomic nervous system dysfunction (dysautonomia).

Based on numerous studies showing harmful biological effects from EMF and RF exposure, medical conditions and disabilities that would more than likely benefit from avoiding exposure include, but are not limited to:

- Neurodegenerative diseases (Parkinson's Disease, Alzheimer's Disease, and Amyotrophic Lateral Sclerosis). [2-6]
- Neurological conditions (Headaches, depression, sleep disruption, fatigue, dizziness, tremors, autonomic nervous system dysfunction, decreased memory, attention deficit disorder, anxiety, visual disruption). [7-10]
- Fetal abnormalities and pregnancy. [11,12]
- Genetic defects and cancer.[2,3,13-19]
- Liver disease and genitourinary disease.[12,20]

Because Smart Meters produce Radiofrequency emissions, it is recommended that patients with the above conditions and disabilities be accommodated to protect their health. The AAEM recommends that no Smart Meters be on these patients' homes, that Smart Meters be removed within a reasonable distance of patients' homes depending on the patients' perception and/or symptoms, and that no collection meters be placed near patients' homes depending on patients' perception and/or symptoms.

Submitted by: Amy L. Dean, DO and William J. Rea, MD

Approved July 12, 2012 by the Executive Committee of the American Academy of Environmental Medicine

Bibliography

1. Rea WJ, Pan Y, Fenyves EJ, et al. Electromagnetic field sensitivity. Journal of Bioelectricity. 1991; 10(1 &2): 243-256.

2. Xu S, Zhou Z, Zhang L, et al. Exposure to 1800 MHZ radiofrequency radiation induces oxidative damage to mitochondrial DNA in primary cultured neurons. Brain Research. 2010; 1311: 189-196.

3. Zhao T, Zou S, Knapp P. Exposure to cell phone radiation up-regulates apoptosis genes in primary cultures of neurons and astrocytes. Neurosci Lett. 2007; 412(1): 34-38.

4. Nittby H, Brun A, Eberhardt J, et al. Increased blood-brain barrier permeability in mammalian brain 7 days after exposure to the radiation from a GSM-900 mobile phone. Pathophysiology. 2009; 16: 103-112.

5. Awad SM, Hassan NS. Health Risks of electromagnetic radiation from mobile phone on brain of rats. J. Appl. Sci. Res. 2008; 4(12): 1994-2000.

6. Leszczynski D, Joenvaara S. Non-thermal activation of the hsp27/p38MAPK stress pathway by mobile phone radiation in human endothelial cells: Molecular mechanism for cancer - and blood-brain barrier - related effects. Differentiation. 2002; 70: 120-129.

7. Santini R, Santini P, Danze JM, et al. Study of the health of people living in the vicinity of mobile phone base stations: 1. Influences of distance and sex. Pathol Biol. 2002; 50: 369-373.

8. Abdel-Rassoul G, Abou El-Fateh O, Abou Salem M, et al. Neurobehavioral effects among inhabitants around mobile phone base stations. Neurotox. 2007; 28(2): 434-440.

9. Hutter HP, Moshammer H, Wallner P, Kundi M. Subjective symptoms, sleeping problems, and cognitive performance in subjects living near mobile phone base stations. Occup. Environ. Med. 2006; 63: 307-313.

10. Kolodynski AA, Kolodynska VV. Motor and psychological functions of school children living in the area of the Skrunda Radio Location Station in Latvia. Sci. Total Environ. 1996; 180: 87-93.

11. Magras IN, Xenos TD. RF radiation-induced changes in the prenatal development of mice. Bioelectromagnetics. 1997; 18:455-461.

12. Ingole IV, Ghosh SK. Cell phone radiation and developing tissues in chick embryo - a light microscopic study of kidneys. J. Anat. Soc. India. 2006; 55(2): 19-23.

13. Phillips JL, Singh NP, Lai H. Electromagnetic fields and DNA damage. Pathophysiology. 2009; 16: 79-88.

14. Ruediger HW. Genotoxic effects of radiofrequency electromagnetic fields. Pathophysiology. 2009; 16(2): 89-102.

15. Lee S, Johnson D, Dunbar K. 2.45 GHz radiofrequency fields alter gene expression on cultured human cells. FEBS Letters. 2005; 579: 4829-4836.

16. Demsia G, Vlastos D, Matthopoulos DP. Effect of 910-MHz electromagnetic field on rat bone marrow. The Scientific World Journal. 2004; 4(S2): 48-54.

17. Lai H, Singh NP. Magnetic-field-induced DNA strand breaks in brain cells of the rat. Environmental Health Perspectives. 2004; 112(6): 687-694. Available from: http://ehp03.niehs.nih.gov/article/info:doi/10.1289/ehp.6355

18. Mashevich M, Foldman D, Kesar, et al. Exposure of human peripheral blood lymphocytes to electromagnetic fields associated with cellular phones leads to chromosomal instability. Bioelectromagnetics. 2003; 24: 82-90.

19. Ban R, Grosse Y, Lauby-Secretan B, et al. Carcinogenicity of radiofrequency electromagnetic fields. The Lancet Oncology. 2011; 12(7): 624-626. Available from: http://www.thelancet.com/journals/lanonc/article/PIIS1470-2045(11)70147-4/fulltext?_eventId=login

20. Lubec G, Wolf C. Bartosch B. Amino acid isomerisation and microwave exposure. Lancet. 1989; 334: 1392-1393.

American Academy of Environmental Medicine

6505 E Central • Ste 296 • Wichita, KS 67206
Tel: (316) 684-5500 • Fax: (316) 684-5709
www.aaemonline.org

Executive Committee

President
Janette Hope, M.D., FAAEM
304 W Los Olivos
Santa Barbara, CA 93105

President-Elect
Wm. Alan Ingram, M.D.
18015 Oak St Ste B
Omaha, NE 68130

Secretary
A.L. Barrier, M.D., FAAO-HNS
One Hospital Dr Room MA314
Columbia, MO 65212

Treasurer
James W. Willoughby, II, D.O.
24 Main St.
Liberty, MO 64068

Immediate Past President
Amy L. Dean, D.O, FAAEM

Advisor
William J. Rea, M.D.,FAAEM

Board of Directors
Craig Bass, M.D.
Robin Bernhoft, M.D., FAAEM
Gregg Govett, M.D.
Martha Grout, M.D., MD(H)
Derek Lang, D.O.
Allan D. Lieberman, M.D., FAAEM
Lisa Nagy, M.D.
Kalpana D. Patel, M.D., FAAEM

Continuing Medical Education
Chair
James W. Willoughby, II, D.O.

Co-Chair
Wm. Alan Ingram, M.D.

November 14, 2013

Wireless Radiofrequency Radiation in Schools

Founded in 1965 as a non-profit medical association, the American Academy of Environmental Medicine (AAEM) is an international organization of physicians and scientists interested in the complex relationships between the environment and health. For forty years the Academy has trained Physicians to treat the most difficult, complex patients who are often left behind by our medical system, because their illness, rather than stemming from traditionally understood factors, is related to underlying environmental causes, including (bio)chemical or radiation exposures. AAEM physicians, and physicians world-wide, are treating patients who report adverse, debilitating health effects associated with exposure to radiofrequency energy (RF).

The AAEM strongly supports the use of wired Internet connections, and encourages avoidance of radiofrequency such as from WiFi, cellular and mobile phones and towers, and "smart meters."

The peer reviewed, scientific literature demonstrates the correlation between RF exposure and neurological, cardiac, and pulmonary disease as well as reproductive and developmental disorders, immune dysfunction, cancer and other health conditions. The evidence is irrefutable. Despite this research, claims have been made that studies correlating emissions from WiFi, phones, smart meters, etc. with adverse health effects do not exist.

In May 2011 the World Health Organization elevated exposure to wireless radiation, including WiFi, into the Class 2b list of Carcinogens; recent research strengthens the level of evidence regarding carcinogenicity.

There is consistent, emerging science that shows people, especially children who are more vulnerable due to developing brains and thinner skulls, are being affected by the increasing exposure to wireless radiation. In September 2010, the Journal of the American Society for Reproductive Medicine-Fertility and Sterility, reported that only four hours of exposure to a standard laptop using WiFi caused DNA damage to human sperm.

In December 2012 the American Academy of Pediatrics, representing 60,000 pediatricians, wrote to Congress requesting that it update the safety levels of microwave radiation exposure especially for children and pregnant women.

With WiFi in public facilities as well as schools, children would be exposed to WiFi for unprecedented periods of time, for their entire childhood. Some of these signals will be much more powerful than would be received at home, due to the need for the signals to go through thick walls and to serve many computers

simultaneously. Signals in institutions are dozens of times more powerful than café and restaurant systems.

To install WiFi in schools plus public spaces risks a widespread public health hazard that the medical system is not yet prepared to address. Statistics show that you can expect to see an immediate reaction in 3% and delayed effects in 30% of citizens of all ages.

It is better to exercise caution and substitute with a safe alternate such as a wired connection. While more research is being conducted, children must be protected. Wired technology is not only safer, it also stronger and more secure.

While the debate ensues about the dangers of RF, it is the doctors who must deal with the after effects. Until we can determine why some get sick and others do not, and some are debilitated for indeterminate amounts of time, we implore you to not take the risk, particularly with the health of so many children with whose safety you have been entrusted. Avoidance will always be the best policy. It should be reflected by minimizing RF exposures in public spaces.

Respectfully,

The Board of Directors of the American Academy of Environmental Medicine

American Academy of Environmental Medicine

6505 E Central • Ste 296 • Wichita, KS 67206
Tel: (316) 684-5500 • Fax: (316) 684-5709
www.aaemonline.org

Executive Committee

President
A.L. Barrier, M.D., FAAO-HNS
One Hospital Drive
Columbia, MO 65212

President-Elect
Amy Dean, D.O.
1955 Pauline Blvd Ste 100D
Ann Arbor, MI 48103

Secretary
Charles L. Crist, M.D.
3009 Falling Leaf Ctr, Ste 1
Columbia, MO 65201

Treasurer
James W. Willoughby, II, D.O.
24 Main St.
Liberty, MO 64068

Immediate Past President
Robin Bernhoft, M.D., FAAEM

Advisor
Gary R. Oberg, M.D.,FAAEM

Board of Directors
Craig Bass, M.D.
Amy Dean, D.O.
Stephen Genuis, M.D., FAAEM
Martha Grout, M.D., MD(H)
Janette Hope, M.D.
W. Alan Ingram, M.D.
Derek Lang, D.O.
Glenn A. Toth, M.D.
Ty Vincent, M.D.

Continuing Medical Education
Chairman
James W. Willoughby, II, D.O.
24 Main St.
Liberty, MO 64068

Executive Director
De Rodgers Fox

American Academy of Environmental Medicine

Electromagnetic and Radiofrequency Fields Effect on Human Health

For over 50 years, the American Academy of Environmental Medicine (AAEM) has been studying and treating the effects of the environment on human health. In the last 20 years, our physicians began seeing patients who reported that electric power lines, televisions and other electrical devices caused a wide variety of symptoms. By the mid 1990's, it became clear that patients were adversely affected by electromagnetic fields and becoming more electrically sensitive. In the last five years with the advent of wireless devices, there has been a massive increase in radiofrequency (RF) exposure from wireless devices as well as reports of hypersensitivity and diseases related to electromagnetic field and RF exposure. Multiple studies correlate RF exposure with diseases such as cancer, neurological disease, reproductive disorders, immune dysfunction, and electromagnetic hypersensitivity.

The electromagnetic wave spectrum is divided into ionizing radiation such as ultraviolet and X-rays and non-ionizing radiation such as radiofrequency (RF), which includes WiFi, cell phones, and Smart Meter wireless communication. It has long been recognized that ionizing radiation can have a negative impact on health. However, the effects of non-ionizing radiation on human health recently have been seen. Discussions and research of non-ionizing radiation effects centers around thermal and non-thermal effects. According to the FCC and other regulatory agencies, only thermal effects are relevant regarding health implications and consequently, exposure limits are based on thermal effects only.[1]

While it was practical to regulate thermal bioeffects, it was also stated that non-thermal effects are not well understood and no conclusive scientific evidence points to non-thermal based negative health effects.[1] Further arguments are made with respect to RF exposure from WiFi, cell towers and smart meters that

due to distance, exposure to these wavelengths are negligible.[2] However, many *in vitro*, *in vivo* and epidemiological studies demonstrate that significant harmful biological effects occur from non-thermal RF exposure and satisfy Hill's criteria of causality.[3] Genetic damage, reproductive defects, cancer, neurological degeneration and nervous system dysfunction, immune system dysfunction, cognitive effects, protein and peptide damage, kidney damage, and developmental effects have all been reported in the peer-reviewed scientific literature.

Genotoxic effects from RF exposure, including studies of non-thermal levels of exposure, consistently and specifically show chromosomal instability, altered gene expression, gene mutations, DNA fragmentation and DNA structural breaks.[4-11] A statistically significant dose response effect was demonstrated by Maschevich *et al.* , who reported a linear increase in aneuploidy as a function of the Specific Absorption Rate(SAR) of RF exposure.[11] Genotoxic effects are documented to occur in neurons, blood lymphocytes, sperm, red blood cells, epithelial cells, hematopoietic tissue, lung cells and bone marrow. Adverse developmental effects due to non-thermal RF exposure have been shown with decreased litter size in mice from RF exposure well below safety standards.[12] The World Health Organization has classified RF emissions as a group 2 B carcinogen.[13] Cellular telephone use in rural areas was also shown to be associated with an increased risk for malignant brain tumors. [14]

The fact that RF exposure causes neurological damage has been documented repeatedly. Increased blood-brain barrier permeability and oxidative damage, which are associated with brain cancer and neurodegenerative diseases, have been found.[4,7,15-17] Nittby *et al.* demonstrated a statistically significant dose-response effect between non-thermal RF exposure and occurrence of albumin leak across the blood-brain barrier.[15] Changes associated with degenerative neurological diseases such as Alzheimer's, Parkinson's and Amyotrophic Lateral Sclerosis (ALS) have been reported.[4,10] Other neurological and cognitive disorders such as headaches, dizziness, tremors, decreased memory and attention, autonomic nervous system dysfunction, decreased reaction times, sleep disturbances and visual disruption have been reported to be statistically significant in multiple epidemiological studies with RF exposure occurring non-locally.[18-21]

Nephrotoxic effects from RF exposure also have been reported. A dose response effect was observed by Ingole and Ghosh in which RF exposure resulted in mild to extensive degenerative changes in chick embryo kidneys based on duration of RF exposure.[24] RF emissions have also been shown to cause isomeric changes in amino acids that can result in nephrotoxicity as well as hepatotoxicity.[25]

Electromagnetic field (EMF) hypersensitivity has been documented in controlled and double blind studies with exposure to various EMF frequencies. Rea *et al.* demonstrated that under double blind placebo controlled conditions, 100% of subjects showed reproducible reactions to that frequency to which they were most sensitive.[22] Pulsed electromagnetic frequencies were shown to consistently provoke neurological symptoms in a blinded subject while exposure to continuous frequencies did not.[23]

Although these studies clearly show causality and disprove the claim that health effects from RF exposure are uncertain, there is another mechanism that proves electromagnetic frequencies, including radiofrequencies, can negatively impact human health. Government agencies and industry set safety standards based on the narrow scope of Newtonian or "classical" physics reasoning that the effects of atoms and molecules are confined in space and time. This model supports the theory that a mechanical force acts on a physical object and thus, long-range exposure to EMF and RF cannot have an impact on health if no significant heating occurs. However, this is an incomplete model. A quantum physics model is necessary to fully understand and appreciate how and why EMF and RF fields are harmful to humans.[26,27] In quantum physics and quantum field theory, matter can behave as a particle or as a wave with wave-like properties. Matter and electromagnetic fields encompass quantum fields that fluctuate in space and time. These interactions can have long-range effects which cannot be shielded, are non-linear and by their quantum nature have uncertainty. Living systems, including the human body, interact with the magnetic vector potential component of an electromagnetic field such as the field near a toroidal coil.[26,28,29] The magnetic vector potential is the coupling pathway between biological systems and electromagnetic fields.[26,27] Once a patient's specific threshold of intensity has been exceeded, it is the frequency which triggers the patient's reactions.

Long range EMF or RF forces can act over large distances setting a biological system oscillating in phase with the frequency of the electromagnetic field so it adapts with consequences to other body systems. This also may produce an electromagnetic frequency imprint into the living system that can be long lasting.[26,27,30] Research using objective instrumentation has shown that even passive resonant circuits can imprint a frequency into water and biological systems.[31] These quantum electrodynamic effects do exist and may explain the adverse health effects seen with EMF and RF exposure. These EMF and RF quantum field effects have not been adequately studied and are not fully understood regarding human health.

Because of the well documented studies showing adverse effects on health and the not fully understood quantum field effect, AAEM calls for exercising precaution with regard to EMF, RF and general frequency exposure. In an era when all society relies on the benefits of electronics, we must find ideas and technologies that do not disturb bodily function. It is clear that the human body uses electricity from the chemical bond to the nerve impulse and obviously this orderly sequence can be disturbed by an individual-specific electromagnetic frequency environment. Neighbors and whole communities are already exercising precaution, demanding abstention from wireless in their homes and businesses.

Furthermore, the AAEM asks for:

- An immediate caution on Smart Meter installation due to potentially harmful RF exposure.
- Accommodation for health considerations regarding EMF and RF exposure, including exposure to wireless Smart Meter technology.
- Independent studies to further understand the health effects from EMF and RF exposure.
- Recognition that electromagnetic hypersensitivity is a growing problem worldwide.
- Understanding and control of this electrical environmental bombardment for the protection of society.
- Consideration and independent research regarding the quantum effects of EMF and RF on human health.
- Use of safer technology, including for Smart Meters, such as hard-wiring, fiber optics or other non-harmful methods of data transmission.

Submitted by: Amy L. Dean, DO, William J. Rea, MD, Cyril W. Smith, PhD, Alvis L. Barrier, MD

Bibliography: Electromagnetic and Radiofrequency Fields Effect on Human Health

1. California Council on Science and Technology. (Internet). (2011). Health Impacts of Radiofrequency Exposure from Smart Meters. Available from: http://www.ccst.us/publications/2011/2011smartA.pdf
2. Electric Power Research Institute. (Internet). (2011). Radio-Frequency Exposure Levels from Smart Meters: A Case Study of One Model. Available from: https://www.nvenergy.com/NVEnergize/documents/EPRI_1022270_caseStudy.pdf
3. Hill, AB. The Environment and Disease: Association or Causation? Proceedings of the Royal Society of Medicine. 1965; 58: 295-300.
4. Xu S, Zhou Z, Zhang L, et al. Exposure to 1800 MHZ radiofrequency radiation induces oxidative damage to mitochondrial DNA in primary cultured neurons. Brain Research. 2010; 1311: 189-196.
5. Phillips JL, Singh NP, Lai H. Electromagnetic fields and DNA damage. Pathophysiology. 2009; 16: 79-88.
6. Ruediger HW. Genotoxic effects of radiofrequency electromagnetic fields. Pathophysiology. 2009; 16(2): 89-102.
7. Zhao T, Zou S, Knapp P. Exposure to cell phone radiation up-regulates apoptosis genes in primary cultures of neurons and astrocytes. Neurosci Lett. 2007; 412(1): 34-38.
8. Lee S, Johnson D, Dunbar K. 2.45 GHz radiofrequency fields alter gene expression on cultured human cells. FEBS Letters. 2005; 579: 4829-4836.
9. Demsia G, Vlastos D, Matthopoulos DP. Effect of 910-MHz electromagnetic field on rat bone marrow. The Scientific World Journal. 2004; 4(S2): 48-54.
10. Lai H, Singh NP. Magnetic-field-induced DNA strand breaks in brain cells of the rat. Environmental Health Perspectives. 2004; 112(6): 687-694. Available from: http://ehp03.niehs.nih.gov/article/info:doi/10.1289/ehp.6355
11. Mashevich M, Foldman D, Kesar, et al. Exposure of human peripheral blood lymphocytes to electromagnetic fields associated with cellular phones leads to chromosomal instability. Bioelectromagnetics. 2003; 24: 82-90.
12. Magras IN, Xenos TD. RF radiation-induced changes in the prenatal development of mice. Bioelectromagnetics. 1997; 18:455-461.

13. Ban R, Grosse Y, Lauby-Secretan B, et al. Carcinogenicity of radiofrequency electromagnetic fields. The Lancet Oncology. 2011; 12(7): 624-626. Available from: http://www.thelancet.com/journals/lanonc/article/PIIS1470-2045(11)70147-4/fulltext?_eventId=login
14. Hardell L, Carlberg M, Hansson Mild K. Use of cellular telephones and brain tumour risk in urban and rural areas. Occup. Environ. Med. 2005; 62: 390-394.
15. Nittby H, Brun A, Eberhardt J, et al. Increased blood-brain barrier permeability in mammalian brain 7 days after exposure to the radiation from a GSM-900 mobile phone. Pathophysiology. 2009; 16: 103-112.
16. Awad SM, Hassan NS. Health Risks of electromagnetic radiation from mobile phone on brain of rats. J. Appl. Sci. Res. 2008; 4(12): 1994-2000.
17. Leszczynski D, Joenvaara S. Non-thermal activation of the hsp27/p38MAPK stress pathway by mobile phone radiation in human endothelial cells: Molecular mechanism for cancer - and blood-brain barrier – related effects. Differentiation. 2002; 70: 120-129.
18. Santini R, Santini P, Danze JM, et al. Study of the health of people living in the vicinity of mobile phone base stations: 1. Influences of distance and sex. Pathol Biol. 2002; 50: 369-373.
19. Abdel-Rassoul G, Abou El-Fateh O, Abou Salem M, et al. Neurobehavioral effects among inhabitants around mobile phone base stations. Neurotox. 2007; 28(2): 434-440.
20. Hutter HP, Moshammer H, Wallner P, Kundi M. Subjective symptoms, sleeping problems, and cognitive performance in subjects living near mobile phone base stations. Occup. Environ. Med. 2006; 63: 307-313.
21. Kolodynski AA, Kolodynska VV. Motor and psychological functions of school children living in the area of the Skrunda Radio Location Station in Latvia. Sci. Total Environ. 1996; 180: 87-93.
22. Rea WJ, Pan Y, Fenyves EJ, et al. Electromagnetic field sensitivity. Journal of Bioelectricity. 1991; 10(1 &2): 243-256.
23. McCarty DE, Carrubba S, Chesson AL, et al. Electromagnetic hypersensitivity: Evidence for a novel neurological syndrome. Int. J. Neurosci. 2011; 121(12): 670-676.
24. Ingole IV, Ghosh SK. Cell phone radiation and developing tissues in chick embryo – a light microscopic study of kidneys. J. Anat. Soc. India. 2006; 55(2): 19-23.

25. Lubec G, Wolf C. Bartosch B. Amino acid isomerisation and microwave exposure. Lancet. 1989; 334: 1392-1393.
26. Smith CW. Quanta and coherence effects in water and living systems. Journal of Alternative and Complimentary Medicine. 2004; 10(1): 69-78.
27. Smith CW (2008) Fröhlich's Interpretation of Biology through Theoretical Physics. In: Hyland GJ and Rowlands P (Eds.) Herbert Fröhlich FRS: A physicist ahead of his time. Liverpool: University of Liverpool, 2nd edition, pp 107-154.
28. Del Giudice E, Doglia S, Milani M, et al. Magnetic flux quantization and Josephson behavior in living systems. Physica Scripta. 1989; 40: 786-791.
29. Tonomura A, Osakabe N, Matsuda T, et al. Evidence for Aharonov-Bohm effect with magnetic field completely shielded from electron wave. Phys. Rev. Let. 1986; 56(8):792-75.
30. Del Giudice E, De Ninno A, Fleischmann, et al. Coherent quantum electrodynamics in living matter. Electromagn. Biol. Med. 2005; 24: 199-210.
31. Cardella C, de Magistris L, Florio E, Smith C. Permanent changes in the physic-chemical properties of water following exposure to resonant circuits. Journal of Scientific Exploration. 2001; 15(4): 501-518.

American Academy of Environmental Medicine

6505 E Central • Ste 296 • Wichita, KS 67206
Tel: (316) 684-5500 • Fax: (316) 684-5709
www.aaemonline.org

Executive Committee

President
Amy L. Dean, D.O., FAAEM
1955 Pauline Blvd Ste 100D
Ann Arbor, MI 48103

President-Elect
Janette Hope, M.D., FAAEM
304 W Los Olivos
Santa Barbara, CA 93105

Secretary
Jennifer Armstrong, M.D., FAAEM
3364 Carling Ave.
Ottawa, Ontario, Canada

Treasurer
Richard G. Jaeckle, M.D., FAAEM
8220 Walnut Hill Ln Ste 404
Dallas, TX 75231

Immediate Past President
A.L. Barrier, M.D., FAAO-HNS

Advisor
William J. Rea, M.D.,FAAEM
Gary R. Oberg, M.D., FAAEM

Board of Directors
Craig Bass, M.D.
Robin Bernhoft, M.D., FAAEM
Martha Grout, M.D., MD(H)
W. Alan Ingram, M.D.
Derek Lang, D.O.
Allan D. Lieberman, M.D., FAAEM
Lisa Nagy, M.D.
Kalpana D. Patel, M.D., FAAEM

Continuing Medical Education
Chair
James W. Willoughby, II, D.O.
24 Main St.
Liberty, MO 64068

Assistant-Chair
Wm. Alan Ingram, M.D.
18015 Oak St Ste B
Omaha, NE 68130

August 30, 2013

Office of the Secretary
Federal Communications Commission
445 12th Street, SW
Washington, D.C. 20554

Re: ET Docket No. 13-84

Dear Federal Communications Commission Commissioners:

The American Academy of Environmental Medicine is writing to request that the FCC review radiofrequency (RF) exposure limits (reference is made to the FCC's NOI sections 48, 51, 52, 53, 56, 60, 65 and 69), recognize non-thermal effects of RF exposure (NOI sections 66 and 69), and lower limits of RF exposure to protect the public from the adverse health effects of radiofrequency emissions (NOI sections 48, 52, 54, 65 and 71).

Founded in 1965 as a non-profit medical association, the AAEM is an international association of physicians and scientists who study and treat the effects of the environment on human health. With an elite membership of highly trained physicians and clinicians, AAEM is committed to education, public awareness and research regarding Environmental Medicine.

It became clear to AAEM physicians that by the mid 1990's patients were experiencing adverse health reactions and disease as a result of exposure to electromagnetic fields. In the last five years with the advent of wireless devices, there has been an exponential increase in the number of patients with radiofrequency induced disease and hypersensitivity.

Numerous peer reviewed, published studies correlate radiofrequency exposure with a wide range of health conditions and diseases. (NOI sections 54, 59, 60 and 65) These include neurological and neurodegenerative diseases such as Parkinson's Disease, ALS, paresthesias, dizziness, headaches and sleep disruption as well as cardiac, gastrointestinal and immune disease, cancer, developmental and reproductive disorders, and electromagnetic sensitivity. The World Health Organization has classified RF emissions as a group 2 B carcinogen. This research is reviewed and cited in the following attached documents: *AAEM Electromagnetic and Radiofrequency Fields Effect on Human Health* and *AAEM Recommendations Regarding Electromagnetic and Radiofrequency Exposure*.

The scientific literature proves that non-thermal adverse effects of RF exposure exist and negatively impact health and physiology. New guidelines based on measurements of non-thermal effects and lowering limits of exposure are needed and critical to protect public health.

In fact, electromagnetic sensitivity and the health effects of low level RF exposure have already been acknowledged by the federal government. In 2002, the Architectural and Transportation Barriers Compliance Board stated:

> *"The Board recognizes...electromagnetic sensitivities may be considered disabilities under the ADA if they so severely impair the neurological, respiratory or other functions on an individual that it substantially limits one or more of the individual's major life activities"*

Additionally, in 2005, the National Institute of Building Sciences, an organization established by the U.S. Congress in 1974, issued an Indoor Environmental Quality Report which concluded:

> *"For people who are electromagnetically sensitive, the presence of cell phones and towers, portable telephones, computers,... wireless devices, security and scanning equipment, microwave ovens, electric ranges and numerous other electrical appliances can make a building inaccessible."*

By recognizing electromagnetic sensitivity, the federal government and affiliated organizations are clearly acknowledging the existence of non-thermal effects. The AAEM urges the FCC to recognize that non-thermal effects of RF exposure exist and cause symptoms and disease. (NOI sections 66 and 69) The AAEM also requests that the FCC base guidelines of RF exposure on measurements of non-thermal effects and lower the limits of RF exposure to protect the health of the public. (NOI sections 48, 52, 54, 65 and 71)

Sincerely ,

Amy L. Dean, DO, FAAEM, DABEM, DAOBIM
President

American Journal of
EPIDEMIOLOGY

Volume 145
Number 1
January 1, 1997

Copyright © 1997 by The Johns Hopkins University
School of Hygiene and Public Health

Sponsored by the Society for Epidemiologic Research

ORIGINAL CONTRIBUTIONS

Cancer Incidence near Radio and Television Transmitters in Great Britain

I. Sutton Coldfield Transmitter

Helen Dolk,[1] Gavin Shaddick,[1] Peter Walls,[1] Chris Grundy,[1] Bharat Thakrar,[1] Immo Kleinschmidt,[1] and Paul Elliott[2]

A small area study of cancer incidence in 1974–1986 was carried out to investigate an unconfirmed report of a "cluster" of leukemias and lymphomas near the Sutton Coldfield television (TV) and frequency modulation (FM) radio transmitter in the West Midlands, England. The study used a national database of postcoded cancer registrations, and population and socioeconomic data from the 1981 census. Selected cancers were hematopoietic and lymphatic, brain, skin, eye, male breast, female breast, lung, colorectal, stomach, prostate, and bladder. Expected numbers of cancers in small areas were calculated by indirect standardization, with stratification for a small area socioeconomic index. The study area was defined as a 10 km radius circle around the transmitter, within which 10 bands of increasing distance from the transmitter were defined as a basis for testing for a decline in risk with distance, and an inner area was arbitrarily defined for descriptive purposes as a 2 km radius circle. The risk of adult leukemia within 2 km was 1.83 (95% confidence interval 1.22–2.74), and there was a significant decline in risk with distance from the transmitter ($p = 0.001$). These findings appeared to be consistent over the periods 1974–1980 and 1981–1986, and were probably largely independent of the initially reported cluster, which appeared to concern mainly a later period. In the context of variability of leukemia risk across census wards in the West Midlands as a whole, the Sutton Coldfield findings were unusual. A significant decline in risk with distance was also found for skin cancer, possibly related to residual socioeconomic confounding, and for bladder cancer. Study of other radio and TV transmitters in Great Britain is required to put the present results in wider context. No causal implications can be made from a single cluster investigation of this kind. *Am J Epidemiol* 1997;145:1–9.

electromagnetic fields; leukemia; neoplasms; radio waves

There has been considerable public and scientific debate concerning the possible adverse health effects associated with environmental exposure to extremely low frequency (0–300 Hz) non-ionizing radiation, as emitted by power cables and electric substations (1–5). Exposure to extremely low frequency radiation has most commonly been associated with leukemia, particularly acute myeloid and childhood leukemia, and also brain cancer, male breast cancer, and skin and eye melanoma (1, 3, 6–12), although there is currently no agreement as to causality (2–5).

Far less attention has been paid to environmental

Received for publication December 13, 1995, and accepted for publication August 12, 1996.

Abbreviations: CI, confidence interval; erp, effective radiated power; FM, frequency modulation; ICD, *International Classification of Diseases*; O/E ratio, observed/expected ratio; TV, television.

[1] Environmental Epidemiology Unit, Department of Public Health and Policy, London School of Hygiene and Tropical Medicine, London, England.

[2] Small Area Health Statistics Unit, Department of Epidemiology and Public Health, Imperial College of Science, Technology and Medicine, Imperial College School of Medicine at St Mary's, London, England.

Reprint requests to Dr. Helen Dolk, Environmental Epidemiology Unit, Department of Public Health and Policy, London School of Hygiene and Tropical Medicine, Keppel Street, London WC1 7HT, England.

exposure to radiation in the radiofrequency range (100 kHz to 300 GHz), including television (TV) and frequency modulation (FM) broadcast frequencies (30 MHz to 1 GHz), at field strengths below those required to produce thermal effects. The few epidemiologic studies that have reported on cancer incidence in relation to radiofrequency radiation (mainly from occupational exposure including microwave and radar) have generally presented negative or inconsistent results, or were subject to possible confounding from other exposures (2, 13–22). A study of residential exposure in Hawaii examined cancer incidence for census tracts with broadcasting antennae (22). A significantly increased relative risk of all cancers was found (standard incidence ratio (SIR) = 1.36 based on 905 cases, $p < 0.01$), and there was a nonsignificant excess of leukemias (SIR = 1.56 based on 23 cases, $p > 0.01$). However, there was only limited control for possible confounding.

Nevertheless, concerns have been expressed about the possible health effects of living near high power radio transmitters. Following a claim (see Appendix) of an excess of cases of leukemia and lymphoma near the Sutton Coldfield radio and television transmitter in the West Midlands, England, the Small Area Health Statistics Unit in the United Kingdom (23) was asked to investigate the incidence of selected cancers in the vicinity. The results of those analyses are reported here.

MATERIALS AND METHODS

The Sutton Coldfield transmitter is sited at the northern edge of the city of Birmingham. It first came into service in 1949 for television. High power transmission at 1 megawatt effective radiated power (erp) per frequency began with one frequency in 1964, rose to 3 frequencies in 1969, and then 4 frequencies in 1982. Three frequencies of very high frequency (VHF) radio began in 1957, at 250 kW erp per frequency. The mast is 240 m high. There are no big hills (above the height of the transmitter) in the study area. Nearby industrial processes registered with Her Majesty's Inspectorate of Pollution include a mineral works 3 km east, a copper works 6.5 km west, and a lead works 7 km west (Department of the Environment, personal communication, 1993).

Cancer incidence data postcoded to address at diagnosis were examined from 1974 to 1986. Population statistics were from the 1981 census enumeration districts and wards. The study area was defined by a circle of 10 km radius centered on the transmitter, grid reference SK 113003 (figure 1). The population within 10 km was around 408,000. Within the study area, ten bands of outer radius 0.5, 1, 2, 3, 4.9, 6.3, 7.4, 8.3, 9.2, and 10 km were defined (giving equal areas beyond 3 km). Populations and cases were located in the study area via the postcode of residence (which refers to an average of 14 households in Great Britain) according to methods described elsewhere (23). The completeness of postcoding of cancer registrations is high both nationally (96.6 percent) and in the West Midlands region (98.7 percent).

The following cancers at ages 15 years and over were considered as a priori groupings according to the 8th and 9th revisions of the *International Classification of Diseases* (ICD):

1) all cancers, excluding non-melanoma skin cancer (ICD-8/9 code 173);

2) cancers of the type stated in the initial cluster report, i.e., hematopoietic and lymphatic cancers: all leukemias (ICD-8/9 code 204–207 + ICD-9 code 208); multiple myeloma (ICD-8/9 code 203 + ICD-9 code 238.6), non-Hodgkin's lymphoma (ICD-8/9 code 200 + ICD-8 code 202 + ICD-9 codes 202.0, 201.1, 202.8); all hematopoietic and lymphatic (all leukemias, multiple myeloma, non-Hodgkin's lymphoma and ICD-8/9 code 201); all leukemias and non-Hodgkin's lymphoma combined; all leukemias; acute leukemia, i.e., acute myeloid leukemia (205.0) and acute lymphatic leukemia (204.0) separately, and combined with ICD-8/9 code 206.0 + ICD-9 codes 204.2, 205.2, 206.2, 208.0, 208.2 + ICD-8 code 207.0; chronic myeloid leukemia (205.1); chronic lymphatic leukemia (204.1);

3) cancers possibly associated with non-ionizing radiation (1, 3, 6–12), i.e., malignant brain and nervous system cancers (ICD-8/9 codes 191, 192); brain and nervous system cancers of malignant, benign, and uncertain behavior (ICD-8/9 codes 191, 192 + ICD-8/9 code 225 + ICD-9 codes 237.5, 237.6, 237.9); skin melanoma (ICD-8/9 code 172); eye (mainly melanoma) (ICD-8/9 code 190); male breast (ICD-8 codes 174.0–2, ICD-9 code 175);

4) common cancers (examined separately), i.e., lung (162), colon (ICD-8 codes 153.0–3, 153.7–8, ICD-9 code 153), rectal (154), colorectal (colon + rectal), stomach (ICD-8/9 code 151), bladder (ICD-8/9 code 188), prostate (ICD-8/9 code 185), female breast (ICD-8 codes 174.0–2, ICD-9 code 174).

Childhood cancer (0–14 years) was restricted to all cancers and all leukemias.

To allow for possible socioeconomic confounding, a deprivation score, shown elsewhere to be a powerful predictor of cancer rates (24), was calculated for each census enumeration district in Great Britain using 1981 census data on unemployment, overcrowding, and social class of head of household. The scores were grouped into quintiles, with a small sixth category for unclassifiable enumeration districts, mostly with institutional populations. According to this deprivation score, the areas closer to the transmitter were more affluent than those further away, i.e., at 1–2 km, 67 percent of the population was in the two most affluent

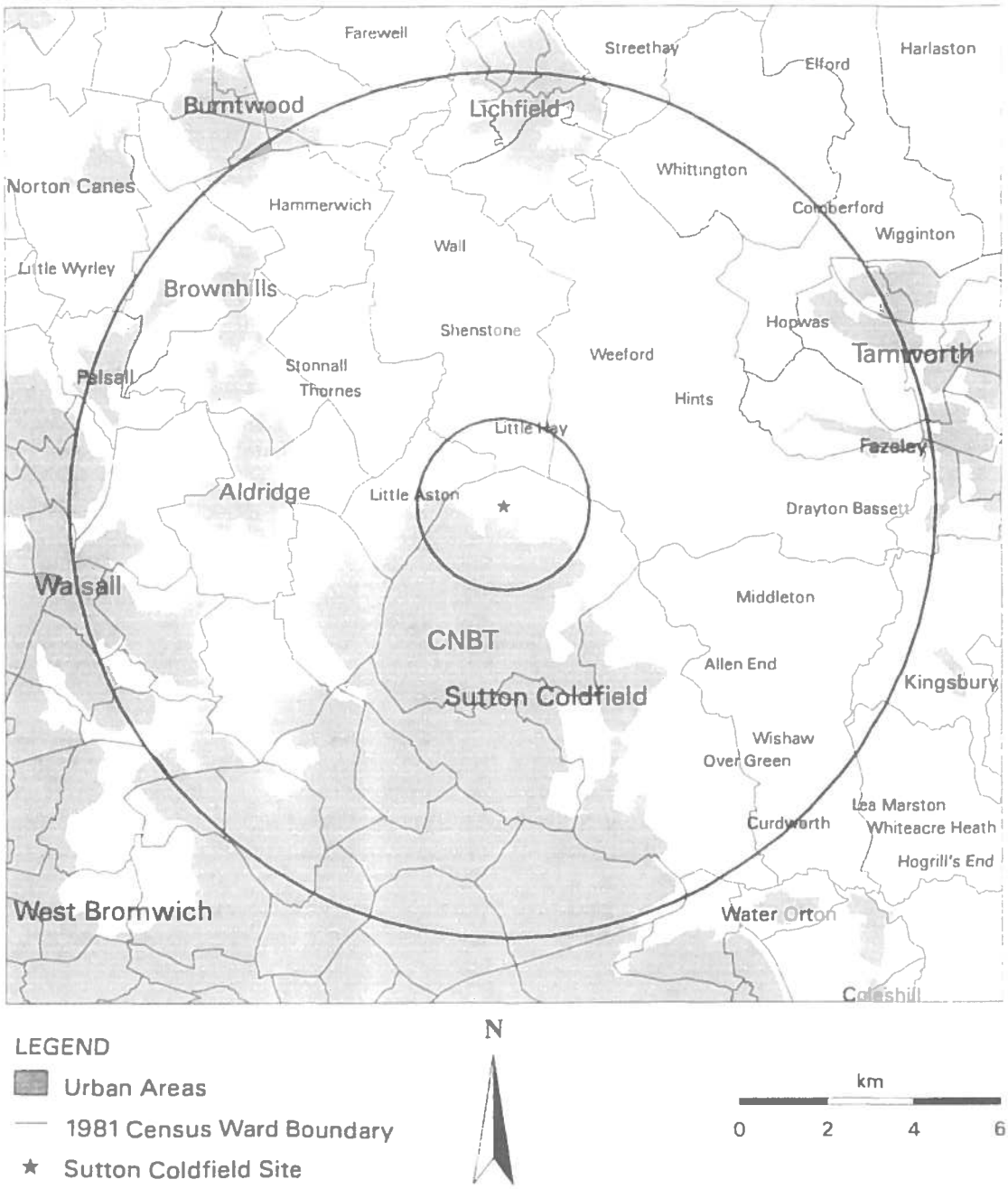

FIGURE 1. Map of 2 and 10 km circles surrounding Sutton Coldfield television and FM radio transmitter, showing position of census ward "CNBT." (Map data copyright Automobile Association.)

quintiles, compared with 28 percent at 9.2–10 km. For many cancers (e.g., lung), lower incidence rates would be expected in the more affluent areas; for some other cancers (e.g., leukemia), there is essentially no relation between incidence and deprivation thus measured, whereas for others (e.g., skin melanoma), higher disease rates are found in the more affluent areas (24).

Statistical analysis was based on the comparison of observed and expected numbers of cancer cases; the expected numbers were calculated from national incidence rates stratified by 5-year age group, sex, year, and deprivation quintile, and regionally adjusted, as described in detail elsewhere (25). Compared with national rates, the West Midlands region had standardized incidence ratios of 0.95 for all cancers and 0.80 for leukemias (0.65 for chronic lymphatic leukemia).

For descriptive purposes, observed and expected values, observed/expected (O/E) ratios, and their 95

percent confidence intervals (calculated assuming a Poisson distribution) are reported for the entire study area (0–10 km) and for an area close to the source, arbitrarily chosen to be 0–2 km. Formal tests of significance were based on those proposed by Stone (26) for isotonic decline in risk with distance from the source. These tests give due weight to the smaller populations near the site, and do not prespecify the shape of the decline, or boundaries between "exposed" and "unexposed" populations. Both an unconditional and a conditional test were performed (25, 27, 28). For the unconditional test, the null hypothesis is that the relative risk is one in each of the bands. An isotonic alternative includes any pattern of non-increasing risk over the study area. The data were further explored by use of the conditional test that corrects for the overall level of risk over the 10 km study area, thereby specifying a null hypothesis where all relative risks are equal to a constant, not necessarily one (25, 27). Significance levels were obtained by Monte Carlo methods based on 999 simulations and the nominal statistical significance level taken to be $p = 0.05$. Stone's tests were in all cases performed on the data in the ten predefined distance bands. For presentation purposes only, we give some data collapsed into four distance bands.

A geographic analysis to investigate the background variability of leukemia incidence in the West Midlands region was also done, in order to place in context the size of any excess found in the vicinity of the transmitter. This analysis was done at census ward level relating to around 10,000 people on average and included supplementary postcoding to reduce the percentage of unpostcoded cases of leukemias from 2.5 percent to 0.3 percent. Observed and expected numbers per ward were calculated as for the main analysis. Departure from Poisson variability was tested by the Pothoff-Whittinghill test (29) and a 5th to 95th percentile range in O/E ratios was calculated using a likelihood method that removes the random component of variability (30). O/E ratios were "smoothed" using an empirical Bayesian method (31). This method produces a set of smoothed estimates on the basis of a compromise between the observed relative risks and the overall regional mean, with the amount of "shrinkage to the mean" being determined by the population size of each ward, thereby removing variability in O/E ratios due to small population sizes. Both raw and smoothed values of the O/E ratio for each of the 832 wards were ranked, and the rank of the census ward containing the transmitter (ward designated as "CNBT" in figure 1) was determined. This ward included 90 percent of the population within 2 km of the transmitter, but with half its population outside the 2 km circle.

RESULTS

At a distance of 0–10 km from the transmitter, there was a 3 percent excess in all cancers with significant unconditional but not conditional Stone's test (table 1). Examination of the data for all ten bands (table 2) demonstrates this overall excess but lack of trend of decreasing risk with distance. Non-Hodgkin's lymphoma showed an excess from 0–10 km (table 1) but no excess at 0–2 km. The Stone's conditional test and

TABLE 1. Selected cancers near the Sutton Coldfield transmitter, West Midlands, England: observed and expected numbers of cases, observed/expected (O/E) ratios, and 95% confidence intervals (CI), by distance of residence from transmitter, in persons aged ≥15 years, 1974–1986

Type of cancer	Distance from transmitter (km)								Stone's *p* value*	
	0–2				0–10					
	Observed	Expected	O/E ratio	95% CI	Observed	Expected	O/E ratio	95% CI	U	C
All cancers†	703	647.49	1.09	1.01–1.17	17,409	16,861.22	1.03	1.02–1.05	0.001	0.462
Hematopoietic and lymphatic	45	37.08	1.21	0.91–1.62	935	895.83	1.04	0.98–1.11	0.153	
All leukemias and non-Hodgkin's lymphomas	31	24.76	1.25	0.88–1.78	661	592.84	1.11	1.03–1.20	0.018	0.161
All leukemias	23	12.59	1.83	1.22–2.74	304	302.34	1.01	0.90–1.13	0.001	0.001
All acute	10	5.38	1.86	0.89–3.42	116	131.75	0.88	0.73–1.06	0.003	0.004
Acute myeloid	4	3.94	1.02	0.28–2.60	81	95.60	0.85	0.68–1.05	0.024	0.045
Acute lymphatic	3	0.84	3.57	0.74–10.43	21	20.62	1.02	0.67–1.56	0.201	
Chronic myeloid	2	1.63	1.23	0.15–4.43	42	39.95	1.05	0.78–1.42	0.257	
Chronic lymphatic	8	3.12	2.56	1.11–5.05	96	72.56	1.32	1.08–1.62	0.002	0.007
Non-Hodgkin's lymphomas	8	12.17	0.66	0.28–1.30	357	290.50	1.23	1.11–1.36	0.005	0.958
Multiple myeloma	10	6.51	1.54	0.74–2.83	174	154.52	1.13	0.97–1.31	0.156	

* *p* values given by Stone's unconditional (U) and conditional (C) tests.
† All cancers excluding non-melanoma skin cancer.

TABLE 2. All cancers, all leukemias, and non-Hodgkin's lymphomas near the Sutton Coldfield transmitter, West Midlands, England: observed and expected numbers of cases, observed/expected (O/E) ratios, and cumulative O/E ratios, by distance of residence from transmitter, in persons aged ≥15 years, 1974–1986

Distance from transmitter (km)	All cancers*				All leukemias				Non-Hodgkin's lymphomas			
	Observed	Expected	O/E ratio	Cumulative O/E ratio	Observed	Expected	O/E ratio	Cumulative O/E ratio	Observed	Expected	O/E ratio	Cumulative O/E ratio
0–0.5	2	5.61	0.36	0.36	1	0.11	9.09	9.09	0	0.11	0.00	0.00
0.5–1.0	96	137.19	0.70	0.69	5	2.72	1.84	2.12	3	2.60	1.15	1.11
1.0–2.0	605	504.59	1.20	1.09	17	9.76	1.74	1.83	5	9.46	0.53	0.66
2.0–3.0	282	279.01	1.01	1.06	9	5.56	1.62	1.76	9	5.76	1.56	0.95
3.0–4.9	1,002	1,050.86	0.95	1.00	25	20.22	1.24	1.49	20	20.25	0.99	0.97
4.9–6.3	2,414	2,301.25	1.05	1.03	54	41.96	1.29	1.38	45	40.60	1.11	1.04
6.3–7.4	2,734	2,650.62	1.03	1.03	48	46.54	1.03	1.25	57	43.95	1.30	1.13
7.4–8.3	2,827	2,798.65	1.01	1.02	51	49.22	1.04	1.19	52	47.19	1.10	1.12
8.3–9.2	3,363	3,213.75	1.05	1.03	40	57.35	0.70	1.07	80	54.56	1.47	1.21
9.2–10	4,084	3,919.59	1.04	1.03	54	68.90	0.78	1.01	86	68.02	1.30	1.23

* All cancers excluding non-melanoma skin cancer.

examination of the data over the ten bands (table 2) do not indicate a decline in risk with distance. Excesses within 2 or 10 km of the transmitter for hematopoietic and lymphatic cancers and multiple myeloma, were not statistically significant (table 1), nor was there evidence of a significant decline in risk with distance.

For adult leukemias from 0–2 km, the O/E ratio was 1.83 (95 percent confidence interval (CI) 1.22–2.74), based on 23 cases (table 1). The Stone's tests indicated a significant ($p = 0.001$) decline in risk with distance; data for all ten bands (table 2) were consistent with a decline in risk extending over the entire 10 km. Risk fell below 1.0 in the outer bands so that there was no overall excess over the 10 km area (O/E ratio = 1.01, 95 percent CI 0.90–1.13) (table 1). A pattern of decline with significant Stone's conditional tests was also found at ages 15–64 and ≥65 years, and for each sex separately (table 3). Acute leukemias, acute myeloid leukemia, and chronic lymphatic leukemia showed significant declines in risk with distance, as indicated by Stone's tests (table 1) and inspection of the data (table 4).

The leukemia excess at 0–2 km was apparent in both the earlier (1974–1980) and later (1981–1986) periods; there were 11 leukemia cases in the first period and 12 leukemia cases in the second period, and O/E ratios of 1.80 and 1.85, respectively. Stone's tests were significant in both periods. Twenty-one of the 23 cases within 2 km are known to have died, as verified by death certificates, and all but one had died by 1988. The stated occupations at diagnosis of the 23 adult leukemia cases were as follows: of 10 females, 4 housewives, 1 clerk/cashier, and 5 unstated; of 13 males, 2 clerk/cashiers, 3 managers, 1 printer, 1 gardener, 1 teacher, 1 farmer, 1 driver/foreman of roads goods vehicles, 1 inadequately described, and 2 unstated.

Among children, there were 97 cancers within 0–10 km of the transmitter (106.1 expected), including 34 leukemia cases (29.7 expected), of which 2 cases were at 0–2 km (1.1 expected); Stone's tests were not significant (leukemia conditional test $p = 0.173$).

Among other adult cancers, there was a significant decline in risk for skin melanoma and for bladder

TABLE 3. Leukemia near the Sutton Coldfield transmitter, West Midlands, England, by age and sex: observed and expected numbers of cases, observed/expected (O/E) ratios, and 95% confidence intervals (CI), by distance of residence from transmitter, in persons aged ≥15 years, 1974–1986

Sex and age (years)	Distance from transmitter (km)								Stone's p value*	
	0–2				0–10					
	Observed	Expected	O/E ratio	95% CI	Observed	Expected	O/E ratio	95% CI	U	C
Both sexes										
15–64	10	4.75	2.11	1.01–3.87	132	121.71	1.08	0.91–1.29	0.003	0.001
≥65	13	7.84	1.66	0.97–2.84	172	180.63	0.95	0.82–1.11	0.009	0.008
Males										
≥15	13	6.72	1.93	1.13–3.31	162	164.72	0.98	0.84–1.15	0.002	0.000
Females										
≥15	10	5.86	1.71	0.82–3.14	142	137.60	1.03	0.88–1.22	0.014	0.006

* p values given by Stone's unconditional (U) and conditional (C) tests.

TABLE 4. Acute leukemias and acute myeloid, acute lymphatic, chronic myeloid, and chronic lymphatic leukemias near the Sutton Coldfield transmitter, West Midlands, England: observed numbers of cases and observed/expected (O/E) ratios, by distance of residence from transmitter, in persons aged ≥15 years, 1974–1986

Leukemia subtype	Distance from transmitter (km)							
	0–2		2–4.9		4.9–7.4		7.4–10	
	Observed	O/E ratio	Observed	O/E ratio	Observed	O/E ratio	Observed	O/E ratio
Acute leukemias	10	1.86	11	0.95	38	0.99	57	0.75
Acute myeloid	4	1.02	8	0.97	28	1.00	41	0.74
Acute lymphatic	3	3.57	3	1.52	5	0.83	10	0.85
Chronic myeloid	2	1.23	3	0.87	19	1.62	18	0.78
Chronic lymphatic	8	2.56	14	2.31	27	1.27	47	1.12

cancer (table 5), although point estimates of O/E ratios were not in excess within 1 km for these cancers (table 6); none of the other Stone's tests were significant.

The ward level geographic analysis of adult leukemia in the West Midlands region showed significant extra-Poisson variability (Pothoff-Whittinghill $z = 2.67$, $p = 0.004$). The 5th to 95th percentile range of O/E ratios was estimated as 0.70 to 1.35 after removing random fluctuation. Census ward "CNBT," containing 90 percent of the population within 2 km of the transmitter, had a raw O/E ratio of 1.55, which ranked 154 out of 832 wards. After smoothing, the ratio was 1.25, ranking second. The highest ranking ward for smoothed values had 26 observed cases and a raw O/E ratio of 1.74, which after smoothing was reduced to 1.26. This analysis therefore indicates that the excess in the 0–2 km circle around Sutton Coldfield, with 23 cases observed and 12.6 expected, was unusual, even in the presence of significant geographic variation in leukemia incidence in the West Midlands region. However, the magnitude of excess was not much greater than that found elsewhere in the region.

DISCUSSION

The main finding was the confirmation of a reported excess of leukemias near the Sutton Coldfield radio and television transmitter, and a decline in risk with distance from the site. Because all but one of the leukemia cases included in our study had died by 1988, this would seem to be independent of the seven apparently current cases reported in the media in 1992, although unfortunately further details of those cases were not made available to us or to the health authorities. Our findings appear to be consistent over two independent time periods (1974–1980 and 1981–

TABLE 5. Other cancers near the Sutton Coldfield transmitter, West Midlands, England: observed and expected numbers of cases, observed/expected (O/E) ratios, and 95% confidence intervals (CI), by distance of residence from transmitter, in persons aged ≥15 years, 1974–1986

Type of cancer	Distance from transmitter (km)								Stone's *p* value*	
	0–2				0–10					
	Observed	Expected	O/E ratio	95% CI	Observed	Expected	O/E ratio	95% CI	U	C
Cancers possibly associated with non-ionizing radiation										
Brain										
Malignant and benign	17	13.20	1.29	0.80–2.06	332	317.74	1.04	0.94–1.16	0.612	
Malignant	12	9.18	1.31	0.75–2.29	218	223.27	0.98	0.86–1.11	0.717	
Skin melanoma	13	9.10	1.43	0.83–2.44	189	196.53	0.96	0.83–1.11	0.027	0.018
Eye melanoma	0	0.71	0	0–4.22	20	17.19	1.16	0.75–1.80	0.849	
Male breast	1	0.61	1.64	0.04–9.13	15	15.08	0.99	0.60–1.64	0.889	
Common cancers										
Female breast	107	98.67	1.08	0.90–1.31	2,412	2,288.30	1.05	1.01–1.10	0.131	
Lung	113	112.31	1.01	0.84–1.21	3,466	3,418.60	1.01	0.98–1.05	0.875	
Colorectal	112	99.48	1.13	0.94–1.35	2,529	2,454.93	1.03	0.99–1.07	0.330	
Stomach	33	43.75	0.75	0.54–1.06	1,326	1,248.40	1.06	1.01–1.12	0.246	
Prostate	37	32.81	1.13	0.82–1.55	785	760.45	1.03	0.96–1.11	0.466	
Bladder	43	28.37	1.52	1.13–2.04	788	728.96	1.08	1.01–1.16	0.008	0.040

* *p* values given by Stone's unconditional (U) and conditional (C) tests.

TABLE 6. Skin melanoma and bladder cancers in the vicinity of the Sutton Coldfield transmitter, West Midlands, England: observed and expected numbers of cases, observed/expected (O/E) ratios, and cumulative O/E ratios, by distance of residence from transmitter, in persons aged ≥15 years, 1974–1986

Distance from transmitter (km)	Skin melanoma				Bladder cancer			
	Observed	Expected	O/E ratio	Cumulative O/E ratio	Observed	Expected	O/E ratio	Cumulative O/E ratio
0–0.5	0	0.09	0.00	0.00	0	0.24	0.00	0.00
0.5–1.0	2	2.02	0.99	0.95	4	5.96	0.67	0.65
1.0–2.0	11	6.99	1.57	1.43	39	22.17	1.76	1.52
2.0–3.0	12	5.03	2.39	1.77	11	11.94	0.92	1.34
3.0–4.9	16	16.16	0.99	1.35	43	45.27	0.95	1.13
4.9–6.3	26	28.77	0.90	1.13	119	100.31	1.19	1.16
6.3–7.4	28	27.93	1.00	1.09	131	114.85	1.14	1.15
7.4–8.3	32	30.90	1.04	1.08	117	120.64	0.97	1.10
8.3–9.2	28	35.66	0.79	1.01	169	140.13	1.21	1.13
9.2–10	34	43.08	0.79	0.96	155	167.45	0.93	1.08

1986). Within the context of some unexplained variability in leukemia incidence across census wards in the West Midlands region, the excess near Sutton Coldfield can be considered unusual.

Possible methodological artefacts to explain the leukemia findings were explored. First, the lower registration of cancers, and particularly leukemias, in West Midlands relative to the country as a whole, is unexplained, but there was no suggestion that the level of registration varied systematically within the region; nor would it seem likely that any such registration artefact could produce local trends in risk of the order seen around Sutton Coldfield. Second, there are known problems of leukemia diagnosis and registration, particularly at older ages, but we found similar results in the younger and older age groups. Third, the study spanned 1974–1986, but relied on population data from the 1981 census, i.e., around the midpoint of the study period. Estimates were made of the extent to which population change over the period (including ageing of the population) may have led to bias in the calculation of the expected numbers of cancers. Based on data from the 1971 and 1991 censuses, there appeared to be a tendency for overestimation of the O/E ratios close to the site (within 2 km), but the bias, estimated at less than 5 percent, was not sufficient to explain the excesses of leukemia observed.

Secondary findings of the study were declines in skin melanoma and bladder cancer with distance from the transmitter site. Because skin melanoma is strongly inversely related to level of deprivation (24), and because this transmitter is located in a relatively affluent area, control for socioeconomic confounding, as expected, reduced the size of the excess—by 11 percent within 2 km. However, it is possible that further socioeconomic confounding could explain at least part of the residual excess of skin melanoma near the site. Bladder cancer was examined along with other causes to explore the small general excess in all cancers, and there was no a priori hypothesis linking it to the exposure under consideration. The results should be viewed in the context of the large number of statistical tests performed and hence may be chance findings.

Field strength measurements have been made in the vicinity of the transmitter (British Broadcasting Corporation, internal report, 1994). In general, both measured and predicted field strength values tended to show a decline in average field strength or power density with distance from the transmitter, although there are undulations in predicted field strength up to distances of about 6 km from the transmitter resulting from the vertical radiation pattern. The maximum total power density equivalent summed across frequencies at any one measurement point (at 2.5 m above ground) was 0.013 W/m^2 for TV, and 0.057 W/m^2 for FM. However, there was considerable variability between different measurement points at any one distance from the transmitter, as would be expected from the impact of reflections from the ground and buildings, and this variability was as great as that related to distance. Power density on average declines by a factor of at least 5 to 10 over 10 km. Field strength varies as the square root of power density, thus declining less steeply, and it is not clear which exposure measure would be biologically more relevant for athermal effects. These measurements cannot of course be converted to personal dose to residents, which depends on numerous factors, including building type, the amount of time spent inside the home as well as away from home, and the number of years spent at the residence. It can nevertheless be assumed that, on average, residents in higher exposure areas receive higher doses unless this is obscured by the combination of patterns

of population density and of variable field strengths at any one distance from the transmitter. The exposures near Sutton Coldfield appear to be much lower than those in other epidemiologic studies where the health effects of radiofrequency exposure have been examined (2, 13, 14, 22). They are well within current guidelines based on the thermal effects of radiofrequency exposure (15, 32).

In conclusion, the results of this study confirm that there was an excess of adult leukemia within the vicinity of the Sutton Coldfield TV/FM transmitter in the period 1974–1986, accompanied by a decline in risk with distance from the transmitter. Further monitoring of cancer statistics in the area appears warranted. No causal implications regarding radio and TV transmitters can be drawn from this finding, based as it is on a single "cluster" investigation. Results of a study of cancer incidence around all other high power radio and TV transmitters in Great Britain are given in the accompanying paper (33) in order to put the present results in wider context.

ACKNOWLEDGMENTS

The Small Area Health Statistics Unit is funded by grants from the Department of Health, Department of the Environment, Health and Safety Executive, Scottish Office Home and Health Department, Welsh Office, and Northern Ireland Department of Health and Social Services.

The authors thank the Office of Population Censuses and Surveys (OPCS) (now the Office of National Statistics) and the Information and Statistics Division of the Scottish Health Service, who made the postcoded cancer data available. They also thank OPCS for checking registration details of specific cases and for providing copies of death certificates. They are grateful to the West Midlands cancer registry for checking individual cases. In addition, they acknowledge the cooperation of the British Broadcasting Corporation for providing field measurements and predicted field strengths in the area of the Sutton Coldfield transmitter.

REFERENCES

1. Electromagnetic fields and the risk of cancer. Report of an advisory group on non-ionising radiation. Documents of the NRPB. Vol 3, no. 1. London: National Radiation Protection Board, 1992.
2. Dennis JA, Muirhead CR, Ennis JR. Human health and exposure to electromagnetic radiation. National Radiation Protection Board, Report NRPB-R241, July 1992.
3. Thériault GP. Health effects of electromagnetic radiation on workers: epidemiologic studies. In: Bierbaum PJ, Peters JM, eds. Proceedings of the Scientific Workshop on the Health Effects of Electric and Magnetic Fields on Workers, January 30–31, 1991. Cincinnati, OH: US Department of Health and Human Services, 1991. (DHHS (NIOSH) publication no. 91–111):91–124.
4. Cartwright RA. Low frequency alternating electromagnetic fields and leukaemia: the saga so far. Br J Cancer 1989;60: 649–51.
5. Coleman B, Beral V. A review of epidemiological studies of the health effects of living near or working with electricity generation and transmission equipment. Int J Epidemiol 1988; 17:1–13.
6. Guénel P, Raskmark P, Anderson JB, et al. Incidence of cancer in persons with occupational exposure to electromagnetic fields in Denmark. Br J Ind Med 1993;50:758–64.
7. Demers PA, Thomas DB, Rosenblatt KA, et al. Occupational exposure to electromagnetic fields and breast cancer in men. Am J Epidemiol 1991;134:340–7.
8. Törnqvist A, Knave B, Ahlbom A, et al. Incidence of leukaemia and brain tumours in some "electrical occupations." Br J Ind Med 1991;48:597–603.
9. Savitz DA, Calle EE. Leukaemia and occupational exposure to electromagnetic fields: review of epidemiologic surveys. J Occup Med 1987;29:47–51.
10. Feychting M, Ahlbom A. Magnetic fields and cancer in children residing near Swedish high-voltage power lines. Am J Epidemiol 1993;138:467–81.
11. Savitz DA, Wachtel H, Barnes FA, et al. Case-control study of childhood cancer and exposure to 60-Hz magnetic fields. Am J Epidemiol 1988;128:21–38.
12. Wertheimer N, Leeper E. Electrical wiring configurations and childhood cancer. Am J Epidemiol 1979;109:273–84.
13. Pollack H. Epidemiological data on American personnel in the Moscow Embassy. Bull NY Acad Med 1979;55:1182–6.
14. Silvermann C. Epidemiologic studies of microwave effects. Proceedings of the IEEE 1980;68:78–84.
15. World Health Organization. Electromagnetic fields (300 Hz to 300 GHz). Environmental Health Criteria 137. Geneva: World Health Organization, 1993.
16. Robinette CD, Silverman C, Jablon S. Effects upon health of occupational exposure to microwave radiation (radar). Am J Epidemiol 1980;112:39–53.
17. Lester JR, Moore DF. Cancer mortality and Air Force bases. J Bioelectricity 1982;1:77–82.
18. Polsen P, Merritt JH. Cancer mortality and Air Force bases: a re-evaluation. J Bioelectricity 1985;4:121–7.
19. Lester JR. Reply to "Cancer Mortality and Air Force Bases: a re-evaluation." J Bioelectricity 1985;4:129–31.
20. Milham S Jr. Increased mortality in amateur radio operators due to lymphatic and hematopoietic malignancies. Am J Epidemiol 1988;127:50–4.
21. Kraut A, Chan E, Lioy PJ, et al. Epidemiologic investigation of a cancer cluster in professional football players. Environ Res 1991;56:131–43.
22. Cancer incidence in census tracts with broadcasting towers in Honolulu, Hawaii. Report submitted to the Honolulu City Council. Honolulu, HI: Environmental Epidemiology Program, Hawaii, October 1986.
23. Elliott P, Westlake AJ, Kleinschmidt I, et al. The Small Area Health Statistics Unit: a national facility for investigating health around point sources of environmental pollution in the United Kingdom. J Epidemiol Community Health 1992;46: 345–9.
24. Elliott P. Small area studies. In: Bertollini R, Lebovitz MD, Saracci R, et al. Environmental epidemiology: exposure and disease. Boca Raton, FL: CRC Press, 1996:187–99.
25. Shaddick G, Elliott P. Use of Stone's method in studies of disease risk around point sources of environmental pollution. Stat Med 1996;15:1927–34.
26. Stone RA. Investigations of excess environmental risks

around putative sources: statistical problems and a proposed test. Stat Med 1988;7:649–60.
27. Hills M. Some comments on methods for investigating disease risk around a point source. In: Elliott P, Cuzick J, English D, et al, eds. Geographical and environmental epidemiology: methods for small-area studies. Oxford: Oxford University Press, 1992:231–7.
28. Bithell JF, Stone RA. On statistical methods for analysing the geographical distribution of cancer cases near nuclear installations. J Epidemiol Community Health 1989;43:79–85.
29. Pothoff RF, Whittinghill M. Testing for homogeneity. II. The Poisson distribution. Biometrika 1966;53:183–90.
30. Martuzzi M, Hills M. Estimating the degree of heterogeneity between event rates using likelihood. Am J Epidemiol 1995; 141:369–74.
31. Clayton D, Kaldor J. Empirical Bayes estimates of age-standardised relative risks for use in disease mapping. Biometrics 1987;43:671–81.
32. Guidance on standards. Guidance as to restrictions on exposures to time varying electromagnetic fields and the 1988 recommendations of the International Non-Ionizing Radiation Committee Report NRPB-GS11. London: National Radiation Protection Board, May 1989.
33. Dolk H, Elliott P, Shaddick G, et al. Cancer incidence near radio and television transmitters in Great Britain. II. All high power transmitters. Am J Epidemiol 1997;145:10–17.
34. Cancer "link with TV transmitter." The Guardian, March 30, 1992:3.

APPENDIX

On March 30, 1992, the *Guardian* newspaper (34) reported that Dr. Mark Payne of Solihull, Birmingham, had collected data on cancer cases from a north Birmingham general practitioner with 2,600 patients. According to the report, seven existing cases of leukemia and lymphoma, five men and two women aged 18–66 years, were identified, living 400 to 1,500 m from the Sutton Coldfield transmitter. All but one of the cases had lived in the region for 14–25 years; the remaining case had lived there for only 2 years. As a rough guide, in a population with the same age structure as England and Wales, one could expect 2.5 cases per 10,000 persons per year to be newly diagnosed with leukemia or lymphoma. Dr. Payne explained later (Dr. M. Payne, Alternative Medicine Centre, Solihull, Birmingham, personal communication, 1993) that his attention had been drawn to the area because of his concerns that non-ionizing radiation is harmful to health, although it is not clear how the particular general practice was chosen for study (the practice population forms approximately 16 percent of the population within 2 km of the transmitter). Details of the study have not subsequently been published outside the popular press.

New study: direct link to 4,924 cancer deaths from cellular antennas radiation.

May 17, 2011

The electromagnetic radiation emitted by transmitting cell phone antennas is linked to the occurrence of some types of cancer, according to a study by Brazilian researchers.

The study established a direct link between cancer deaths in Belo Horizonte, the third largest city, with the antennae of the mobile telephone network, reported in Science Hoje site, the news portal of the Brazilian Society for Progress Science (Sociedad Brasileña para el Progreso de la Ciencia.)

Federal University of Minas Gerais (UFMG) Belo Horizonte - Brazil

The research was conducted by scientists at the Federal University of Minas Gerais (UFMG), Brazil's southeastern state whose capital is Belo Horizonte.

The results give a warning in a country where, according to the latest data available, at least one person has a cell phone in 82 percent of the residences.

According to the engineer Adilza Condessa Dode, PhD, UFMG researcher and coordinator of the study, repeated exposure of cell phone users to the electromagnetic radiation transmitted by the device and the antennas is not as safe as indicated by other research.

According to the study, more than 80 percent of people who die in Belo Horizonte by specific types of cancer live less than 500 meters away from the 300 identified cell phone antennas in the city.

Scientists found between 1996 and 2006 died in Belo Horizonte a total of 4924 victims of cancer types that may be caused by electromagnetic radiation, such as tumors in the prostate, breast, lung, kidneys and liver.

After finding on the map nearly 300 points antennas of cellular phone networks in the city, the researcher found that 80 percent of those victims lived within 500 meters away from one of these premises.

According to estimates quoted by the researcher, the level of local radiation in excess of 300 GHz antennas considered maximum under Brazilian law of 2009.

"These levels are already high and dangerous to human health. In the closer you live on an antenna, the greater the contact with the electromagnetic field," said Dode.

The researcher claims that the antennas of the devices themselves are also dangerous.

"The power emitted by the cell phone is continuous and exacerbated by the position of the antennas that are directed toward the user's brain," he said.

The engineer said that the legislation setting emission limits for electromagnetic radiation is not based upon health criteria, but solely upon industrial, economic and technological criteria.

Dode cited countries such as Switzerland and Italy, with more restrictive laws, and suggested that each Brazilian municipality set limits as it deems appropriate.

"This is a precaution. I think we will succeed only with social mobilization and must wait for a change in the law," he said.

Until the legislation does guarantee the health of the population, the engineer suggested that consumers just use the phones for emergency calls and to give more preference to text messaging rather than to speaking on their cell phones.

Researcher Dode also recommended the use of a cellular headset to keep the unit away from the body, and to ban the use of mobiles by children and in places such as schools and hospitals. (Xinhua)

PDF UK: 12 BASIC PRECAUTION to minimise exposure o radiation when using a mobile phone.

PDF De: 12 grundlegende Vorsichtsmaßnahmen um die Strahlungsbelastung bei Nutzung eines Handys zu minimieren.

PDF Sp: 12 Consejos elementales de prevención con el fin de limitar la exposición del usuario a las radiaciones del Teléfono Móvil.

PDF Nl: 12 BASISVOORZORGSMAATREGELEN om blootstelling aan straling te minimaliseren bij het gebruik van een mobiele telefoon

PDF It : 12 semplici consigli di prevenzione per limitare l'esposizione alle radiazioni del cellulare in chi lo usa.

INCREASED INCIDENCE OF CANCER NEAR A CELL-PHONE TRANSMITTER STATION.

RONNI WOLF MD[1]

DANNY WOLF MD[2]

From:

The Dermatology Unit, Kaplan Medical Center, Rechovot, and the Sackler Faculty of Medicine, Tel-Aviv University, Tel-Aviv, ISRAEL.

The Pediatric Outpatient Clinic, Hasharon Region, Kupat Holim, ISRAEL.

Running title: Cancer near a cell-phone transmitter station.

Address for correspondence: Ronni Wolf, MD, Dermatology Unit, Kaplan Medical Center, Rechovot 76100, ISRAEL.

Fax 972-9-9560978. E-mail: wolf_r@netvision.net.il

International Journal of Cancer Prevention

VOLUME 1, NUMBER 2, APRIL 2004

Increased Incidence of Cancer near a Cell-Phone Transmitter Station

by Ronni Wolf and Danny Wolf

Abstract

Significant concern has been raised about possible health effects from exposure to radiofrequency (RF) electromagnetic fields, especially after the rapid introduction of mobile telecommunications systems. Parents are especially concerned with the possibility that children might develop cancer after exposure to the RF emissions from mobile telephone base stations erected in or near schools. The few epidemiologic studies that did report on cancer incidence in relation to RF radiation have generally presented negative or inconsistent results, and thus emphasize the need for more studies that should investigate cohorts with high RF exposure for changes in cancer incidence. The aim of this study is to investigate whether there is an increased cancer incidence in populations, living in a small area, and exposed to RF radiation from a cell-phone transmitter station.

This is an epidemiologic assessment, to determine whether the incidence of cancer cases among individuals exposed to a cell-phone transmitter station is different from that expected in Israel, in Netanya, or as compared to people who lived in a nearby area. Participants are people (n=622) living in the area near a cell-phone transmitter station for 3-7 years who were patients of one health clinic (of DW). The exposure began 1 year before the start of the study when the station first came into service. A second cohort of individuals (n=1222) who get their medical services in a clinic located nearby with very closely matched, environment, workplace and occupational characteristics was used for comparison.

In the area of exposure (area A) eight cases of different kinds of cancer were diagnosed in a period of only one year. This rate of cancers was compared both with the rate of 31 cases per 10,000 per year in the general population and the 2/1222 rate recorded in the nearby clinic (area B). Relative cancer rates for females were 10.5 for area A, 0.6 for area B and 1 for the whole town of Netanya. Cancer incidence of women in area A was thus significantly higher ($p<0.0001$) compared with that of area B and the whole city. A comparison of the relative risk revealed that there were 4.15 times more cases in area A than in the entire population.

The study indicates an association between increased incidence of cancer and living in proximity to a cell-phone transmitter station.

Key Words:

Radiofrequency radiation; Cell-phone transmitter station (cell-phone antenna); Cancer incidence study; Netanya.

Introduction

Much concern has been expressed about possible health effects from exposure to radiofrequency (RF) electromagnetic fields, particularly following publication of scientific reports suggesting that residence near high voltage power lines may be associated with an increased risk of developing childhood leukemia. While interest tended to focus on microwave ovens and radar equipment in the past, it is now mobile telecommunication that attracts the most attention. The rapid introduction of mobile telecommunications systems, the exponential increase in the use of such phones, and the many base stations needed for serving them have engendered renewed concerns about exposure to RF radiation.

The biological effects of low level electromagnetic fields and a possible potential relation to cancer causation are controversial. There have been several epidemiological studies of the possible adverse health effects associated with environmental exposure to extremely low frequency (0-300 Hz) non-ionizing radiation, such as that emitted by power cables and electric substations, linking such exposure to leukemia, brain cancer, male breast cancer and skin and eye melanoma (1-11).

Far less attention has been paid to health hazards from environmental exposure to radiation in the RF range (100 kHz to 300 GHz), including the radiation emitted from cell-phone equipment, in the frequencies of 850 MHz, at field strengths much below those required to produce thermal effects. The few epidemiologic studies that did report on cancer incidence in relation to RF radiation (mainly from occupational exposure including microwave and radar and from living in proximity to TV towers) have generally presented negative or inconsistent results, or were subject to possible confounding from other exposures (12-20).

Laboratory studies in this area have also been confusing and conflicting. While some animal studies suggested that RF fields accelerate the development of cancers, other studies found no carcinogenic effect (21).

Obviously, there is an urgent need for extensive, well-conducted epidemiological and laboratory studies (21-24).

An opportunity for studying the effect of RF radiation presented itself in South Netanya, where a cell-phone transmitter station was located in the middle of a small area. We took advantage of the fact, that most of the population in the investigated area belong to one outpatient clinic (of DW), and undertook an epidemiologic assessment, in which we compared the cancer incidence of this area to those of a nearby clinic, to the national incidence rates of the whole country and to the incidence rates in the whole town of Netanya.

Material and methods

Radio-frequency radiation

The cell-phone transmitter unit is located at the south of the city of Netanya in an area called Irus (area A). It first came into service in 7/96. The people in this area live in half a circle with a 350 meter radius centered on the transmitter.

The antenna is 10 meters high. The antenna bears total maximum transmission power at frequencies of 850 MHz of 1500 watt when working at full power.

Both measured and predicted power density (for the frequencies of 850 MHz) in the whole exposed area were far below 0.53 $\mu w/cm^2$ thus the power density is far below the current guidelines which are based on *the thermal effects of RF exposure.* Exact measured power density in each house are described in table 1.

The current Israeli standard uses 50 packets/sec with Time-Division-Multiple-Access (TDMA) quadrature modulation. The antenna produces 50 packets/sec, using a 3:1 multiplexed Time-Division-Multiple-Access (TDMA) modulation with a 33% duty cycle.

Statistical analysis:

We conducted a cancer incidence study to investigate the incidence of cancer cases of individuals exposed to a cell-phone transmitter station, in comparison to those of a nearby clinic, to the national incidence rates of the whole country and to the incidence rates in the whole town of Netanya.

The cohort included 622 people living in the Irus area (area A) for at least 3-7 years and were patients of one health clinic (of DW). The exposure began in 7/96 which was 1 year before the start of our study.

Statistical analysis was based on the comparison of observed and expected numbers of cancer cases.

In order to compare incidence rates, 95% confidence intervals were computed.

The observed number of cancer cases is the number of all the cancer cases in the exposed cohort in the period between 7/97 - 6/98.

In order to estimate relative risk, rate ratios were computed using the rate of 3 different cohorts as the base (the expected values):

The rate in a nearby clinic (which serves a population of 1222 people, all of them living in area B) during the same period of time, i.e. 7/97 - 6/98. In order to compare area A and area B populations we used:

χ^2 test to compare origin and sex division

t- test to compare age means

The national incidence rates of the whole country.

The incidence rates in the whole town of Netanya where the 2 clinics (of area A and B) are located. The data of 2 and 3 were given to us by the Israel cancer registry and are updated to the years 91-94.

We also examined the history of the exposed cohort (of the A area) for malignancies in the 5 years before the exposure began and found only 2 cases in comparison to 8 cases detected one year after the transmitter station came into service.

Results

Of the 622 people of area A, eight cases of different kinds of cancer were diagnosed in a period of only one year (from July 1997 to June 1998). Details on these cases are presented in Table 1. Briefly, we found 3 cases of breast carcinoma, and one case of ovary carcinoma, lung carcinoma, Hodgkin's disease, osteoid osteoma, and hypernephroma.

This rate of cancers in the population of area A was compared both with the rate of 31 cases per 10,000 per year in the general population and the 2/1222 rate recorded in a nearby clinic. To each one of the rates, a 95 percent confidence interval was calculated (Table 2): the rates in area A were significantly higher than both those in area B, and the population as a whole.

A comparison of the relative risk revealed that there were 4.15 times more cases in area A than in the entire population.

The population characteristics of areas A and B were very similar (Table 2-5). The χ^2 test for comparing gender and origin frequencies showed no significant differences in these parameters between the two areas. Age means, as compared by t-test and age distribution stratum also showed no significant difference between the two groups.

Table 2a lists the rates of cancer incidence of areas A and B compared to data of the whole town of Netanya. The comparison clearly indicated that the cancer incidence of women in area A is significantly higher ($p<0.0001$) compared with that of the whole city.

Discussion

Our study indicates an association between an increased incidence of cancer and living in proximity to a cell-phone transmitter station.

Studies of this type are prone to biases. Possible methodological artefacts to explain our alarming results were considered:

Differences in socioeconomic class and employment status, and demographic heterogeneity due to differences in age, sex and ethnicity were excluded. The two areas that were compared have very closely matched environment, workplace and occupational characteristics.

Confounding variables affecting individuals could not be absolutely adjusted for, however, there was no ionizing radiation that could affect the whole community except the previously mentioned mobile antenna station. There is no traffic density in this area, neither is there any industry or any other air pollution. The population of area A

(on which adequate data could be gathered) did not suffer from uncommon genetic conditions, nor did they receive carcinogenic medications.

Differences in diagnosis and registration of cancer cases. Although we cannot altogether exclude the possibility that higher awareness of the physician responsible for area A led to an artificial increase in cancer cases in this area, this possibility seems to us very unlikely, since both are qualified family physicians.

Several findings are of particular interest:

The measured level of RF radiation (power density) in the area was low; far below the current guidelines based on the thermal effects of RF exposure. We suggest, therefore, that the current guidelines be re-evaluated.

The enormous short latency period; less than 2 years, indicates that if there is a real causal association between RF radiation emitted from the cell-phone base station and the cancer cases (which we strongly believe there is), then the RF radiation should have a very strong promoting effect on cancer at very low radiation!

Although the possibility remains that this clustering of cancer cases in one year was a chance event, the unusual sex pattern of these cases, the 6 different cancer kinds, and the fact that only one patient smoked make this possibility very improbable and remote. It should be noted that 7 out of 8 cancer cases were women, like in the work of Maskarinec (25) who found 6 out of 7 leukemia cases in proximity to radio towers to occur in girls. Such unusual appearances of cancer cases due to one accused factor on two completely different occasions is alarming.

We are aware of at least 2 areas in which a drastic increase in the incidence of cancer cases occurred near a cell-phone antenna, however, the setup was not suitable for a well design study of those cases. In one of them (which also got publication in the daily newspapers) there were 6 out of 7 cancer cases in women working in a store in close proximity to a cell-phone antenna.

In conclusion, the results of this study showed that there was a significantly greater incidence of cancers of all kinds within the vicinity of a cell-phone transmitter station.

It would be certainly too premature to draw any conclusions from our results before they are confirmed and repeated by other studies from other areas, particularly in view of the fact that a great majority of papers on this subject showed that RF fields and mobile telephone frequencies were not genotoxic, did not induce genetic effects in vitro and in vivo, and were not found to be teratogenic or to induce cancers (24). The results of this paper should, however, serve as an alarm and emphasize the need for further investigations.

Addendum

At one year following the close of the study, 8 new cases of cancer were diagnosed in area A and two cases in area B. Among the cases diagnosed in area A was one of osteoid osteoma, the second case from the beginning of the study.

References

1. Cartwright R (1989) Low frequency alternating electromagnetic fields and leukaemia: the saga so far. *Br J Cancer* 60:649-651.

2. Demers PA et al (1991) Occupational exposure to electromagnetic fields and breast cancer in men. *Am J Epidemiol.* 134:340-347.

3. Dolk H et al (1997) Cancer incidence near radio and television transmitters in Great Britain. *Am J Epidemiol* 145:1-9.

4. Elliott P et al (1992) The Small Area Health Statistics Unit: a national facility for investigating health around point sources of environmental pollution in the United Kingdom. *J Epidemiol.Community Health* 46:345-349.

5. Feychting M and Ahlbom A (1993) Magnetic fields and cancer in children residing near Swedish high-voltage power lines. *Am J Epidemiol* 138:467-481.

6. Goldsmith J (1995) Epidemiologic evidence of radio-frequency (microwave) effects on health in military broadcasting and occupational studies. *Int J Occup Med Environ Health* 1:47-57.

7. Guenel P et al (1993) Incidence of cancer in persons with occupational exposure to electromagnetic fields in Denmark. *Br.J Ind.Med* 50:758-764.

8. Hocking B et al (1996) Cancer incidence and mortlity and proximity to TV towers. *Med J Aust* 165:601-615.

9. Kraut A et al (1991) Epidemiologic investigation of a cancer cluster in professional football players. *Environ.Res.* 56:131-143.

10. Lester J and Moore D (1982) Cancer mortality and Air Force bases. *J Bioelectricity* 1:77-82.

11. Maskarinec G et al (1994) Investigation of increased incidence in childhood leukaemia near radio towers in Hawaii: preliminary observations. *J Environ Pathol Toxicol Oncol* 13:33-37.

12. McGregor A (1998) WHO launches mobile-phone hazards study. *Lancet* 351:276.

13. Milham S Jr (1988) Increased mortality in amateur radio operators due to lymphatic and hematopoietic malignancies. *Am J Epidemiol.* 127:50-54.

14. Pollack H (1979) Epidemiologic data on American personnel in the Moscow embassy. *Bull N.Y.Acad.Med* 55:1182-1186.

15. Polsen P and Merritt J (1985) Cancer mortality and Air Force bases: a re-evaluation. *J Bioelectricity* 4:121-127.

16. Repacholi M (1997) Radiofrequency field exposure and cancer: what do the laboratory studies suggest. *Environ Health Perspect* 105 (Suppl 6):1565-1568.

17. Repacholi M (1998) Low-level exposure to radiofrequency electromagnetic fields: health effects and research needs. *Bioelectromagnetics* 19:1-19.

18. Robinette C, Silvermann C, and Jablon S (1980) Effects upon health of occupational exposure to microwave radiation (radar). *Am J Epidemiol* 112:39-53.

19. Savitz DA et al (1988) Case-control study of childhood cancer and exposure to 60-Hz magnetic fields. *Am J Epidemiol.* 128:21-38.

20. Savitz D, Ahlbom A (1994) Epidemiologic evidence of cancer in relation to residential and occupational exposure. In Carpenter D, Ayrapetyan S (eds) Biological effects of electric and magnetic fields. Sydney: Academic Press.

21. Savitz D and Calle E (1987) Leukaemia and occupational exposure to electromagnetic fields: review of epidemiologic surveys. *J Occup Med* 29:47-51.

22. Theriault, GP. Health effects of electromagnetic radiation on workers: epidemiologic studies. Bierbaum, PJ and Peters, JM. 91-124. 1991. Cincinnati, OH, US Department of Health and Human Services. Proceedings of the Scientific

Workshop on the health Effects of Electric and Magnetic Fields on Workers. Ref Type: Conference Proceeding

23. Tornqvist S et al (1991) Incidence of leukaemia and brain tumours in some "electrical occupations". *Br.J Ind.Med* 48:597-603.

24. Verschaeve L and Maes A (1998) Genetic, carcinogenic and teratogenic effects of radiofrequency fields. *Mutat Res* 410:141-165.

25. Wertheimer N and Leeper E (1979) Electrical wiring configurations and childhood cancer. *Am J Epidemiol.* 109:273-284.

Acknowledgment

The authors are grateful to Aviva Zeer M.Sc from the Zinman College of Phisical Education and Sport Sciences At the Wingate Institute, Israel, for help with the statistical analysis.

The opinions expressed herein are solely those of the writers and do not necessarily reflect the opinions of the institutions with which the writers are associated.

Table 1: Cancer cases in area A

NAME	AGE	SEX	ORIGIN[1]	SMO-KING	CANCER TYPE	Measured power density in $\mu w/cm^2$
Hemda	52	f	ash	No	Ovary ca stage 1	$0.3\mu w/cm^2$
Edna	42	f	sph	No	Breast ca in situ	$0.4\mu w/cm^2$
Tania	54	f	ash	No	Breast ca	$0.5\mu w/cm^2$
Neli	67	f	ash	Yes	Breast ca	$0.4\mu w/cm^2$
Galit	24	f	ash	No	Hodgkins	$0.5\mu w/cm^2$
Miriam	61	f	sph	No	Lung ca	$0.3\mu w/cm^2$
Masal	37	f	sph	No	Osteoid osteoma	$0.4\mu w/cm^2$
Max	78	m	ash	No	Hypernephroma	$0.3\mu w/cm^2$

1. Origin: ash - Ashkenazien Jews sph - Spharadic Jews

Table 2: Cancer rates in area A, B and the total population.

	No. of cancer cases	populati on size	Rate per year per 10,000	confide interval lower limit	ce (95%) upper limit	relative risk
Area A	8	622	129	40.1	217.2	4.15
Area B	2	1222	16	-6.3	39.0	0.53
total populat	31	10,000	31	20.1	41.9	1.00

Table 2a: Cancer rates in area A, B and the whole town.

	Male		Female	
	rate	Relative rate	rate	relative rate
Area A	33	1.4	262	10.5
Area B	17	0.7	16	0.6
Whole town	24	1	25	1

Table 3: Comparing area A to area B by gender.

Gender	Area A		Area B	
	N	%	N	%
male	290	49	669	49
female	305	51	685	51

Table 4: Comparing area A to area B by origin.

Origin	Area		Area	
	N	%	N	%
Sfaradic	340	55	551	45
Ashkenaz	239	38	620	51
Russian	41	7	51	4

Table 5: Comparing age means in both areas.

	Area A		Area B	
	mean	Std	mean	std
age	26.5	17.9	25.5	12.4

Table 5: Age distribution by stratum.

	0-1	**1-10**	**10-20**	**20-30**	**30-40**	**40-50**	**50-60**	**60-70**	**>70**
IRUS	16	143	157	65	70	88	41	21	21
POLEG	31	285	257	139	180	158	83	55	34

The Influence of Being Physically Near to a Cell Phone Transmission Mast on the Incidence of Cancer

Horst Eger, Klaus Uwe Hagen, Birgitt Lucas, Peter Vogel, Helmut Voit

Published in *Umwelt·Medizin·Gesellschaft* 17,4 2004, as:
'Einfluss der räumlichen Nähe von Mobilfunksendeanlagen auf die Krebsinzidenz'

Summary

Following the call by Wolfram König, President of the Bundesamt für Strahlenschutz (Federal Agency for radiation protection), to all doctors of medicine to collaborate actively in the assessment of the risk posed by cellular radiation, the aim of our study was to examine whether people living close to cellular transmitter antennas were exposed to a heightened risk of taking ill with malignant tumors.

The basis of the data used for the survey were PC files of the case histories of patients between the years 1994 and 2004. While adhering to data protection, the personal data of almost 1,000 patients were evaluated for this study, which was completed without any external financial support. It is intended to continue the project in the form of a register.

The result of the study shows that the proportion of newly developing cancer cases was significantly higher among those patients who had lived during the past ten years at a distance of up to 400 metres from the cellular transmitter site, which has been in operation since 1993, compared to those patients living further away, and that the patients fell ill on average 8 years earlier.

In the years 1999-2004, *ie* after five years' operation of the transmitting installation, the relative risk of getting cancer had trebled for the residents of the area in the proximity of the installation compared to the inhabitants of Naila outside the area.

Key words: cellular radiation, cellular transmitter antennas, malignant tumours

The rapid increase in the use of mobile telephony in the last few years has led to an increasing number of cell phone transmission masts being positioned in or near to residential areas. With this in mind, the president of the German governmental department for protection against electromagnetic radiation (Bundesamtes für Strahlenschutz) Wolfram König, has challenged all doctors to actively help in the work to estimate the risks from such cell phone masts. The goal of this investigation was therefore to prove whether on not people living near to cell phone masts have a higher risk of developing cancerous tumours.

The basic data was taken from the medical records held by the local medical authority (Krankenkasse) for the years 1994 to 2004. This material is stored on computer. In this voluntary study the records of roughly 1,000 patients from Naila (Oberfranken) were used, respecting the associated data protection laws. The results from this study show a significantly increased likelihood of developing cancer for the patients that have lived within 400 metres of the cell phone transmission mast (active since 1993) over the last ten years, in comparison to those patients that live further away. In addition, the patients that live within 400 metres tend to develop the cancers at a younger age. For the years 1999 to 2004 (*ie* after five or more years of living with the cell phone transmission mast), the risk of developing cancer for those living within 400 metres of the mast in comparison to those living outside this area, was three times as high.

Introduction

A series of studies available before this investigation provided strong evidence of health risks and increased cancer risk associated with physical proximity to radio transmission masts. Haider *et al.* reported in 1993 in the Moosbrunn study frequent psychovegetive symptoms below the current safety limit for electromagnetic waves (1). In 1995, Abelin *et al.* in the Swiss- Schwarzenburg study found dose dependent sleep problems (5:1) and depression (4:1) at a shortwave transmitter station that has been in operation since 1939 (2).

In many studies an increased risk of developing leukaemia has been found; in children near transmitter antennas for Radio and Television in Hawaii (3); increased cancer cases and general mortality in the area of Radio and Television transmitter antennas in Australia (4); and in England, 9 times more leukaemia cases were diagnosed in people who live in a nearby

area to the Sutton Coldfield transmitter antennas (5). In a second study, concentrating on 20 transmitter antennas in England, a significant increased leukaemia risk was found (6). The Cherry study (7) indicates an association between an increase in cancer and living in proximity to a transmitter station. According to a study of the transmitter station of Radio Vatican, there were 2.2 times more leukaemia cases in children within a radius of 6 km, and adult mortality from leukaemia also increased (8).

In 1997 Goldsmith published the Lilienfeld-study that indicated 4 times more cancer cases in the staff of the American Embassy in Moscow following microwave radiation during the cold war. The dose was low and below the German limit (9).

The three studies of symptoms indicated a significant correlation between illness and physical proximity to radio transmission masts. A study by Santini *et al.* in France resulted in an association between irritability, depression, dizziness (within 100m) and tiredness within 300m of a cell phone transmitter station (10).

In Austria there was an association between field strength and cardiovascular symptoms (11) and in Spain a study indicates an association between radiation, headache, nausea, loss of appetite, unwellness, sleep disturbance, depression, lack of concentration and dizziness (12).

The human body physically absorbs microwaves. This leads to rotation of dipole molecules and to inversion transitions (13), causing a warming effect. The fact that the human body transmits microwave radiation at a very low intensity means that since every transmitter represents a receiver and transmitter at the same time, we know the human body also acts as a receiver.

In Germany, the maximum safe limit for high frequency microwave radiation is based on purely thermal effects. These limits are one thousand billion times higher than the natural radiation in these frequencies that reaches us from the sun.

The following study examines whether there is also an increased cancer risk close to cellular transmitter antennas in the frequency range 900 to 1800 MHz. Prior to this study there were no published results for long-term exposure (10 years) for this frequency range and its associated effects to be revealed. So far, no follow-up monitoring of the state of health of such a residential population has been systematically undertaken.

Materials and Methods

Study area

In June 1993, cellular transmitter antennas were permitted by the Federal Postal Administration in the Southern German city of Naila and became operational in September 1993.

The GSM transmitter antenna has a power of 15 dbW per channel in the 935MHz frequency range. The total

Fig. 1: Schematic plan of the antenna sites

transmission time for the study period is ca. 90,000 hours. In December 1997 there followed an additional installation from another company. The details are found in an unpublished report, appendix page 1-3 (14).

To compare results an 'inner' and 'outer' area were defined. The inner area covered the land that was within a distance of 400 metres from the cellular transmitter site. The outer area covered the land beyond 400 metres. The average distance of roads surveyed in the inner area (nearer than 400m) was 266m and in the outer area (further than 400m) 1,026m. Fig. 1 shows the position of the cellular transmitter sites I and 2, surrounded by circle of radius 400 metres. The geographical situation shows the transmitter sites (560m) are the highest point of the landscape, which falls away to 525m at a distance of 450m. From the height and tilt angle of the transmitter it is possible to calculate the distance where the transmitter's beam of greatest intensity strikes the ground (see Fig. 2).

The highest radiation values are in areas of the main

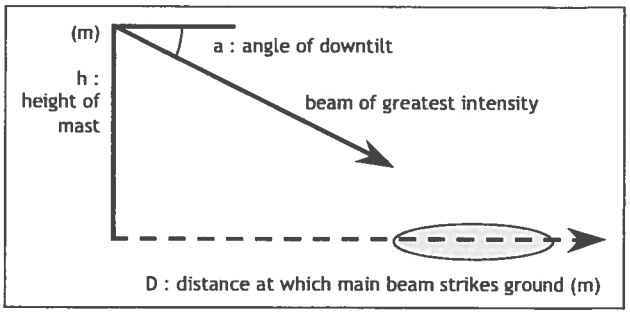

Fig. 2: From the mast height h and the downtilt angle a, the distance D at which the main beam reaches ground is given by D = tan(90-a) × h

beam where it hits the ground and from the expected associated local reflection; from this point the intensity of radiation falls off with the square of the distance from the transmitter.

In Naila the main beam hits the ground at 350m with a beam angle of 6 degrees (15). In the inner area, additional emissions are caused by the secondary lobes of the transmitter; this means in comparison that from purely mathematical calculations the outer area has significantly reduced radiation intensity.

The calculations from computer simulations and the measurements from the Bavaria agency for the environmental protection, both found that the intensity of radiation was a factor of 100 higher in the inner area as compared to the outer area. The measurements of all transmitter stations show that the intensity of radiation from the cell phone transmitter station in Naila in the inner area was higher than the other measurement shown in the previous studies of electromagnetic fields from radio, television or radar (14).

The study StSch 4314 from the ECOLOG Institute indicates an association between a vertical and horizontal distance from the transmitter station and expected radiation intensity on the local people (16). The reason for setting a distance of 400m for the differentiation point is partly due to physical considerations, and partly due to the study of Santini *et al.* who chose 300m (10).

Data Gathering

Similar residential streets in the inner area and outer areas were selected at random. The large old people's home in the inner area was excluded from the study because of the age of the inhabitants. Data gathering covered nearly 90% of the local residents, because all four GPs in Naila took part in this study over 10 years. Every team researched the names of the patients from the selected streets that had been ill with tumours since 1994. The condition was that all patients had been living during the entire observation time of 10 years at the same address.

The data from patients was handled according to data protection in an anonymous way. The data was evaluated for gender, age, tumour type and start of illness. All cases in the study were based on concrete results from tissue analysis. The selection of patents for the study was always done in exactly the same way. Self-selection was not allowed. Also the subjective opinion of patients that the radio mast detrimentally affected their health has not affected this study. Since patients with cancer do not keep this secret from GPs, it was possible to gain a complete data set.

Population study

In the areas where data was collected 1,045 residents were registered in 31.12.2003. The registration statistics for Naila at the beginning of the study (1.1.1994) show the number of old people in the inner and outer areas, as shown in Table 1. The average age at the beginning of the study (1.1.1994) in both the inner and outer areas was 40.2 years. In the study period between 1994-2004, 34 new cases of cancer where documented out of 967 patients (Table 3). The study covered nearly 90% of local residents.

	female	male	total
Inner area	41.48	38.70	40.21
Outer area	41.93	38.12	40.20
Naila total	43.55	39.13	41.45

Table 1 : Overview of average ages at the beginning of the study in 1994

1994	inner 22.4%	outer 2.8%	Naila total 24.8%
2004	inner 26.3%	outer 26.7%	

Table 2 : Proportion of patients aged over 60

The average age of the residents in Naila is one year more than that of the study due to the effects of the old people's home. From the 9,472 residents who are registered in Naila, 4,979 (52.6%) are women and 4,493 (47.4%) are men. According to the register office, in 1.1.1994 in the outer area, the percentage was 45.4% male and 54.5% female, and in the inner area 45.3% male and 54.6% female. The number of people who are over 60 years old is shown in Table 2.

The social differences in Naila are small. Big social differences like in the USA do not exist here. There is also no ethnic diversity. In 1994 in Naila the percentage of foreigners was 4%. Naila has no heavy industry, and in the inner area there are neither high voltage cable nor electric trains.

Results

Results are first shown for the entire 10 year period from 1994 until 2004. Secondly, the last five-year period 1999 to 2004 is considered separately.

Period 1994 to 2004

As a null hypothesis it was checked to see if the physical distance from the mobile transmission mast had no effect on the number cancer cases in the selected population, *ie* that for both the group nearer than 400 metres and the group further than 400 metres the chance of developing cancer was the same. The relative frequencies of cancer in the form of a matrix are shown in Table 3. The statistical test method used on this data was the chi-squared test with Yates's correction. Using this method we obtained the value of 6.27, which is over the critical value of 3.84 for a

Period 1994-2004	Inner area	Outer area	total
new cases of cancers	18	16	34
with no new cancer	302	631	933
total	320	647	967

Table 3 : numbers of patients with and without cancers, 1994-2004

statistical significance of 0.05).

This means the null hypothesis that both groups within the 400-metre radius of the mast and beyond the 400 metre radius, have the same chance of developing cancer, can be rejected with a 95% level of confidence. With a statistical significance of 0.05, an even more significant difference was observed in the rate of new cancer cases between the two groups.

Calculating over the entire study period of 1994 until 2004, based on the incidence matrix (Table 3) we arrive at a relative risk factor of 2.27 (quotient of proportion for each group, *eg* 18/320 in the strongly exposed inner area, against 16/647 in the lower exposed comparison group). If expressed as an odds ratio, the relationship of the chance of getting cancer between strongly exposed and the less exposed is 2.35.

The following results show clearly that inhabitants who live close to transmitter antennas compared to inhabitants who live outside the 400m zone, double their risk of developing cancer. In addition, the average age of developing cancer was 64.1 years in the inner area whereas in the outer area the average age was 72.6 years, a difference of 8.5 years. That means during the 10 year study that in the inner area (within 400 metres of the radio mast) tumours appear at a younger age.

In Germany the average age of developing cancer is approximately 66.5 years, among men it is approximately 66 and among women, 67 (18).

Over the years of the study the time trend for new cancer cases shows a high annual constant value (Table 4). It should be noted that the number of people in the inner area is only half that of the outer area, and therefore the absolute numbers of cases is smaller.

Table 7 shows the types of tumour that have developed in the cases of the inner area.

Period 1994 to 1999

No. of cases of tumours per year of study	inner area: of the 320 people		outer area: of the 647 people	
	total cases	per 1,000	total cases	per 1,000
1994	–	–	I	1.5
1995	–	–	–	–
1996	II	6.3	I	1.5
1997	I	3.1	III	4.6
1998	II	6.3	III	4.6
1999	II	6.3	I	1.5
2000	IIIII	15.6	I	1.5
2001	II	6.3	II	3.1
2002	II	6.3	II	3.1
2003-3/2004	II	6.3	II	3.1

Table 4 : Summary of the total tumours occurring per year (no. and per thousand)

Period 1994-1999	Inner area	Outer area	total
new cases of cancers	5	8	13
with no new cancer	315	639	954
total	320	647	967

Table 5 : numbers of patients with and without cancers, 1994-1999

For the first five years of the radio transmission mast operation (1994-1998) there was no significant increased risk of getting cancer within the inner area as compared to the outer area (Table 5).

Period 1999 to 2004

Under the biologically plausible assumption that cancer caused by detrimental external factors will require a time of several years before it will be diagnosed, we now concentrate on the last five years of the study between 1999 and 2004. At the start of this period the transmitter had been in operation for 5 years. The results for this period are shown in Table 6. The chi-squared test result for this data (with Yates's correction) is 6.77 and is over the critical value of 6.67 (statistical significance 0.01). This means, with 99% level of confidence, that there is a statistically proven difference between development of cancer between the inner group and outer group. The relative risk of 3.29 revealed that there was 3 times more risk of developing cancer in the inner area than the outer area during this time period.

Period 1999-2004	Inner area	Outer area	total
new cases of cancers	13	8	31
with no new cancer	307	639	946
total	320	647	967

Table 6 : numbers of patients with and without cancers, 1999-2004

The odds-ratio 3.38 (VI 95% 1.39-8.25, 99% 1.05-10.91) allows us with 99% confidence to say that the difference observed here is not due to some random statistical effect.

Discussion

Exactly the same system was used to gather data in the inner area and outer areas. The medical chip card, which has been in use for 10 years, enables the data to be processed easily. The four participating GPs examined the illness of 90% of Naila's inhabitants over the last 10 years. The basic data for this study were based on direct examination results of patients extracted from the medical chip cards, which record also the diagnosis and treatment. The study population is (in regards to age, sex and cancer risk) comparable, and therefore statistically neutral. The study deals only with people who have been living permanently at the same address for the entire study period and therefore

Type of tumour (organ)	no. of tumours found	total expected	incidence per 100,000	ratio inner: outer
breast	8	5.6	112	5:3
ovary	1	1.1	23	0:1
prostate	5	4.6	101	2:3
pancreas	m 3 f 2	0.6 0.9	14 18	2:1 1:1
bowel	m 4 f 0	3.7 4.0	81 81	2:2 0:0
skin melanoma	m 1 f 0	0.6 0.7	13 14	1:0 0:0
lung	m 3 f 0	3.6 1.2	79 24	2:1 0:0
kidney	m 2 f 1	1.0 0.7	22 15	1:1 1:0
stomach	m 1 f 1	1.2 1.1	27 23	0:1 0:1
bladder	m 1 f 0	2.0 0.8	44 16	0:1 0:0
blood	m 0 f 1	0.6 0.7	14 15	0:0 1:0

Table 7 : Summary of tumours occurring in Naila, compared with incidence expected from the Saarland cancer register

have the same duration of exposure regardless of whether they are in the inner area or outer area.

The result of the study shows that the proportion of newly developing cancer cases was significantly higher ($p<0.05$) among those patients who had lived during the past ten years within a distance of 400 metres from the cellular transmitter site, which has been in operation since 1993, in comparison to people who live further away. Compared to those patients living further away, the patients developed cancer on average 8.5 years earlier. This means the doubled risk of cancer in the inner area cannot be explained by an average age difference between the two groups. That the transmitter has the effect that speeds up the clinical manifestations of the illness and general development of the cancer cannot be ruled out.

In the years 1999-2004, *ie* after five years and more of transmitter operation, the relative risk of getting cancer had trebled for the residents of the area in the proximity of the mast compared to the inhabitants of Naila in the outer area ($p>0.01$). The division into inner area and outer area groups was clearly defined at the beginning of the study by the distance to the cell phone transmission mast. According to physical considerations people living close to cellular transmitter antennas were exposed to heightened transmitted radiation intensity.

Both calculated and empirical measurements revealed that the intensity of radiation is 100 times higher in the inner area compared to the outer area. According to the research StSch 4314 the horizontal and vertical position in regards to the transmitter antenna is the most important criterion in defining the radiation intensity area on inhabitants (16).

The layered epidemiological assessment method used in this study is also used in assessment of possible chemical environmental effects. In this case the layering is performed in regards to the distance from the cell phone transmitter station. Using this method it has been shown that there is a significant difference in probability of developing new cancers depending on the exposure intensity.

The number of patients examined was high enough according to statistical rules that the effects of other factors (such as use of DECT phones) should be normalised across the inner area and outer area groups. From experience the disruption caused by a statistical confounding factor is in the range between 20% and 30%. Such a factor could therefore in no way explain the 300% increase in new cancer cases. If structural factors such as smoking or excessive alcohol consumption are unevenly distributed between the different groups this should be visible from the specific type of cancers to have developed (*ie* lung, pharyngeal or oesophageal). In the study inner area there were two lung cancers (one smoker, one non-smoker), and one in the outer area (a smoker), but no oesophageal cancers. This rate of lung cancer is twice what is statistically to be expected and cannot be explained by a confounding factor alone. None of the patients who developed cancer was from a family with such a genetic propensity.

Through the many years experience of the GPs involved in this study, the social structures in Naila are well known. Through this experience we can say there was no significant social difference in the examined groups that might explain the increased risk of cancer.

The type and number of the diagnosed cancers are shown in Table 7. In the inner area the number of cancers associated with blood formation and tumour-controlling endocrine systems (pancreas), were more frequent than in the outer area (77% inner area and 69% outer area).

From Table 7, the relative risk of getting breast cancer is significantly increased to 3.4. The average age of patients that developed breast cancer in the inner area was 50.8 years. In comparison, in the outer area the average age was 69.9 years, approximately 20 years less. In Germany the average age for developing breast cancer is about 63 years. The incidence of breast cancer has increased from 80 per 100,000 in the year 1970 to 112 per 100,000 in the year 2000. A possible question for future research is whether breast cancer can be used as a 'marker cancer' for areas where there is high contamination from electromagnetic radiation. The report of Tynes *et al.* described an increased risk of breast cancer in Norwegian female radio and telegraph operators (20).

To further validate the results the data gathered were compared with the Saarland cancer register (21). In this register all newly developed cancers cases since 1970 are recorded for each Bundesland. These data are accessible via the Internet. Patents that suffer two separate tumours were registered twice, which increases the overall incidence up to 10%. In this

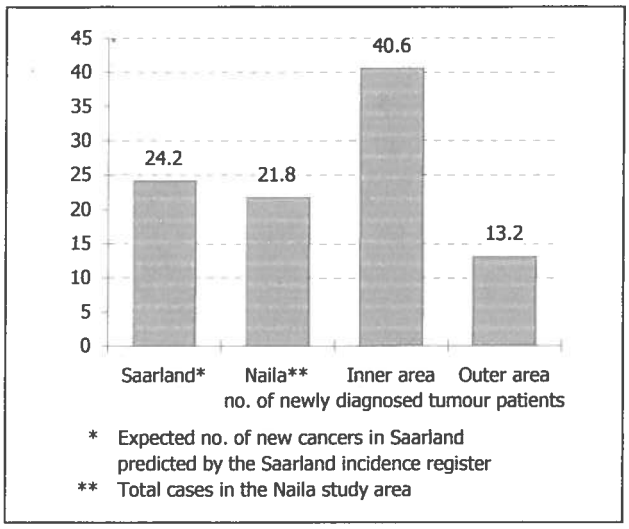

Fig. 3 : Number of new cancer cases 1999 to 2004, adjusted for age and gender, calculated for the 5,000 patient years

register there is no location-specific information, for instance proximity to cell phone transmission masts. The data in the cancer register therefore reflect no real control group but rather the effect of the average radiation on the total population.

From the Saarland cancer register for the year 2000 the incidence of new cancer cases was 498 per 100,000 for men and 462 per 100,000 for women. When adjusted for age and sex one would expect a rate of between 480 and 500 per 100,000 in Naila. For the years 1999 to 2004 there were 21 new cases of cancer among 967 patients. The expected number was 24 cases per 1,000 patients.

The results of the study are shown graphically in Fig. 3. The bars of the chart represent the number of new cancer cases per 1,000 patients in the separate areas, over the five years (bars 2 to 4). The first bar represents the expected number from the Saarland cancer register.

In spite of a possible underestimation, the number of newly developed cancer cases in the inner area is more than the expected number taken from the cancer register, which represents the total population being irradiated. The group who had lived during the past five years within a distance of 400 m from the cellular transmitter have a two times higher risk of developing cancer than that of the average population. The relative risk of getting cancer in the inner area compared with the Saarland cancer register is 1.7 (see to Table 7).

Conclusion

The result of this retrospective study in Naila shows that the risk of newly developing cancer was three times higher among those patients who had lived during past ten years (1994-2004), within a distance of 400m from the cellular transmitter, in comparison to those who had lived further away.

Cross-sectional studies can be used to provide the decisive empirical information to identify real problems. In the 1960s just three observations of birth deformities were enough to uncover what is today an academically indisputable Thalidomide problem.

This study, which was completed without any external financial support is a pilot project. Measurements of individual exposure as well as the focused search for further side effects would provide a useful extension to this work, however such research would need the appropriate financial support.

The concept of this study is simple and can be used everywhere, where there it a long-term electromagnetic radiation from a transmitting station.

The results presented are a first concrete epidemiological sign of a temporal and spatial connection between exposure to GSM base station radiation and cancer disease.

These results are, according to the literature relating to high frequency electromagnetic fields, not only plausible and possible, but also likely.

From both an ethical and legal standpoint it is necessary to immediately start to monitor the health of the residents living in areas of high radio frequency emissions from mobile telephone base stations with epidemiological studies. This is necessary because this study has shown that it is no longer safely possible to assume that there is no causal link between radio frequency transmissions and increased cancer rates.

Acknowledgements

Our thanks go to all those involved in developing this study, in particular, Herrn Professor Frentzel-Beyme for his advice on all the epidemiological questions.

(Received 14.09.2004; Accepted 08.10.2004)

Footnotes

(1) HAIDER, M., KUNDI, M., KNASMÜLLER. S., HAIDER,T., GROLL KNAPP, E. & G. OBERMEIER (1993): Medizinisch-hygienische Untersuchungen und Beurteilungen der Kurzwellensendeanlage Moosbrunn, Institut für Umwelthygiene,Universität Wien.

(2) ABELIN, T., ALTPETER, E.S., PFLUGER, D.H., KREBS, T., KÄNEL, J.V., STÄRK, K. & C. GRIOT (1995): Gesundheitliche Auswirkungen des Kurzwellensenders Schwarzenburg, BEW Schriftenreihe Studie Nr. 56 (BEW: Bundesamt für Energiewirtschaft).

(3) MASKARINEC, G., COOPER, J. & L. SWYGERT (1994): Investigation of increased incidence in childhood leukemia near radio towers in Hawaii: Preliminary observations, J. Environ. Pathol.Toxicol. and Oncol. 13: 33-37.

(4) HOCKING, B., GORDON, IR., GRAIN HL. et al. (1996): Cancer Incidence and Mortality and Proximity to TV-Towers. Med. J. Australia 165, 11-12: 601-605.

(5) DOLK, H., SHADDICK, G.,WALLS, P., GRUNDY, C., THAKRAR, B., KLEINSCHMIDT, I. & P. ELLIOT (1997a):Cancer Incidence Near Radio and Television Transmitters in Great Britain, Part 1. Sutton Coldfield Transmitter, Am. J. Epidemiol. 145: 1-9.

(6) DOLK, H., ELLIOT, G., SHADDICK, G., WALLS, P. & B. THAKRAR (1997b): Cancer Incidence Near Radio and Television Transmitters in Great Britain, Part 2. All High Tower Transmitters, Am. J. Epidemiol. 145: 10-17.

(7) CHERRY, N. (1999): Critism of the proposal to adopt the ICNIRP guidelines for cellsites in New Zealand, ICNIRP Guideline Critique, Lincoln University, Environmental Management and Design Division, Canterbury, NZ.

(8) MICHELOZZI, P., CAPON, A., KIRCHMAYER, U., FORASTIERE, F., BIGGERI, A., BARCA, A. & C.A.PERUCCI (2001):Department of Epidemiology.Local Health Authority RME Rom, Italy.

(9) GOLDSMITH, JR. (1997): European EpiMarker 2(4): 4-7; Lilienfeld 1978 Final report US Dept. of State, NTIS PB-288163, 1978.

(10) SANTINI, R., SANTINI, P., DANZE, J. M., LE RUZ, P. & SEIGNE,M. (2002): Symptoms experienced by people living in vicinity of cell phone base stations: I. Incidences of distance and sex, Pathol. Biol. 50: 369-373.

(11) KUNDI, M. (2002): Erste Ergebnisse der Studie über Auswirkungen von Mobilfunk-Basisstationen auf Gesundheit und Wohlbefinden. Bericht des Instituts für Umwelthygiene der Universität Wien.

(12) NAVARRO EA., SEGURA J., PORTOLES M., GOMEZ-PERRETTA de MATEO C. (2003): Das Mikrowellensyndrom: Eine vorläufige Studie in Spanien. Electromagnetic Biology an Medicine (früher: Electro- and Magnetobiology) 22(2): 161-169,www.grn.es/electropolucio/TheMicrowaveSyndrome.doc.

(13) BROCKHAUS (1973): abc Physik, VEB F.A. Brockhaus Verlag, Leipzig: 991 ff.

(14) EGER, H., HAGEN, K.U., LUCAS, B., VOGEL, P. & H. VOIT (2004): Einfluss der räumlichen Nähe von Mobilfunk-sendeanlagen auf die Krebsinzidenz,Tabellarischer Teil, unveröffentlicht, Naila

(15) Regulierungsbehörde für Post und Telekom (oJ): Standortbescheinigungen,

(16) ECOLOG-INSTITUT (2003): Bestimmung der Exposition von Personengruppen, die im Rahmen des Projektes "Querschnitts-studie zur Erfassung und Bewertung möglicher gesund-heitlicher Beeinträchtigungen durch die Felder von Mobilfunkbasisstationen" untersucht werden, Berichtszeitraum: 1.2.2003 bis 31.5.2003, Förderkennzeichen: StSch 4314, ECOLOG-Institut für sozial-ökologische Forschung und Bildung gGmbH, Hannover.

(17) KLEINBAUM, D.G., KLEIN, M. (2002): Logistic Regression - A. Self - learning text, Springer Verlag

(18) AG BEVÖLKERUNGSBEZOGENER KREBSREGISTER IN DEUTSCHLAND (Hrsg.) (2004):Krebs in Deutschland, 4. überarb., akt.Ausgabe, Arbeitsgemeinschaft bevölkerungs-bezogener Krebsregister in Deutschland in Zusammenarbeit mit dem Robert Koch-Institut, Saarbrücken.

(19) LEGATOR, M.S. & B. STRAWN (1998): Umwelt-Risiko: Chemie, Haug-Verlag.

(20) TYNES, I., HANNEVIK, M., ANDERSEN, A., VISTNES, AI. & HALDORSEN T. (1996): Incidence of breast cancer in Norwegian female radio and telegraph operators. Cancer Causes Control 7: 197-204.

(21) www.krebsregister.saarland.de

Kontakt:

Dr. med. Klaus Uwe Hagen
Birgitt Lucas
Peter Vogel
Dr. med.Helmut Voit

Korrespondenz:
Dr. med.Horst Eger
Marktplatz 16
95119 Naila
Tel.: 09282-1304
horst.eger@arcormail.de

AVE SUGARLOAF FROM CELL PHONE TOWER!

NAME	DATE	ADDRESS
Eric Williams		PO Box 2029 Sedona AZ 86339
Chikafi Myers	5/8/17	30 Concho Way Sedona 86351
Debbie SantaCruz	5/8/17	65 Antelope Dr Sedona 86336
Cynthia Kapp	5/8/17	2680 [illegible] Cornville 86325
Ellen Ferreira	5/8/17	95 Silverleaf DR.
Rick [illegible]	5/8/17	" "
Sandy Immerso	5/8/17	15 N Slopes Sedona
Peter Periharos	5/8/17	15 N Slopes Sedona
Elisa Andreis	5/8/17	100 Carol Canyon dr Sedona
Allen Wood	5/8/17	PO Box 146 Sedona 86339
Rima Borgogni	5/8/17	3150 W. 89A
Rachel Tucker	5/12/17	371 Cedar St. #1 Sedona AZ 86336
Kayla Clements	5/12/17	145 Navajo Drive, Sedona AZ
Belsha Akers	5/12/17	5 Caswell Dr, Sedona 86336
KRISTINA PALEY	5/18/17	280 ARROYO Pinon Drive

Thank You!

SAVE SUGARLOAF FROM CELL PHONE TOWER!

NAME	DATE	ADDRESS
Samson Love	5/8/17	2030 Sanborn Dr (west Sedona)
Pamela Malone	5/8/17	190 Hummingbird Ln Sedona
Cheryl Brenman	5/8/17	270 MT SHADOWS DR. AZ
HUGO COHEN	5/8/17	460 Mogan Rd
Jen Burns	5-11-17	482 Smith RD Sedona
Rick Lewis	5-12-17	P.O. Box 198 2380 W 89a Sedona
~~Savanah Van Block~~	~~5-12-17~~	~~1965 Bueno Vista Drive, Sedona, AZ~~
Hunter Jackson	5/12/17	70 Concho Wash, AZ
~~Jackie Thompson~~	5-13-17	280 Windsong Dr Sedona AZ 86336
~~Natara Moon~~	5-15-17	1395 Vista Montana #418

SAVE SUGARLOAF FROM CELL PHONE TOWER!

15

NAME	DATE	ADDRESS
JolyNN Greenfield	5.6.17	20 Roadrunner Sedona, AZ
Steve A. MACK	5/6/17	120 CASWELL DR
BRENDA G. REYNOLDS	5/6/17	120 Caswell Dr.
LINDA MATHES	5-6-17	55 Caswell DR
JOHN C. WAHNON	5-6-17	2010 MAXWELL HOUSE Dr SEDONA
Robert DeMayo	5-6-17	95 Lipton Dr. Sedona, AZ
MICHAEL DALLY	5-6-17	50 LIPTON DR. SEDONA, AZ
Lucy Mgeorge	5.6.17	1980 Del Monte Dr Sedona AZ 86336
Sitara Van Block	5.6.17	1965 Buena Vista Dr, Sedona AZ 86336
Zoe VanBlock	5/6/17	1965 Buena Vista Dr, Sedona AZ 863
Savannah Van Block	5/6/17	1965 Buena Vista Dr, Sedona
Cynthia Rosenblum	5/6/17	2045 Maxwell House Dr.
KEN SCHNITKER	5/6/17	145 LITTLE ELF DR
Randy Shams	5/6/17	100 Little Elf Dr.
Patty Thorne	5-6-17	2035 Maxwell House

SAVE SUGARLOAF FROM CELL PHONE TOWER!

NAME	DATE	ADDRESS
Magdalena Dickson	April 6th	120 ARBUTLE DR.
David R Lindsey	May 6 17	2055 MAXWELL House DR
[illegible]	May 6 17	105 Caswell Dr
[illegible]	5/6/17	45 Caswell Dr.
[illegible]	5-6-17	58 Caswell Dr.
Bennie Kelly	5-6-17	85 Caswell Dr
MARTY JOHNSON	5-6-17	1955 HILLS DR
THOMAS BRENNAN	5-6-17	1980 DEL MONTE DRIVE
Ariella Mirvis	5/6/17	1965 Buena Vista Dr.
Jacob Greene	5/6/17	1965 Buena Vista Dr
Randy Smith	5/6/17	2065 Buena Vista Dr.
Janni Smith	5/6/17	2065 Buena Vista Dr.
Karl Wiseman	5/6/17	75 Little Elf Dr.
Jane Backus	5/6/17	35 Little Elf. Dr.
[illegible]	5/6/17	2060 Sanborn Dr.
Paul Ingraham	5/6/17	1945 maxwell House Dr
Paula Medow	5/6/17	2010 Buena Vista Dr.
Mike Medow	5/6/17	2010 Buena Vista Dr

SAVE SUGARLOAF FROM CELL PHONE TOWER!

NAME	DATE	ADDRESS
Tatiana Temple	05/08/2017	55 Borden DR Sedona AZ
Robert Sardis	5/8/2017	40 Borden Sedona
DEVIN NORRIS	5/8/2017	35 BORDEN DR SEDONA AZ
Brandy ROE	5/8/2017	35 Borden DR sedona
Johnine C. Norris	5/8/2017	35 Borden Dr. Sedona 86336
Jeff Kekala	5/8/2017	10 Borden Dr. Sedona 86336
Jared Cram	5/8/2017	230 Table top Rd Sedona AZ 86336
Barbara Griffin	5/8/2017	175 Goodrock Lane Sedona
RICHARD WINDSOR	5/8/2017	2195 NESCAFE DR. Sedona AZ
M.L. Nock	5/8/2017	115 Yucca Dr. Sedona
Chris Kinsel	5-8-2017	110 Yucca Drive Sedona
Nisay mizrahi	5-8-17	135 Yucca Dr Sedona
Paul Blanchard	5-8-17	150 Yucca Dr. -Sedona
Tracy Greer B	5-8-17	170 Yucca Dr. Sedona
RAYMOND RODRIGUEZ	5.8.17	175 YUCCA DR. SEDONA
NICK Paletic	5-8-17	190 Yucca Dr. Sedona

SAVE SUGARLOAF FROM CELL PHONE TOWER!

20

NAME	DATE	ADDRESS
Patty Herrmann Juda	5-7-2017	370 Farmer Brothers Dr. Sedona
ROY JUDA	5/7/2017	370 FARMER BROS DR SEDONA 86336
Amy Lienhart	5/8/17	Country lane, Sedona
ALAN DE ANDRA	5/8/17	2575 Red Rock Loop Rd 8633
JOEL EGAN	5/8/17	155 EL CAMINO RD SEDONA
DANIEL HARMSWORTH	5/8/17.	2,270 W. Hwy 89A, Suite #1, Sedona
WILLIAM H LANDAU	5/8/17	1124 VISTA MONTANA RD, SEDONA
JOSEPH Bergen	5/8/17	230 CAMINO DEL CABALLO, Sedona
Joanna Conway	5/8/17	50 stations west Dr Sedona
CINDY DYAR	5/8/17	80 STUTZ BEARCAT DR.
Jason Thompson	5/8/17	60 Pinion DR
Karen [illegible]	5/8/17	20 Farmer Bros
[illegible]	5/8/17	70 Farmer Bros.
Daniel Mirelli	5/8/17	70 FARMER BROS
Jean Harmon	5/8/17	P.O. Box 3033 Sedona
[illegible]	5/8/17	110 FARMER BROS SEDONA AZ
Madeleine Callachan	5/8/17	180 Farmer Bros Sedona AZ
[illegible]		
[illegible]	"	105 Farmer Brothers Dr. Sedona AZ
Jackie Ayala	5/8/17	50 Border Dr. Sedona, AZ
		Thank You!

SAVE SUGARLOAF FROM CELL PHONE TOWER!

23

NAME	DATE	ADDRESS
Kirk Landauer	May 6 17	2045 Buena Vista Dr
Laura Pratt	5-6-17	115 Caswell Dr
Airen Sapp	5-6-17	90 Caswell DR
Debb Carl	5.6.17	90 CASWELL DR.
[illegible]	5/6/17	85 Caswell Dr
[illegible]		40 Caswell Dr
Tammy Newton	5-6-17	35 CASWELL Dr. Sedona AZ 86336
Bannye Marie	5/6-17	35 Caswell Dr Sedona 86336
John Osgood	5/6/17	2035 Grasshopper Ln, Sedona, AZ
Laren Madjidi Rodvick	5/6/17	450 coffee pot dr Sedona Az
DEWEY AKERS	5/6/17	5 CASWELL DR SEDONA 86336
BARBARA BAILEY	5/6/17	2060 MAXWELL HOUSE SEDONA
Chris Gruneberg	5/6/17	45 LITTLE ELF DR SEDONA
Noël Dupree	5/6/17	65 Little Elf Dr Sedona
Lynn Gentile	5/6/17	2270 Vista Sedona
Steve Gentile	5/6/17	2270 VISTA SEDONA
Lauren McCue	5/6/17	110 Little Elf Dr Sedona
CINDY ANDERSON	5/6/17	115 Little Elf Dr
Carol Bittinger	5-6-17	135 Little Elf Dr. Sedona
Tarra Walter	5-6-17	
Mary Hoffmann	5/5/17	160 Little Elf Drive
Richard W. [illegible]	5 May 17	155 " " "
Jean [illegible]	5/5/17	" " " "

SAVE SUGARLOAF FROM CELL PHONE TOWER!

NAME	DATE	ADDRESS
Diana Sparks	5/14/17	Sedona West Sub
George Sparks	5/14/17	" "
Amanda Rigg	5/14/17	Sedona, West
ARTHUR POOLE	5/14/17	SEDONA, WEST
SIERRA McKENNA	5/14/17	SEDONA WEST
Robert Dale	5/14/17	OCC
Cheree Dale	5-14-17	OCC
KEITH PEIRCE	5/14/17	VILLAGE OF OAK CREEK
Leane LeBlanc	14-05-17	NB Canada
Janelle Ripley	14/5/17	New Brunswick, Canada
SAMANTHA HARDY	5-14-17	SCOTTSDALE, AZ
Lara Michele	5/15/17	Sedona, AZ
James Madison	5/15/17	Sedona, AZ
Gil Waldo	5/15/17	Prescott AZ
Justin Whittaker	5/16/17	West Sedona
Carol Riney	5/16/17	Little Elf Dr
Kristy Kimsey	5/14/17	" " "
Leah Jan LINDNER	5/15/17	75 Caswell Drive
PAUL V WAND	5/15/17	445 coffeepot DR
Helen Proctor	5/16/17	West Sedona

Thank You!

SAVE SUGARLOAF FROM CELL PHONE TOWER!

NAME	DATE	ADDRESS
Gail West	5/11/17	265 Flamingo Meadows Way
Cindy Lee	5/12/17	2000 Maxwell House Dr
Carol Landauer	5/12/17	30 Coffee Cup Dr.
Vera Hendrix	5-12-17	325 Coffee Pot
Cynthia Mabry	5-12-17	39532 S. Hwy 89
[illegible]	5/12/17	30 Maxwell House Dr
E. Bussa	5/12/17	30 Maxwell House Dr
L. Hudak	5/13/17	115 Stutz Bearcat
H. Hudak	"	"
B. Ernst	5/13/17	11363 W. Smooth Pumice Sk
Mark Huebner	5/13/17	80 Caswell.
Kelly Boeddeker	5/13/17	Sedona
Helen Lassen	5/13/17	Flagstaff
LAURA KOLLER	5/13/17	SEDONA
RON TRUMAN	5-13-17	Sedona Western Hills
JANINE JENNINGS	5-13-17	400 FARMER BROS DR
RICHARD BRENNICH	5-13-17	400 FARMER BROS. DR
Benjamin Walls	5-13-17	1935 Maxwell House Dr.
Vicky George	5/17-17	2280 E Mule Deer

Thank You!

SAVE SUGARLOAF FROM CELL PHONE TOWER!

NAME	DATE	ADDRESS
Ty Hudnall	5/6/17	775 Andante Dr.
Tina Penman	5/6/17	775 Andante Dr.
Jeanne Yancer	5/6/17	155 FARMER Brothers Dr.
Kimberly Trefz	5/6/17	115 Farmer Brothers Drive.
R. Swan	5/6/17	75 HARMONY
Suzanne Wilson	5/7/17	75 GROUNDS DR
Ben Tannin	5/7/17	535 Rodeo Rd
AL NEMOFF	5/7/17	~~SANTA~~ 230 MISSION
SHELLEY BURKE	5/7/17	230 MISSION
Leslie Kelly	5/7/17	1630 Fabulous Texan
David Kelly	5/17/17	1630 Fabulous Texan
Sharon Stapleton	5/7/17	1530 Sanborn Dr
Erica Swain	5/7/17	1530 Sanborn Dr.
Danielle Baker	5-7-17	237 McAllister St.
Rebekah Lucero	05/07/2017	7008 E Gold Dust Ave
Sherry Cooley	05/07/2017	13248 N. 39th Ave
Tara Valentine	5/7/17	410 [illegible] Jordan Rd.
Ryan DeRouen	5/7/17	15 SANTA BARBARA Drive
Shana Paredes	5/12/17	15 Santa Barbara Dr.
Alexander Mazzone	5/12/17	15 SANTA BARBARA DR.

SAVE SUGARLOAF FROM CELL PHONE TOWER!

NAME	DATE	ADDRESS
L. Gale	5/11/17	Grounds Drive
Terry McKibben	5/11/17	2020 Buena Vista
KIRSTEN EDIN	(5/11	Sugarloaf
Kristi Johnson	5/11/17	230 Juniper dr.
Doug Johnson	5/11/17	230 Juniper Dr.
Megan Johnson	5/11/17	165 New Castle In #17
Matt Switzer	5/11/17	165 New Castle In #17
Bryan Smith	5/11/17	75 Caswell Dr
Evelyn Guadalupe	5/11/17	2900 Hopi Dr.
Colette Wallisch	5/11/17	170 Farmer Bros. Dr.
Carolyn Anderson	5/11/17	255 El Camino Rd.
Chenoa White	5/11/17	255 EL Camino Rd
LORNA JACKSON	5.11.17	195 Little ELF DR
Ben Singer	5.11.17	85 Last Wagon Dr
Jann Martin	5.11.17	130 VISTA BONITA DR.
Joel Casey	5/11/17	P.O. Box 391
Roger Clark	5/11/17	260 Coffee Pot Dr Sedona
Bonnie Hudgins	5/12/17	85 little ELF Sedona
Nadia Terra	5/12/17	85 little ELF Sedona
Charity Cigal	5/12/17	480 Coffee Pot Dr
Joyce Pittman	5/18/17	240 Ross Rd Sedona AZ

Thank You!

SAVE SUGARLOAF FROM CELL PHONE TOWER!

NAME	DATE	ADDRESS
Emily Harding	5-14-2017	4928 PAULA Ave, ClarkstonMI
Jake McNeil	5-14-0'17	13880 rattalee lk rd clarksburg MI 48346
Scott Hays	5-14-17	17155 HIDDEN POINT DR. OH. 44023
Jordyn Hays	5/14/17	" "
Carlyn Hays	5/14/17	
Christy Hays	5/14/17	
Gavin Cianci	5/14/17	" "
BILL ARENDT	5/14/17	10224 BRITTENFORD DR. VIENNA VA. 22182
MARLA RUNDT	5/14/17	" " "
MARCEE OSMONOVICH	5/14/17	85 Lipton Drive, Sedona
CASEY OSMONOVICH	5/14/17	85 Lipton Drive Sedona
HANS RAHM	5/14/17	BASEL SWITZERLAND
Ruth Rahm	5/14/17	BASEL Switzerland
[illegible]	5/14/17	MANITOBA CANADA
Gail Brooks	5/14/17	Manitoba, CANADA
J. RAINWATER	5.14.17	P.O. BOX 2317, PHOENIX 85002
M. Mendenhall	5-14-17	104's N 11th PL Unit1 Phoenix, AZ 85021
Bonnie Grace	5.14.17	1985 Maxwell House Dr, Sedona 86336
Jeanne Wolf	5-14-17	3810 Windward Rd GB, WI 5302
Renée Ummus	5.14.17	1244 Pond View - DePere, WI
Joyce Dudek	5-14-17	525 E. Eagle Ter, Green Bay, WI
[illegible]	5-14-17	380 N. Lynndale Rd Green Bay WI 54303

SAVE SUGARLOAF FROM CELL PHONE TOWER!

NAME	DATE	ADDRESS
[illegible]	5/14/17	1240 E Linda Vista FLAGSTAFF
[illegible]	5/14/17	1240 E Linda Vista
[illegible]	5/14/17	42 Sienmact Sedona
[illegible]	5-14-17	PO Box 401 Sedona AZ 86339
[illegible]	5/14/17	PO Box 442 JACKSON NH 03846
Robert T. [illegible]	5/14/17	PO Box 1028, GLEN, NH 03838
Trance Kelley	5/14/17	85 Caswell
Madelyn Gonzales	5/14/17	85 Caswell
[illegible]	5/14/17	2502 E. Browning Pl Chandler AZ
[illegible]	5/14/17	2502 E Browning PL Chand AZ
Kevin McEnaney	05/14/17	17 Attitash Woods Rd. Bartlett, NH 03812
Darlene McEvoy	5/14/17	17 ATTITASH WOODS RD. BARTLETT NH 03812
Lauren Lewis	5/14/17	200 Calle Del Norte Sedona AZ
Barbara Lepper	5/14/17	45 Caswell Drive
[illegible]	5/14/17	45 Caswell Drive

SAVE SUGARLOAF FROM CELL PHONE TOWER!

NAME	DATE	ADDRESS
Allyson Waak	5/8/2017	495 Smith Road, Sedona.

Thank You!

SAVE SUGARLOAF FROM CELL PHONE TOWER!

NAME	DATE	ADDRESS
Mary Paquette		120 Thunderbird Dr.
Bren Paquette		" " "
Melianna Anastasiodis		105 castle rock trail
Lee Ann Berner	5-6	120 Carrol Canyon Dr.
Aldona Holland	5-6	345 Van Deren Rd
Kim Chisholm	5-6	537 SCHNEBLY RD
Jerry O Burgstedt	5-6	3661 E. Comanche Dr.
[illegible]	5/6	965 Rodeo Road Sedona
Linda Carter	5/6	330 El Camino Rd Sedona 86336
Lane Bodger	5/6	POB 1776 Sedona 86339
Bobbi Steinmetz	5/6/17	2675 W. SR89A #1244 Sedona 86336
Sarah Brown	5/6/17	250 Manzanita Dr. Sedona 86336
Rain Laudisio	5/6/17	305 Oak creek Blv. Sedona, 86336
Crystal Sunn	5/7/17	365 View dr. Sedona AZ 86336
Laura Schappert	5-7-17	35 Sunshine Ct Sedona AZ 86336
Rita Harding	5/8/17	603 Desert Sage Ln Sedona 86336
Christy Clouse	5/8/17	50 Corrico Way Sedona
DAVID RAMIREZ	5-8-17	85 RIMROCK RIDE.
~~Lee Ann B~~	~~5-8~~	
Kathy Featherstone	5/9	330 Apple Ave, Sedona, AZ
Marci Taylor	5/6	2060 Grasshopper Lane, Sedona AZ

SAVE SUGARLOAF FROM CELL PHONE TOWER!

NAME	DATE	ADDRESS
Debra Fleegs	5/10/17	465 Little Scout Rd.
Shari Ham	5/10/17	55 Cindy Lane 86336
Kandy Shaoul	5-19-17	51 Calle Del Arboles 86336

SAVE SUGARLOAF FROM CELL PHONE TOWER!

NAME	DATE	ADDRESS
Garrett Jayal	May 16, 2017	500 Washington St. Hoboken NJ 07030
Melissa Jaime	May 16, 2017	500 Washington St. Hoboken, NJ 07030
Kendra Mark	May 16, 2017	130 Canyon Wren Dr. Sedona
Blair Darby	May 17, 2017	100 El Camino Rd 86336

SAVE SUGARLOAF FROM CELL PHONE TOWER!

NAME	DATE	ADDRESS
Jackie Berger (signature) JACKie Berger	5/17/17	1910 Sanborn DR
Paul Berger	5/17/17	"
Peter Ney	5/17/17	300 Pony Soldier [illegible]
Yvonne Ney	5/17/17	"
Lorie McClure	5/17/17	674 Mountain Shadows
Frans [illegible]	5/17/17	674 Mountain Shadows Dr.
Wm. Watkins	5/17/17	230 Last Wagon Dr.
Samantha Malinski	5/17/17	426 W Gila St Cottonwood, AZ
GAVin [illegible]	5/17/17	
Bailey Belanger	5/17/17	145 Navajo Dr. #F2 Sedona
CHRISTIAN Cuff	5/17/17	145 NAVAJO DR.
Peggy Sands	5/17/17	80 Caswell Dr. Sedona
KAREN PUCKETT	5/18/17	650 Mtn. Shadows Sedona
BARBARA MARCUS	5/18/17	1845 Gun Fury Sedona
David Marcus	5/18/17	1845 Gun Fury Sedona
Jim Puckett	5/18/17	650 MOUNTAIN SHADOWS
		Thank You!

SAVE SUGARLOAF FROM CELL PHONE TOWER!

NAME	DATE	ADDRESS
Hannah MISchler	5/16/17	809 Nesbitt Rd Maple PA 19002
Austin Joyal	5/16/17	53d Horizon Way Branchburg NJ 08853
Lauren Broekemeier	5/16/17	1950 Maxwell House Dr Sedona, AZ
Stephanie Smith	5/16/17	#8 Sedona Shadows Sedona 86336
Brianna Solis	5/17/17	55 Birch Blvd, Sedona AZ 86336
MARIA TONELLO	5-17-17	2870 W 89th SEDONA 86336
Diane Nowak	5-17-2017	400 Bart River Rd Clarkdale AZ 86324
Erika Netzband	5-17-17	1901 W. Madison St. Apt. 17, Phoenix, AZ 85009
Briana Diaz	5/17/17	220 Stardust hn. Sedona AZ 86336
Amy Carter	5/17/17	200 E Cortez Dr #42 Sedona 86351
Zac Timmons	5/17/17	50 Sombast Ln, #209, Sedona, 86336
Mara Leake	5/17/17	330 Zane Grey Dr Sedona 86336
Shayla DeAment	5/18/17	180 Harmony Dr.

SAVE SUGARLOAF FROM CELL PHONE TOWER!

129 SIGNATURES

NAME	DATE	ADDRESS Need to put full address
Matthew Reid	5/19/2017	89a
John Lakowski	5/19/17	
Alan Lakowski	5/19/17	
Kathryn Wilson	5-19-17	89A
[illegible]	5-19-17	"
Jenn Strattmeyer	5-19-17	"
Laura Toito	5-19-17	"
[illegible]	5-19-17	"
[illegible]	5/19/17	
[illegible]	5/19/17	"
Cheryl Lee	5/20/17	"
James Lucy	5/20/17	Lupton Drive
Ginnie Murphy	5/20/17	Texas
Teri Murphy	5/20/17	Texas
Sean Haines	5/20/17	Tofocto
Olivia Haines	5/20/17	Toronto
Shaye Mann	5/20/17	Mt. Shadows, Sedona
Debra May	5/20/17	2271 Roadrunner Rd. Sedona
Gary Hendrickson	5/20/17	15 Windmill Dr. Sedona 86336

Thank You!

SAVE SUGARLOAF FROM CELL PHONE TOWER!

NAME	DATE	ADDRESS
Robin Welty	5/19/17	77 Morning Sun Dr Sedona 86336
Melissa Thomas	5/19/17	125 Mt Shadows
Don Burns	5/19/17	750 Rolling Hills Rd.
Jim Hanlee	5/19/17	160 Wild Flower Circle Sedona AZ
Thomas Messina	5/20/17	240 Mountain Shadows Sedona
JEFFREY JONES	5/20/17	240 Mountain Shadows Sedona
Ehren Moler	5/20/17	6635 N. Jamison Blvd, Flagstaff, A
Cassandra GEORGE	5/20/2017	7339 E NORTHLAND DR, Scottsdale, AZ
ELIZABETH GEORGE	5/20/2017	372 ELK TRAIL, whitefish, MT 59937 85263
Daniel Appel	5/20/17	445 Coffee Pot Dr
Sean Bark	5/20/17	445 Coffee Pot Dr
Clay Bonekemeier	5/21/17	1594 Black Eagle Dr San Diego CA
JANE CONLON	5/21/17	813 Dusty Rose Dr Sedona
DAVID J SPERO	5/21/17	P.O. Box 4098 SEDONA, AZ 86340
Barbara Hofmann	5/21/17	160 Little Elf Sedona 86336
Lauren Welsh	5/21/17	835 Dusty Rose Dr. Sedona 86336
Matt Bernsdorf	5/21/17	1152 Oakwood Ln. Westerville, OH 43229

SAVE SUGARLOAF FROM CELL PHONE TOWER!

NAME	DATE	ADDRESS
Charles Van Block	5/21 [illegible]	560 Sunshine Lane
Keith Merrill	5/21/17	80 Grounds Dr
E B Merrill	"	"
Alexander	05/20/17	300 Hillside Ct
Christi Kaspar	5/22/17	Austin, TX
Ken Dale	"	"
Thomas Kroner	5/22	2925 W Rancho, PHX, AZ
Serena Hsieh	5/22	2925 W Rancho, PHX, AZ
Doug Bower	5/22	245 Ross, Sedona
Diana Doran	5-22	2109 Sanborn Dr
Necole Zeigler	5-22	75 Birch Blvd #A
Chandler [illegible]	5/22	5925 N. Beatty Dr. Rimrock
Mary Watson	5/23	3223 Calle Del Montana
Don & Jaque	5/23	265 Jackrabbit Lane
Leonard Taczo	5/23	" " "
Patricia Shuy	5/23	" " "
Alex [illegible]	5/23	15 Caswell R
Sudie Shipman	5/23	140 Camino Del Sol Sedona
Bevin McCabe	5/23	53 Bell Rock Dr, Sedona, AZ

SAVE SUGARLOAF FROM CELL PHONE TOWER!

NAME	DATE	ADDRESS
Mark Russell	5-23-17	Ojuelos Jalisco Mexico
[illegible] Russell	5-23-17	Ojuelos Jalisco mexico
[illegible] Brown	5-23-17	65 Ranch Rd Sedona
Doyle Dodge	5-24-17	2555 Leisure Ln, Sedona
Charles Ness	5-24-17	910 N Cactus Cottonwood
Deb Rae	5/24/17	910 N. Cactus St. Cottonwood
Keith Dedenbach	5-25-17	2015 Maxwell House Dr. SDA
EVAN GRIGGS	5-25-17	137 TIGER LN. ROEBUCK S.C.
George Braam	5-25-17	275 Goodrow, Sedona
Linda Braam	5-25-17	275 Goodrow Sedona
Jim Reich	5-25-17	PO Box 1280 86339
Megan Rinebarger	5-26-17	1013 Beards Hill Rd M-119
JOHN BUXBAUM	5-26-17	35 JOHNNY GUITAR SEDONA
CAROLYN BUXBAUM	5-26-17	35 Johnny Guitar SEDONA
Leoni Winter	5-26-17	123 W Gorham Street, Madison (WI)
Sylvia Horne	5/26/17	25658 W [illegible] Rd. [illegible]
Kevin and Angela Restivo	5/26/17	07676 New Jersey
Julie Randolph	5-27-17	2222 Memorial Houston TX
ANN DONOHUE	"	VANCOUVER, BC

SAVE SUGARLOAF FROM CELL PHONE TOWER!

NAME	DATE	ADDRESS
Jonathan Sprague	5/27/17	2020 Sanborn Dr. 86336
Darius Rustam	5/27/17	2675 W. SR89A, #1323, Sedona
TIFFANY DAVIS-RUSTAM	5/27/17	2740 SANBORN DR 86336
Lawrence Moughan	5/27/17	1013 Calle Figura, RD 86324
Jasmina Henley	5-27-17	228 Diaz St Jerome 86331
Tiffany Donibo	5/27/17	2105 Sanborn dr 86336
Bonnie Perry	5/27/17	510 Coffee Pot Dr 86336
Will Hanson-Regan	5/27/17	3710 Tauber St, KCMO 64
Christa Christian	5/27/17	5444 E Dragoon Ave Mesa AZ
Brittany Peña	5/28/17	4120 Dawn Ave, SD, CA 92115
Brooke Birrenkott	5/28/17	4616 Campus Ave, SD, CA
Remi Cohen	5/28/17	11340 Camu Linda Cir Clp, tx
Ryan Sands	5/28/17	11340 Camu Linda Cir Clp, tx
Jamie Chou	5/28/17	3819 18th St SF, CA
Wez Holder	5/28/17	3819 18th St SF CA
Martine DiBenedetto	5/28/17	9118 Hemlock Av. Prescott
YESAI SELLASSIE	5/28/17	77 LEUPP FLAGSTAFF AZ
Mother EArth GAiA	5/28/17	77 leuPP FlAgStAFF AZ
DAncing leAF	5/28/17	77 leuPP
MiA Bella Sunshine	5/28/17	77 leuPP
QuestAFArI	5/28/17	77 leuPP
Pedro Bruaie	5/28/17	77 LeuPP

SAVE SUGARLOAF FROM CELL PHONE TOWER!

NAME	DATE	ADDRESS
Dan Gardner	5 28 17	Anthem AZ
KARTHICK NATARAJAN	5/28/17	
[illegible]	5 28 17	Charlotte NC
ANAMIKA KAK	5/28/17	CHARLOTTE NC
Sarica Shekhar	5/28/17	California (Walnut Creek)
Mukul Shekhar	5/28/17	" "
KRISTEN HANSON	5/28/17	KANSAS CITY MO 64111
Denise Kast	5/28/17	Canton, Ohio 4478
Derek Daugherty	5/29/17	380 coffee Pot DRIVE
Heather Fairfield	5/29/17	Yucca Dr
Elinna Ortiz	5/29/17	Pastoral pl.
Wren Putnam	5/29/17	Ross Rd.
[illegible]	5/29/17	Prickly Pear
Vicky [illegible]	5/29/17	STONE WAY
Arielle Bogness	5/30/17	PO Box 3554 Sedona AZ 86340
Azael Gonzalez	5/30/17	460 concord Dr Sedona AZ 86336
Cris Lara	5/30/17	35 Grey mountain Dr

Thank You!

SAVE SUGARLOAF FROM CELL PHONE TOWER!

NAME	DATE	ADDRESS
Allison Davis	5-17-17	150 BUDD WAY Sedona
Tyler Davis	5-17-17	150 BUDD WAY Sedona
Eliana Frim	5-18-17	445 Coffee pot Drive
Adam Vallequette	5-18-17	445 Coffee pot Drive
Paul Wark	5-18-17	445 Coffee pot Drive
Paul Berard	5-16-	1910 5th Ave
Kim Rein	5-18-17	1660 Gambell St Anchorage AK
Chalon Rein	5-18-17	Same " "
Tina Lenn	5/18/17	775 Andante
Kurt Schmidt	5/18/17	Andante
Trevor Lancaster	5/18/17	5310 Park Ave NC
Jessica Patrick	5/18/17	5310 Park Ave NC
Charles Vissa	5/18/17	15 Sycamore Canyon Rd Sedona
		Thank You!

SAVE SUGARLOAF FROM CELL PHONE TOWER!

NAME	DATE	ADDRESS
Rich + Judy Berg	5-31-17	370 Indian Cliffs
Ben Beck	5 31 17	Phoenix AZ
Sean Sullivan	5-31-17	550 Oak Creek Blvd.
Kieran Kael	5-31-17	Parrish FL

In regards to the proposed wireless tower site at 11 Newcastle Lane,

The neighboring property at 70 Newcastle Lane is a historic property in this historical area. It was home to the salvage of the Call of the Canyon, a Creekside Cabin and Oak Creek Bait and Tackle. The historically designated Owneby Irrigation Ditch runs through the property and was incorporated by the previous residents Kay and Clyde Tillotson. There is a tranquility here that is offered by the sensitivity of the area, the established wildlife reside in this area because of this sensitivity.

The lift station property the city is proposing for a 20' wireless tower is in a valley on a mountainside in this historical area of Oak Creek, the property is near the creek surrounded by established natural wildlife such as rookeries, it is next to the historically designated irrigation ditch and is less than 100 feet from my creekside property and home. A historical creekside home with irrigation is a rare and special place in the desert, this must be considered in accordance with Article 17 WIRELESS COMMUNICATIONS FACILITIES, section C, which states " Consideration of historical and environmentally sensitive areas as well as consideration of potential impacts on adjacent properties; ". This article indicates that the City of Sedona is being negligent and has not in any way taken into consideration the impact of the proposed wireless tower on this historical creekside area.

The geographical maps that were presented by the city do not represent what the coverage would potentially look like from the proposed sites. The mapping does not accurately show the actual amount of coverage that would be gained by these specific proposed sites. This came to my attention and was confirmed, it seems impossible for a 20' tower placed at 11 Newcastle Lane to actually be effective as it is in a creekside valley nestled up against a mountainside which would give it a maximum of a 180 degree coverage radius, all this is clear when visiting this specific proposed site. Of course, if the city adds the allotted 20' addition and turns the proposed 20' tower into a 40' tower perhaps they will achieve more than 180 degrees of coverage radius. This is not the ideal location for an additional tower to support the area around Highway 179, it is simply a city site in this general area. Perhaps there is a private location or a place in the nexus that is better suited, with less impact if any and offers more coverage because it is in an ideal geographical location.

In regards to the lift station that was put in at 11 Newcastle Lane, the City of Sedona has already neglected their part of the road and drainage maintenance which has caused me a great deal of flooding damage and this neglect is an on going issue at this point. This area can flood during heavy rains making it impossible to get a utility vehicle down the road for repairs during and after a storm, a wireless tower placed here could go out and become inaccessible to fix due to the sensitivity and vulnerability of the area.

People are always making decisions that affect our lives without even asking us what we think. On a local level we'd like to think that our ideas are actually considered, actually valued, as we work towards building a community we enjoy living in. Yes, we would like to be considered when decisions are being made that directly affect us and could cause great change for us. We'd like to know that important decisions are being made with care, that they are being re-evaluated and re-considered until there is only benefit to the city and those who call it home. When the local authorities make decisions that threaten the survival of the life we have and continue to work to create within the community, what are we meant to do?

Ron Eland of the Red Rock News and city officials have expressed that they are vetting the city's choices. As I experience the city exercising control, they are my neighbor and they are proposing to eventually put up a wireless tower less than 100 feet from my creekside home. Seven homes in the Newcastle Lane area are directly affected by this decision. If a tower goes up, the views and property values will be compromised as well as the historical and sensitive nature of this area. This decision will affect all the residents who live and enjoy these private tree lined roads everyday. The City of Sedona will in essence make us bear a burden that doesn't make sense or even need to be born. When entrusted to the city this area and my property have already suffered due to their negligence, so at this point it makes more sense to trust my neighborhood, the carriers and the federal government to choose, perhaps they won't even come near this historical, creekside, mountainside valley that I call home.

Kind regards, Kimberly

Dear Sedona Officials: June 1, 2017

I present today no matter of mere concern, but solely matters of substance, fact and law.

It is essential that you vote NO on all 5G wireless proposals and applications. 5G is an unnecessary taking of public funds and property values, alongside losses of public health and safety, and human and agricultural productivity. Sedona has strong interest in protecting its economic base and residents' and visitors' freedom from physical injury and impairment. The 4G/5G Distributed Antenna System (DAS) would result in scientifically established hazardous radiation exposure with often immediate and therefore provable adverse effects, particularly immediate neurological and cardiologic effects.

DAS 5G involves telecoms installing powerful microwave radiation antennae, misleadingly called "small cells" to conceal their radiation power and concentration, on light poles and utility poles in the public right of way. Poles may be only 15-20 feet from homes and offices. Thousands of these antennae and large power supplies would be placed on residential blocks and farms, deploying radio frequency / microwave (RF/MW) radiation penetrating homes and bodies 24/7/365 forever.

Pulse-modulated RF/MW radiation, particularly this close to homes, offices and farm animals, is a "hazard", as acknowledged by IEEE and FCC in 1991 in the guideline-setting process.

Although proponents claim a financial bonanza from DAS 5G deployment, there is no evidence to support it. In fact, the Russians refused 5G as badly engineered (as also US engineers have admitted) and instead provided fiberoptics, which works much better, to all homes and apartments in large cities. Furthermore, cell phones are a mature industry: everyone who wants a cell phone already has one.

We oppose 5G based on health and agricultural science, with human and animal physical injuries and impairments, violation of federal and state laws, and violation of the powers of local government.

Health and agricultural science, and physical injury/impairments to human, animals, insects:

The Chair of the original FCC guideline Committee himself (John Osepchuk) acknowledges >20,000 scientific studies, with immediate, short-term and/or long-term adverse effects from RF/MW radiation.

5G RF/MW radiation has a 20-inch wave that penetrates the body deeply and is particularly harmful to babies and children. Four wavelengths, each 2-4 inches, are optimally absorbed by the human brain, heart, liver, thyroid, kidneys, and reproductive organs, impairing their functions. Effects include headaches, insomnia, tinnitus, heart

arhythmia, suppressed melatonin production (essential for sleep, productivity and the immune system), DNA damage and much more. The final ten simultaneous wavelengths of 1/10 to ½ inch target the eyes, ears and skin, and fall within the resonance of pollinating insects' antennae, producing bee colony collapse. The U.S. National Institutes of Health, National Toxicology Program's 16-year, $25 million study concluded in 2016 that cell phone RF/MW radiation causes cancer of the brain (glioma) and the heart (schwannoma). 5G radiation is even worse.

Incredibly, no monitoring of actual radiation emissions from 5G antennae in homes or public places is intended. The relevant FCC guideline was based in fraud from the start and has not been updated since 1996 to reflect current scientific knowledge. It does not protect against biological harm, and is based on a false absorption model of a doll head filled with water! It utterly fails to protect children, whose brains are still developing and whose skulls are thinner than an adult skull. Studies show that RF/MW radiation even less potent than 5G is harmful to every human, animal, insect and plant.

Proponents misrepresent the Telecommunications Act of 1996 (TCA) as preempting all state and local regulation of wireless facilities. State and local governances are preempted only from regulating the "placement, construction, and modification" of wireless facilities based on their "environmental effects". Preemption includes neither health effects nor health science. Nor is regulation of operations preempted on any basis. State and local governments remain authorized and obligated to regulate every activity not preempted by TCA, and on every basis not preempted.

Violation of federal laws:

Allowance of any 5G wireless facilities would not only violate TCA: it would violate the Americans with Disabilities Act (ADA) and the Federal Fair Housing Act. These laws guarantee equal access for all, but 5G would make public places and federal housing, not to mention *all* housing, uninhabitable for already injured, impaired and/or electromagnetically sensitive (EMS) persons. Sedona says it requires compliance with ADA, but given 5G's multiple simultaneous wavelengths, its intensities, and its15-degree, near-maser (direct-energy weapon) arc of radiation concentration, compliance is impossible.

Sedona must protect health, safety, agriculture and its own economy. 5G would sacrifice it all, with resulting chronic health problems and loss of productivity by some degree to all Sedonans, right where they live and work, and the permanent loss of agricultural pollinators. Please oppose 5G throughout Sedona now. The Federal TCA authorizes you so to do.

Thank you.

Richard Sacks, Independent holistic health scientist since 1965
richardatlostartsradio.com or richard at globalleadersconsulting.com

July 18th, 2017

Dear City Councilors,

This letter and the attached petition are to express the concern of us Sedona residents who live in the vicinity of 700 El Camino Road. We are aware that this location is one of 20 sites that the City is considering leasing for the purpose of a new cell phone tower installation. We are opposed to this line of action.

Urban Density vs. Rural Density Models: We understand that the City is embracing an urban density model rather than a rural density model for the placement of these towers in our small town. We don't think this is appropriate. We dispute that there will be much of an increased demand for cell phone coverage in the future - especially since census data shows that the city population has decreased from 11,436 (2009) to 10,388 (2016). The urban density model requires twice the number of wireless infrastructure sites than the rural model and increases the negative effects on health and safety, aesthetics, and property values.

Existing Sites: According to the FCC cell tower database, there are already at least 44 cell phone and antenna towers registered in Sedona. If increased coverage is truly necessary, why not build on these existing sites, instead of establishing new ones? Utilizing newer and safer technology solutions on the existing sites would mean that additional towers would no longer be necessary to build up our wireless infrastructure.

Not an Optimal Site: The site at 700 El Camino is in a valley or depression. Thus a cell tower there would have to "work harder" in order to disseminate its signal, thereby increasing the electromagnetic pollution in the vicinity. This is not an optimal site for a proposed new tower because it would increase public exposure to health hazards.

Health Concerns: We are aware that federal regulations prohibit health concerns from being used as reasons to disallow the installation of new cell phone towers. However, there is a very real health risk to people living near these towers. The majority of worldwide studies on this subject conclude that cancer rates and numerous neurological problems (headaches, memory changes, dizziness, sleep disturbances etc.) increase among populations close to cell phone towers. Towers emit radio frequencies for up to 2 ½ miles; and negative health changes have been verified up to 1,600 feet away.

An overwhelming majority of the residents we polled in our affected neighborhood was very concerned and signed the attached petition. We urge you as our public representatives to reconsider this issue and not to allow the installation of any more cell phone towers in our town. It is a matter of public health. Specifically we ask that you remove 700 El Camino Road from the list of possible new installation sites. Thank you for your time and consideration of this matter.

Sincerely,
Residents of El Camino Road, Arroyo Pinon Drive, Arroyo Drive, Carol Canyon Drive, Table Top Road, Thunderbird hills and Sedona meadows.

Save Arroyo Pinon and El Camino from Cell Phone Tower !

Name	Date	Address & Email or phone #
Kristina Paley	6/20/17	280 Arroyo Pinon DRIVE, Sedona 86336 paleyk@gmail.com
Steven Paley	6/20/17	280 Arroyo Pinon Drive, Sedona 86336 chorold1@yahoo.com
Lorna Menard	6/21/17	295 Arroyo Pinon Dr. lornamenard Sedona, Az. 86336 @gmail.com
Richard Menard	6/21-17	295 Arroyo Pinon Dr Sedona AZ 86336
Sahar Paydar	6,21,17	410 Arroyo Pinon Dr Sedona, AZ 86336 Saharp@msn.com
Farshid Paydar	6,21,17	410 Arroyo Pinon Dr Sedona, AZ 86336
Rhonda Peck	6/21/17	(no mail) 425 Arroyo Pinon Dr. Sedona 86336 drpck@npgcable.com
Ron Raimonde	6/21/17	510 Juniper Dr northwall65@gmail Sedona, 86336 .com.
Kimberly Tucker	6/21/17	260 Arroyo Pinon Dr. Sedona AZ 86336 kimmyjtucker@yahoo.com
Sally Moore	6-21-17	370 Arroyo Pinon Dr. Sedona, Az 86336 92Sal@cox.net
Don Moore	6-21-17	370 Arroyo Pinon Dr. Sedona, Az 86336 pt.safety@cox.net
Gabriel Fiedler	6-21-17	lovefromgabriel@gmail.com 390 Arroyo Pinon Dr. Sedona Az 86336
Kate Macharen	6-21-17	AFLESCH@CENTURYLINK.NET. 325 Arroyo Pinon Dr. Sedona AZ 86336
Anthony Flesch	6-21-17	325 " Arroyo Pinon Drive Sedona AZ 86336
Amy Tedrick	6/23/17	210 Arroyo Pinon Dr Sedona, AZ 86336
Steve Tedrick	6/23/17	210 Arroyo Pinon Sedona 86336
Ethan Tedrick	6/23/17	210 Arroyo Pinon Sedona 86336
Janice Roeder	6/23/17	390 Arroyo Pinon Dr. 86336 janicebennett935@gmail.com
Patricia Dimillo	6/24/17	edimillo@yahoo.com 385 Arroyo Pinon Dr. 86336
Ernest Dimillo	6/24/17	edimillo@yahoo.com 385 Arroyo Pinon Dr. 86334

Save Arroyo Pinon and El Camino from Cell Phone Tower !

Name	Date	Address & Email or phone #
Henry Twombly	6/23/17	350 Arroyo Pinon Dr Sedona AZ
Evan Danger	6/23/17	420 Arroyo Pinion Dr.
Pamela [illegible]	6/23/17	355 Arroyo Penon Dr
William R [illegible]	6/23/17	355 Arroyo Pinon Drive
Anne [illegible]	6/24/17	375 Arroyo Pinon Dr
Matt Seils	6/24/17	165 Arroyo Piñon Sedona
Alice Martin	6/24/17	155 Arroyo Pinon
[illegible]	6-24-17	220 El Camino Rd.
[illegible]	6-24-17	238 El Camino Rd
Scott Carter	6-24-17	330 El Camino Sedona
Linda Carter	6/24/17	330 El Camino Rd Sedona 86336
Marc Maddux	6/24/17	5 Lisa Ln Sedona 86336 marc.maddux@yahoo.com
Krysta Kirsten	6/24/17	483 El Camino Rd 206 495-1617
Nicholas Kirsten	6/24/17	483 El Camino Rd 206-300-9029
James [illegible]	6/24/17	90 El Camino Rd
Craig [illegible]	6/24/17	170 El Camino Rd

Save Arroyo Pinon and El Camino from Cell Phone Tower !

Name	Date	Address & Email or phone #
MIKE SOUZA	6/24/17	430 ARROYO PINON DR SEDONA, AZ 86336
Dag Shields	6/24/17	70 Arroyo Dr. 86336 928-606-1876
Chenoa White	6/24/17	255 El Camino Rd 928-203 1778
Carolyn Anderson	6/24/17	255 El Camino Rd 928 300-8266 86336
Evelyn Rowland	6/24/17	325 El Camino Rd 282-0039 86336
William Rowland	6/24/17	325 El Camino Rd. 282-0039 86336
Russ Hanneyer	6/24/17	600 El Camino Rd. 928 5544119
George Gutierrez	6-24-17	105 EL CAMINO Rd. 928-301 6302
Shelley Holiday	6/24/17	70 Arroyo Dr. 928-274-4787
Stephanie Maciel	7/15/17	75 Arroyo R - 928300-0775
Stella Vasquez	7/15/17	75 Arroyo Dr 928 301-5045
Mark Navarro	7/15/17	75 Arroyo DR 928 2823700
James Cathell	7/15/17	515 El Camino Rd
Chris Redish	7/15/17	180 Carol Canyon Dr credish@aol.com
Carl Dalio	7/15/17	210 Table Top Rd 7209885348
Linda Henry	7/15/17	210 Table Top Rd. Lhenry sedona Cgmail

Save Arroyo Pinon and El Camino from Cell Phone Tower !

Name	Date	Address & Email or phone #
David Sunfellow	06/24/17	325 Arroyo Pinon Drive
"	"	david.sunfellow@gmail.com 928-592-2732
John Dean	7/15/17	100 Hillside Ct. (928) 301-4155
Mary Kay Egan	7/15/17	305 El Camino 282-5515
[illegible signature]	7/15/17	305 EL CAMINO RD 282-5515
Sandra Galbreath	7/15/17	400 EL Camino Rd. 928-274-1078
Jan Bradley	7/15/17	400 EL CAMINO 970-209-7159
[illegible signature]	7/15/17	114 Deer Trail [illegible]@cox.net
Jessi K. Chevara	7/15/17	311 DEER TRL DR 928[illegible]
PEGGY DICKISON	7/15/17	165 TABLETOP RD. 282-3714
Cheryl Fleet	7/15/17	200 Carol Canyon 282-0916
Patricia Brooke	7/15/17	200 Carol Canyon 301-~~057~~ 1585
Regina Chaja Mueller ~~Brada~~ Bronstein	7/16/17	503 El Camino Rd 928 821 1187
Gerald Bronstein	7/16/17	503 El Camino Rd 928-821-2743
[illegible signature]	7/17/17	430 Arroyo Pinon Dr 928 351-7472

Save Arroyo Pinon and El Camino from Cell Phone Tower !

Name	Date	Address & Email or phone #
SHIRA GELLER	6/24/17	275 EL CAMINO RD SHIRA@LARRYGELLER.NE
Leanne Marco	6/24/17	310 El Camino - ~~602~~ 928 - 554-1470
Joseph Cosgrave	6/24/17	310 El Camino 602 550-7735
Fred Wight	6/24/17	315 El Camino 928-821-5480
Kimberly Wight	6/24/17	315 El Camino 928-300-0452
Laura Vida	6/24/17	421 El Camino Rd 300-0180
Jeffrey Klistenicz	6/24/17	421 El Camino Rd
Lucinda Evans	6/24/17	485 El Camino Rd 928-842-2812
Dana Shiloh	6/24/17	100 El Camino Rd 300 2267
Michael deKoning	6/24/17	140. El. Camino Rd. 847/257/5287
Jeff McGrath	6/24/17	35 Arroyo Drive 928.301.4060

Save Arroyo Pinon and El Camino from Cell Phone Tower !

Name	Date	Address & Email or phone #
Doug Wade	6/24/17	360 Arroyo Pinon 928 300 1370
Christina Wade	6/24/17	360 Arroyo Pinon 928 300 6070
Frank Fowsky	06-24-2017	405 Arroyo Pinon Dr. 214-708-7580
Becky "	"	"
Doug Copp	6-24-17	230 Arroyo Pinon Dr
Carol Copp	6-24-17	230 Arroyo Pinon Dr.
Susanna Bear + child	6-24-17	260 Arroyo Pinon Dr. 808-634-0957

Save Thunderbird Hills, Whippet, Stutz Bearcat, Road Runner, Hummingbird, Blue Jay, Canyon Wren, Prairie Falcon, Timber Owl and Golden Eagle, from Cell Phone Tower!

Name	Date	Address & Email or phone #
Ann Carpenter	6-15-17	170 Hummingbird Ln
Galen Carpenter	6-15-17	170 Hummingbird Ln.
CHERYL FULLER	6-17-17	210 Stutz Bearcat
BRIAN FULLER	6-17-17	210 STUTZ BEARCAT
KATHY RUDD	6-17-17	45 FARMER BROS. RD
DAVID RUDD	6-17-17	45 FARMER BROS RD
Pamela Richards	6-17-17	25 Blue Jay
RAMAZAN MENEKSE	06.17.17	95 ARLO DR.
Kendra Mark	06/18/17	130 Canyon Wren Dr.
David Castelli	06/18/17	130 Canyon Wren Dr.
Adam DaVirro	6/18/17	30 Emerald Ct.
ANDY BONNETT	6/18/17	255 PAGE PARKWAY
Austin Gates		DUSTIDENT014@GMAIL.COM
" "	6/18/17	95 Roadrunner Rd
Christina Verquer	6/18/17	175 Canyon Wren Dr
Aneela Mahmud	6-18-17	2610 Whippet Way
Lesa Peterson	6-18-17	70 Essex Ave Sedona AZ
MELODY MILLER	6/18/17	125 GOLDEN EAGLE DR
Robt Elschner Enterprises @ panara.net	6/18/17	125 Golden Eagle Dr. SEDONA, AZ

MONICA [illegible] 928 554 4089 6-18-17 125 GOLDEN EAGLE

[illegible] 6-18-17 125 Golden Eagle

Marc Maddux 6/18/2017 (5 Lisa Ln) 145 Golden Eagle marc.maddux@yahoo.com (928) 301-7716

Keri Oskar 6/18/17 sunshinekeri@gmail.com

Pamela Malone 6/18/17 190 west Hummingbird

JOUMANA MINASSIAN 30 ROLLS RD SEDONA AZ 86336 86336 lane

[illegible] 6-18-17 190 West Hummingbird sedona[illegible]@gmail.com

* Back side of previous page

Save Thunderbird Hills, Whippet, Stutz Bearcat, Road Runner, Hummingbird, Blue Jay, Canyon Wren, Prairie Falcon, Timber Owl and Golden Eagle, from Cell Phone Tower!

Name	Date	Address & Email or phone #
Greg Van Dam	6/15/17	40 Blue Jay Dr.
Jerry Austin	7/18/17	20 Hummingbird Ln
[illegible]	7/18/17	2570 Timber Owl
Rachel Grant	7/18/17	2570 Timber Owl
Veronica Sunbellow	7-18-17	190 hummingbird lane
Ron Whipple##	"	95 Canyon Wren Dr
Marlene McCoy	7/19/17	10 N Hummingbird Ln
Barry McCoy	"	"
Paula Starcher	"	"
Gary Corey Damaskos	7/18/17	mgary@gmail.com 80 Roadrunner Rd
Mara Davis	7/18/17	80 Roadrunner Rd.
Ed Cruz	7/18/17	105 Blue Jay Dr.
RDK	7/18/17	125 Blue Jay Dr.
Eli Bachar	7-18-17	125 Blue Jay Dr.
Josh Bachar	7-18-17	125 Blue Jay Dr.