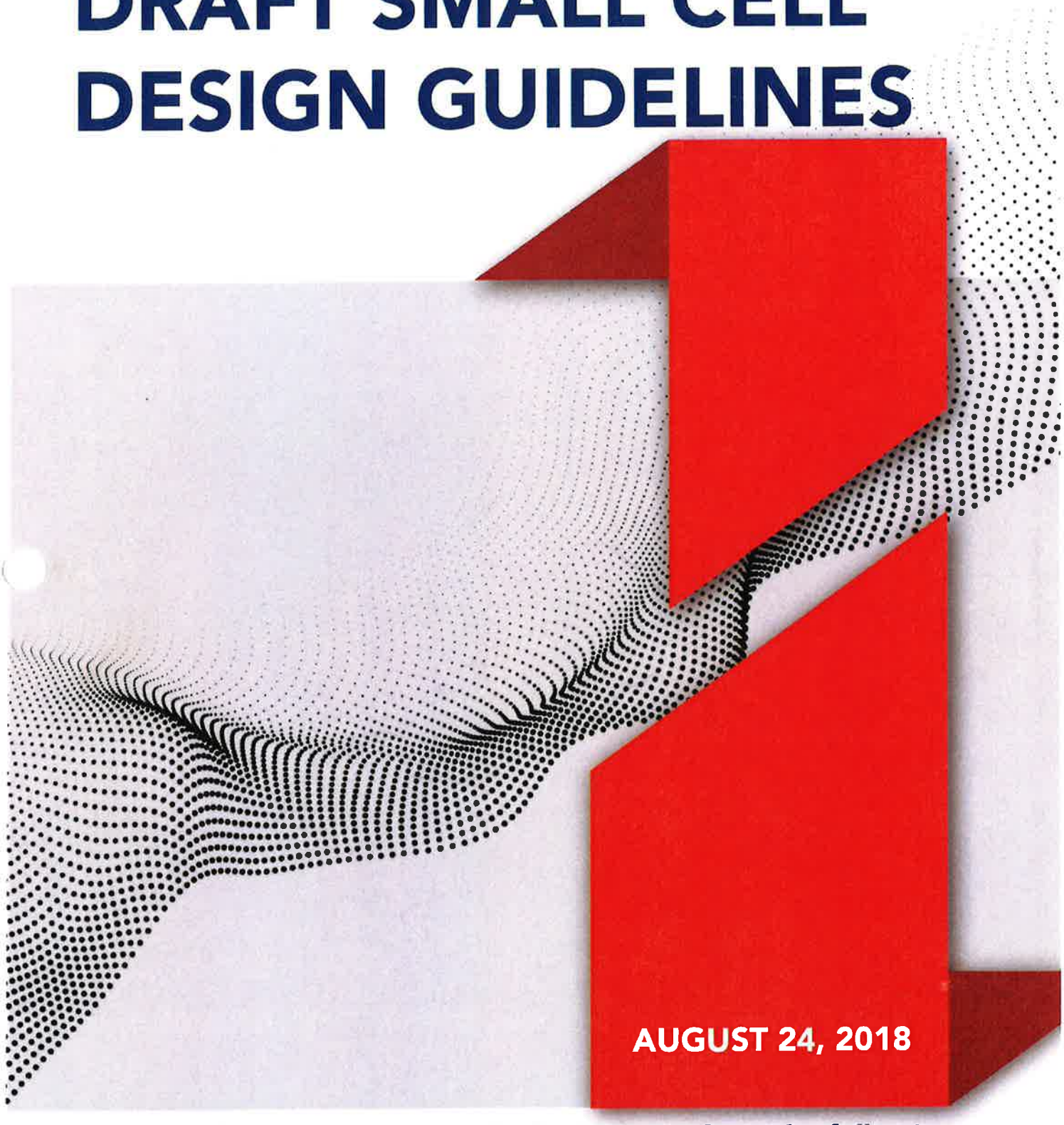
DRAFT SMALL CELL DESIGN GUIDELINES



The guidelines have been drafted with input from the following:

U.S. COMMISSION OF FINE ARTS
ESTABLISHED BY CONGRESS 17 MAY 1910

National Capital Planning Commission

GOVERNMENT OF THE DISTRICT OF COLUMBIA
MURIEL BOWSER, MAYOR

DRAFT SMALL CELL DESIGN GUIDELINES
8/24/2018

TABLE OF CONTENTS

1. Background

1.1. The District of Columbia has a history spanning more than two centuries establishing a unique streetscape that sets it apart from any other city in the world. A crucial component of that streetscape is its extensive network of public space. The public space enhances the quality of life for our residents and visitors, and ensures that the city has the foundation to become a more walkable and sustainable city. **The District's public space is a valuable and intentional asset that requires careful stewardship to maintain its integrity and safeguard it as a legacy to future generations**. This heritage is safeguarded through the work of many agencies, including the District of Columbia's Historic Preservation Office and Public Space Committee (among others), and the Federally constituted Commission of Fine Arts and National Capital Planning Commission. Any new use made of that public space must be cognizant of and adapted to the special characteristics of the District of Columbia.

1.2. To address the growing demand for wireless technology across the United States, cellular providers propose to increase the capacity of their networks by deploying small cell infrastructure (Small Cell), a new lower-powered antenna technology, to reduce data traffic load on roof mounted equipment and larger cell towers. This new technology requires infrastructure to be installed in closer proximity to the users on the ground; this infrastructure will affect the aesthetics of public spaces.

1.3. Small Cell infrastructure consists of antennas and related power equipment that transmits wireless signals to improve reliable data streaming. This infrastructure will provide cellular and data coverage to smaller geographic areas. New Small Cell facilities will improve the provider's ability to meet the public's current 4G (LTE) voice and data demands and the future 5th generation cellular needs for interconnected devices to operate at high speeds to access data.

1.4. Cities across the nation are beginning to address the issue of balancing the need to accommodate the increased cellular demand with their community's public space character and function.

1.5. To provide the necessary coverage, each cellular provider will install infrastructure to serve their individual needs; additionally, some companies serve as an infrastructure provider, or hotelier, installing equipment that will house infrastructure for multiple cellular providers. Like other utilities, federal law allows Small Cell infrastructure equipment in the public right-of-way.

2. Adoption

2.1. The guidelines are intended to cover the general standards and aesthetics for the design and installation of Small Cell technology in public space across the District of Columbia. They are comprehensive in nature while recognizing the unique characteristics and history of the District of Columbia. The guidelines cover the different areas of the District while keeping generally applicable standards based on the type of infrastructure installed.

2.2. As a result of this comprehensive approach, the guidelines have been drafted with input from a variety of government stakeholders, including staff of the District Department of Transportation (DDOT), the Office of Planning (OP), the Historic Preservation Office

(HPO), the U.S. Commission of Fine Arts (CFA), and the National Capital Planning Commission (NCPC).

2.3. The guidelines are also the result of the review of information shared by telecommunication providers, technical limitations, and requirements of Small Cell infrastructure standards and practices across the country, such as Denver, Boston, Dublin, OH, and Lincoln, NE. In addition, these guidelines have been informed through a best practices review of international cities in North America, Europe, and Asia.

2.4. The guidelines supplement applicable local and federal policies and regulations. The applications shall comply with the most current version of guidelines and regulations, including but not limited to:

2.4.1. District of Columbia (DC) Code
2.4.2. DC Municipal Regulations
2.4.3. DDOT Manual on Uniform Traffic Control Devices
2.4.4. DDOT Design and Engineering Manual (DEM)
2.4.5. The Comprehensive Plan for the National Capital
2.4.6. Shipstead-Luce Act
2.4.7. National Historic Preservation Act

3. Purpose

3.1. Goals of the Guidelines

3.1.1. The Small Cell Infrastructure Guidelines set forth requirements and specifications for the placement and design of Small Cell infrastructure within the District's public right of way (ROW) to address engineering, safety, and aesthetic concerns. The guidelines intend to fit the functional needs of the cellular infrastructure necessary to provide adequate coverage within the character and function of the capital city's public space with the goals of:

3.1.1.1. Avoiding impact on the most important view sheds and vistas within the L'Enfant Plan of the District of Columbia;
3.1.1.2. Minimizing the impact on the character of designated historic districts and landmarks;
3.1.1.3. Protecting access and circulation to public open spaces;
3.1.1.4. Minimizing visual and physical clutter within the streetscape; and
3.1.1.5. Treating all areas of the District equitably; i.e. historic districts will be dealt with the same way, regardless of location within the District.

3.2. The Monumental Core

3.2.1. The L'Enfant Plan of 1791 established Washington's historic urban form and its framework for development. Reinforced by the McMillan Plan of 1902, the combined Plan of the City of Washington includes an orthogonal grid and a series of diagonal avenues radiating from the White House and U.S. Capitol, which at the Capitol's center point, establishes the District's four quadrants. The intersection of the street grid and diagonal avenues create a system of parks, open space, and vistas that are integral to the District's historic street network. L'Enfant's urban framework is recognized for its national importance through its listing in the National Register of Historic Places.

3.2.2. The character of Washington's streetscape reinforces the importance of the public realm, where the streets, squares, and public spaces are the primary figures in the city defined against the background of private development. A strong tradition of public space planning in the late 19th and early 20th centuries built upon Washington's historic plans through intentionally designed public infrastructure and streetscapes, such as curb and gutters, tree planting, streetlights, and traffic control devices. Many of these elements are contributing elements to the District's cultural landscapes. This essential quality of the District's streetscapes and public spaces must be maintained as a creative, welcoming and livable environment, and to reinforce the District's unique role as the nation's capital and the home to approximately 700,000 residents.

4. Review Process

4.1. Master License Agreement

4.1.1. Before an entity can install Small Cell infrastructure in the ROW, it must first submit and have executed a Master License Agreement (MLA) with the District of Columbia.

4.1.2. The MLA governs many aspects of Small Cell infrastructure and is a standardized document that does not allow modification or alteration by or for individual MLA applicants. The MLA includes multiple provisions that establish conditions, requirements, and limitations on the MLA holder and any Small Cell infrastructure installed in the District. In and of itself the MLA does not permit the installation of any Small Cell infrastructure. It serves as a preliminary step in the process to an MLA holder submitting applications with DDOT for public space permits to install Small Cell infrastructure.

4.1.3. All of the conditions, requirements, and limitations to which the MLA holder agrees by executing an MLA with the District of Columbia are incorporated by reference into every public space permit an MLA holder may receive. In addition, particular provisions may be reiterated in this document and in an issued public space permit.

4.1.4. A copy of each executed MLA can be found online at octo.dc.gov. The webpage is: https://octo.dc.gov/page/small-cells

4.2. Public Space Permits

4.2.1. All Small Cell installations in the District of Columbia require a public space permit from the District Department of Transportation (DDOT). DDOT uses an online permitting system (TOPS: tops.ddot.dc.gov) to process public space permit applications. All applications will require review to ensure adherence both to these guidelines and all other applicable standards, regulations, and laws. Any applications that are not consistent with these guidelines require review and approval by the Public Space Committee (PSC) and will include review and comment by Advisory Neighborhood Commissions (ANCs) as well as by NCPC, CFA, and HPO as appropriate. Consistent with standard PSC practice, applications that comply with these guidelines and all other applicable standards,

regulations, and laws will be processed by DDOT's Public Space Regulation Division.

4.2.2. NCPC and CFA are discussing the review process for applications that are consistent with the guidelines in locations that may affect the federal interest.

5. General Guidelines

5.1. General limits: Locations

5.1.1. These guidelines for Small Cell infrastructure apply to all areas in the District, except those areas that are under Federal ownership.

5.1.2. Small Cell infrastructure is not permitted to be installed on:

5.1.2.1. Medians and traffic islands (i.e. any public space that is contiguous only with roadways and does not border any private property, regardless of whether it currently houses a District owned streetlight or a 3rd party utility pole)

5.1.2.2. Bridges and tunnels

5.1.2.3. Poles that have traffic control devices

5.1.2.4. All sidewalks immediately adjacent to Federal reservations within the L'Enfant Plan

5.1.2.5. Pennsylvania Avenue NW, between 1st and 15th Street

5.2. General limits: Preference for Locations and Methods

5.2.1. The preferred locations of Small Cell infrastructure, in order, are:

5.2.1.1. Any type of mount in unnamed alleys

5.2.1.2. A mount to Pendant Pole streetlights with cobra heads or on 3rd party poles on streets

5.2.1.3. Standalone poles on streets or named alleys.

5.2.1.4. Where there are existing poles that the guidelines allow for attachment, no new standalone poles will be permitted.

5.3. General limits: Appearance

5.3.1. Except when Small Cell infrastructure is attached to a wood pole, poles and all equipment must be the same color and finish as surrounding streetlight poles or 3rd party poles.

5.3.2. Except when Small Cell infrastructure is attached to a wood pole, exposed wires are not permitted.

5.3.3. Corporate or company names (except for location identification purposes noted below), logos, identifying graphics or other advertisements shall not be painted, embossed, applied or displayed in any manner on the poles, equipment enclosures (boxes, cabinets, etc.), hand hole covers, or other component of the pole. Individual location identification information will be permitted, provided no letter, number, or graphic symbol is taller than one inch in height.

5.3.4. Height

5.3.4.1. Existing Poles: Any attachment, including antenna(e), to an existing pole shall not extend the existing pole to a height of more than 31 feet or by more than 10 percent, whichever is greater.

5.3.4.2. Standalone Poles: The height of any standalone pole including its antenna(e) shall not exceed 31 feet or no more than 10 percent taller than other adjacent poles, whichever is greater.

5.4. General limits: Adherence to Other Applicable Standards

5.4.1. Nothing in these guidelines is intended to limit the applicability of any other duty, requirement, limitation, or condition for work in public space in the District of Columbia. As required in the Master License Agreement (MLA) and in accordance with DC Municipal Regulations persons working in the public ROW are required to abide by all traffic control, construction safety, and public space restoration standards. Separate public space permits approving temporary traffic control may be required.

5.4.2. Nothing in these guidelines is intended to limit the responsibility of a person who obtains a public space permit to install Small Cell infrastructure in public space to obtain all other necessary licenses, permits, and approvals from any government agency or other party that has authority or responsibility to grant and issue such license, permit, or approval.

5.5. General Parameters on Installations: Types, Locations, and Frequency

5.5.1. Chart 1, Permissible Installation Types and Locations, indicates where Small Cell installations are allowed based on the location and context of each proposed placement.

5.5.2. Chart 2, Permissible Spacing and Frequency of Installations, indicates the spacing and frequency of Small Cell installations that will be allowed.

5.5.3. Map 1, Applicable Boundaries, indicates the areas included in the L'Enfant Plan, Shipstead-Luce Act, Old Georgetown, and Historic Districts.

Pole Ownership	Pole Type	Cabinetry	Monumental Core (L'Enfant Plan, Shipstead Luce Act and Old Georgetown)	Historic Districts	District other than MC/HD
District	**Existing 5A Poles**	Depends on location	Ok, w/ underground vault only		Ok, attach cabinetry to pole
District	**Existing Wood Poles**	Depends on location	Ok, w/ underground vault only		Ok, attach cabinetry to pole
District	**Existing Pendant Poles with cobraheads**	Below grade vaults[1]	Ok, w/ underground vault only		
Carrier	**New Standalone Poles: Pendant Pole or Washington Pole**	Below grade vaults[1]	Ok, w/ underground vault only		
3rd Party	**Existing Utility Pole**	Attach to pole	Un-named alley only, attach cabinetry to pole	Ok, attach cabinetry to pole	Ok, attach cabinetry to pole

Chart 1, Permissible Installation Types and Locations

[1] Applications for at grade cabinet installations may be considered on a per location basis. Any application would require review by the Public Space Committee as well as ANCs, CFA, NCPC, and SHPO as appropriate. Additional guidelines would have to be developed.

Blockface Length Intervals[1]	Number of Small Cell Facilities Permitted per Blockface[2] outside the Monumental Core and Historic Districts	Number of Small Cell Facilities Permitted per Blockface within the Monumental Core and Historic Districts	Minimum Distance between Facilities on same Blockface[3]	Minimum Distance between Facilities on same Blockface within the Monumental Core and Historic Districts	Limit per Carrier per Block[4]
0'-150'	1	1	N/A	N/A	1
151'-300'	2	1	60'	60'	1
301'-450'	3	2	60'	75'	1
451'-600'	4	3	60'	90'	1
601'-750'	5	4	60'	105'	2
Over 750'	6	5	60'	120'	2

[1]Block lengths should be measured along the edge of curb between the edge line extended of adjacent intersecting streets.

[2]This is inclusive of all types of installations and regardless of carrier.

[3]In other words, the minimum distance between two facilities sharing the same side of the block. Distance should be measured in a linear fashion along the edge of curb between the two facilities' center points.

[4]A block is defined as two opposing blockfaces.

Chart 2, Permissible Spacing and Frequency of Installations

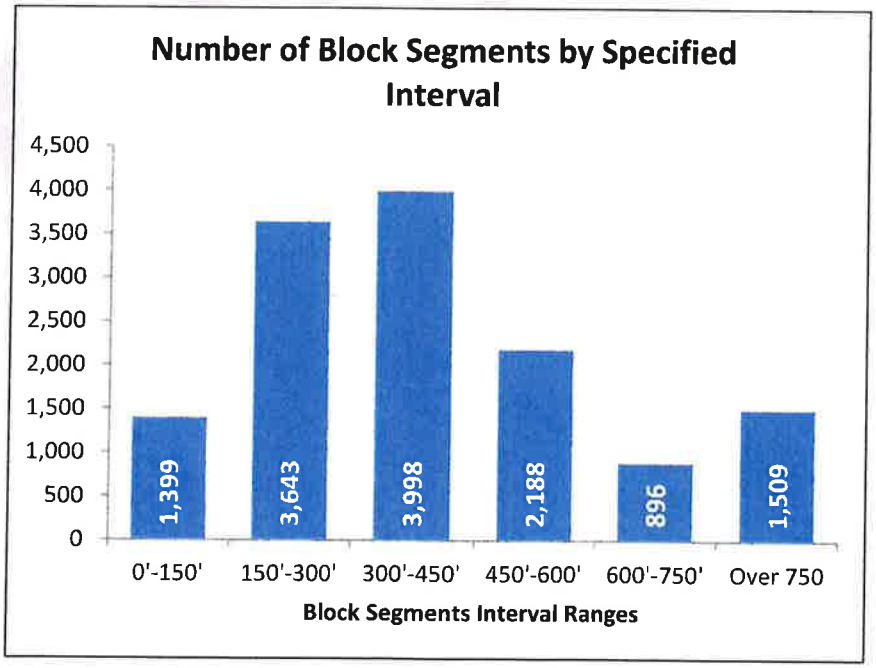
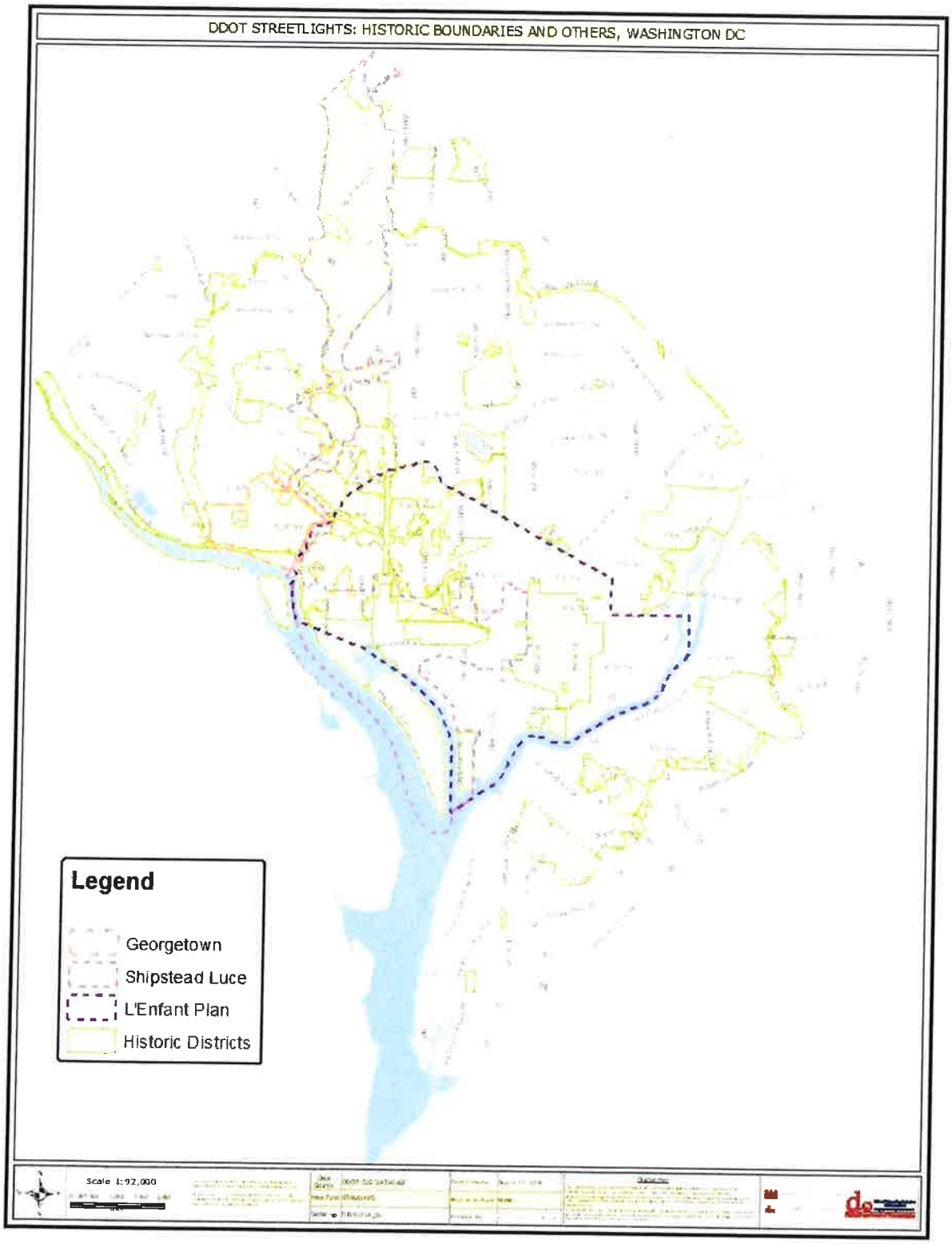


Chart 3, Number of Block Segments by Specified Interval

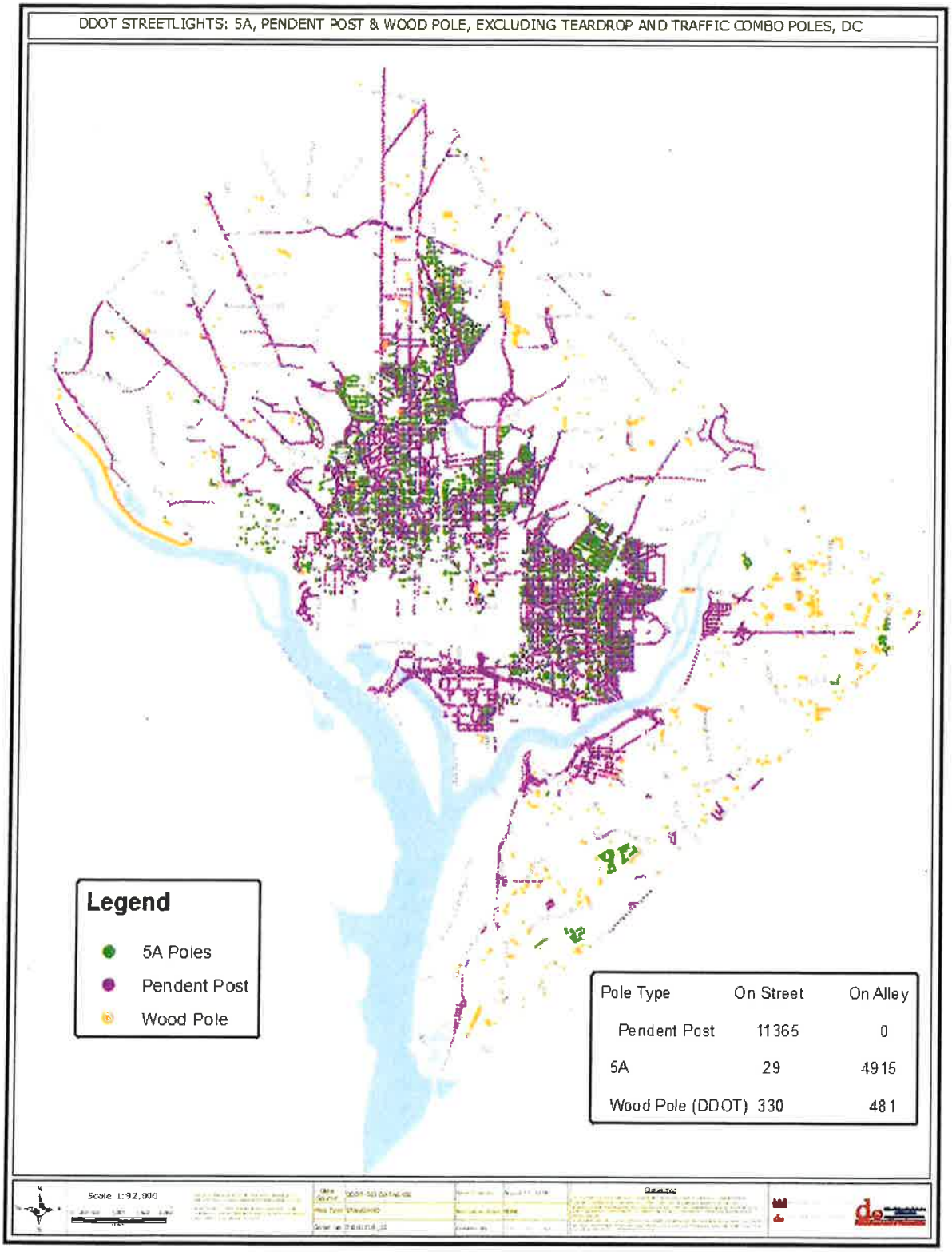


Map 1, Applicable Boundaries

6. **Guidelines regarding Historic Districts and Landmarked Properties**
   6.1. Small Cell infrastructure shall not be located within twenty feet (20') of the front or side boundary lines of a D.C. Landmark, a National Historic Landmark, federal properties or a property individually listed in the National Register of Historic Places.
   6.2. Small Cell infrastructure located in unnamed alleys within a historic district shall be a minimum of twenty feet (20') from the property line extended across the alley entrance. If the properties adjacent to the alley have a building restriction line (BRL) the twenty feet (20') shall be measured from the BRL.

7. **Guidelines regarding DDOT Streetlights**
   7.1. The guidelines will allow attachments to certain categories of poles. These include Pendant Poles with cobra head fixtures, wood poles, and 5A poles (aka metal alley poles). (See Map 2, Pole Types and Locations and Illustrations 1 & 2.)
   7.2. All other categories of DDOT streetlights will not be permitted for attachment of Small Cell infrastructure.
   7.3. These guidelines do not allow the installation of new DDOT streetlights.
   7.4. Any application intended to install on an existing DDOT streetlight must indicate the replacement of an existing DDOT streetlight pole. The replacement pole must be exactly the same in outward appearance, while having increased structural strength to support the additional equipment.
   7.5. These guidelines do not allow the use of any streetlight on bridges or in tunnels.
   7.6. DDOT will require engineer stamped plans showing the replacement of its existing streetlight pole.

8. **Guidelines regarding New Standalone Poles**
   8.1. Appearance
      8.1.1. New standalone poles must match the appearance of existing DDOT streetlights
      8.1.2. There are two types: Pendant Pole or Washington Upright Pole (See Illustrations 3 & 4).
         8.1.2.1. The type of pole to be used is based on the type of DDOT streetlight in the surrounding neighborhood. The pole will not include a streetlight; with the exception of a light fixture, it will mimic the appearance of streetlights in the area.
         8.1.2.2. In areas where the surrounding streetlights are Washington Uprights or Twin-Twenties, new standalone poles shall use the Washington Pole. (See Illustration 3)
         8.1.2.3. In areas where the surrounding streetlights are Pendant Poles, the Pendant Pole type shall be used. (See Illustration 4)



Map 2, Pole Types and Locations

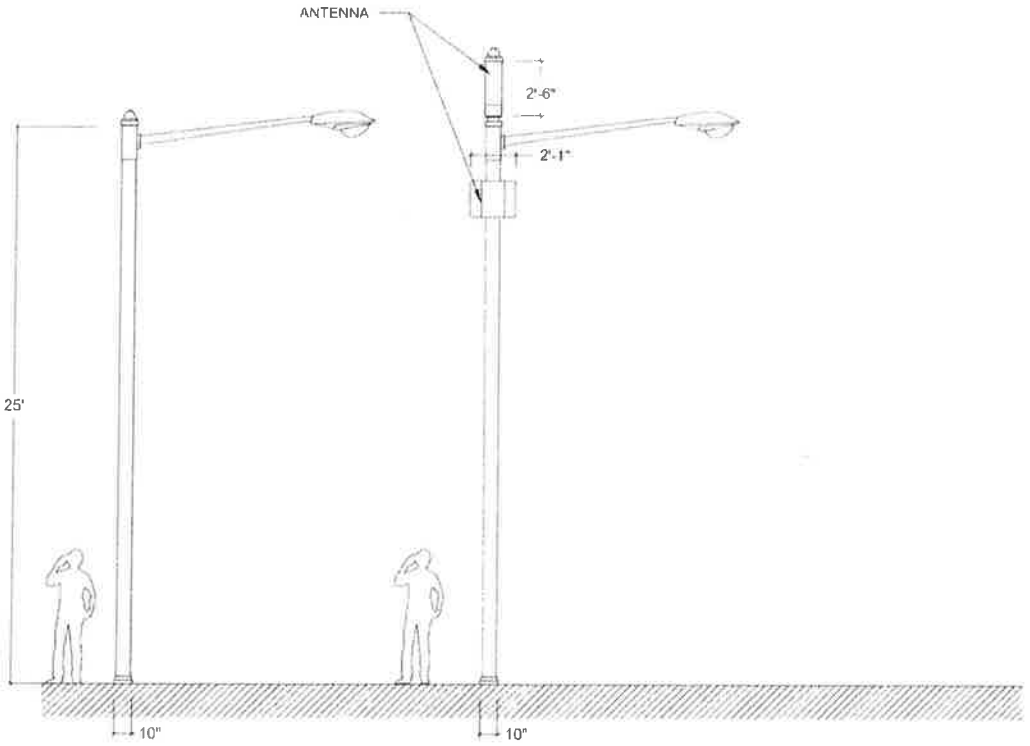


Illustration 1, 5A Pole

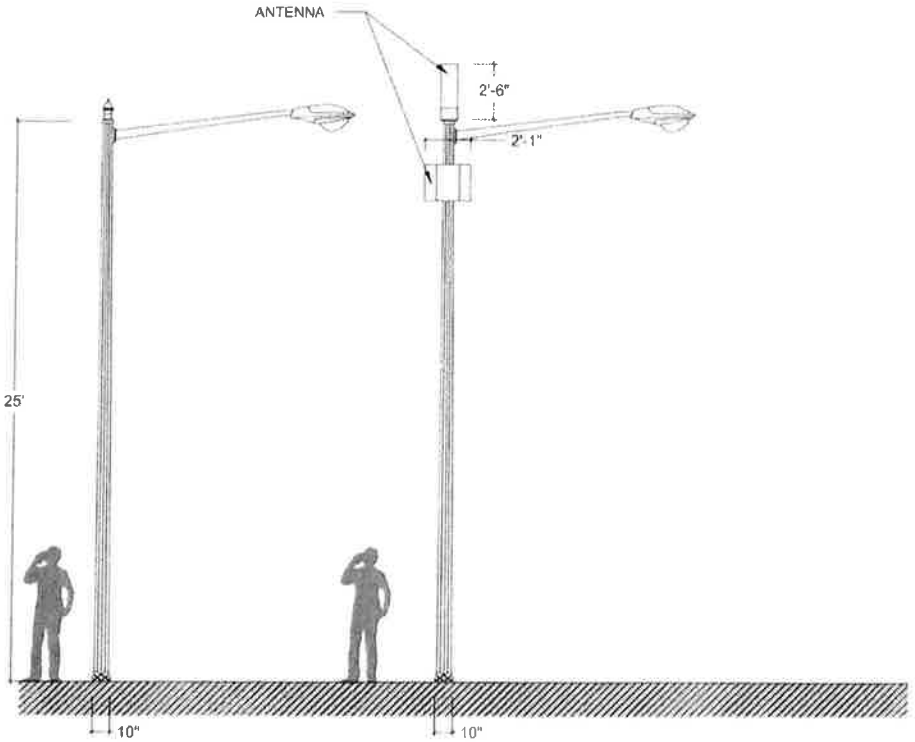


Illustration 2, Pendant Pole w/Cobra Head

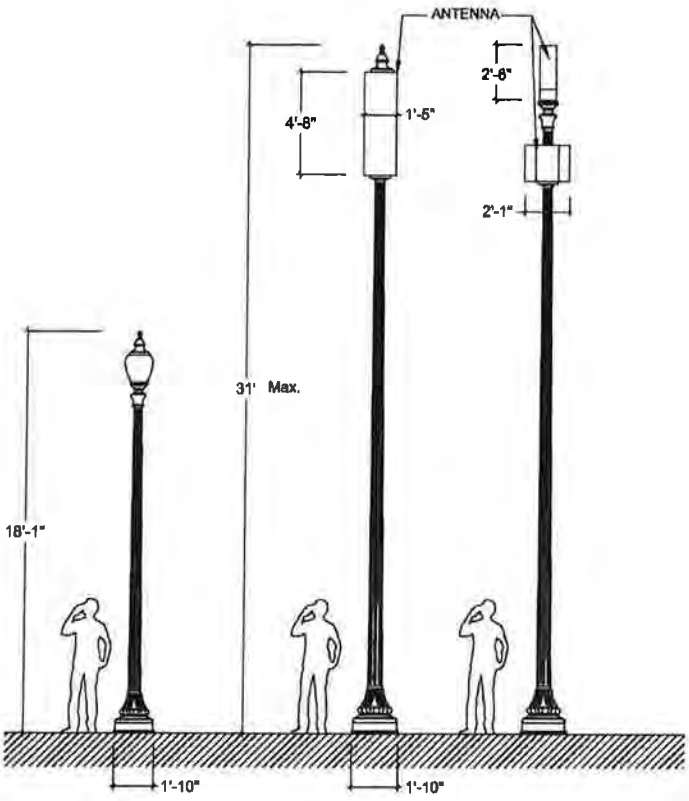


Illustration 3, Washington Standalone Pole

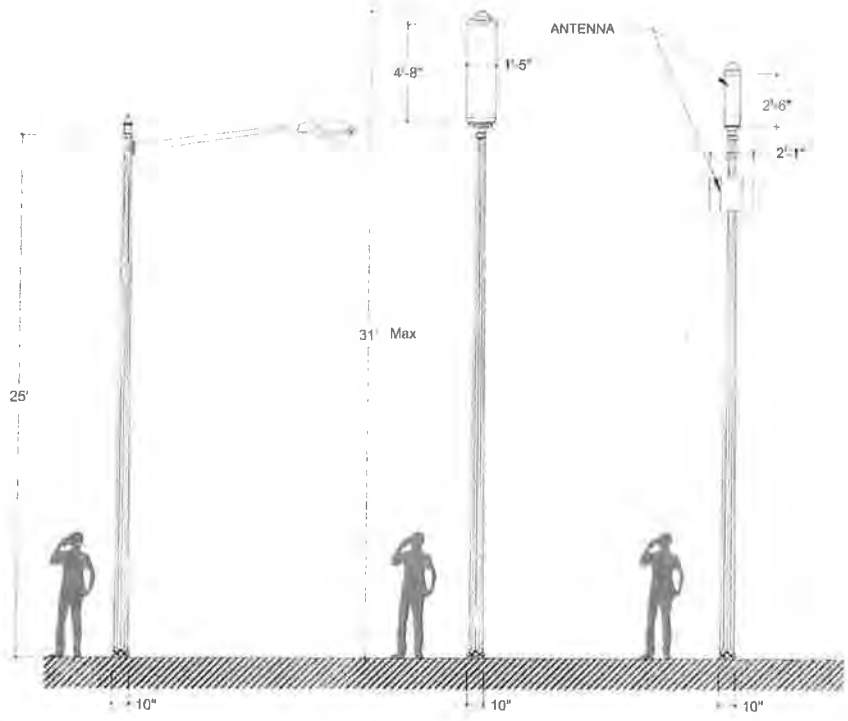


Illustration 4, Pendant Pole Standalone

8.2. Pedestrian Path and Amenity Zone

8.2.1. The sidewalk area of public space is typically delineated into pedestrian paths and tree box zones, which are also referred to as the amenity zone. The amenity zone is located between the pedestrian path and the roadway and provides access between the two as well as the area for street trees, streetlights and traffic signals, and other functional elements. It is critical that all pedestrian paths are clear to facilitate safe and optimal access and circulation along sidewalks.

8.2.2. Standalone poles shall not be located in the clear pedestrian path, as established by the most current DC Municipal Regulations and the most current Manual on Uniform Traffic Control Devices.

8.2.3. Standalone poles shall be located in the amenity zone, when one is provided. Nevertheless, poles shall not be located in a manner that requires the removal of an existing street tree or that prevents the planting of a street tree in the future.

8.2.4. Standalone poles shall not be located within a designated right-of-way of a paper street or paper alley within the L'Enfant Plan.

8.2.5. In non-residential areas where there is no amenity zone, standalone poles shall be placed within the area traditionally devoted to the amenity zone within the right-of-way if it does not obstruct the required width for the clear pedestrian path in accordance with DDOT's most current Design and Engineering Manual (DEM) and DC Municipal Regulations.

8.2.6. In non-commercial areas where there is no amenity zone, poles may be located in the sidewalk space within the right-of-way if it does not obstruct the required width for the clear pedestrian path in accordance with DDOT's most current Design and Engineering Manual (DEM) and DC Municipal Regulations.

8.2.7. Standalone poles shall be aligned with existing streetlights, 3rd party poles, and street trees as applicable in order to maintain a visual and physical organization of structures within the right-of-way, as measured from the center of the base of the pole.

8.2.8. All measurements shall be taken from the outer edge of the standalone pole and the infrastructure listed in the following specific limits/prohibitions.

8.2.8.1. The exterior of the standalone pole shall be placed a minimum of two feet six inches (2'6") from the face of curb Standalone poles must be placed a minimum of six feet (6') from existing fire hydrants or buildings' fire connections.

8.2.8.2. Standalone poles shall be located a minimum of 10 feet (10') from light poles and traffic signal poles.

8.2.8.3. Standalone poles shall be located a minimum of 3 feet (3') from bicycle racks and shall not impede the attachment of bicycles.

8.2.8.4. Standalone poles shall not interfere with the operation of Capital Bikeshare docks and stations. This requires a minimum of four feet (4') of clearance from the rear wheel of a docked bicycle, five feet (5') distance from each end of a station, and should not be installed in such a way that would prevent solar access to the solar panel.

8.2.8.5. Standalone poles shall be placed a minimum of ten feet (10') from any above grade building face, including bay windows, show windows, or oriel windows.

8.2.9. In areas where DDOT does not have streetlight poles and instead attaches its streetlights to existing 3rd party poles, no new standalone poles will be allowed.

8.2.10. In residential areas, standalone poles shall be placed in alignment with lot lines extended to the maximum degree possible.

8.3. Access, Circulation, and Sight Distances

8.3.1. Safe and functional access, circulation, and clear sight lines are important for pedestrian ease of movement and to maintain unobstructed line of sight among drivers, pedestrians, bicyclists.

8.3.2. Standalone poles shall not obstruct ADA access, including maintaining a clear landing at the top of curb ramps at crosswalks.

8.3.3. Pole placement shall not impede, obstruct, violate, conflict with, or hinder any mode of travel or access to the public right-of-way, an alley, or driveway.

8.3.4. Poles shall be placed consistent with the most current Manual on Uniform Traffic Control Devices (MUTCD) and adopted District standards for maintenance of an intersection's sight line triangles.

8.3.5. Poles shall not be placed to obstruct the sight line of any alley or driveway. A minimum of fifteen feet (15') shall be maintained between the pole and the outside edge of the alley or driveway.

8.4. Spacing among Streetscape Elements

8.4.1. A standalone pole shall not be located within an existing street tree's critical root zone. The protected zone shall be equal to one foot for each inch of the tree's diameter or a minimum of fifteen feet (15'), whichever is greater. The protected zone shall be measured from the outside of the tree to protect root growth.

8.4.2. Trees shall not be removed or have their critical root zones damaged for the installation of Small Cell infrastructure, regardless of whether the application is for a standalone pole or to replace an existing DDOT streetlight or 3rd party pole. Excavation to install a replacement streetlight or 3rd party pole may damage an existing trees critical root zone. As such DDOT reserves the right to deny a permit for a location where a tree has been recently removed.

8.4.3. Standalone poles shall not be placed where it limits the ability of the District of Columbia to plant a street tree in the future, regardless of whether the District plans to plant a tree in that location at the time the application is submitted.

9. Guidelines regarding Existing Utility Poles

9.1. Poles owned by a 3rd party (i.e. poles installed in public space by entities other than DDOT) are typically wood utility poles and are located throughout the District's rights-of-way and alleyways.

9.2. With the consent of the pole owner, Small Cell providers may submit applications to install infrastructure attached to these poles.

9.3. These guidelines do not allow the installation of new 3rd party poles. Any application must indicate the installation on and replacement of an existing 3rd party pole.

9.4. All Small Cell equipment on third party poles, including antennas, antenna related equipment, cabinets, shrouds, conduit, and mounting hardware shall be a grey powder coated finish.

10. Glossary

The following serve to define terms used in the guidelines as they relate to the public spaces in the District of Columbia.

5A Pole – A DDOT-standard pole type as described in the DDOT Streetlight Policy and Design Guidelines, typically round in shape and found in alleys

Amenity Zone – The area of public space between the curb and the sidewalk reserved for the installation of street lights, parking meters, bicycle racks, signs regulating curbside management. It also includes the tree space, the area of public space reserved for the planting of street trees.

Antenna - an apparatus designed for the purpose of emitting radiofrequency (RF) radiation, to be operated or operating from a fixed location, for the transmission of writing, signs, signals, data, images, pictures, and sounds of all kinds.

Building face – Any building wall, or its projection, that fronts a right-of-way.

Clear pedestrian path - The straight path that is free of all obstructions within the sidewalk between the amenity zone and the public parking area or property line/building restriction line. The clear pedestrian path is measured from the farthest extended portion of any element projecting out from the building facade, such as a sidewalk café, to the curb line or the nearest obstruction, such as the outer edge of a tree box.

Cobra head fixture – A DDOT-standard lighting fixture as described in the DDOT Streetlight Policy and Design Guidelines, typically attached to a pendant pole, wood pole or 5A pole.

Monumental Core – The spatial and symbolic center of the city, which includes the U.S. Capitol grounds, the White House, the National Mall, Federal Triangle, and the surrounding government offices and civic, cultural, and symbolic structures. The monumental core is most closely linked to the distinctive image of the capital city and the functions of the federal government. While the major landmarks and resources within the core are perceived, it does not have a rigid geographic or jurisdictional boundary and continues to evolve.

Paper street or paper alley – An unimproved public right of way.

Pendant Pole – A DDOT-standard pole type as described in the DDOT Streetlight Policy and Design Guidelines, that is typically fluted.

Primary building face – The face of a building that generally represents the building's overall design intent and includes access points with the highest volume of pedestrian traffic.

Small Cell infrastructure – Low-powered antennas and related equipment that provide cellular and data coverage to smaller geographic areas, supplementing the larger cellular network and improving service for wireless customers.

Standalone poles – Independent poles that antennas are attached to for the purpose of transmitting wireless signals.

Streetscape elements – Components that make up the city street, such as trees, light poles, bicycle racks, traffic cabinets, parking meters, signs, sculptures, and street furniture.

Teardrop fixture – A DDOT-standard lighting fixture as described in the DDOT Streetlight Policy and Design Guidelines, typically attached to a pendant pole that is teardrop in shape.

Terminating Vista (Linear view corridors): Linear views that extend from a street level viewpoint to and terminate at a focal point object(s) such as a structure and building. Within the L'Enfant Plan, there are important terminating vistas (linear view corridors), defined by street walls and public realm elements, which terminate at significant civic buildings or memorials.

Third-party pole – An existing pole in public space owned by a party other than the District or the cellular provider installed to provide public utilities and that can accommodate Small Cell infrastructure equipment.

Traffic signal – A pole of any type to which a traffic or pedestrian signal or other traffic right of way regulating equipment is attached. This includes Stop, Yield, and similar signage. It does not include street name, parking regulation, or similar signage.

Twin-Twenty Pole – A DDOT-standard pole type as described in the DDOT Streetlight Policy and Design Guidelines that is in the same family as the Washington Upright, that is typically fluted and decorative in design with two globe-type light fixtures mounted on top.

Washington Upright Pole – A DDOT-standard pole type as described in the DDOT Streetlight Policy and Design Guidelines, also referred to as Washington Globe, available in several heights and is typically fluted and decorative in design with a globe-type light fixture mounted on top.

Advisory Neighborhood Commission 1C
PO Box 21009, NW, Washington, DC 20009
www.anc1c.org
Representing Adams Morgan

October 4, 2018

Public Space Committee
c/o Public Space Permit Office
District Department of Transportation
1100 4th Street SW, Room 360
Washington, DC 20024

RE: Small Cell Guideline Comments

Public Space Committee:

At a duly-noticed public meeting held on Wednesday, October 3, 2018, with a quorum present, Advisory Neighborhood Commission 1C passed the enclosed resolution by a vote of 4-0-1 (Huezo, abstaining).

Sincerely,

Hector Huezo, Esq.
Chair, ANC 1C

Enclosure

ANC1C RESOLUTION
Regarding Small Cell Technology Guidelines
October 3, 2018

WHEREAS, wireless providers plan to install between 2,000 and 2,500 small cell technology and supporting infrastructure installations on light poles in public space throughout the city for the purpose of building a 5G/LTE network;

WHEREAS, these wireless companies have already identified locations in the city where they plan to install the technology and related equipment and have signed Master License Agreements with the District Department of Transportation (DDOT);

WHEREAS, DDOT has worked with these wireless companies and the Office of Planning, Historic Preservation Office, the U.S. Commission of Fine Arts and the National Capital Planning Commission to develop design guidelines to address the general standards and aesthetics for the design and installation of the small cell technology and related equipment;

WHEREAS, ANCs were not notified by DDOT about the small cell technology design guidelines until late August, and were given only until October 5 to comment on the guidelines;

WHEREAS, the wireless carriers have not provided important information about the small cell technology infrastructure, including the size of the boxes that will house the cells;

WHEREAS, the guidelines provide very limited renderings of what the installations will look like, nor do they provide information about the standards that will be used to determine what the installations should look like in certain parts of the city, including historic districts;

WHEREAS, the Master Agreement charges the carriers fees for installing the small cell technology on poles and notes that the District may require carriers to provide equipment for the Smart City program, but the District would pay them for it. The Master Agreement doesn't require the carriers to provide any other public benefit to District residents;

WHEREAS, the Master Agreement states that before applying for a permit for the first installation, the carrier must notify the ANCs and the Ward Councilmember of its plans to install small cell technology in the neighborhood. However, under the draft guidelines, ANCs only have the opportunity to review and comment on proposed installations that are not consistent with the guidelines, making it unclear what opportunity the ANCs will have for review and comment;

WHEREAS, the general public is largely unaware of the existence of this project;

WHEREAS, the installation of small cell technology infrastructure could have a significant impact on street trees in the District, as there may be no physical impediments between the poles on which the cells will be placed;

THEREFORE, BE IT RESOLVED that ANC1C:

Finds that ANCs and residents were left out of the process of developing the small cell technology design guidelines until a month before the Public Space Committee's scheduled vote on them, which is not enough time for resident and ANC review;

Finds that not enough detail about the deployment of the technology and supporting infrastructure and their effects on the streetscape have been provided to the public;

Recommends that the guidelines be amended to ensure that ANCs have 30 days to review and comment on all proposed small cell technology installations, not just those that do not comply with the guidelines;

Authorizes the Chair or his commissioner-designee to write a letter to Mayor Bowser and DDOT Director Marootian urging DDOT to delay consideration of the guidelines until additional informational meetings about the small cell technology can be held in each ward, the D.C. Council has held hearings, and residents and ANCs have had ample opportunity to comment;

FURTHER, BE IT RESOLVED that the Chair or his designees are authorized to represent ANC1C in this matter.

Advisory Neighborhood Commission 2A

"Serving the Foggy Bottom and West End communities of Washington, D.C."

October 5, 2018

Mr. Matthew Marcou
Chair, Public Space Committee
District Department of Transportation
1100 4th Street SW, Third Floor
Washington, DC 20004
PublicSpace.Committee@dc.gov

RE: The DC Government's Draft Small Cell Design Guidelines

Dear Chair Marcou,

At its regular meeting on September 20, 2018, Advisory Neighborhood Commission 2A **("ANC 2A" or "Commission")** considered the above-referenced matter. With seven of seven commissioners present, a quorum at a duly-noticed public meeting, the Commission voted unanimously **(6-0-0*)**, after a motion made by Commissioner Smith and seconded by Commissioner Kennedy, to adopt the following resolution:

> WHEREAS, ANC 2A supports the DC Government's advocacy of broadband infrastructure deployment with the goal of ensuring that residents, businesses, and public safety operations in DC have reliable access to wireless telecommunications network technology and state-of-the-art mobile broadband communication services, and
>
> WHEREAS, ANC 2A has reviewed the DC Government's Draft Small Cell Design Guidelines, which are currently being considered by the Public Space Committee.
>
> THEREFORE, BE IT RESOLVED that ANC 2A requests that the following concepts are incorporated into the Draft Small Cell Design Guidelines:
>
> 1. The "hoteling" of several wireless carriers into a single small cell facility should be prioritized over facilities that only serve a single carrier so as to prevent an over-abundance of small cell installations in the District's residential neighborhoods. ANC 2A notes that the Metropolitan Government of Nashville and Davidson County's regulations (Ordinance No. BL2016-415) require that "All new proposed [small cell] structures, or a stealth telecommunications support structure replacing an existing support structure or alternative structure, within the right of way shall be designed for a minimum of two personal wireless service facilities providers."

2. The requirements for ANC notification as part of the public space application process for small cells should be expanded to include all individual small cell installations and all upgrades to installed facilities.

3. Periodic reviews of all installed small cell facilities should be undertaken in order to ensure compliance, ongoing maintenance, and compatibility with DC's public space interests for all facilities.

4. Small cell facilities should initially be rolled out as a pilot program in order to review the impacts that the facilities have on DC's public space.

5. Installations of representational "mock up" equipment should cease until the permitting process has been finalized for small cell facilities.

Commissioners Patrick Kennedy (2A01@anc.dc.gov) and William Kennedy Smith (2A04@anc.dc.gov) are the Commission's representatives in this matter.

ON BEHALF OF THE COMMISSION.

Sincerely,

William Kennedy Smith, MD
Chairperson

CC: Joe Gibbons, Chair, Advisory Neighborhood Commission 2E

* Commissioner Florence Harmon recused herself from voting on this matter.

GOVERNMENT OF THE DISTRICT OF COLUMBIA
Dupont Circle Advisory Neighborhood Commission 2B

September 24, 2018

Mr. Matthew Marcou
Chair, Public Space Committee
District Department of Transportation
1100 4th Street SW, Third Floor
Washington, DC 20004
PublicSpace.Committee@dc.gov

RE: The DC Government's Draft Small Cell Design Guidelines

Dear Chair Marcou:

At its regular meeting on September 12, 2018, the Dupont Circle Advisory Neighborhood Commission ("ANC 2B" or "Commission") considered the above-referenced matter. With 7 of 8 Commissioners in attendance, a quorum at a duly-noticed public meeting, the Commission approved the following resolution by a vote of (7-0-0):

WHEREAS, ANC 2B supports the DC Government as a strong advocate for broadband infrastructure deployment and the goals of ensuring that residents, businesses, and public safety operations in DC have reliable access to wireless telecommunications network technology and state-of-the-art mobile broadband communication services,

WHEREAS, ANC 2B agrees that coverage and connectivity are drivers of the economic growth of the District, the innovation of businesses, and the education of District residents,

WHEREAS, ANC 2B appreciates and supports the DC Government's convening of multiple agencies, including the District Department of Transportation (DDOT), the Office of Planning (OP), and the Historic Preservation Office (HPO), along with the National Capital Planning Commission (NCPC) and the U.S. Commission of Fine Arts (CFA), to draft guidelines governing the method, location, and appearance of small cell infrastructure in public space in DC,

WHEREAS, ANC 2B supports the DC Government's development of efficient and streamlined processes for wireless providers to install wireless communications facilities (small cells) on poles throughout the District,

Attachment A
ANC3C Comments on Small Cell Design Guidelines and Master License Agreement

Small Cell Technology Design Guidelines

The District Department of Transportation has developed the draft guidelines with the input of all stakeholders – except residents. The short timeframe for ANCs and residents to review and comment on the guidelines (less than 30 days after a single poorly advertised meeting for ANC commissioners) is insufficient. DDOT should delay consideration of the guidelines until informational meetings about the small cell technology can be held in each ward, the D.C. Council has held hearings, and residents and ANCs have had ample opportunity to comment.

The guidelines state that ANCs will have an opportunity to review and comment on proposed small cell technology installations only if the installations are not consistent with the guidelines. Applications that comply with the guidelines "will be processed by DDOT's Public Space Regulation Division" (Section 4.2.1). It is unclear what opportunity to review and comment, if any, ANCs will have on these installations. ANCs should have at least 30 days to comment on all installations, and a process should be put in place to review and hear ANC objections if they are made.

The guidelines indicate that only underground vault installations will be allowed in historic districts (Chart 1). But the glossary lacks a definition of underground vault, and there are no illustrations of it or explanation of it.

The guidelines reference the possibility of "at grade" installations, saying they may be considered on a per location basis after additional guidelines are adopted (Chart 1, footnote 1). ANCs and neighborhoods should be provided information about what an at grade installation would entail and be meaningfully involved in the development of the guidelines.

Although the Master Agreement limits the size of small cell technology facilities to 28 cubic feet (Section 5.6), the guidelines do not address size. They should limit size as well.

Master License Agreement*

The city is giving away valuable public right of way without asking enough in return. The city will charge permit fees to carriers for using city-owned poles (fees ranging from $300 per pole to $1,500 per pole, based on the number of poles). And the city says it may require companies to provide equipment and installations for the Smart City program, but the District would pay the carriers for this work and equipment "subject to the availability of appropriated funds" – (Section 9.7). The city should consider requiring the carriers to provide free wifi to Wards 7 and 8, or to help disadvantaged areas in other ways.

Companies are to submit plans describe the quantity, type and general location of small cell technologies expected to be deployed within six months, one year and two years but the plans

GOVERNMENT OF THE DISTRICT OF COLUMBIA
Advisory Neighborhood Commission 2D

September 26, 2018

Mr. Matthew Marcou
Chair, Public Space Committee
District Department of Transportation
1100 4th Street SW, Third Floor
Washington, DC 20004
PublicSpace.Committee@dc.gov

RE: The DC Government's Draft Small Cell Design Guidelines

Dear Chair Marcou,

At its regular meeting on September 17, 2018, Advisory Neighborhood Commission 2D ("ANC 2D" or "Commission") considered the above-referenced matter. With 2 of 2 Commissioners in attendance, a quorum at a duly-noticed public meeting, the Commission approved the following resolution by a vote of (2-0-0):

> ANC 2D, after a brief discussion of 5G small cell technology at its September 17, 2018 meeting, expresses four concerns regarding the DC Government's Draft Small Cell Design Guidelines:
>
> 1. The number of small cell facilities that would be allowed per block in the Sheridan-Kalorama Historic District.
> 2. The effects of the small cell facilities on quality of life issues such as light, air, privacy, sound, and vandalism.
> 3. The small cell facilities' interface between WiFi and cellular technology.
> 4. The effects of the small cell facilities on the protection of the neighborhood's tree canopy.

Commissioners David Bender (2D01@anc.dc.gov) and Ellen Goldstein (2D02@anc.dc.gov) are the Commission's representatives in this matter.

ON BEHALF OF THE COMMISSION.

Sincerely,

David R Bender

David Bender
Chair

GOVERNMENT OF THE DISTRICT OF COLUMBIA

Advisory Neighborhood Commission 2E

Representing the communities of Burleith, Georgetown, and Hillandale
3265 S Street, NW • Washington, DC 20007
(202) 724-7098 • anc2e@dc.gov

October 3, 2018

Mr. Matthew Marcou
Chair, Public Space Committee
District Department of Transportation
1100 4th Street SW, Third Floor
Washington, DC 20004
PublicSpace.Committee@dc.gov

RE: The DC Government's Draft Small Cell Design Guidelines

Dear Chair Marcou,

On October 1, 2018 ANC 2E held its regularly scheduled public meeting, which was properly noticed and attended by seven commissioners, constituting a quorum. At this meeting the Commission adopted the following resolution by a vote of (6-0-0*) with regard to the above-referenced matter:

ANC 2E supports the DC Government's advocacy of broadband infrastructure deployment with the goal of ensuring that residents, businesses, and public safety operations in DC have reliable access to wireless telecommunications network technology and state-of-the-art mobile broadband communication services.

ANC 2E advises the Public Space Committee that before the Draft Small Cell Design Guidelines are adopted, DC's Urban Forestry Advisory Council should be asked to render an opinion or provide commentary on the possible effects of small cell deployment on the District's tree canopy goals. Furthermore, the proposed guidelines should be submitted to the Historic Preservation Review Board (HPRB), the U.S. Commission of Fine Arts (CFA), and the National Capital Planning Commission (NCPC) for full reviews within their jurisdictional authority and a vote.

ANC 2E advises the Public Space Committee that ANC 2E requests that the committee incorporate the following into the Draft Small Cell Design Guidelines:

1. A full scale mock-up of small cell installations by each carrier should be constructed for review, comments, and CFA approval prior to consideration of initial applications for Georgetown.

2. The size, color, diameter, and finish of all small cell equipment, including antennas, antenna-related equipment, cabinets, shrouds, and conduit (no exposed wiring), should be specified and mounting hardware should not exceed the dimensions of the approved mock up.

3. The guidelines should require carriers to submit yearly photographs of all small cell installations to ensure compliance.

4. Real-time maps of all actual small cell pole locations should be made publicly available.

5. Real-time maps of all proposed small cell pole locations should be made publicly available.

6. All small cell facilities should be required to perform pre- and post-installation radio frequency emission measurements on a minimum of three selected nodes, yearly, within the small cell system to confirm compliance with Federal Communications Commission (FCC) regulations, as ANC 2E's entire community will be subjected to involuntary radio frequency exposure and this exposure may have negative effects for people with radio frequency emission disabilities or sensitivities.

7. There should be no fans, cooling devices, or back-up generators permitted to be placed on or in small cell facilities or installations.

8. Small cell facilities or installations should be located at intersecting residential property lines.

9. Small cell facilities or installations in residential neighborhoods should be located to reduce any obstructions to property sight lines as much as possible.

10. When installed in a business, commercial district, and/or mixed-use zoned area, care should be taken to locate the small cell facilities or installations so as to avoid negatively impacting businesses. Small cell facilities or installations should not be located in front of storefront windows, sidewalk cafes, outdoor patio seating, primary walkways, primary entrances, or exits, or in such a way that would impede deliveries to the establishment. Small cell facilities or installations should be located between properties as much as possible.

11. The number of poles installed in ANC 2E should be minimized. ANC 2E advises that hoteling should be seriously considered as a requirement and that the maximum numbers of poles per block face that are specified in the guidelines should not be increased.

12. Any additional poles that are installed in ANC 2E should be required to conform to the illustrations set forth in the guidelines, unless any modifications are approved on an individual case-by-case basis by the Public Space Committee, the U.S. Commission of Fine Arts, and the Historic Preservation Review Board.

13. As proposed in the guidelines, and as stressed by members of the U.S. Commission of Fine Arts during its most recent public hearing, the vaults for all poles should be required to be located underground.

14. Should small cell technology become obsolete and/or the pole owners cease conducting business in the District of Columbia, the poles should be removed within 60 days.

ANC 2E advises the Public Space Committee to incorporate, in the current version of the Draft Small Cell Design Guidelines, the Office of the Chief Technology Officer (OCTO) WiFi hardware concept design for the hardware that is proposed to attach to the small cell poles.

ANC 2E advises the Public Space Committee that the following should require a 30-day notice to the affected ANC and the specific single member district commissioner:

1. Any small cell facility installations.
2. All small cell facility maintenance.
3. All small cell facility upgrades.
4. Any location changes to existing small cell facility deployments.

ANC 2E advises the Public Space Committee that any future changes to the Draft Small Cell Design Guidelines should require a 30-day notice to the ANCs and to the public.

ANC 2E advises the Public Space Committee that this resolution has the support of the Citizens Association of Georgetown, the Burleith Citizens Association, the Hillandale Homeowners Association, Trees for Georgetown, Georgetown Main Street, the Georgetown Business Improvement District, and the Georgetown Business Association.

ANC 2E advises the Public Space Committee to incorporate the recommendations contained in this resolution into the revised Draft Small Cell Design Guidelines and to then hold public hearings for community input as soon as possible.

Commissioners Jim Wilcox (2E06@anc.dc.gov) and Joe Gibbons (2E02@anc.dc.gov) are the Commission's representatives in this matter.

Respectfully submitted,

Joe Gibbons
Chair, ANC 2E

* Commissionner Zac Schroepfer recused himself from voting on this matter.

WHEREAS, ANC2E supports the DC Government's advocacy of broadband infrastructure deployment with the goal of ensuring that residents, businesses, and public safety operations in DC have reliable access to wireless telecommunications network technology and state-of-the- art mobile broadband communication services.

ANC2E advises the Public Space Committee that before the Small Cell Design Guidelines are adopted, the DC Urban Forestry Advisory Council should be asked to render an opinion or provide commentary on the possible effects of small cell deployment on the District's Tree Canopy Goals. Furthermore, the proposed Guidelines should be submitted to each of the Historic Preservation Review Board (HPRB), the Commission of Fine Arts (CFA), and the National Capital Planning Commission (NCPC) for full reviews within their jurisdictional authority and a vote.

ANC2E advises the Public Space Committee that ANC 2E requests it incorporate the following into the Small Cell Design Guidelines:

1. A full scale mock-up of small cell installation by each carrier should be constructed for review, comments and CFA approval prior to consideration of initial applications for Georgetown,
2. The size, color, diameter and finish of all Small Cell equipment including antennas, antenna related equipment, cabinets, shrouds, conduit (no exposed wiring) should be specified, and mounting hardware should not exceed the dimensions of the approved mock up,
3. The Guidelines should require carriers to submit yearly photographs of all Small Cell installations to ensure compliance,

4. Real-time maps of all actual Small Cell pole locations should be made publically available,□
5. Real-time maps of all proposed Small Cell pole locations should be made publically available,□
6. All Small Cell Facilities should be required to perform pre- and post-installation radio frequency emission measurements on a minimum of three selected nodes, yearly, within the Small Cell system to confirm compliance with FCC regulations. As our entire Community will be subjected to involuntary radio frequency exposure and this exposure may have negative effects for people with radio frequency emission disabilities or sensitivities,

7. There should be no fans, cooling devices, or back-up generators permitted to be placed on or in Small Cell Facilities or installations,
8. Small Cell Facilities or installations should be located at intersecting residential property lines,
9. Small Cell Facilities or installations in residential neighborhoods should be located to reduce any obstructions to property sight lines as much as possible,
10. When installed in a business, commercial district and/or in a zoned mixed-use area, care should be taken to locate the Small Cell Facilities or installations so as to avoid negatively impacting businesses.
Small Cell Facilities or installations should not be located in front of storefront windows, sidewalk cafes, outdoor patio seating, primary walkways, primary entrances or exits, or in such a way as would impede deliveries to the establishment.
Small Cell Facilities or installations should be located between properties as much as possible,

11. The number of poles installed in ANC2E should be minimized. ANC2E advises that hoteling should be seriously considered as a requirement, and one way or the other, the maximum numbers of poles per blockface specified in the Guidelines should not be increased,
12. Any additional poles that are installed in ANC2E should be required to conform to the illustrations set forth in the Guidelines, unless any modifications are approved on an individual case basis by the Public Space Committee, the Commission of Fine Arts and the Historic Preservation Review Board,
13. As proposed in the Guidelines, and as stressed by members of the Commission of Fine Arts during its most recent public hearing, the vaults for all poles should be required to be located underground.
14. That should the Small Cell technology become obsolete and/or the pole owners cease conducting business in the District of Columbia, then the poles will be removed within 60 days.

ANC2E advises the Public Space Committee to incorporate, in this version of the Small Cell Design Guidelines, the OCTO WiFi hardware concept design that attaches to the Small Cell Poles.□
ANC2E advises the Public Space Committee that the following will require a 30 day notice to the affected ANC and the specific Single Member District:□
1. Any Small Cell Installations,□
2. All Small Cell Facility maintenance,□
3. Small Cell Facility upgrades,□
4. Any location changes to existing deployments.□
□
ANC2E advises the Public Space Committee, that any future changes to the Small Cell Design Guidelines will require a 30 day notice to the

ANC's and the Public.□

ANC2E advises the Public Space Committee that this Resolution has the support of the Citizens Association of Georgetown, the Burleith Citizens Association, the Hillandale Homeowners Association, Trees for Georgetown, Georgetown Main Street, the Georgetown Business Improvement District and the Georgetown Business Association.□

Therefore be it Resolved, ANC2E advises the Public Space Committee to incorporate the recommendations contained in this resolution into the revised Small Cell Design Guidelines and then hold Public Hearings for Community input, as soon as possible.□

ADVISORY NEIGHBORHOOD COMMISSION 3C
GOVERNMENT OF THE DISTRICT OF COLUMBIA
CATHEDRAL HEIGHTS • CLEVELAND PARK
MASSACHUSETTS AVENUE HEIGHTS • MCLEAN GARDENS
WOODLAND-NORMANSTONE • WOODLEY PARK

Single Member District Commissioners
01-Lee Brian Reba; 02-_Gwendolyn Bole; 03-Jessica Wasserman
04- Beau Finley; 05- Emma Hersh; 06-Angela Bradbery
07- Maureen Kinlan Boucher; 08-Vacant; 09-Nancy MacWood

P.O. Box 4966
Washington, DC 20008
Website http://www.anc3c.org
Email all@anc3c.org

ANC3C Resolution 2018-033
Regarding Small Cell Technology Guidelines

WHEREAS, At least five wireless providers plan to put a total of between 2,030 and 2,230 small cell technology and supporting infrastructure installations on light poles in public space throughout the city to build a 5G network;

WHEREAS, Verizon, Crown Castle, AT&T, Mobilitie and ExteNet have identified locations in the city where they plan to install the technology and related equipment and have signed master license agreements with the District Department of Transportation (DDOT);

WHEREAS, DDOT has worked closely with the companies as well as the Office of Planning, the Historic Preservation Office, the U.S. Commission of Fine Arts and the National Capital Planning Commission to develop design guidelines to address the general standards and aesthetics for the design and installation of the small cell technology and related equipment;

WHEREAS, DDOT notified ANCs only in late August about the development of the small cell technology design guidelines and held just one informational meeting on Sept. 6 for all ANC commissioners that was not well advertised;

WHEREAS, DDOT is giving the public and ANCs only until Oct. 5 to comment on the guidelines - just under a month from the date of the informational meeting;

WHEREAS, representatives of the carriers at the informational meeting refused to provide dimensions of the boxes that are part of the small cell technology infrastructure, claiming the information was proprietary;

WHEREAS, pictures provided at the meeting show the boxes and other equipment installed on light poles, but from a distance, making it difficult to discern the actual size of the boxes;

WHEREAS, DDOT has not provided an analysis of how the small cell technology program will affect neighborhoods or arterial roadways, and maps provided at the information meeting that show proposed small cell technology installation locations are small and blurry;

WHEREAS, in the guidelines, DDOT notes the unique nature of the District's streetscape and states that the public space enhances the quality of life for residents and visitors, and ensures that the city has the foundation to become a more walkable and sustainable city;

WHEREAS, the already-executed Master Agreement charges the carriers fees for installing the small cell technology on poles and notes that the District may require carriers to provide equipment for the Smart City program but the District would pay them for it. The Master

Nancy J. MacWood
Chair, on September 17, 2018

This resolution was approved by a voice vote on September 17, 2018 at a scheduled and noticed public meeting of ANC 3C at which a quorum (a minimum of 5 of 9 commissioners) was present.

Government of the District of Columbia
ADVISORY NEIGHBORHOOD COMMISSION 3/4G
CHEVY CHASE, BARNABY WOODS, HAWTHORNE

COMMISSIONERS
3/4 G-01 - Abraham Clayman
3/4 G-02 - Chanda Tuck-Garfield, Treasurer
3/4 G-03 - Randy Speck, Chair
3/4 G-04 - Rebecca Maydak, Secretary
3/4 G-05 - Gerald Malitz
3/4 G-06 - Dan Bradfield
3/4 G-07 - Christopher Fromboluti, Vice-Chair

5601 Connecticut Avenue N.W.
P.O. Box 6252 Washington, D.C. 20015
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http://www.anc3g.org
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202.363.5803

ANC 3/4G Resolution Opposing Small Cell Wireless and 5G Technology Without Studies Confirming Safety

1. The District Department of Transportation has issued draft guidelines (https://ddot.dc.gov/sites/default/files/dc/sites/ddot/page_content/attachments/FINAL%20DRAFT%20SMALL%20CELL%20DESIGN%20GUIDELINES%20082320 18.pdf) that are intended to govern the installation of small cell wireless equipment on streetlight and utility poles throughout the District. Small cells are designed to boost cellular service from the existing wireless carriers like Verizon and AT&T and will enable those carriers to implement 5G technology.

2. Concerns have been raised about the health risks of 5G technology, which includes these small cell installations. See, e.g., "EMF Scientist Appeal Advisors Call For Moratorium On Policies For 5G "Small Cell" Antennas," https://ehtrust.org/key-issues/cell-phoneswireless/emf-scientist-appeal-advisors-call-moratorium-5g/, and Doctors Letters on Cell Towers Near Schools - https://ehtrust.org/wp-content/uploads/Doctors-Letters-on-Cell-Towers-and-Cell-Towers-at-Schools.pdf Additionally, many studies have linked low-level wireless radio frequency radiation exposures to a long list of adverse biological effects, including: DNA single and double strand breaks; oxidative damage; disruption of cell metabolism; increased blood brain barrier permeability; melatonin reduction disruption to brain glucose metabolism; and, generation of stress proteins. This list certainly warrants additional scientific studies before District residents are put at risk.

3. The health hazards of 5G technology have been intensely debated at the federal

level, before Congress and the Federal Communications Commission (FCC). There does not appear to be any widely accepted definitive scientific study, however, that proves one way or the other whether small cell installations — emitting extremely high or "millimeter wave" frequencies above 24 GHz — may have an adverse health impact, although in 2011 the World Health Organization classified radio frequency radiation as a possible 2B carcinogen. Moreover, the only applicable FCC standards for radio-frequency radiation emissions were set in 1996, and did not consider the use of modern wireless equipment like small cells that will be located close to residences. Mere compliance with the FCC's outdated standards does not assure safety.

4. On September 26, 2018, the FCC adopted regulations that are intended to facilitate 5G technology by severely limiting the objections that states and cities can raise to small cell installations. The FCC's press release stated that this was "another important step in its ongoing efforts to remove regulatory barriers that inhibit the deployment of infrastructure necessary for 5G and other advanced wireless services. This action, which builds upon those already taken by states and localities to streamline deployment, underscores the FCC's commitment to ensuring that the United States wins the global race to 5G." FCC Press Release, "FCC Facilitates Deployment of Wireless Infrastructure for 5G Connectivity," September 26, 2018, available at https://docs.fcc.gov/public/attachments/DOC-354283A1.pdf. The FCC Chair described this action to "cut red tape for small-cell deployment" that will "mak[e] it cheaper and easier to string fiber optic lines on utility poles." Agit Pai, "5G is in reach. But only if we set the right policies," *Washington Post*, September 26, 2018, available at https://www.washingtonpost.com/opinions/5g-is-in-reach-but-only-if-we-set-the-right-policies/2018/09/26/9d5c322e-c1c7-11e8-8f06-009b39c3f6dd_story.html?utm_term=.cbadc613d419.

5. Rather than "winning the global race to 5G," ANC 3/4G considers the protection of residents' health and welfare to be the District's highest priority — not simply making installations cheaper and easier. Instead of racing pell-mell to authorize small cell installations without any reliable basis for finding that they are safe, the District should oppose this federal imposition until scientific data shows that it will have no serious adverse consequences for District residents. We should not willingly participate in this population-wide experiment that could have catastrophic consequences.

6. The FCC's action and DDOT's draft guidelines will give private cell providers the right to put antennas and transmission control boxes on District-owned streetlight poles and privately-owned utility wood poles subject to only minimal limitations. This means that a 5G antenna could be mounted on the streetlight or utility pole in front of a resident's home, and there would be little the resident could do about it.

Given the health concerns described above, the ANC believes this should cause great concern for all District residents.

7. Because of these concerns, ANC 3/4G urges the Mayor, the Council, and the Attorney General to oppose the imposition of small cell wireless and 5G technology on the District unless scientifically reliable studies demonstrate that they pose no undue health risks for residents or their pets and that those installations will have no damaging consequences for people or the natural environment. This opposition should include, but is not limited to, adoption of legislation or initiation of lawsuits that will protect District residents and our environment from untested and unproven 5G technology.

Approved by ANC 3/4G after a discussion at its regularly scheduled and noticed September 24, 2018 meeting by a vote of 7 to 0 (a quorum being 4).

Randy Speck, Chair

Rebecca Maydak, Secretary

District of Columbia Government
Advisory Neighborhood Commission 6A
Box 75115
Washington, DC 20013

September 14, 2018

Mr. Matthew Marcou
Associate Director for Public Space Regulation
District Department of Transportation
55 M Street SE, Suite 400
Washington, DC 20003

Re: Design Guidelines for Small Cell Infrastructure

Dear Associate Director Marcou:

At a regularly scheduled and properly noticed meeting[1] on September 13, 2018, our Commission voted 6-0 (with 5 Commissioners required for a quorum) to express our concerns regarding the draft Guidelines for Small Cell Infrastructure.

We have two procedural concerns:

1. Although the guidelines have been in development since November 2017, our ANC did not receive the draft guidelines until August 27, 2018 and DDOT declined requests to meet and answer questions until the public meeting on September 6, 2018. Given the monthly meeting schedule of the ANCs, a deadline of October 5 for submission of written comments (October 15 for in-person testimony) is unreasonable. The hearing should be rescheduled for sometime in November and the deadline for written comments be extended by at least thirty (30) days.

2. When a revised draft of the Design Guidelines has been prepared, incorporating both public comment and that of the installation companies, there must be another round of review, open meetings, and comment so that the public, including the ANCs can respond to changes. In the document. It will not be acceptable to deny the public an opportunity to comment on accommodations made to the installation companies.

A request (prior to end of comment period) for the following information:

- Why are the "Carriers and third (3rd) party service providers "who are not actual utilities and are not overseen by any local government agency or commission getting use of our right of way?
- Are they going to be afforded eminent domain in locations where residents are against the deployment of these systems but the Carriers say they must have them?
- What is the fee structure for the lease of each of these small cell locations? On what basis was that negotiated?

---

[1] ANC 6A meetings are advertised electronically on the anc6a-announce@yahoogroups.com, anc-6a@yahoogroups.com, and newhilleast@yahoogroups.com, at www.anc6a.org, and through print advertisements in the Hill Rag.

ANC 6B
Capitol Hill / Southeast

921 Pennsylvania Avenue SE
Washington, DC 20003-2141
6B@anc.dc.gov

September 21, 2018

DDOT Public Space Committee
c/o DDOT Public Space Permit Office
1104 4th Street SW, Room 360
Washington DC 20024

VIA EMAIL: PublicSpace.Commitee@dc.gov

RE: Small Cell Design Guideline Comments

To whom it may concern:

At a properly noticed regular meeting of Advisory Neighborhood Commission 6B on September 11, 2018, with a quorum present the Commission voted 9-0-0 to inform the Public Space Committee that it has reviewed the "Draft Small Cell Design Guidelines" document, dated August 24, 2018, and has the following comments:

> DC needs to ensure that the guidelines have sufficient flexibility to enable a multitude of operators to participate and that the system will not interfere with existing wireless WiFi ISPs, such as DC Access.
>
> In addition, the ANC does not agree with the distinction made in the document between unnamed and named alleys (Section 5.2.1.1). Within the borders of ANC6B are a multitude of alleys and there is no physical distinction between those that are named or unnamed.

Please contact Commissioner Kirsten Oldenburg, ANC 6B Transportation Committee Chair at 202-546-8542 or 6B04@anc.dc.gov if you have any questions about this request or need further information.

Sincerely,

Daniel Ridge
Chair, ANC 6B

Government of the District of Columbia

Advisory Neighborhood Commission 6C

P.O. Box 77876 Washington, D.C. 20013, (202) 547-7168

September 21, 2018

Mr. Matthew J. Marcou
Public Space Committee
c/o Public Space Permit Office
District Department of Transportation
1100 4th Street SW, Room 360
Washington, D.C. 20024

Re: Small Cell Guideline Comments

Dear Mr. Marcou:

On September 12, 2018, at a duly noticed and regularly scheduled monthly meeting, with a quorum of five out of five commissioners and the public present, the commissioners voted 5-0 to support making the following comments to the Public Space Committee concerning the draft Small Cell Design Guidelines dated 8/24/2018:

* Section 5.2.1.4. The requirement that standalone poles are not permitted if suitable existing poles are present is important to be preserved in the final version of the guidelines in order to limit the number of standalone poles.

* Sections 5.3.4.1 and 5.3.4.2 state antennas on existing or standalone poles may not be greater than 31' combined height or more than 10% above existing poles, whichever is GREATER but should be LESS. As written, these sections would allow a 10' antenna to be placed on a 20' street light.

* Chart 2. The number of cells allowed per block is excessive for larger blocks if all five carriers seek to place cells on a block over 750'.

* Section 6.1. Restricts cells from being within 20' of the front or side boundary lines of a D.C. Landmark, a National Historic Landmark, federal properties or a property individually listed in the National Register of Historic Places. In addition, however, standalone poles should be prohibited when within a certain, greater distance of these landmark properties. Furthermore, the phrase "federal properties or a property individually listed in the National Register of Historic Places." needs to be clarified, as it is unclear whether the intent is to restrict small cell installation near ALL federal properties or only those listed in the Register.

* Sections 8.2.3 and 8.4.2 seek to protect trees and their critical root zones but the guidelines should in addition protect the tree canopy. In Section 8.2.3, in the phrase "poles shall not be located in a manner that requires the removal of an existing street-tree or that prevents the planting of a street tree in the future" insert "or significant pruning of more than 5 percent of its canopy" after "the removal". In Section 8.4.2, in the phrase "Trees shall not be removed or have their critical root zones damaged for the installation of Small Cell Instructure" insert "or their canopies" after "critical root zones".

* Missing from the guidelines is control over the number of cells on a large scale. The Guidelines limit the number per block but there is no prohibition on small cells being installed on every block in the District. The guidelines should place limits on a larger scale. If the technology requires a massive number of cells, the program should be reconsidered.

* ANC 6C is not endorsing the draft Small Cell Guidelines even with adoption of these suggested comments and believes additional study and refinement should take place before their adoption.

Thank you for giving great weight to the views of ANC

On behalf of ANC 6C,

Karen J. Wirt

Karen Wirt
ANC 6C chair

Small Cell Guideline Comments

Holmes, Antawan (ANC 7C07)

Fri 10/5/2018 4:56 PM

To: Committee, Public Space (DDOT) <Public.SpaceCommittee@dc.gov>;

Cc: Goodall, Lee (DDOT) <Lee.Goodall@dc.gov>; Gray, Vincent (Council) (vgray@dccouncil.us) <vgray@dccouncil.us>; Malloy, Patricia (ANC 7C01) <7C01@anc.dc.gov>; Morgan, Mary C. (SMD 7C02) <7C02@anc.dc.gov>; Woods, Catherine (ANC 7C03) <7C03@anc.dc.gov>; Green, Anthony Lorenzo (SMD 7C04) <7C04@anc.dc.gov>; Gaffney, Mary L. (ANC 7C05) <7C05@anc.dc.gov>; Conley, Jarred (SMD 7C06) <7C06@anc.dc.gov>; Holmes, Antawan (ANC 7C07) <7C07@anc.dc.gov>; Simon, Gottlieb (OANC) <Gottlieb.Simon@dc.gov>;

All,

Here are my comments for the Small Cell Guideline (5G):

1. It is preferred that all 5G modems are hosted/hotel in one box instead of each company setting up their own pole and creating more clutter in our business districts.
2. It should be required that OCTO provide a mesh Wi-Fi system at all proposed 5G deployment locations to facilitate broadband connectivity for low income residents.
3. DDOT & OP3 should coordinate the installation of the small cell and LED light deployments to minimize disruption in our communities.
4. It is required that all 5G providers complete infrastructure equipment installation in Ward 5, 7, 8 before starting in the rest of the District
5. It is required that 5G operators provide node saturation data via a dashboard to proactively inform consumers about the status of their broadband connectivity.

Regards,
Antawan Holmes
Advisory Neighborhood Commission 7C Chair
ANC Commissioner SMD-7C07
site: http://anc7c.org
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Crown Castle
10980 Grantchester Way, 4th Floor
Columbia, MD 21044

October 5, 2018

VIA Email: PublicSpace.Committee@dc.gov

Mathew Marcou, Chair
Public Space Committee
District Department of Transportation
55 M Street, SE, Suite 400
Washington, DC 20003

Re: Crown Castle's Comments to DDOT Draft Small Cell Design Guidelines dated August 24, 2018

Dear Mr. Marcou:

Thank you for your continued consideration of Crown Castle NG Atlantic LLC's (Crown Castle) proposal for wireless infrastructure in the District of Columbia (City or DC).

Crown Castle appreciates the opportunity to comment on DDOT's Draft Small Cell Design Guidelines (Guidelines). We look forward to continuing to work closely with DDOT and the other stakeholders involved in the development of the Guidelines.

Set forth below are our general concerns with the Guidelines followed by comments to specific sections for your review.

General Concerns

1. **Strand Mounting.** There is no mention of strand-mounted wireless solutions in the Guidelines. As discussed during the informational sessions, strand mounting is a form of small cell technology that Crown Castle has extensively deployed in West Coast markets. It has the potential to be less visually intrusive in the City streetscape. Crown Castle has obtained approval for the use of this type of equipment within the Pepco service area and is prepared to commence installations within the City. For efficient deployment within the City, Crown Castle recommends that strand-mounted wireless solutions be permitted to be deployed in advance of the approval of the Guidelines.

2. **Design Criteria for Wood Pole Installations.** The Guidelines have no specific design criteria for wood pole installations. Crown Castle suggests adding affirmative language to the Guidelines stating that any proposed wood pole installations that comply with/are authorized under applicable utility attachment agreements and their corresponding design standards are deemed acceptable under the Guidelines without a hearing.

3. **Aesthetics.** The Guidelines are intended to cover the general standards and aesthetics for the design and installation of Small Cell Technology in public space across the District of Columbia (Section 2.1). As you are aware, changes to federal law governing wireless attachment rights were adopted by the FCC on Wednesday, September 26, 2018 and will preempt the Guidelines

in several material respects. The recently released order states that "aesthetics requirements are not preempted if they are (1) reasonable, (2) no more burdensome that those applied to other types of infrastructure deployments, and (3) objective and published in advanced." FCC Order 18-133 para. 86 (rel. Sept. 27, 2018). The Guidelines on their face do not meet these requirements because they are unreasonable, overly burden small cell facilities compared to those applied to other types of infrastructure deployments, and do not include objective aesthetic requirements.

Comments to Specific Sections of the Guidelines

Section 5. General Guidelines

With respect to Sections 5.1 (General Limits, Locations) and 5.2 (General Limits: Preference for Locations and Methods), we note that there is no criteria for defining an unusable pole. In addition, we suggest expanding the use of all "pendant" style poles to the list of allowable installations.

Section 5.1.2.3. Poles that have traffic control devices. This Section states Small Cell Infrastructure is prohibited on poles with "Traffic Control Devices" which is a different term than what is used in the "***Glossary***". The Glossary uses the term "Traffic Signal ", and Crown Castle recommends utilizing the same term in both sections.

Section 5.2.1.3. Preference for installations in alleys. The limitation on placement of equipment in alleys in the City prevents deployment. Because the spacing of sites or nodes in a network design is critical, nodes cannot be placed too close together due to RF interference and they cannot be placed too far from one another. Here, if the location of equipment is limited to alleys it would significantly impact the ability to design an integrated system that addresses a carrier's coverage and capacity needs. Given the integrated nature of a Distributed Antenna System network, the Guidelines could have the effect of prohibiting the provision of wireless services in violation of the Telecommunications Act.

Section 5.2.1.4. The Guidelines state that "where there are existing poles that the guidelines allow for attachment, no new standalone poles shall be permitted." Crown Castle recommends adding this language immediately following in order to account for the prohibitive effect this policy may have on deployment if the utility standards do not allow use of the existing pole for attachment: "Provided, however, that new standalone poles shall be permitted if the construction standards of the existing pole owner do not allow attachment of any or all wireless infrastructure thereto."

Section 5.3.3. States that all approved lettering is limited to 1" in height. Crown Castle suggests modifying the language in this section to state that all approved lettering shall conform to applicable FCC and NESC code requirements.

Section 5.3.4. Crown Castle concurs with language governing height but suggests adding language that states that this applies to metal street lights. Third party wood utility pole heights are regulated by the utility.

Section 5.5.3. The Use Chart mandates the use, without exception (apart from full Public Space Committee review process) of vaults in all of Georgetown, Monumental Core, Shipstead Luce act and any other historic district area. We request that some form of relief be provided, for instance, standalone poles with enlarged bases. The reasons for avoiding vaults is due to the very nature of the equipment (radios and associated electronics). Water intrusion and the use of pumps is a major concern, blocked access doors during snow events, enhanced galvanic corrosion of the equipment due to the concentration of salt and other snow melting chemicals during the winter, among others.

Further, Chart "1" in this Section uses the term "cabinetry" which is undefined in the ***Glossary***. Crown Castle suggests adding this term to the ***Glossary*** and defining it as "any enclosure not exceeding 28 cubic feet of gross internal volume designed to house radios and related equipment."

Section 5.5.3. Regarding Chart 2, Crown Castle suggests that, given the length of the block set forth in the Chart, that the limit per carrier per block be changed to read "2" for intervals of 451'-600' and "3" for intervals over 750'.

Section 6. Guidelines regarding Historic Districts and Landmarked Properties

Section 6.2. The use of alleys, which should be re-considered for the reasons stated above, is further compounded by the requirement to set poles 20' behind the building restriction line. RF signals do not travel as well in these alleyways and this distance limitation exacerbates the issue by ensuring that the RF signal does not extend to any meaningful distance.

Section 7. Guidelines regarding DDOT Streetlights

Section 7.4. The term "must be exactly the same in outward appearance" should be changed to specifically exclude the base (with a maximum dimension) to allow for an aesthetically compatible structure to house equipment and any antenna (with a maximum dimension).

Section 8. Guidelines regarding New Standalone Poles

Section 8.1.2.3. This section which states that if the nearby poles are "Pendant poles" then the "Pendant Pole type" shall be used for new standalone poles requires clarification to match "Illustration 4" in this Section. A suggested addition is "without a pendant arm".

Sections 8.2.8.1/.2/.3/.4 & 8.3.5. These Sections regulate the distances from any of the following: 6' from a hydrant or building fire connection point, 10' from light poles and traffic signal poles, 3' to 5' from bicycle racks or docking stations, 15' (minimum) from street trees and 15' from either edge of an alley. Adding doorways in all districts, driveways, and in residential districts placement at property lines may lead to only one (if any) location on any given block that would be acceptable under the Guidelines. Crown Castle strongly encourages the addition of language to the Guidelines recommending the provision for co-location at all new standalone pole installations.

Section 8.4.3. This Section prohibits the installation of standalone poles where if the installation limits the ability of the City to plant a street tree in the future. No information or criteria is provided on how this would be determined.

Section 9. Guidelines regarding Existing Utility Poles

Section 9.4. A minor issue here but the Guidelines call for grey paint on all wood pole attached equipment. Clearly a matter of taste but, given the surrounding poles and taking aesthetics of the City into account, brown may be a more unobtrusive color.

* * *

Crown Castle and its affiliates look forward to continuing our working relationship with DDOT and other stakeholders to improve mobile broadband connectivity throughout all Wards of the District. Please contact the undersigned with questions.

Respectfully submitted,

Carly T. Didden
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BEFORE THE DISTRICT OF COLUMBIA DEPARTMENT OF TRANSPORTATION PUBLIC SPACE COMMITTEE

COMMENTS OF VERIZON WIRELESS ON DRAFT SMALL CELL DESIGN GUIDELINES

Wireless usage has exploded in the past decade, as wireless devices have increasingly replaced landline telephones and desktop computers as the preferred means of communications. Reliable wireless network infrastructure is critical in the Nation's Capital, not only to meet the needs of its residents and businesses, but District and federal government agencies. To meet this demand, wireless carriers need to install more, newer and smaller network facilities.

The District has shown tremendous leadership in modernizing its policies for the citing of wireless infrastructure in District Rights-of-Way quickly by adopting a master license agreement ("MLA") for the deployment of wireless infrastructure in public space. The Small Cell Guidelines adopted by the Public Space Committee must balance the need to meet the dramatic growth in demand for wireless services with preserving the unique characteristics of the District as the Nation's Capital for over two centuries. However, as drafted, the Guidelines so severely restrict the locations where small cell infrastructure can be deployed as to ensure insufficient infrastructure deployment to meet the growing demand for current and next generation wireless services such as 5G. Verizon Wireless recommends the following amendments to the Guidelines to alleviate the potential to materially inhibit wireless carriers' ability to fill coverage gaps, densify existing networks, introduce new services or otherwise improve service capabilities:

- Clarify that the installation location prohibitions and preferences contained in the guidelines are not absolute, but that non-conforming installations can be reviewed on a case-by-case basis;
- Remove undergrounding vaulting requirements;
- Permit small cell infrastructure on pendant pole streetlights with teardrop heads;

- Permit small cell infrastructure on poles with non-electronic traffic control devices;
- Permit small cell infrastructure within twenty feet of federal properties;
- Permit small cell infrastructure in medians and traffic islands under certain circumstances;
- Revise height limitations applicable to third-party utility poles to reflect safety separation requirements between communications and electric equipment;
- Prioritize other locations for small cell installation higher than unnamed alleys; and
- Permit new standalone poles in areas where DDOT streetlights are installed on third party utility poles if no other pole suitable for attachment is available.

I. The Explosive Demand for Wireless Services in the District Necessitates Increased Deployment of Wireless Facilities at a Rapid Pace.

As the Federal Communications Commission ('FCC") observed last year, "[m]obile wireless services are an important and ubiquitous part of Americans' daily lives, and competition in the provision of mobile wireless services drives innovation and investment to the ultimate benefit of the American people and economy."[1] Just last week, the FCC noted that "[t]he introduction of advanced wireless services has already revolutionized the way Americans communicate and transformed the U.S. economy," and "American demand for wireless services continue to grow exponentially,"[2]

The demand for wireless services in the District have likewise grown dramatically over the past decade. Since 2008, wireless subscribership in the District has increased 36%, from 1.1

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[1] *In the Matter of Implementation of Section 6002(b) of the Omnibus Budget Reconciliation Act of 1993; Annual Report and Analysis of Competitive Market Conditions With Respect to Mobile Wireless, Including Commercial Mobile Services,* WT Docket No. 17-69, Federal Communications Commission Twentieth Report (rel. Sept. 27, 2017) at ¶ 1 ("Twentieth Wireless Competition Report").

[2] *In the Matter of Accelerating Wireless Broadband Deployment by Removing Barriers to Infrastructure Investment,* WT Docket No. 17-79 and WC Docket No. 17-84, Federal Communications Commission, Declaratory Ruling and Third Report and Order (rel. Sept. 27, 2018)("*FCC Wireless Infrastructure Order*") at ¶23.

million subscribers to 1.5 million in 2016.[3] Significantly, in 2015, for the first time since the National Center for Health Statistics began tracking wireless substitution at the national and state levels, ***over half*** (54.2 percent) of all households in the District were wireless only.[4] That number grew to 55.3 percent in 2016, compared to only 20 percent in 2007.[5] In 2016, another 17.8 percent of District households mostly used wireless phones, and 15.0 percent of District households were dual-use; by comparison, only 3.8 percent of District household exclusively used landline telephones and 3.9 percent mostly used landline telephones.[6] These numbers have no doubt increased, as nationally the number of wireless-only households grew by 3.1 percent between the second half of 2016 and the second half of 2017.[7] Indeed, cord-cutting in the District outpaces the nation: the number of wireless-only American households crossed the majority threshold (50.8%) in the second half of 2016, and reached 53.9 percent in the second half of 2017 (compared to only 38.2 percent in 2012).[8]

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[3] FCC Voice Telephone Services Status as of December 31, 2016 (rel. 02.18)(https://www.fcc.gov/voice-telephone-services-report), Nationwide and State-Level Data for 2008-Present (https://www.fcc.gov/sites/default/files/vts_dec16_hist.zip) (accessed September 25, 2018).

[4] Wireless Substitution: State-Level Estimates from the National Health Interview Survey, 2015 (released August 2016) at https://www.cdc.gov/nchs/data/nhis/earlyrelease/wireless_state_201608.pdf.

[5] *See* Wireless Substitution: State-Level Estimates from the National Health Interview Survey, 2016 (released 12/28/2017) at https://www.cdc.gov/nchs/data/nhis/earlyrelease/Wireless_state_201712.pdf ("2016 NHIS State Wireless Substitution Report"); Blumberg SJ, Luke JV, Davidson G, Davern ME, Yu T, Soderberg K. Wireless Substitution: State-Level Estimates from the National Health Interview Survey, January–December 2007. National Health Statistics Reports; No 14. Hyattsville, MD: National Center for Health Statistics. 2009 ("2009 NHIS State Wireless Substitution Report") at 5;

[6] 2016 NHIS State Wireless Substitution Report.

[7] Blumberg SJ, Luke JV. Wireless substitution: Early release of estimates from the National Health Interview Survey, July-December 2017. National Center for Health Statistics. May 2018. Available from: https://www.cdc.gov/nchs/data/nhis/earlyrelease/wireless201806.pdf (released 06/07/2018) at 1; NHIS Wireless Substitution: Early Release of Estimates From the National Health Interview Survey, July-December 2013 at 1.

[8] Blumberg SJ, Luke JV. Wireless substitution: Early release of estimates from the National Health Interview Survey, July–December 2016. National Center for Health Statistics. May 2017. Available from: http://www.cdc.gov/nchs/nhis.htm.

This dramatic growth in demand for wireless services necessitates increased deployment of wireless facilities in the District to meet customer demand. To expand or improve coverage in existing service areas, and to accommodate newer technologies, wireless providers traditionally deployed macro cells through towers and collocated large antennas. Increasingly, however, wireless providers have deployed small cell systems to fill local coverage gaps, densify networks, increase local capacity, or to prepare for 5G and other advances services. This new era of wireless infrastructure deployment requires forward-looking policies and streamlined review procedures that balance competing demands and meet the needs of the District community and economy.

As noted in the *FCC's Wireless Infrastructure Order* released just last week, "[a]s more Americans use more wireless services, demand for new technologies, coverage and capacity will necessarily increase, making it critical that the deployment of wireless infrastructure, particularly Small Wireless Facilities, not be stymied by unreasonable state and local requirements."[9] However,

> [t]he challenge for policymakers is that the deployment of these new networks will look different than the 3G and 4G deployments of the past. Over the last few years, providers have been increasingly looking to densify their networks with new small cell deployments that have antennas often no larger than a small backpack. From a regulatory perspective, these raise different issues than the construction of large, 200-foot towers that marked the 3G and 4G deployments of the past. Indeed, estimates predict that upwards of 80 percent of all new deployments will be small cells going forward. To support advanced 4G or 5G offerings, providers must build out small cells at a faster

[9] FCC Wireless Infrastructure Oder at ¶ 23.

> pace and at a far greater density of deployment than before.[10]

The Small Cell Guidelines adopted by the Public Space Committee should be examined in this broader context.

II. The Guidelines Must Comply with Sections 253 and 332 of the Federal Communications Act.

In adopting the Telecommunications Act of 1996, Congress placed limits on state and local regulation of telecommunications and wireless communications services. Specifically, Section 253(a) provides that "[n]o State or local statute or regulation, or other State or local legal requirement, may prohibit or have the effect of prohibiting the ability of any entity to provide any interstate or intrastate telecommunications service."[11] Similarly, Section 332(c)(7)(B)(i) specifies that

> [t]he regulation of the placement, construction, and modification of personal wireless service facilities by any State or local government or instrumentality thereof—(I) shall not unreasonably discriminate among providers of functionally equivalent services; and (II) shall not prohibit or have the effect of prohibiting the provision of personal wireless services."[12]

The *FCC Wireless Infrastructure Order* reaffirms that a state or local legal requirement constitutes an effective prohibition of service if it materially limits or inhibits the ability of any competitor or potential competitor to compete in a fair and balanced legal and regulatory environment or engage in a variety of activities related to its provision of a covered service.[13] The FCC clarified that the "material inhibit" test is met not only when filling a coverage gap but

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[10] Id. at ¶ 3.

[11] 47 U.S. C. § 245(a).

[12] 47 U.S.C. § 332(c)(7)(B)(i).

[13] FCC Wireless Infrastructure Order ¶ 35.

also when densifying a wireless network, introducing new services or otherwise improving service capabilities.[14]

The *FCC Wireless Infrastructure Order* also provides guidance on when state and local requirements that are allowed under the Act—such as aesthetics, undergrounding, and minimum spacing requirements—may constitute an effective prohibition of service. Specifically, the FCC found state and local aesthetics requirement are permissible only if they are (1) reasonable, (2) no more burdensome than those applied to other types of infrastructure deployments, and (3) objective and published in advance.[15]

III. Comments on Specific Draft Guidelines.

In the context of the dramatic changes in wireless demand and infrastructure and the legal framework outlined above, Verizon Wireless applauds the District's efforts to streamline its public space permitting processes for the deployment of wireless infrastructure deployment through the development of an MLA and the Draft Small Cell Guidelines. Overall, these actions modernize and streamline the District's permit process in a way that will facilitate deployment to meet the growing demands of District residents, businesses, and government agencies, and pave the way for 5G and other advanced wireless services. However Verizon Wireless seeks clarification and modification of some provisions of the guidelines to ensure they do not constitute an effective prohibition of service or impose unnecessary or unreasonable costs or delays on the deployment of small cell wireless facilities in the District. While the Guidelines create a preference for collocation of small cell equipment on existing poles, some of the

[14] *Id.* at ¶ 35.

[15] *Id.* ¶ 86.

restrictions on small cell locations undermine this preference by limiting the number of existing poles that can accommodate small cell equipment and meet the coverage and capacity needs of the wireless carriers. The guidelines further restrict installation of small cell equipment through Section 5.2.1.4's prohibition on new standalone poles where there are existing poles that the guidelines allow for attachment, even if those exiting poles are not technically or structurally feasible to meet a carrier's coverage needs. These limitations effectively restrict entire sections of the District from installation of any small cell equipment at all. Verizon Wireless offers suggested amendments to alleviate these problems.

A. The Guidelines Should Clarify that the Prohibitions and Preferences Contained Therein are not Absolute.

Several provisions in the Guidelines prohibit installation of small cell infrastructure in specific locations or on specific structures.[16] The Draft Guidelines do not specify whether these prohibitions are absolute, or whether permit applications for proposed installations in such locations would be reviewed by the Public Space Committee ("PSC") and other relevant federal entities as outlined in Section 4.2.1. Similarly, Section 5.2 establishes a preference for locations and methods of installing small cell facilities. The Guidelines do not specify whether locations outside of these preferences will be considered consistent with the Guidelines and processed through the DDOT TOPS process or will require additional Public Space Committee review under Section 4.2.1. In totality, the restrictions in the Draft Guidelines leave insufficient options available to carriers to attach small cell equipment that meets their coverage needs to meet the demands for wireless services in the District. As a result, unless non-conforming proposed

[16] *See* e.g. Section 5.1.2 prohibiting installation of small cell infrastructure in certain locations; Section 6.1 prohibiting small cell infrastructure installation within twenty feet of the front or side boundary lines of a D.C. Landmark, National Historic Landmark, federal properties or a property individually listed in the National Register of Historic Places; and Section 7 limiting small cell installations to specific categories of DDOT streetlights.

installations are addressed on a case-by-case basis by the Public Space Committee, the Guidelines could constitute an effective prohibition of service as currently drafted. Section 4.2 should clarify that applications that do not comply with the Guidelines will be reviewed for approval by the Public Space Committee on a case-by-case basis, and outline the circumstances under which review and comment will be required by the National Capital Planning Commission ("NCPC"), the U.S. Commission of Fine Arts ("CFA"), and the Historic Preservation Office ("HPO"). For example, the Guidelines should expressly allow review of new stand-alone that would otherwise be prohibited under Section 5.2.1.4 in the event a carrier can show that exiting poles that are permissible for collocation under the guidelines are not technically or structurally feasible to meet a carrier's coverage needs. Similarly, the Guidelines should expressly allow for review of small cell installations that do not meet the spacing and frequency of installation requirements in Section 5.4.2 and Chart 2 if a carrier can demonstrate that additional installations are required to meet coverage demand requirements in particular locations.

While non-conforming proposals should be rare, a process nevertheless should be available to address non-conforming installations on a case-by-case basis to meet service needs. Moreover, any denials of non-conforming applications should be provided in writing, and supported by record evidence to provide carriers with guidance on alternatives that would be acceptable.

B. The Guidelines Should Not Impose Underground Vaulting Requirements.

Section 5.5.1 requires underground vaults for small cell installations on existing District owned 5A poles and wood poles in the Monumental Core and Historic Districts, and for all existing District owned pendant poles with cobra heads and new Carrier owned standalone poles anywhere in the District. The Guidelines note that at grade cabinet installations may be

considered on a per location basis for existing pendant poles with cobra heads and new standalone carrier poles overall with review by the PSC, and review and comment by Advisory Neighborhood Commissions ("ANCs"), CFA, NCPC and HPO as appropriate. However, the Guidelines contain no such provision for any District owned or Carrier owned poles in the Monumental Core or Historic Districts, suggesting vaulting requirements for these poles is absolute.

As noted in the *FCC Wireless Infrastructure Order*, undergrounding requirements can amount to effective prohibitions by materially inhibiting the deployment of wireless service.[17] Vaulting requirements effectively prohibit small cell equipment altogether on District and Carrier owned poles in the Monumental Core and Historic Districts. Placing small cell equipment in vaults increases to unacceptable levels the risk of equipment failure that will lead to service outages. Indeed, in the handful of areas where Verizon Wireless has tried placing small cell equipment in underground vaults, it has been plagued with service interruptions due to equipment failure in those vaults.

Small cell radio equipment will not work if submerged in water for any amount of time. As a result, any flooding in a vault for any period of time will result in a service outage. Because the District is located in a humid subtropical climate and in the Chesapeake Bay drainage basin, it is susceptible to moisture and flooding. A 2010 study conducted by the Federal Emergency Management Agency ("FEMA") noted that the District's location results in three primary sources of moisture: air moving inland from the Atlantic Ocean; air of tropical origin in the Gulf

[17] *FCC Wireless Infrastructure Order* at ¶ 90.

of Mexico; and air containing moisture recycled from land surfaces, lakes, and reservoirs. [18] Likewise, the NCPC has noted that "[t]he District's location at the confluence of the Potomac and Anacostia Rivers, combined with three buried waterways, broad floodplains, and relatively flat elevations, renders it highly susceptible to periodic flooding." [19] While placing pumping equipment could mitigate the effects of such flooding, it cannot prevent the small cell equipment from failing.

Similarly, small cell radio equipment is sensitive to heat. Any vaulting would require ventilation, which creates opportunities for water infiltration. Pump equipment necessary to address water in the vault also will increase the overall heat load in the vault. Any fan equipment installed to mitigate heat will create concerns with air supply and exhaust vents becoming obstructed, resulting in equipment overheating and failure.

C. The Guidelines Should Permit Small Cell Installations on Pendant Pole Streetlights with Teardrop Heads.

The Guidelines do not permit small cell installation on any District pendant pole streetlight with teardrop heads.[20] However, in many areas in the District, these are the only existing poles available to install small cell facilities. For example, in the area around 1600 Church Street NW, pendant pole streetlights with tear drop arms anchor the corners of the block and the District uses 18 foot single globes down the street between the corners. In areas such as

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[18] Federal Emergency Management Agency, "Flood Insurance Study, District of Columbia, Washington, D.C." (Revised Sept. 27, 2010) at 6 (available at http://www.ncpc.gov/DocumentDepot/Planning/flooding/DC_Flood_Insurance_Study_Pre-17th_Street_Levee.pdf).

[19] National Capital Region Planning Commission, "Report on Flooding and Stormwater in Washington. DC," (Jan. 2008) at 1 ("NCPC Flood Report"), available at http://www.ncpc.gov/DocumentDepot/Publications/FloodReport2008.pdf).

[20] Section 7.1 and 7.2

these, no other poles are available in to install small cell equipment to meet a carrier's coverage needs without installing a new pole. The Guidelines should allow installation on pendant poles with teardrop heads.

D. Small Cell Infrastructure Should Be Permitted on Poles With Non-Electronic Traffic Control Devices.

Section 5.1.2.3 prohibits installation of small cell infrastructure on poles that have traffic control devices.[21] Traffic control devices include not only electronic street lights, but non-electronic street signs that include stop, yield, no left turn, no pedestrian crossing, or similar signage. An otherwise permissible pole should not be excluded from small cell installations solely because it has a stop, yield, street name, or other non-electronic sign if the installation can be installed in a manner that is not in conflict with the sign. For example, an installation at the top of a pendant light pole with a cobrahead light is high enough to be outside of a driver's line of sight and should be permitted.

E. The Guidelines Should Not Prohibit Small Cell Infrastructure Within Twenty Feet of Federal Properties.

Section 6.1 of the Guidelines prohibits small cell infrastructure from installation within twenty feet of the front or side boundary lines of a D.C. Landmark, a National Landmark, federal properties, or a property individually listed in the National Register of Historic Places. Given the number of federal properties in the District, this effectively bans small cell infrastructure in the very locations that have high demand for wireless services. For example, no small cell facilities

[21] The Guidelines do not define "traffic control device," but define "traffic signals" as "[a] pole of any type to which a traffic or pedestrian signal or other traffic right of way regulating equipment is attached. This includes stop, yield, and similar signage. It does not include street name, parking regulation, or similar signage." D.C. Code § 50-2351 defines "traffic control device" as "any device, whether manually, electrically, or mechanically operated, by which traffic is alternately directed to stop and to proceed." This creates some confusion as to whether 5.1.2.3 permits installation of small cell infrastructure on poles that contain only pedestrian traffic control devices. It is also unclear whether traffic control device includes street name, parking regulation, or similar signage.

could be installed on large swaths of land between E Street, NW and I-695 in the Southwest quadrant of the District. The Guidelines should remove federal properties from this restriction.

F. Small Cell Infrastructure Should Be Permitted on Otherwise Permissible Poles in Medians and Traffic Islands.

Section 5.1.2.1 of the Guidelines prohibit small cell infrastructure in medians and traffic islands. Collocation of small cell equipment should be permitted in medians and traffic islands where an otherwise permissible existing District owned pole or third party utility pole is located if it does not present a distraction. Moreover, the Guidelines should allow new standalone poles in medians and traffic islands if it does not impair the flow of traffic and no existing pole is available suitable for collocating small cell equipment.

G. The Guidelines Do Not Account for the Need to Replace Existing Third-Party Poles to Install Small Cell Equipment.

The Guidelines Glossary define third-party poles as an ***existing*** pole in the public space owned by a party other than the District or the cellular provider installed to provide public utilities and that can accommodate Small Cell infrastructure equipment. Many existing utility poles were installed decades ago and do not comply with current standards for the placement of new utility poles or collocating wireless equipment, such as the National Electric Safety Code, Occupational Safety and Health Administration regulations, and technician safety standards. Consequently, often a utility will need to replace an existing pole with a newer pole that complies with current standards and can accommodate small cell equipment. These replacements are performed by the utility owner, and wireless providers have no control over the height or characteristics of the replacement poles.

As drafted, replacement utility poles do not constitute an "existing" pole under the definition of a third party pole covered by the Guidelines. Indeed, Section 9.3 of the Guidelines

expressly states "[t]hese guidelines do not allow the installation of new third party poles." Yet it is unclear whether that means that Section 9 governing Existing Utility Poles does not apply, or whether replacement third party poles are excluded from the Guidelines in total. The Guidelines should address situations in which a third party owner replaces an existing pole to accommodate small cell deployment. Otherwise, a majority of the third party pole installations will not benefit from the streamlines approval process contemplated by the MLA and Guidelines.

Likewise, the height restrictions contained in 5.3.4.1 do not reflect the reality of where small cell equipment must be installed on third party utility poles. An antenna itself it approximately 2.5 feet tall. Due to safety standards, telephone company wooden poles that require a new overhead power service with electric equipment require a safety separation space of at least 48 inches between the new power cable and the communications zone, and at least another 48 inches safety separation space between the new power cable and the bottom of the antenna. For example, for a typical wood telephone pole at 25 feet, an antenna will likely raise the total height of that pole to approximately 35 feet. PEPCO poles are usually taller than telephone poles because they require even more separation space between the power zone and any communications equipment, as well as between the power zone and an antennae on the top. For example, adding an antennae to a 40-foot PEPCO pole would likely raise the total height to at least 53 feet. For these reasons, Verizon recommends that the Guidelines permit existing third party utility poles to be extended by the greater of 10 feet or the maximum utility company's safety separation standard up to 50 feet.

H. Placing Small Cell Equipment in Alleyways Will Restrict Coverage.

Section 5.2.1 creates a preference for the placement of small cell infrastructure in unnamed alleys over all other locations. However, small cell technology uses low powered, low

elevation antennas with a shorter signal range than traditional macro antennas. As a result, placing small cell infrastructure in alleyways will limit the reach of the service supported by the antenna. In most cases, placing small cell equipment in an alley will not provide coverage to meet the demands of users along the street. Therefore, the Guidelines should not prioritize small cell installations in unnamed alleys and/or require small cell installations in alleys.

I. New Standalone Poles Should Be Permitted In Areas Where DDOT Attaches Streetlights to Existing Third Party Poles.

Section 8.2.9 of the Guidelines prohibits new standalone poles in areas where DDOT does not have streetlight poles and instead attaches its streetlights to existing third party poles. Utility companies place strict conditions on wireless carrier's ability to collocate small cell equipment on their poles, which dramatically reduce the number of viable wood utility pole candidates. The addition of District street light arms on a wood pole further decreases the number of viable pole candidates. Often, an entire pole line will contain DDOT streetlights, making the entire pole line unavailable for small cell equipment. In these cases, new poles should be permitted across the street or nearby if no other suitable pole for attachment is available.

Conclusion

Verizon Wireless respectfully requests that the Public Space Committee revise the draft guidelines as outlined above.

Respectfully submitted,

Jennifer L. McClellan
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October 5, 2018

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Sent via E-mail

October 1, 2018

District Department of Transportation
Public Space Regulation Administration
Permits Office
1100 4th Street SW, Suite E-360
Washington, DC 20024
Email: PublicSpace.Committee@dc.gov

RE: Small Cell Guideline Comments

Dear Public Space Committee, the Commission on Fine Arts, and the National Capital Planning Commission:

Please find below Mobilitie, LLC's comments to the District Department of Transportation's ("DDOT") draft small cell design guidelines.

5.3. GENERAL LIMITS: APPEARANCE

5.3.2.

We request clarification regarding what is considered to be exposed wires. Is a conduit along the outside of the pole acceptable? Additionally, if all wiring must be routed internally through non-wood poles, a small amount of cabling from the equipment hand hole will be exposed.

5.3.4.1.

In the event that the existing pole is not structurally sound, the pole will need to be replaced. Therefore, we recommend including a reference to replacement poles in this section. Additionally, provide guidance on pole design and manufacturer.

5.5. GENERAL PARAMETERS ON INSTALLATIONS: TYPES, LOCATIONS, AND FREQUENCY; CHART 1, PERMISSIBLE INSTALLATION TYPES AND LOCATIONS

We highly recommend allowing pole mounted cabinetry (so long as applicant can prove the pole is structurally capable of supporting the cabinet). In most instances, below grade vaults are not technically feasible due to a lack of sufficient ventilation and the higher risk of sensitive electronic equipment being submerged. Additionally, below grade vaults can be cost prohibitive. Ground mounted cabinets add unnecessary clutter to the ROW. Pole-mounted cabinetry tends to be more aesthetically pleasing.

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8.1. APPEARANCE; ILLUSTRATION 1, 5A POLE

The current illustration does not clearly identify the maximum antenna dimensions. We would suggest using the FCC standard of three cubic feet rather than capping the height at two feet, six inches as depicted in Illustration 1. To reduce the need for additional ground equipment, we highly recommend allowing for pole-mounted cabinets, not to exceed twenty-eight (28) cubic feet.

8.4. SPACING AMONG STREETSCAPE ELEMENTS; 8.4.3.

Section 8.4.3 is overly broad as written because it effectively prohibits all standalone poles in all districts. Please further clarify how applicants can identify locations that limit DC's ability to plant trees.

Thank you for your time and willingness to work collaboratively with industry stakeholders. If you have any questions, please do not hesitate to contact me at 312.450.4725 or by email at michael.walker@mobilitie.com.

Respectfully submitted,

Michael Walker
Government Relations Director

October 5th, 2018

District of Columbia Public Space Committee
DDOT Public Space Permit Office
1100 4th St SW, Room 360
Washington DC, 20024

RE: Small Cell Guideline Comments

To Whom It May Concern:

On behalf of CTIA, the trade association for the wireless communications industry, I am writing to provide general public policy comments on the District's Small Cell Guidelines.

The wireless industry is one that is constantly evolving and innovating and our networks are also constantly changing as a result. One key driver of this evolution is consumer demand as demonstrated by the fact that there are more wireless devices in the District than there are people.[1] In addition, over 1/2 of the District's residents live in wireless-only households.[2] These demands from the wireless industry's customers require that wireless networks be both updated to meet the existing demand and readied to support the next generation of wireless infrastructure and technology.

Tomorrow's networks need to be denser, closer to the end user, and will increasingly rely on new small wireless infrastructure, commonly referred to as small cells. Consistent with these needs, small cells will be placed on structures such as utility poles and streetlights, oftentimes in the public rights-of-way. This is the policy area in which the District plays an important role.

Over the past two years, twenty state legislatures have passed legislation streamlining and expediting the deployment of small wireless infrastructure, recognizing that infrastructure should not be treated in the same manner as larger macro cell towers. Each piece of legislation is different, but all the legislation addresses three key areas of reform in some manner:

- **Access:** Providers must have reasonable access to the public rights-of-way (ROW) so they can responsibly deploy, maintain and upgrade small cells, which helps to meet customer

[1] FCC, Voice Telephone Services Report: Status as of December 31, 2016, at https://www.fcc.gov/wireline-competition/voice-telephone-services-report, last accessed 10/4/2018.
[2] CDC, National Center for Health Statistics, https://www.cdc.gov/nchs/data/nhis/earlyrelease/wireless_state_201712.pdf, last accessed 10/4/2018.

demands for faster data speeds, stronger in-building signals and an overall improved customer experience.

- **Reasonable Costs and Fees:** Today, ROW access and pole attachment rights often come with exorbitant prices that curb investment in wireless infrastructure. Pole attachment rates frequently exceed 100 times what the FCC has determined to be reasonable for similar poles. Application and attachment fees must be based on direct management costs, without discriminating against any technology.

- **Streamlined Siting Processes:** Small cells should not be treated like tall cell towers. Streamlined approval processes with expedited timelines and objective standards must be adopted. Applications should be deemed approved if no action is taken within a specified time. Providers should also be allowed to consolidate small cell requests, to minimize administrative impacts while improving efficiency in deployment.

The wireless industry is building the platform for our innovation economy – including the next wave of technology that will support smart communities, autonomous vehicles and other applications. The District has executed Master License Agreements with several parties, which work towards accomplishing these goals. CTIA and its members look forward to working with the District to implement these rules using reasonable Design Guidelines. These Guidelines should encourage wireless network infrastructure investment by providing collocation on publicly owned poles without undue design and location burdens that would delay or prevent investment and deployment. Moreover, the Guidelines should be finalized quickly to ensure investment can begin and the District can be at the forefront of having an enhanced state of the art wireless network that supports public safety, economic development, health and educational solutions.

We are hopeful the District will see the value of moving forward expeditiously to the processing, approval and deployment of small cells.

Sincerely,

Bethanne Cooley

Bethanne Cooley
Senior Director, State Legislative Affairs
CTIA

Encl: Accenture, "How 5G Can Help Municipalities Become Smart Cities," https://newsroom.accenture.com/content/1101/files/Accenture_5G-Municipalities-Become-Smart-Cities.pdf

420 10th Street, SE Washington, DC 20003

October 5, 2018

Public Space Committee email: PublicSpace.Committee@dc.gov
c/o DDOT Public Space Permit Office, 1100 4th St SW, Room 360
Washington DC, 20024
Att: Small cell

October 5, 2018

Subject: Small cell technology on Capitol Hill

Dear Mr. Marcou:

The Capitol Hill Restoration Society (CHRS), is the oldest and largest civic organization on Capitol Hill and one of the largest in the city. CHRS is committed to preserving the historic fabric and character of Capitol Hill and protecting its neighborhoods, streets, environment, and viewsheds,

Small cell technology is needed to provide wireless service (including future 5G service) in high-density, high-demand areas, complementing cell towers. Each small cell unit is comprised of an antenna and equipment. Wireless carriers have stated at public meetings that they plan to install 2,500 to 2,700 units throughout the city, raising major issues on clutter, all neighborhoods and historic districts, and street trees.

The FCC has determined that it is essential to prepare or 5G technology and has preempted local jurisdictions from prohibiting the installation of 5G technology. The four major cell phone carriers in our area plan to offer 5G mobile cell service in the first half of 2019. Even after 5G is more widely available, many devices will still rely on 4G for roaming outside of 5G coverage areas. Research firm Strategy Analytics projects that by 2023, only 6.5% of global wireless subscriptions will be 5G, while 70% will be 4G.

5G uses ultra-high-frequency airwaves. These signals are fragile, traveling comparatively small distances and easily blocked by buildings and other objects, requiring line-of-sight

transmission and reception. Each cell unit has three parts, receiving and transmitting antennae (mounted on a pole), and electronic equipment. The four major carriers in DC have taken the position that they need their own cell installations because of differences in their equipment that might interfere - that would likely mean four or more 31-foot high poles with attached equipment in every city block.

The FCC regulations allow DC to impose design guidelines. DDOT has issued design guidelines that would allow placing the equipment on cobra-neck street light poles (but not on Washington Globe light poles), wooden telephone poles or new, stand-alone poles located on streets and named alleys. DDOT has already signed master license agreements with the four carriers, and while 5G is not ready, the licenses would allow the carriers to put the new poles in now with 4G cells and add 5G cells to the poles later. The equipment is not small, consisting of fiber cabinets, electrical boxes, amplifiers, antennas, and other components (apparently there would be essentially duplicate 4G and 5G equipment). At least one carrier has refused to place the equipment below-grade.

Because thousands of units are expected to be installed in the District, this raises major issues on clutter, and effects on viewsheds, the monumental core, historic districts, and street trees. The Public Space Committee plans a hearing on October 15, 2018 to consider small cell installations. We urge that that the October 15 deadline be extended so that everyone can have a more transparent and deliberative approach to the issues.

Thank you for considering our comments

Sincerely,

Elizabeth Nelson

Elizabeth Nelson, President

cc:

Hon. Charles Allen, Ward 6 Councilmember callen@dccouncil.us

GREATER WASHINGTON
Board of Trade

October 5, 2018

Public Space Committee
c/o DDOT Public Space Permit Office
1100 4th Street, SW
Room 360
Washington DC, 20024

Dear Public Space Committee Members:

We believe Greater Washington can be a world-class economic center where everyone can thrive. But first, we must harness smart city technology and innovation to make the region more inclusive, livable, and efficient. That is why we are requesting that District officials expedite the execution of 5G Master License Agreements.

The concept of a smart city may conjure images of spotless, high-tech urban living: silent, driverless electric vehicles zipping through traffic-free streets; sleek, energy-efficient buildings; watches synced to real-time schedules for public transportation; solar-paneled homes controlled by Nest learning thermometers; and neighborhoods cloaked under an invisible web of 5G connectivity. These advancements will make life easier and safer for the people who live, work, and visit the region.

5G connectivity can unlock these technological advancements and more, but it requires continued investment in broadband networks, including the installation of newer technology known as small cells. This low-profile, compact, and unobtrusive technology can be readily deployed to high-traffic areas to increase network capacity and provide enhanced voice and data services. The deployment of small cells is necessary to provide a better experience for consumers—from students to business owners to tourists—who rely on enhanced mobile networks for work, study, entertainment and enjoying the many benefits of our region.

In Washington, D.C., the wireless industry is making significant investments to prepare for this 5G future. We are pleased to hear that District officials approved Master License Agreements earlier this year. However, the ongoing community outreach initiative launched by the District of Columbia Department of Transportation should move quickly to permit execution by adopting guidelines as soon as possible.

On behalf of our members who are eager to enhance their networks by adding small cells and for those who rely on those networks to stay connected, we hope you will expedite the execution of these agreements.

Sincerely,

Jack McDougle
President and CEO

800 Connecticut Avenue NW Suite 001 Washington DC 20006
www.boardoftrade.org

ENVIRONMENTAL HEALTH TRUST

October 5, 2018
Mr. Matthew Marcou
Chair, Public Space Committee
District Department of Transportation
1100 4th Street SW, Third Floor
Washington, DC 20004
PublicSpace.Committee@dc.gov

RE: The DC Government's Draft Small Cell Design Guidelines

Dear Chair Marcou,

As a nonprofit research and policy organization dedicated to identifying and reducing environmental health hazards, Environmental Health Trust (EHT) writes to advise you of important scientific grounds for addressing major health and environmental concerns pertaining to small cell deployment in the District of Columbia (DC).

EHT carries out research on controllable environmental health hazards and works directly with local communities, teachers, parents, students, and policy makers to understand and mitigate these hazards through research, education and advocacy. EHT has offices in the DC region and elsewhere, and EHT President Dr. Devra Davis has been a DC resident for more than forty years. On April 10, 2013 Dr Davis testified before the Washington DC Committee on Health about the health effects of cell phone radiation.[1] However no action was take to inform residents about this important environmental health issue.

Today, EHT writes to:

- ***Share technical information explaining why more than 200 expert scientists are urging a moratorium***[2][3] be imposed regarding the build-out of infrastructure necessary to implement 5G technology.
- ***Request that city officials halt the deployment of 5G "small cells" in DC.*** Instead, the companies who will profit from this proposed technology should be required to implement a wired system using fiber optic cables. As explained in more detail below, wired systems are faster, cheaper, and safer than wireless systems.
- ***Emphasize that major changes are needed to the to the DC Draft Small Cell Design Guidelines to protect DC residents, visitors, and the environment.*** We believe these guidelines are currently inadequate, as they will result in an unprecedented, large-scale increase in involuntary exposures to wireless radiation, a recognized environmental pollutant. Children, pregnant women, and other groups are particularly vulnerable to this pollutant, but everyone living in or traveling to DC would be impacted. DC should require a large setback of at least 500 feet (as is being done in other localities) of the installations from residences, parks and schools to protect the public.

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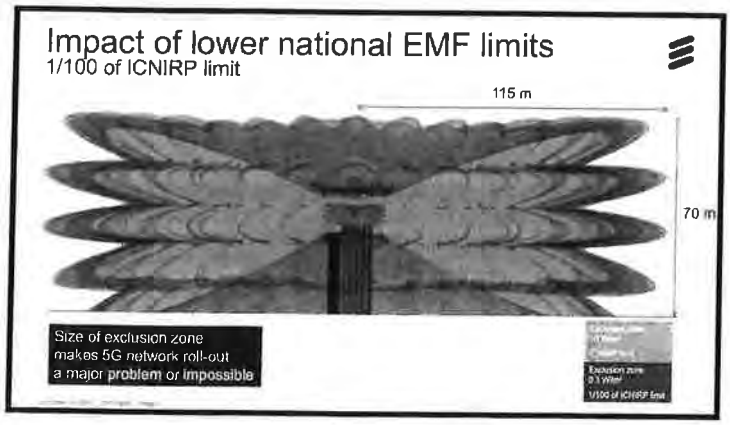
[1] Washington D.C Health Committee Council Hearing on Cell Phone Radiation April 10, 2013. See Testimony PDF Submitted for the Record; Video Link to Dr. Davis Testimony.
[2] 2017 Scientific Appeal on 5G to the European Commission
[3] Martin Blank et al., International Appeal: Scientists call for protection from non-ionizing electromagnetic field exposure, Eur. J. Oncol. (2015).

GHz–100 GHz). Industry has stated that because these faster frequency waves cannot travel as far, there is a need to add thousands of new antennas to accommodate the new system. The telecommunications industry is effectively asking the city for access to public utilities so industry can employ these utilities to build or host new antennas that will transmit an untested technology for which the public will then be charged for access.

In addition to the health and environmental concerns, this massive increase in antennas could wreak havoc on D.C. property values. Studies show property values drop up to 20% on homes located near cell towers.[8] The current proposed 5G rollout would effectively put thousands of cell towers in front of DC homes, as it stipulates that up to 18 distinct towers can be constructed on a single large block and does not expressly require towers to be shared ("hoteling").

Contrary to assumptions that radiation from Small Cell 5th Generation Technology (5G) is "low," the radiation from 5G will increase overall radiation levels so high that the environmental exposures close to the antenna could exceed radiation limits in several countries. The DC Draft Small Cell Design Guidelines refer to *"a new lower-powered antenna technology...installed in closer proximity to the users on the ground...to improve the provider's ability to meet the public's current 4G (LTE) voice and data demands and the future 5th generation cellular needs."*[9]

Countries such as China, India, Poland, Russia, Italy, and Switzerland have far more protective and strict radiation limits than the United States has with one of the highest allowable radiation limits for networks in the world. Other countries' more protective radiation limits require larger distances for exclusion zones and will not allow the full deployment of 5G, because, according to industry reports, the increased radiation would exceed these governments' allowable limits. A recent Telecom Paper article[10] cites a new report by the International Telecommunications Union, *The impact of RF-EMF exposure limits stricter than the ICNIRP or IEEE guidelines on 4G and 5G mobile network deployment*, which states, "RF-EMF exposure limits below the ICNIRP or IEEE guidelines will further restrict upcoming 5G network deployment." In a 2017 presentation titled "Impact of EMF limits on 5G network roll-out," Ericsson stated, *"In countries with EMF limits significantly below the international science-based ICNIRP limits the roll-out of 5G networks will be a major problem."* The image below, which Ericsson included in its presentation, shows how radiation will emanate out from the antenna installations.



[8] Cell Phone Towers Lower Property Values: Documentation And Research on Cellular Base Stations Near Homes, Environmental Health Trust.
[9] District of Columbia, Draft Small Cell Design Guidelines 1, 3 (Aug. 24, 2018).
[10] ITU says strict electromagnetic radiation exposure limits may negatively impact 5G roll-out, Telecom Paper (July 2, 2018).

power-saving features. Without dramatic increases in efficiency, communications technology could use 20% of all electricity and emit up to 5.5% of the world's carbon emissions by 2025. This would be more than is currently emitted by any country except the U.S., China, and India. Dr. Andrae states:

> *The situation is alarming...We have a tsunami of data approaching. Everything which can be is being digitalised. It is a perfect storm. 5G [the fifth generation of mobile technology] is coming, IP [internet protocol] traffic is much higher than estimated, and all cars and machines, robots and artificial intelligence are being digitalised, producing huge amounts of data which is stored in data centres.*[16]

Safer. As discussed in further detail below, microwave radiation poses a host of health and environmental risks. Wired systems avoid these risks by transmitting information through cables instead of through microwave radiation.

Companies Warn Their Investors But Not The Public

For the past decade, a number of corporations have been advising their shareholders that they face serious financial risks from RF. For instance, the Crown Castle International 2016 10-K Annual Report states:

> *If radio frequency emissions from wireless handsets or equipment on our wireless infrastructure are demonstrated to cause negative health effects, potential future claims could adversely affect our operations, costs or revenues. The potential connection between radio frequency emissions and certain negative health effects, including some forms of cancer, has been the subject of substantial study by the scientific community in recent years. We cannot guarantee that claims relating to radio frequency emissions will not arise in the future or that the results of such studies will not be adverse to us...If a connection between radio frequency emissions and possible negative health effects were established, our operations, costs, or revenues may be materially and adversely affected. We currently do not maintain any significant insurance with respect to these matters.*[17]

Most wireless companies, from AT&T to Nokia to T Mobile to Verizon Wireless, have issued similar warnings to their shareholders. For example, Verizon noted in its 2017 10-K Annual Report:

> *We are subject to a significant amount of litigation, which could require us to pay significant damages or settlements.... In addition, our wireless business also faces personal injury and wrongful death lawsuits relating to alleged health effects of wireless phones or radio frequency transmitters. We may incur significant expenses in defending these lawsuits. In addition, we may be required to pay significant awards or settlements.*[18]

Will the citizens of Washington, D.C. also be warned of the risks?

Most Secondary Insurance Companies Do Not Cover Harm from Pollutants Like Electromagnetic Fields

Due to the high risk posed by electromagnetic field (EMF) exposures, insurance authorities like Swiss Re, AM Best and Lloyd's of London have issued white papers and reports which state that the risk is "high" and could increase

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[16] Tsunami of data' could consume one fifth of global electricity by 2025, The Guardian (Dec. 11, 2017).
[17] Crown Castle, Form 10-K (2016).
[18] Verizon Communications Inc., Form 10-K (2017).

EMFs are classified as a "pollutant" alongside smoke, chemicals, and asbestos. Due to the high risk that EMF exposure poses, most insurance companies decline to cover health effects or damages from the emissions — even at levels compliant with FCC limits. They have an "Electromagnetic Fields Exclusion" as a General Insurance Exclusion which is applied across the market as standard.[26]

> *"Insurers often exclude the risk from commercial general liability policies, strictly limit the coverage or avoid policyholders in the wireless industry, brokers say."*-Roseanne White Geisel, Business Insurance

Some examples of the language used in these electromagnetic exclusions include:

> *"We will not pay anything under this policy, including claim expenses, in respect of: Electromagnetic fields any liability of whatsoever nature directly or indirectly caused by, in connection with or contributed to by or arising from electromagnetic fields (EMF) or electromagnetic interference (EMI)"* Zurich Community Care Liability Insurance[27]

> *"Health Hazard or Occupational Disease as defined in the original policy. In the absence of these terms being defined in the original policy, they shall be defined cumulatively as follows: C7.1. Any loss, damage, injury or expense directly or indirectly caused by or arising out of: asbestos; tobacco; coal dust; polychlorinated biphenyls; silica; silicosis; benzene; lead; talc; dioxin; mold; pesticides or herbicides; electromagnetic fields; pharmaceutical or medical drugs/products/substances/devices; or any substance containing such material or any derivative thereof."* REINS[28]

> *"Standard: Pollution, Asbestos, Electromagnetic fields*
> *Due to potentially catastrophic losses and high clean up costs, product liability insurance contracts frequently exclude, whether partially or completely, the insured's liability for asbestos, pollution and contamination, radiation and electromagnetic fields."* BIICL[29]

> *"GENERAL INSURANCE EXCLUSIONS: Electromagnetic fields directly or indirectly arising out of, resulting from or contributed to by electromagnetic fields, electromagnetic radiation, electromagnetism, radio waves or noise."*A&M Insurance for Medical Professionals[30]

Coverage for EMF-related damage typically requires purchasing an environmental policy enhancement for "pollution liability."

> *"Public health and toxic tort liabilities concerns surrounding EMFs have become contentious among utility companies, regulatory agencies, land owners and other affected stakeholders. While many studies have produced varying (and sometimes contradictory) results, many epidemiological studies suggest a possible human carcinogenic link in a classification group similar to, say – formaldehyde, DDT, dioxins and PCBs."*

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[26] CFC Underwriting LTD in London, the UK agent for Lloyd's, *available at* Electromagnetic Field Insurance Policy Exclusions, Environmental Health Trust.
[27] Zurich, Zurich Community Care Liability Insurance: Group Policy Wording.
[28] REINS American Institute of Marine Underwriters, Liability Exclusion Clause (2015).
[29] Alex Hamer, Reynolds Porter Chamberlain, BIICL Product Liability Forum: Insurance Perspectives on Product Liability.
[30] A&M Insurance for Medical Professionals, MedSurance A&M Policy Document (2013).

leaders who permit deployment of insufficiently tested technology that will affect us all?" — Dr. Darius Leszczynski, July 18th, 2018[35]

If antenna installations are mounted on buildings, what are the legal liability issues of which the building owner should be aware? The Wall Street Journal did an investigative report titled "Cellphone Boom Spurs Antenna-Safety Worries: Many Sites Violate Rules Aimed at Protecting Workers From Excessive Radio-Frequency Radiation" which states that, "one in 10 sites violates the rules, according to six engineers who examined more than 5,000 sites during safety audits for carriers and local municipalities, underscoring a safety lapse in the network that makes cellphones hum, at a time when the health effects of antennas are being debated world-wide" yet the FCC has issued only two citations to cell carriers since 1996 because "the FCC says it lacks resources to monitor each antenna." A CBS Atlanta investigation "Failure to follow cellular antenna regulations raises safety issue" also found radiation excesses up to 400 percent of the limit close up to the antennas on rooftops, posing serious health risks especially to any worker coming on the roof[36].

What safeguards does DC have in place to protect the health of building occupants and workers such as window washers, HVAC mechanics, etc. from the radiofrequency radiation emissions of small cell installations on buildings and rooftops?

> *"Historically, antennas have been placed at inaccessible, remote, or fenced locations to prevent accidental RF exposure. However, as the demand for better service has increased, antennas have continued to encroach into urban and residential areas. Wireless carriers now install antennas in the sides of buildings, on rooftops, or in faux-chimneys, many of which are disguised to the untrained eye. As such, a painter, roofer, or other contractor performing routine maintenance on the building is placed in immediate danger due to close proximity to transmitting antennas while remaining unaware of any potential hazard."* Investment Analyst Gloria Vogel, July 27, 2017 [37]

Has D.C. investigated these liability issues to protect city officials and taxpayers? Deployment of small cells must be halted until the answers to these questions are clarified.

The International Association of Firefighters has officially opposed cell towers on their stations since 2004 after a study found neurological damage in firefighters with antennas mounted on their station. Thus in 2017, when 5G "small cells were coming to California via a 5G streamlining bill (SB649), firefighter organizations came out in strong opposition to the bill and cited the many peer-reviewed studies indicating health effects. They requested that 5G towers ***not*** be installed on firehouses. They were successful and SB649 was amended to exempt their stations from the deployment due to their health concerns[38].

Conflicting Statements by Industry on the "Need" for Installations in Close Vicinity

On the one hand we are told by industry that small cells are needed for the latest technology. On the other hand, the cell phone companies themselves have confirmed that 5G "small" cell towers *do not* need to be placed every hundred feet (despite industry statements that densely placed small cells *are needed* in close vicinity to homes). For example, Verizon's CEO, Lowell McAdam stated on camera that 4G and 5G antennas will work from 3,000 feet

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[35] Dr. Darius Leszczynski, July 18th, 2018 Assumption of Safety for 5G by Government Agencies, No Science.
[36] CBS News Report, (Nov. 20, 2014).
[37] Gloria Vogel, A Coming Storm For Wireless?, Talk Markets (July 27, 2017).
[38] Firefighter Unions Opposing Cell Towers, Environmental Health Trust.

The American Academy of Pediatrics (AAP) is one of many medical organizations[42] that is calling for federal action to protect children in regards to radiofrequency radiation. The AAP not only instructs parents to reduce cell phone radiation exposure, they also have a webpage about cell towers that states:

> *An Egyptian study confirmed concerns that living nearby mobile phone base stations increased the risk for developing:*
>
> - *Headaches*
> - *Memory problems*
> - *Dizziness*
> - *Depression*
> - *Sleep problems*

The American Academy of Pediatrics is our largest organization of children's doctors, has repeatedly written to the U.S. government about current regulations on cellular radiation being outdated and non-protective for children and pregnant women[43, 44, 45, 46].

> *"Children are not little adults and are disproportionately impacted by all environmental exposures, including cell phone radiation. Current FCC standards do not account for the unique vulnerability and use*

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[42] Statements by medical organizations on EMF and Wireless

[43] Time Magazine (2012): Pediatricians Say Cell Phone Radiation Standards Need Another Look

[44] 2012 AAP Letter to the FCC Chairman calling for the FCC to open up a review of RF guidelines

[45] 2012 AAP Letter to US Representative Dennis Kucinich in Support of the Cell Phone Right to Know Act

[46] 2013 AAP Letter to FCC Commissioner Mignon Clyburn and FDA Commissioner Margaret Hamburg calling for a review of RF guidelines

to human health from cumulative exposure. In 2017, Paul Ben-Ishai, PhD, delivered a lecture at the Israel Institute for Advanced Studies, Environmental Health Trust Expert Forum on this finding.[53, 54]

The biological effect of cumulative exposures to these frequencies must be considered in 5G development in order to ensure adequate public protection. The potential long-term impact of such stimulation on precancerous skin growths should be evaluated carefully, including potential super-growth of bacteria.[55]

The DC Government should initiate a large scale public education program to inform DC residents about this issue so they can reduce exposure to their personal devices as well. We have attached in our Appendix examples of educational materials that can be disseminated.

Wireless Radiation is a Human Carcinogen Not Tested for Long-Term Safety

Like its wireless predecessors, the widespread introduction of 5G wireless radiation frequency has never been tested for its impact on public health or the environment. In 2011, the microwave radiation fields emitted by cell phones and other wireless devices were classified as a 'possible carcinogen' by the International Agency for Research on Cancer. Since this date, the scientific evidence has increased to where scientists consider this radiation a human carcinogen. Dr. Lennart Hardell has multiple published reviews documenting that cellular radiation now meets scientific criteria for a Group 1 carcinogenic agent to humans.[56] Such conclusions are now corroborated by World Health Organization advisor Dr. Anthony Miller and experts who have published a literature review concluding the current body of evidence supports a classification for radiofrequency as a human carcinogen.[57,58]

The extensive scientific literature that has accumulated about the dangers of electromagnetic radiation speaks for itself. Additional investigations are required to determine the levels of involuntary radiation DC families and visitors would be exposed to on a daily basis if 5G small cells are installed throughout the area.

Wireless Radiation Produces Acute Health Symptoms

In addition to long-term health effects, radiofrequency radiation can cause acute symptoms, particularly in individuals with electromagnetic sensitivity or microwave sickness. When exposed to wireless radiation, these individuals experience acute symptoms such as "headache, difficulties with concentration or memory, dizziness, sleep disturbances, irritability, rashes, vision changes, heart palpitations, muscle twitching, fatigue, tinnitus, and others."[59] Even in the general population, however, acute symptoms such as fatigue, sleep disturbance, headaches,

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[53] Yuri Feldman and Paul Ben-Ishai, Potential Risks to Human Health Originating from Future Sub-MM Communication Systems, Conference on Wireless and Health (2017).

[54] Itai Hayut et al., Circular polarization induced by the three-dimensional chiral structure of human sweat ducts, 89 Physical Review E, no. 042715 (2014).

[55] Diana Soghomonyan et al., Millimeter waves or extremely high frequency electromagnetic fields in the environment: What are their effects on bacteria?, 100 Applied Microbiology and Biotechnology no. 11, 4761-71 (2016).

[56] Michael Carlberg and Lennart Hardell, Evaluation of Mobile Phone and Cordless Phone Use and Glioma Risk Using the Bradford Hill Viewpoints from 1965 on Association or Causation, BioMed Res. Int'l (2017).

[57] Michael Peleg et al., Radio frequency radiation-related cancer: assessing causation in the occupational/military setting, 163 Envt'l Res. 123–133 (2018).

[58] Anthony B. Miller et al., Cancer epidemiology update, following the 2011 IARC evaluation of radiofrequency electromagnetic fields (Monograph 102), 167 Envt'l Res. 673 (2018).

[59] Electrohypersensitivity Overview, Physicians for Safe Technology.

- Read "California City blocks 5G deployments over cancer concerns"
- Read "Tiny Doylestown Borough battled Verizon over 5G and won a big settlement" and "Tiny Town Rejects Verizon Small Cells and Wins in Court"
- Read Cell tower ordinance read for first time at (Booneville) council meeting
- Read San Rafael residents take pre-emptive strike against 5G installations
- Read "Official: Palm Beach exempt from 5G wireless law"
- Read "Petaluma 360: Petaluma sets cell phone tower policy"
- Read "Mill Valley blocks faster, smaller cell phone towers over cancer fears" and Urgent Ordinance from City of Mill Valley

The District of Columbia would thus not be alone in demanding safer infrastructure from the telecommunications industry. For example, setbacks of a minimum of 500 feet from residences would increase the distance to the antenna and decrease the radiation exposure to people in their homes.

"Hoteling" Is Realistic, Despite Industry Claims

Providers insist that they are unable to share towers because their antenna designs are not compatible. However, this industry is the most creative and productive in modern history. If mandated to develop shared facilities, there is no doubt that they will be able to do so. Granting companies' requests for separate towers would result in 18 towers per block -- an unsightly and unnecessary blight on our city.

The history of technology and regulation is replete with instances where industry has innovated only after being required to do so. For example, after insisting that requiring automobiles to be equipped with catalytic converters would bankrupt the American automobile industry, that industry developed the most advanced environmentally sound engine systems in the world. We expect similar developments to occur in this instance.

Thus, if D.C. allows small cell installations, we urge that hoteling be required as a matter of sound public policy to enhance the physical environment and protect traditional neighborhood aesthetics.

Conclusion: Prioritize Wired Systems Over Wireless Systems

In summary, the assumption that all wireless technology is safe has been shown through numerous studies to be completely incorrect. In fact, ever-mounting scientific evidence produced by experts around the world shows that various forms of microwave radiation can have profoundly harmful effects on wildlife, including birds and bees, as well as on public health.

Sound public policy requires taking into account the latest technical information.

Because of the substantial health impacts posed by telecommunications networks that use microwave radiation, **EHT strongly opposes the widespread installation of new wireless antennas and 5G infrastructure until properly modernized safety testing has been done to assure the public is protected from long-term exposure and until safer, faster, and more secure wired systems are devised to minimize human and environmental impacts. We join with hundreds of scientific experts from around the world to urge that the District of Columbia instead support the installation of fiber optic cables buried in the ground to every business, home, school, and hospital.** This cabling system is the foundation for Korea's much higher rate of broadband access, while we continue to cope with inadequacies reflecting our continued reliance on antiquated wireless systems that have proven to be incapable of meeting growing demand.

KALORAMA CITIZENS ASSOCIATION

October 5, 2018

DDOT Public Space Committee
Sent by email to: PublicSpace.Committee@dc.gov

Comments of the Kalorama Citizens Association on the Draft Small Cell Design Guidelines Published by the DC Department of Transportation, August 24, 2018

October 5, 2018

1. Legal status of the Guidelines: The District should take the necessary steps to give the appropriate portions of the Guidelines mandatory legal effect.

In producing the Guidelines the District has thus far opted to forgo enactment through the normal regulatory process, which would entail publication of a proposed rulemaking, opportunity for public comment, and scrutiny by the Council. The result is a set of rules that have no binding legal effect on either District officials or the small cell providers, although in some cases couched in mandatory language, and substantial portions of which consist of declarations about the city's special history and character or the intentions of the Guidelines' drafters. Moreover, there is at least one significant conflict between the Guidelines and the MLAs (as to the permissible height of mounting poles[1]), which presumably would have to be resolved in favor of the contractually binding MLAs as things now stand.

Consequently, after the October 15, 2018 hearing on the Guidelines, DDOT should prepare a revised draft, taking all comments into account, and publish it as a proposed rulemaking for eventual inclusion in the DCMR.[2] In so doing, it should revisit the MLAs, to the end of identifying conflicts or inconsistencies with the Guidelines, and undertake the necessary revisions in each, so as to produce a coherent overall regime to govern the installation of small cell facilities in the District.

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1 Guidelines §5.3.4 limits the height of existing and standalone poles to 31 feet plus a possible 10%; MLA §5.1.2 establishes a 50-foot height limit, "unless in the Department's discretion a greater height is accepted."

2 At present the draft text makes the following the following obscure reference to DC laws and Regulations: "The applications shall comply with the most current version of guidelines and regulations, including but not limited to" the DC Code, DCMR, two named DDOT Manuals, the Comprehensive Plan, the Shipstead-Luce Act and the National Historic Preservation Act.

Committee give "great weight" to ANC comments regarding any proposed small cell installation, as is statutorily required of other agencies.

4. **At-or-above-grade installation of cabinetry.**

Chart 1 appears to bar such installation in the Monumental Core and historic districts for two types of poles, without the possibility of waiver, and for three types of poles with a possibility of waiver, stating "additional guidelines would have to be developed" for that purpose. The possibility of waiver in the latter cases should be eliminated as well, except for alleys, obviating the need for development of any additional guidelines, which in any event would have to be drafted and put out for comment before the Guidelines went into effect. At the same time, in view of the physical and aesthetic intrusiveness of the vaults installed at grade level on sidewalks or on poles, the public should be fully informed of the technical or economic reasons deemed to warrant permitting them anywhere.

5. Strict compliance with appearance standards.

The Guidelines should require (with no exceptions or waivers) the rejection of a permit application for a new pole that does not satisfy any one of the appearance-related requirements spelled out in §8 of the Guidelines.

6. Location requirements.

A. Strict compliance with location preferences.

The Guidelines should make the order of preferences set out in §5.2 mandatory, so that, for example, new poles cannot be installed on side streets were alley space is available for new poles.

B. Limit new pole installation on side streets.

The Guidelines should bar small cell installations on new poles on side streets, or, alternatively, require that they be limited in height to that of the Washington Globe poles (18 feet instead of the proposed 32 feet).

C. Public parks and schools

These should be added to the list in §5.1 of areas where small cell infrastructure is not permitted to be installed.

ASLA
POTOMAC

POTOMAC
CHAPTER
AMERICAN
SOCIETY OF
LANDSCAPE
ARCHITECTS

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October 4, 2018

Kathryn Roos
P3 Manager
District Department of Transportation
Operations Administration
55 M Street, SE, Suite 400
Washington, DC 20003
Kathryn.Roos@dc.gov

Dear Ms. Roos:

The Potomac Chapter of the American Society of Landscape Architects (ASLA) recently became aware of the Small Cell Infrastructure Proposal for Washington, DC. Our association represents more than 400 landscape architects in the District, Northern Virginia, and suburban Maryland.

Our request is that this proposal be studied carefully and allow more time for public engagement through presentations and public hearings. This process may enable the public and other agencies to collaborate on solutions that lessen the impacts to city trees caused by the added infrastructure. Our understanding is that the 5G cells are not yet ready to be installed until carriers are ready to implement the technology. Thus, there should be no rush to implement any changes at this time.

There are several areas of concern regarding the impacts of this infrastructure on the city tree canopy. Aesthetically, the reduction and damage to tree canopies in one of the most beautiful, and walkable cities in the U.S. will have negative impacts not only to the urban fabric, but also harm property values. Several studies indicate healthy urban trees increase leasing rates and real estate values compared to similar areas without healthy trees. Environmentally, the District's stormwater, air quality and heat island reduction goals will also be severely impacted by damage to city tree canopy. Trees are known to contribute positively to environmental and public health. Research has shown a 60% reduction in particulates from car exhaust fumes on streets lined with trees. A single mature tree can absorb CO2 at a rate of 21.6 KG/year and release enough oxygen back into the atmosphere to support 2 humans.

Trees reduce stormwater runoff by capturing and storing rainfall in the canopy and releasing water into the atmosphere through evapotranspiration. In addition, tree roots and leaf litter create soil conditions that promote the infiltration of rainwater into the soil and promote bio-diversity. For every 5% of tree cover in a community, stormwater runoff is reduced by 2%. Trees prevent stormwater runoff from reaching waterways with harmful chemicals collected from roads and sidewalks.

Trees have also been proven to have a positive impact on the reduction of skin cancer, asthma, hypertension, and other stress related illness by filtering out polluted air, reducing smog formation, providing shade from solar radiation, and providing an attractive, calming setting for recreation.

Other issues to be explored are the potential health risks of living or working near these small cells We have read that exposure to 5G signals has been demonstrated to cause brain cancer and would like to learn more about how this potential risk would be mitigated.

DRAFT SMALL CELL DESIGN GUIDELINES
8/24/2018
TABLE OF CONTENTS

(HPO), the U.S. Commission of Fine Arts (CFA), and the National Capital Planning Commission (NCPC).

2.3. The guidelines are also the result of the review of information shared by telecommunication providers, technical limitations, and requirements of Small Cell infrastructure standards and practices across the country, such as Denver, Boston, Dublin, OH, and Lincoln, NE. In addition, these guidelines have been informed through a best practices review of international cities in North America, Europe, and Asia.

2.4 The guidelines supplement applicable local and federal policies and regulations. The applications shall comply with the most current version of guidelines and regulations, including but not limited to:

2.4.1. District of Columbia (DC) Code
2.4.2. DC Municipal Regulations
2.4.3. DDOT Manual on Uniform Traffic Control Devices
2.4.4. DDOT Design and Engineering Manual (DEM)
2.4.5. The Comprehensive Plan for the National Capital
2.4.6. Shipstead-Luce Act
2.4.7. National Historic Preservation Act

3. Purpose

3.1. Goals of the Guidelines

3.1.1. The Small Cell Infrastructure Guidelines set forth requirements and specifications for the placement and design of Small Cell infrastructure within the District's public right of way (ROW) to address engineering, safety, and aesthetic concerns. The guidelines intend to fit the functional needs of the cellular infrastructure necessary to provide adequate coverage within the character and function of the capital city's public space with the goals of:

3.1.1.1. Avoiding impact on the most important view sheds and vistas within the L'Enfant Plan of the District of Columbia;
3.1.1.2. Minimizing the impact on the character of designated historic districts and landmarks;
3.1.1.3. Protecting access and circulation to public open spaces;
3.1.1.4. Minimizing visual and physical clutter within the streetscape; and
3.1.1.5. Treating all areas of the District equitably; i.e. historic districts will be dealt with the same way, regardless of location within the District.

3.2. The Monumental Core

3.2.1. The L'Enfant Plan of 1791 established Washington's historic urban form and its framework for development. Reinforced by the McMillan Plan of 1902, the combined Plan of the City of Washington includes an orthogonal grid and a series of diagonal avenues radiating from the White House and U.S. Capitol, which at the Capitol's center point, establishes the District's four quadrants. The intersection of the street grid and diagonal avenues create a system of parks, open space, and vistas that are integral to the District's historic street network. L'Enfant's urban framework is recognized for its national importance through its listing in the National Register of Historic Places.

3.2.2. The character of Washington's streetscape reinforces the importance of the public realm, where the streets, squares, and public spaces are the primary figures in the city defined against the background of private development. A

5. General Guidelines

5.1. General limits: Locations

5.1.1. These guidelines for Small Cell infrastructure apply to all areas in the District, except those areas that are under Federal ownership.

5.1.2. Small Cell infrastructure is not permitted to be installed on:

5.1.2.1. Medians and traffic islands (i.e. any public space that is contiguous only with roadways and does not border any private property, regardless of whether it currently houses a District owned streetlight or a 3rd party utility pole)

5.1.2.2. Bridges and tunnels

5.1.2.3. Poles that have traffic control devices

5.1.2.4. All sidewalks immediately adjacent to Federal reservations within the L'Enfant Plan

5.1.2.5. Pennsylvania Avenue NW, between 1st and 15th Street

Comment [NG3]: Please define traffic control devices. Does this include street name signs?

Comment [NG4]: This limitation constitutes a prohibition of service in areas of the District.

Comment [NG5]: Remove from guidelines as this is NPS property and outside of DDOT's jurisdiction.

5.2. General limits: Preference for Locations and Methods

5.2.1. The preferred locations of Small Cell infrastructure, in order, are:

5.2.1.1. Any type of mount in unnamed alleys

5.2.1.2. A mount to Pendant Pole streetlights with cobra heads or on 3rd party poles on streets

5.2.1.3. Standalone poles on streets or named alleys.

5.2.1.4. Where there are existing poles that the guidelines allow for attachment, no new standalone poles will be permitted.

Comment [NG6]: Requesting addition of the following: that meet the coverage requirements and have commercially reasonable terms.

5.3. General limits: Appearance

5.3.1. Except when Small Cell infrastructure is attached to a wood pole, poles and all equipment must be the same color and finish as surrounding streetlight poles or 3rd party poles.

5.3.2. Except when Small Cell infrastructure is attached to a wood pole, exposed wires are not permitted.

5.3.3. Corporate or company names (except for location identification purposes noted below), logos, identifying graphics or other advertisements shall not be painted, embossed, applied or displayed in any manner on the poles, equipment enclosures (boxes, cabinets, etc.), hand hole covers, or other component of the pole. Individual location identification information will be permitted, provided no letter, number, or graphic symbol is taller than one inch in height.

5.3.4. Height

5.3.4.1. Existing Poles: Any attachment, including antenna(e), to an existing pole shall not extend the existing pole to a height of more than 31 feet or by more than 10 percent, whichever is greater.

5.3.4.2. Standalone Poles: The height of any standalone pole including its antenna(e) shall not exceed 31 feet or no more than 10 percent taller than other adjacent poles, whichever is greater.

Comment [NG7]: Existing cobrahead poles come in 2 sizes 28'6" and 38'6" per our research. Suggest changing to a straight number – i.e. shall not extend greater than 6' above the top of the existing pole.

5.4. General limits: Adherence to Other Applicable Standards

5.4.1. Nothing in these guidelines is intended to limit the applicability of any other duty, requirement, limitation, or condition for work in public space in the District of Columbia. As required in the Master License Agreement (MLA) and in accordance with DC Municipal Regulations persons working in the public ROW are required to abide by all traffic control, construction safety, and public space

Blockface Length Intervals[1]	Number of Small Cell Facilities Permitted per Blockface[2] outside the Monumental Core and Historic Districts	Number of Small Cell Facilities Permitted per Blockface within the Monumental Core and Historic Districts	Minimum Distance between Facilities on same Blockface[3]	Minimum Distance between Facilities on same Blockface within the Monumental Core and Historic Districts	Limit per Carrier per Block[4]
0'-150'	1	1	N/A	N/A	1
151'-300'	2	1	60'	60'	1
301'-450'	3	2	60'	75'	1
451'-600'	4	3	60'	90'	1
601'-750'	5	4	60'	105'	2
Over 750'	6	5	60'	120'	2

[1]Block lengths should be measured along the edge of curb between the edge line extended of adjacent intersecting streets.

[2]This is inclusive of all types of installations and regardless of carrier.

[3]In other words, the minimum distance between two facilities sharing the same side of the block. Distance should be measured in a linear fashion along the edge of curb between the two facilities' center points.

[4]A block is defined as two opposing blockfaces.

Chart 2, Permissible Spacing and Frequency of Installations

Comment [NG9]: This limitation constitutes a prohibition of service. It is discriminatory as it favors third party providers.

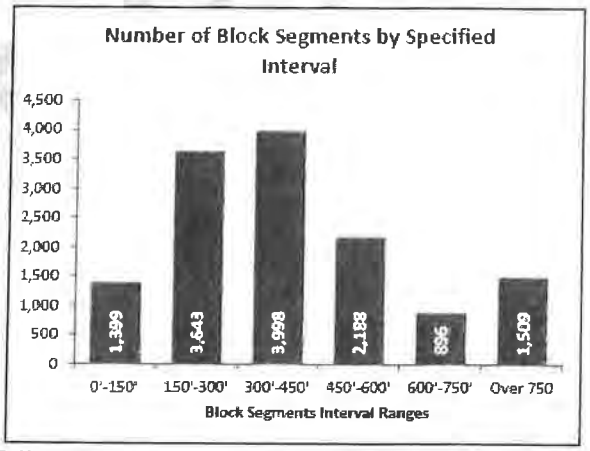

Chart 3, Number of Block Segments by Specified Interval

Guidelines regarding Historic Districts and Landmarked Properties

6.1. Small Cell infrastructure shall not be located within twenty feet (20') of the front or side boundary lines of a D.C. Landmark, a National Historic Landmark, federal properties or a property individually listed in the National Register of Historic Places.

6.2. Small Cell infrastructure located in unnamed alleys within a historic district shall be a minimum of twenty feet (20') from the property line extended across the alley entrance. If the properties adjacent to the alley have a building restriction line (BRL) the twenty feet (20') shall be measured from the BRL.

Comment [NG10]: This limitation constitutes a prohibition of service.

7. Guidelines regarding DDOT Streetlights

7.1. The guidelines will allow attachments to certain categories of poles. These include Pendant Poles with cobra head fixtures, wood poles, and 5A poles (aka metal alley poles). (See Map 2, Pole Types and Locations and Illustrations 1 & 2.)

Comment [NG11]: Cobra head or tear drop light fixtures

7.2. All other categories of DDOT streetlights will not be permitted for attachment of Small Cell infrastructure.

7.3. These guidelines do not allow the installation of new DDOT streetlights.

7.4. Any application intended to install on an existing DDOT streetlight must indicate the replacement of an existing DDOT streetlight pole. The replacement pole must be exactly the same in outward appearance, while having increased structural strength to support the additional equipment.

7.5. These guidelines do not allow the use of any streetlight on bridges or in tunnels.

7.6. DDOT will require engineer stamped plans showing the replacement of its existing streetlight pole.

8. Guidelines regarding New Standalone Poles

8.1. Appearance

8.1.1. New standalone poles must match the appearance of existing DDOT streetlights

8.1.2. There are two types: Pendant Pole or Washington Upright Pole (See Illustrations 3 & 4).

8.1.2.1. The type of pole to be used is based on the type of DDOT streetlight in the surrounding neighborhood. The pole will not include a streetlight; with the exception of a light fixture, it will mimic the appearance of streetlights in the area.

8.1.2.2. In areas where the surrounding streetlights are Washington Uprights or Twin-Twenties, new standalone poles shall use the Washington Pole. (See Illustration 3)

8.1.2.3. In areas where the surrounding streetlights are Pendant Poles, the Pendant Pole type shall be used. (See Illustration 4)

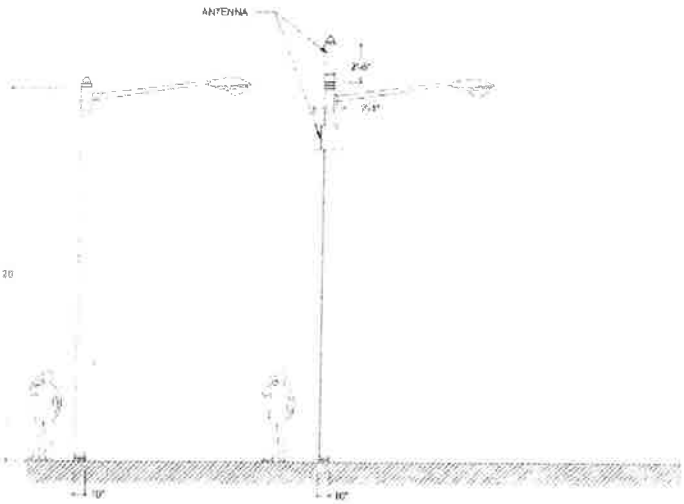

Illustration 1, 5A Pole

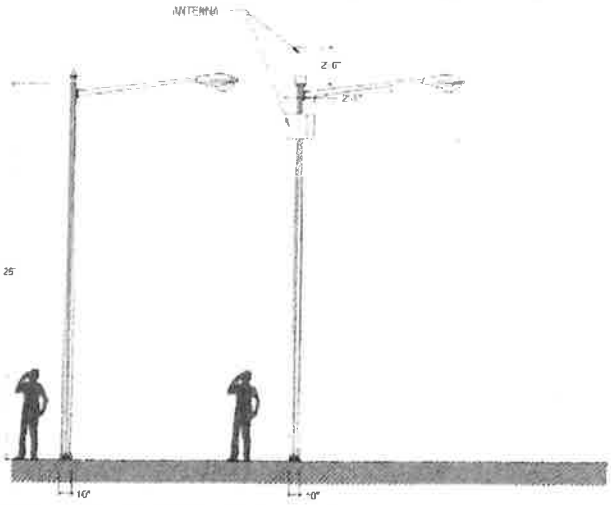

Illustration 2, Pendant Pole w/Cobra Head

Comment [NG12]: Per our research, poles are 28'6", not 25'.

8.2. Pedestrian Path and Amenity Zone

8.2.1. The sidewalk area of public space is typically delineated into pedestrian paths and tree box zones, which are also referred to as the amenity zone. The amenity zone is located between the pedestrian path and the roadway and provides access between the two as well as the area for street trees, streetlights and traffic signals, and other functional elements. It is critical that all pedestrian paths are clear to facilitate safe and optimal access and circulation along sidewalks.

8.2.2. Standalone poles shall not be located in the clear pedestrian path, as established by the most current DC Municipal Regulations and the most current Manual on Uniform Traffic Control Devices.

8.2.3. Standalone poles shall be located in the amenity zone, when one is provided. Nevertheless, poles shall not be located in a manner that requires the removal of an existing street tree or that prevents the planting of a street tree in the future.

Comment [NG13]: This is extremely broad. Requesting clarification, is there a reference document for future tree locations?

8.2.4. Standalone poles shall not be located within a designated right-of-way of a paper street or paper alley within the L'Enfant Plan.

8.2.5. In non-residential areas where there is no amenity zone, standalone poles shall be placed within the area traditionally devoted to the amenity zone within the right-of-way if it does not obstruct the required width for the clear pedestrian path in accordance with DDOT's most current Design and Engineering Manual (DEM) and DC Municipal Regulations.

8.2.6. In non-commercial areas where there is no amenity zone, poles may be located in the sidewalk space within the right-of-way if it does not obstruct the required width for the clear pedestrian path in accordance with DDOT's most current Design and Engineering Manual (DEM) and DC Municipal Regulations.

8.2.7. Standalone poles shall be aligned with existing streetlights, 3rd party poles, and street trees as applicable in order to maintain a visual and physical organization of structures within the right-of-way, as measured from the center of the base of the pole.

8.2.8. All measurements shall be taken from the outer edge of the standalone pole and the infrastructure listed in the following specific limits/prohibitions.

8.2.8.1. The exterior of the standalone pole shall be placed a minimum of two feet six inches (2'6") from the face of curb Standalone poles must be placed a minimum of six feet (6') from existing fire hydrants or buildings' fire connections.

Comment [NG14]: Unless existing light poles along the blockface are placed closer to the curb.

8.2.8.2. Standalone poles shall be located a minimum of 10 feet (10') from light poles and traffic signal poles.

Comment [NG15]: Where commercially reasonable.

8.2.8.3. Standalone poles shall be located a minimum of 3 feet (3') from bicycle racks and shall not impede the attachment of bicycles.

8.2.8.4. Standalone poles shall not interfere with the operation of Capital Bikeshare docks and stations. This requires a minimum of four feet (4') of clearance from the rear wheel of a docked bicycle, five feet (5') distance from each end of a station, and should not be installed in such a way that would prevent solar access to the solar panel.

8.2.8.5. Standalone poles shall be placed a minimum of ten feet (10') from any above grade building face, including bay windows, show windows, or oriel windows.

Comment [NG16]: Per table 31-1 Minimum Sidewalk Widths in DDOT Design and Engineering Manual 2017, the minimum sidewalk width in low density residential is only 10'. This would be a prohibition of service.

8.2.9. In areas where DDOT does not have streetlight poles and instead attaches its streetlights to existing 3rd party poles, no new standalone poles will be allowed.

Comment [NG17]: To the extent that it is commercially reasonable to attach to the existing 3rd party poles.

8.2.10. In residential areas, standalone poles shall be placed in alignment with lot lines extended to the maximum degree possible.

10. Glossary

The following serve to define terms used in the guidelines as they relate to the public spaces in the District of Columbia.

5A Pole – A DDOT-standard pole type as described in the DDOT Streetlight Policy and Design Guidelines, typically round in shape and found in alleys

Amenity Zone – The area of public space between the curb and the sidewalk reserved for the installation of street lights, parking meters, bicycle racks, signs regulating curbside management. It also includes the tree space, the area of public space reserved for the planting of street trees.

Antenna - an apparatus designed for the purpose of emitting radiofrequency (RF) radiation, to be operated or operating from a fixed location, for the transmission of writing, signs, signals, data, images, pictures, and sounds of all kinds.

Building face – Any building wall, or its projection, that fronts a right-of-way.

Clear pedestrian path - The straight path that is free of all obstructions within the sidewalk between the amenity zone and the public parking area or property line/building restriction line. The clear pedestrian path is measured from the farthest extended portion of any element projecting out from the building facade, such as a sidewalk café, to the curb line or the nearest obstruction, such as the outer edge of a tree box.

Cobra head fixture – A DDOT-standard lighting fixture as described in the DDOT Streetlight Policy and Design Guidelines, typically attached to a pendant pole, wood pole or 5A pole.

Monumental Core – The spatial and symbolic center of the city, which includes the U.S. Capitol grounds, the White House, the National Mall, Federal Triangle, and the surrounding government offices and civic, cultural, and symbolic structures. The monumental core is most closely linked to the distinctive image of the capital city and the functions of the federal government. While the major landmarks and resources within the core are perceived, it does not have a rigid geographic or jurisdictional boundary and continues to evolve.

Paper street or paper alley – An unimproved public right of way.

Pendant Pole – A DDOT-standard pole type as described in the DDOT Streetlight Policy and Design Guidelines, that is typically fluted.

Primary building face – The face of a building that generally represents the building's overall design intent and includes access points with the highest volume of pedestrian traffic.

Small Cell infrastructure – Low-powered antennas and related equipment that provide cellular and data coverage to smaller geographic areas, supplementing the larger cellular network and improving service for wireless customers.

Standalone poles – Independent poles that antennas are attached to for the purpose of transmitting wireless signals.

Streetscape elements – Components that make up the city street, such as trees, light poles, bicycle racks, traffic cabinets, parking meters, signs, sculptures, and street furniture.

Teardrop fixture – A DDOT-standard lighting fixture as described in the DDOT Streetlight Policy and Design Guidelines, typically attached to a pendant pole that is teardrop in shape.

Terminating Vista (Linear view corridors): Linear views that extend from a street level viewpoint to and terminate at a focal point object(s) such as a structure and building. Within the L'Enfant Plan, there are important terminating vistas (linear view corridors), defined by street walls and public realm elements, which terminate at significant civic buildings or memorials.

Third-party pole – An existing pole in public space owned by a party other than the District or the cellular provider installed to provide public utilities and that can accommodate Small Cell infrastructure equipment.

The Committee of 100 on the Federal City

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October 5, 2018

Public Space Committee — email: PublicSpae.Committee@dc.gov
c/o DDOT Public Space Permit Office
Attn: Small cell
1100 4th St SW, Room 360
Washington DC, 20024

Subject: Comments on the draft guidelines for small cell technology

Dear Mr. Marcou:

The Committee of 100 on the Federal City (C100) was founded in 1923 and continues to work toward protecting and enhancing, in our time, Washington's historic distinction, natural beauty and overall livability. The Committee is concerned with respecting the L'Enfant Plan of 1791 and the McMillan Commission Plan of 1901-02, while accommodating the needs of the 21st Century, and with providing responsible oversight in all pertinent aspects of citywide planning. These include parks and conservation, historic preservation, visual planning and architecture, land use regulation and renewal planning, pollution control and environmental protection, and transportation planning.

The Committee of 100 is pleased to submit the following comments on the draft guidelines for small cell technology.

Introduction

Small cell technology is needed to provide wireless service (including future 5G service) in high-density, high-demand areas, complementing cell towers. Each small cell unit has two parts, an antenna and equipment; thousands of units are expected to be installed in the District, raising major issues on clutter, and effects on viewsheds, the monumental core, all neighborhoods, historic districts, and street trees. [1]

[1] There is already an immense amount of clutter on streetlights have traffic signals historic district signs. BID signs, street address (green signs), holiday decorations, hanging flower baskets, festival banners, traffic lights, walk/don/t walk signs, pedestrian call signals, traffic signs (stop, speed limit, no parking, residential parking permit area, street cleaning), neighborhood watch, evacuation route), security cameras.

- All Wireless Communications Facilities and poles must be sited to insure that every adjacent existing and potential street tree boxes will remain at least 4 feet by 9 feet, contain DDOT's specified minimum soil volume; and located at least 15 feet (preferably 20) from any street tree.

- DDOT's Urban Forestry Administrant must sign off on all small cell installation permits.
  - DDOT's street tree maps on its website should be included in the Design Guidelines, to clarify where locations where small cell technology may not be installed (See example below showing existing and potential street tree locations in downtown Washington).

Amendments needed to the MLA

The MLA can be amended. MLA section 19. All carriers must enter into an amendment to the MLA, incorporating all of the following provisions:

- All carriers must agree to comply with the final Design Guidelines. There must be significant penalties for failure to correct noncompliance after notice to a carrier. (At the Small Cell Town hall, there was an impression, although not an express statement, that carriers might refuse to comply with the Design Guidelines.)

- All carriers must agree not to directly, or indirectly damage, alter, prune, or remove any street tree, or to seek a permit authorizing any of these actions. DDOT's penalties for damage to street trees must also apply.

- The performance bond in the MLA (section 18) must be increased to the greater of $250,000 or 35% of the pole attachment fee, cover all damage to District property, including street trees, pay for removal of abandoned small cell equipment if not promptly removed by the carrier, and remain in effect for five years after termination of the MLA.

Questions on the MLA

How much remediation to streets and sidewalks will be needed before and after small cell installation, and who will pay for this? Fierce Wireless notes:

> So while hanging a small cell on, say, a light pole sounds simple, it can be a logistical nightmare. Connecting the pole to both the power grid and the network could require installers to dig up streets and sidewalks, which (again) requires permitting and perhaps other city approvals.
> Colin Gibbs, "Small cells: Still plenty of potential despite big challenges," Sept. 1, 2016.

Components of small cell technology

Small cell technology has several components, as defined in the MLA:

[SEC. 253] (b) STATE REGULATORY AUTHORITY.—Nothing in this section shall affect the ability of a State to impose, on a competitively neutral basis and consistent with section 254, requirements necessary to preserve and advance universal service, protect the public safety and welfare, ensure the continued quality of telecommunications services, and safeguard the rights of consumers.

[SEC. 253] (c) STATE AND LOCAL GOVERNMENT AUTHORITY.—Nothing in this section affects the authority of a State or local government to manage the public rights-of-way or to require fair and reasonable compensation from telecommunications providers, on a competitively neutral and nondiscriminatory basis, for use of public rights-of-way on a nondiscriminatory basis, if the compensation required is publicly disclosed by such government. [emphasis added]

The FCC has ruled that section 253 of the 1996 Act blocks section 106 or NEPA review in most cases. There is no section 106 review for small cell structures that satisfy the following volumetric rules:

- *Height.* ... small wireless facilities ... deployed on new structures that are either no taller than the greater of 50 feet (including their antennas) or no more than 10 percent taller than other adjacent structures. [or] ... any small wireless facility that is affixed to an existing structure, where as a result of the deployment that structure is not extended to a height of more than 50 feet or by more than 10 percent, whichever is greater.

- *Antenna Volume.* ... an antenna associated with the deployment, excluding the associated equipment, must be no more than three cubic feet in volume.

- *Equipment Volume.* In addition, the wireless equipment associated with the antenna must be no larger than 28 cubic feet. [6]

Comprehensive Plan

The Comprehensive Plan, consistent with section 253 of the 1996 Act, mandates the following protections:

1. Establishing Locational and design criteria for telecommunications facilities. Action IN-4.1.A Guidelines for Siting/Design of Facilities. (p. 13-17.)

2. The Comprehensive Plan encourages hotelling:
   Consider the joint use and co-location of communication antennas to reduce the number of towers necessary, thereby reducing aesthetic impacts and limiting the area of radiofrequency exposure.
   Policy E-4.7.2: Co-location of Antennas (p. 6-41).

Although this policy references towers, these protections should apply equally to all Wireless Communications Facilities and poles.

[6] Wireless Infrastructure, WTB Docket No. 17-79 (March 22, 2018).

with the manhole cover design, it should be included as an option in the Design Guidelines for possible future application.

The Design Guidelines should add rules on co-location of Wireless Communications Facilities on buildings (e.g., behind a parapet) and integrate this rule with the list of preferred locations in Design Guidelines 5.2.1. As noted, the Comprehensive Plan encourages hotelling.

To minimize visual clutter, the Design Guidelines should encourage locating any new poles at intersections, not in the middle of the block.

A- grade cabinets and below-grade vaults are allowed in many locations, but "additional guidelines would have to be developed." Design Guidelines, Chart 1. The potential impacts of these cabinets, which can be up to 28 cubic feet, are immense. These guidelines need to be developed now.

The Design Guidelines should require that all carriers shroud all wiring, including on wood pole installations. Compare Crown Castle's and Mobilitie's wood pole photo simulation shown on September 13 (antenna on top of pole and enclosed cabinet containing all wiring) with photographs in Marcus Spectrum Solutions, FCC Dockets 17-79 and 17-84 (July 17, 2018. If all elements will not be shrouded, all carriers must produce accurate images of these installations.

Questions on Design Guidelines

What are the dimensions of each element of Wireless Communications Facilities and Poles which each carrier will install?

Will vaults be installed, and if so, what are the dimensions?[9]

Apparently Wireless Communication Facilities emit noise. See Small Cell Forum, "Small cell siting challenges and recommendations," August 2018, p. 39. For 4G and 5G what are the range of frequencies and decibels emitted? What are the best methods to reduce or eliminate noise?

The Design Guidelines forbid installations on sidewalks immediately adjacent to federal reservations. within the L'Enfant Plan. Design Guidelines 5.1.2.4. Do "reservations" include triangle parks owned by the National Park Service and administered by District government, (including DDOT)? [10]

Effect on neighborhoods

[9] AT&T and Verizon stated that they will not install vaults because of damage to small cell equipment from water and salt. Small Cell Town hall meeting September 13, 25, 2018.

[10] See generally, DDOT Proposed regulations 24 DCMR 3399; Elizabeth Barthold, "The Predicament of the 'Parklet's: Understanding Washington's Smaller Parks," *Washington History* (Vol. 5, summer 1993, 29-45).

3.12 Environmental, Landmarks and Historic District Approvals: Licensees is required to obtain all federal approvals from appropriate federal agencies pertaining to siting of Wireless Communications Facilities and poles in or near designated historic districts of environmentally sensitive areas. [emphasis added]

5.1 General Design Standards. ... Licensee's Wireless Communications Facilities shall comply with the following general design standards:

...

6. Wireless Communication Facilities within a designated historic district shall comply with any special requirements applicable to such areas, and may be subject to additional agency [federal agency?] or departmental [presumably DDOT] or its designee.

Do these requirements apply only to federal historic districts?

5.3 Pedestals and vaults. A permit for a Wireless Communication Facility that involves a Pedestal or Vault may be issued if the Department finds the following:

...

5. In any historical area, that the Pedestal or Vault does not detrimentally affect the historic nature of the area, to the satisfaction of the Department.

Does "historical area" refer to a historic district or landmark listed in the D.C. Inventory of Historic Sites"?

Design Guidelines Chart 1, allows attaching cabinetry to existing third-party owned poles in historic districts and other areas. Will new "existing" third-party poles be allowed?

Preserving the District's urban forest

The District continuously stresses the importance of its street trees (trees between the sidewalk and the curb), and is striving to achieve 40% tree coverage. Comprehensive Plan E-1, Protecting Natural and Green Areas. Healthy trees require tree boxes at least 4 feet by 9 feet that contain a specified minimum soil volume; trees and be planted at least 15 feet (preferably 20) from a light pole. DDOT DEM (2017), section 37.3.2.1; 37.4.1; 37.5.3; 37.5.3. DDOT Public Realm Design Manual (2011) 3.6, 3.6.1. Below-grade obstructions, including vaults, can threaten tree health.

The Design Guidelines state that "Standalone poles shall not be located in a manner that requires the removal of an existing street tree, or that prevents the planting of a street tree in the future." 8.2.3. [emphasis added]. This protection for street trees, limited only to poles, and omitting vaults, and other elements of Wireless Communication Facilities, opens the door to damage to street trees. All "Wireless Communications Facilities" and poles must be sited and operated in a manner that protects street trees. For these reasons, the following protections must be added to the Design Guidelines:

street trees; there are many tree species that would be appropriate. Every year DDOT plants approximately 8,000 trees; if shorter street trees are the new reality, lets begin the switchover now. [16]

As background to this issue, we also note that the District's track record has been to sacrifice street trees for infrastructure projects:

- Virginia Avenue tunnel - 160 street trees cut down.
- Streetcar- when Vincent Gray was mayor, DDOT proposed to cut down dozens of street trees in several blocks near the west terminus, to create space for a turnaround. (from H Street, NE south on 3rd to G, west on G to 2nd, south on 2nd to F, east on F to 3rd, and north on 3rd to H Street, NE). These trees were saved only because it was determined that it was possible to turnaround the streetcars by having the operator move to the other end of the street car to begin a return trip. There was an SRO meeting at the Atlas Theater with Mayor Gray and DDOT where Gray announced that the street trees would be saved.

DDOT has granted permits to Pepco to trim trees. At the September 6, 2018 public meeting representatives from AT&T and Verizon said that their companies would not request trimming street trees. This promise should included in an amendment to the MLA and all carriers must agree to this provision

Amount, scope, and duration of performance bond must be increased

While the MLA provides for a bond (higher of $50,000 or 35% of pole attachment fee) to remove small cell equipment and restore poles to prior condition. MLA 18, "Performance Bond." The MLA's duration is one year after the term (10 years plus two possible renewal periods, five years each, MLA 18. The amount, scope and duration are inadequate. With an expected 2,500 or more poles, DDOT may not find all the abandoned small cell eq. in time; $50,000 is low, and the bond does not cover other damage, including destroyed/damaged street trees.

Public space permit process

Public space permits for Wireless Communication Facilities and poles present complex issues, and carriers will seek over 2,000 permits. What staffing, engineering expertise does the Public Space Committee have? and timelines are proposed? Adequate professional staffing is particularly important in order to provide adequate review within the FCC's 90-day shotclock (deadline) for new small cell installations and 60 days for colloction on existing structures. (WT Docket No. 17-79; WC Docket No. 17-84, September 26, 2018).

[16] "DDOT Kicks Off Tree Planting Season," www.ddot.dc.gov, 5 Oct. 2017.

Figure 1. DDOT presenation to NCPC on Small Cell Technology, July 2018

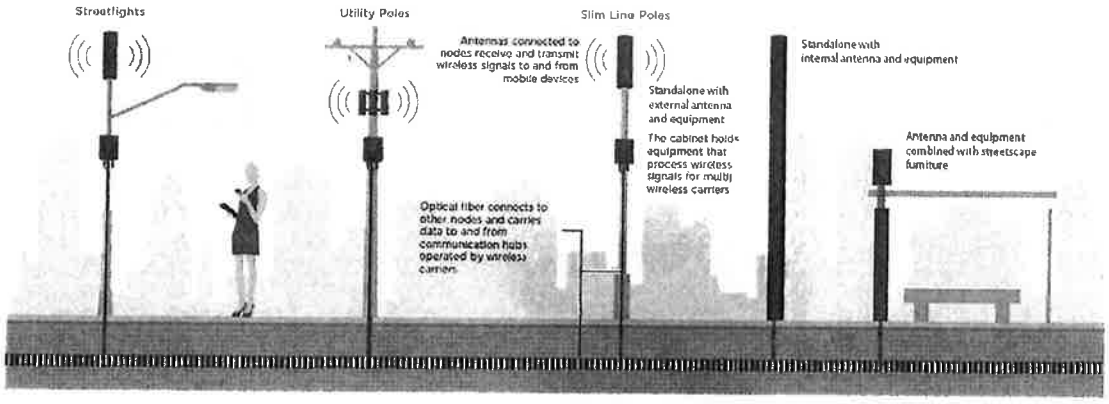

Figure 3. Marcus Spectrum Solutions, FCC Dockets 17-79 and 17-84 (July 17, 2018) showing small cell installation in Potomac, Md. See also, Michael J. Marcus, "The Growing Visual Impact of Wireless Antennas in the Urban Landscape: Strategies for Coexistence," *IEEE Wireless Communications*, Feb. 2018, 4-5.

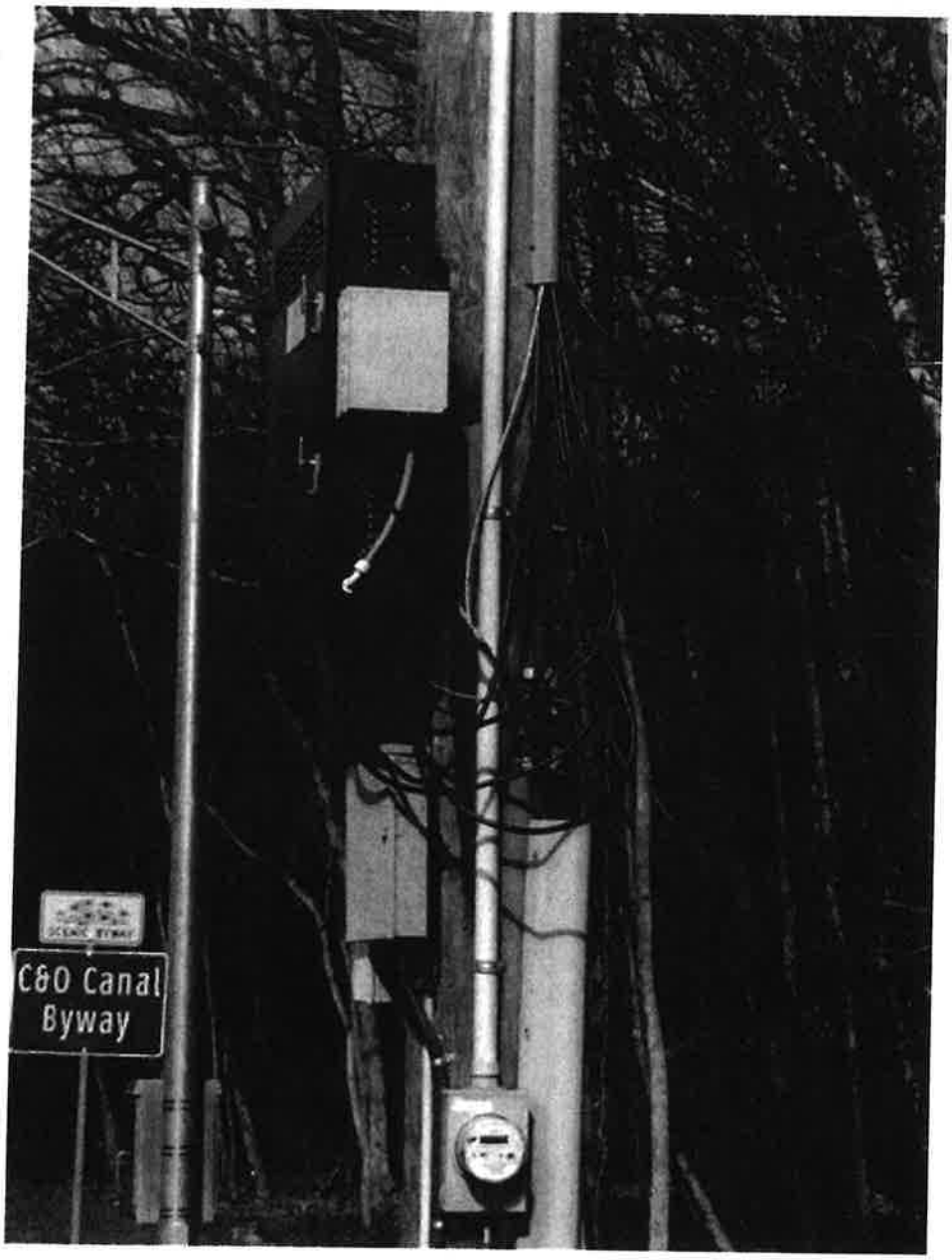

Figure5. Pepco tree pruning in Kemp Mill, Md. to avoid power lines. Rachel Siegel, "Pepco sent a contractor to prune trees. Residents say it butchered the neighborhood," *Washington Post*, 1 Aug. 2017.

A tree in Kemp Mill hangs over the road after it was trimmed to avoid power lines. Residents say many of the trees in the neighborhood were left looking deformed. (Rachel Siegel/The Washington Post)

ASLA
POTOMAC

POTOMAC
CHAPTER
AMERICAN
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October 4, 2018

Kathryn Roos
P3 Manager
District Department of Transportation
Operations Administration
55 M Street, SE, Suite 400
Washington, DC 20003
Kathryn.Roos@dc.gov

Dear Ms. Roos:

The Potomac Chapter of the American Society of Landscape Architects (ASLA) recently became aware of the Small Cell Infrastructure Proposal for Washington, DC. Our association represents more than 400 landscape architects in the District, Northern Virginia, and suburban Maryland.

Our request is that this proposal be studied carefully and allow more time for public engagement through presentations and public hearings. This process may enable the public and other agencies to collaborate on solutions that lessen the impacts to city trees caused by the added infrastructure. Our understanding is that the 5G cells are not yet ready to be installed until carriers are ready to implement the technology. Thus, there should be no rush to implement any changes at this time.

There are several areas of concern regarding the impacts of this infrastructure on the city tree canopy. Aesthetically, the reduction and damage to tree canopies in one of the most beautiful, and walkable cities in the U.S. will have negative impacts not only to the urban fabric, but also harm property values. Several studies indicate healthy urban trees increase leasing rates and real estate values compared to similar areas without healthy trees. Environmentally, the District's stormwater, air quality and heat island reduction goals will also be severely impacted by damage to city tree canopy. Trees are known to contribute positively to environmental and public health. Research has shown a 60% reduction in particulates from car exhaust fumes on streets lined with trees. A single mature tree can absorb CO2 at a rate of 21.6 KG/year and release enough oxygen back into the atmosphere to support 2 humans.

Trees reduce stormwater runoff by capturing and storing rainfall in the canopy and releasing water into the atmosphere through evapotranspiration. In addition, tree roots and leaf litter create soil conditions that promote the infiltration of rainwater into the soil and promote bio-diversity. For every 5% of tree cover in a community, stormwater runoff is reduced by 2%. Trees prevent stormwater runoff from reaching waterways with harmful chemicals collected from roads and sidewalks.

Trees have also been proven to have a positive impact on the reduction of skin cancer, asthma, hypertension, and other stress related illness by filtering out polluted air, reducing smog formation, providing shade from solar radiation, and providing an attractive, calming setting for recreation.

Other issues to be explored are the potential health risks of living or working near these small cells We have read that exposure to 5G signals has been demonstrated to cause brain cancer and would like to learn more about how this potential risk would be mitigated.

October 4, 2018

Public Space Committee
District Department of Transportation
1100 4th Street SW
Washington, DC 20024

RE: Small Cell Design Guideline Comments

Dear Committee Members:

My name is Mark Buscaino, Executive Director of Casey Trees, a D.C. based non-profit with a mission to *Restore, Enhance and Protect the Tree Canopy of the Nation's Capital.* We engage in a host of activities, including but not limited to: planting trees, monitoring the gain/loss of tree canopy over time, community advocacy aimed at encouraging more tree-centric development, and helping the District reach its 40 percent tree canopy goal by 2032. We appreciate the opportunity to provide comments on the District's proposed Small Cell Design Guidelines.

Based on our observations and comments below, we strongly suggest that the committee wait to approve these guidelines until the city completes a full assessment of the potential impacts these cells may have on D.C.'s street trees, and trees located on adjacent private lots.

Section 8.2.3 of DDOT's Small Cell Design Guidelines states that this infrastructure will not require "the removal of an existing street tree or prevent the planting of a street tree in the future." While this statement is undoubtedly well-intended, what we know about street trees tells us that it is quite possible – and even probable – that these cell structures will indeed have a long-lasting detrimental impact on both D.C.'s street trees and trees located on adjacent private lots.

Based on the preliminary information we were able to obtain, it appears as though small cells require a clear line of sight from one to another to ensure clear transmissions. Therefore, even if the cells/structures are initially installed in a manner that avoids tree conflicts, trees do not respect these artificial boundaries and their limbs undoubtedly will need to be pruned and/or removed over time to maintain the sight line. When this occurs, how will the city pay for these additional pruning/removal treatments? Will they be conducted according to professional standards? And what will the long-lasting impacts be, not just to the tree(s) in question, but to the overall tree canopy which the city is working so diligently to increase?

In closing, strong considerations must be given to the potential impacts of these structures on both street trees and adjacent private property trees, in addition to determining who will conduct long-term maintenance of trees in/around these cells and what costs will be incurred. Further, we feel it imperative that a greater public voice be sought on the potential impacts of these structures, given the strong affinity that the public holds towards D.C.'s street trees.

October 5, 2018

Matthew Marcou, PSRD Associate Director
Public Space Committee
c/o DDOT Public Space Permit Office
1100 4th St SW, Room 360
Washington, DC 20024

Dear Mr. Marcou:

The American Society of Landscape Architects (ASLA), founded in 1899, is the Washington, D.C.-based professional association for landscape architects in the United States. ASLA has 49 chapters, representing all 50 states and U.S. territories. Our members are community leaders in the stewardship, planning, and design of our built and natural environments. On behalf of our more than 15,000 members, we appreciate the opportunity to provide comments on the Draft Small Cell Design Guidelines.

The quality of the District of Columbia's visual environment, both natural and man-made, has a profound impact on how residents interact with their city and how visitors experience the nation's capital. ASLA supports the development of the District's Small Cell Guidelines; however, we believe the guidelines leave the city's tree canopy at risk. Although the guidelines do address the street tree root zone, they fall short of fully protecting the crowns of street trees. As written, the draft guidelines (8.4) create a protection zone "equal to one foot for each inch of the tree's diameter or a minimum of fifteen feet (15'), whichever is greater." Unfortunately, they don't provide protection for existing, or future, tree crown spread. There is a possibility that a tree's crown could extend past the draft guidelines' current protection zone. Additionally, the draft guidelines do not provide specific guidance on how conflicts between street tree canopy and small cell infrastructure will be handled. The guidelines should specifically address this likely conflict or, at a minimum, reference an applicable city regulation for street tree preservation.

Furthermore, ASLA recommends amending the title of section 8.4 to better reflect the goal of protecting street trees. Section 8.4's current title refers to "Spacing Among Streetscape Elements," though street trees are the only such elements it considers with respect to the spacing of small cell infrastructure. Also, the protection of street trees should be added to Section 3.1.1, to better define goals for the District of Columbia's public right-of-way.

Finally, we would request the District Department of Transportation proceed judiciously by allowing additional time for stakeholder comments to help refine the guidelines. Communities, especially in the nation's capital, should be beautiful places, reflecting the time-honored tradition of civic commitment to high quality and lasting infrastructure. The high investment cost to public and private entities for small cell technology should not be hastily implemented within the District's distinctive landscape without a robust public engagement period.

Sincerely,

Nancy C. Somerville, Hon. ASLA

CITIZENS ASSOCIATION of GEORGETOWN

Mr. Matthew Marcou
Associate Director
Public Space Regulation Division
District Department of Transportation
1100 4th St SW, Room 360
Washington DC, 20024

RE: Small Cells Draft Design Guideline Comments – Citizens Association of Georgetown

Dear Assoc. Director Marcou,

The following comments are provided in response to the Draft Small Cells Design Guidelines (August 24, 2018) issued by DDOT. The Citizens Association of Georgetown (CAG) Board of Directors approved these during the meeting of its Board held September 25, 2018.

The Citizens Association of Georgetown (CAG) is dedicated to the restoration, preservation, maintenance, and protection of the historic character of Georgetown, particularly the exterior, architectural features of buildings, historic sites, and landmarks in our National Historic Landmark historic district.

CAG is aware about Smalls Cells – having attended the DDOT presentation on Sept 6, and its prior meeting to finalize the Master Licensing Agreements, as well as its presentations to the NCPC and CFA. We were a co-sponsor and a presenter of the Small Cells Town Hall held in Georgetown on Sept 13. We are thus providing these comments after careful and thoughtful review and input from our membership to ensure that the deployment of Small Cell technology is seamlessly woven into the unique character of the District of Columbia and the Georgetown National Historic Landmark District.

1. 4.2.1 Notice And Comment On Public Space Permits is not consistent with Master License Agreement 5.4.4.and fails to seek or allow input from community stakeholders in the approval process.

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finds has been determined to be pose no health risk to occupants.

5. Chart 1 Vaults refers to underground vaults. The maximum depth and dimensions of these vaults and how the surface over the vaults is finished needs to be specified.
- How will utilities be protected?
- Note 1 states that applications for on grade cabinet installations will be considered on a per location basis on notice to various government agencies. However, affected nearby property owners and civic associations such as CAG should also be notified and provided an opportunity for comment. Compare DCRA notification requirements for applications for alterations in an historic district.

6. Chart 2 Permissible Spacing and Frequency of Installations, provides that there is a limit of one carrier per block for most blocks. If this criteria is meant to restrict any carrier to only one pole per block that needs to be made clear.
- How does that provide adequate coverage for carriers not having poles on the block?
- How will the pole locations be made available to the carriers if there are competing applications for the same location?

7. 8.1.1 Appearance, should require the poles to "match exactly" the appearance, color, design and diameter of existing streetlights.
- CAG requests the Guidelines specify a default diameter for new poles, at least for historic districts with Washington Globe lights. Any exceptions would need to be reviewed by the CFA/OGB for installation in Georgetown-and HPRB for other historic districts.

8. 8.1 Dimensions of Equipment, should specify:
- The approved maximum dimensions of the antenna and other equipment.

Casey Trees
WASHINGTON DC

October 4, 2018

Public Space Committee
District Department of Transportation
1100 4th Street SW
Washington, DC 20024

RE: Small Cell Design Guideline Comments

Dear Committee Members:

My name is Mark Buscaino, Executive Director of Casey Trees, a D.C. based non-profit with a mission to *Restore, Enhance and Protect the Tree Canopy of the Nation's Capital.* We engage in a host of activities, including but not limited to: planting trees, monitoring the gain/loss of tree canopy over time, community advocacy aimed at encouraging more tree-centric development, and helping the District reach its 40 percent tree canopy goal by 2032. We appreciate the opportunity to provide comments on the District's proposed Small Cell Design Guidelines.

Based on our observations and comments below, we strongly suggest that the committee wait to approve these guidelines until the city completes a full assessment of the potential impacts these cells may have on D.C.'s street trees, and trees located on adjacent private lots.

Section 8.2.3 of DDOT's Small Cell Design Guidelines states that this infrastructure will not require "the removal of an existing street tree or prevent the planting of a street tree in the future." While this statement is undoubtedly well-intended, what we know about street trees tells us that it is quite possible – and even probable – that these cell structures will indeed have a long-lasting detrimental impact on both D.C.'s street trees and trees located on adjacent private lots.

Based on the preliminary information we were able to obtain, it appears as though small cells require a clear line of sight from one to another to ensure clear transmissions. Therefore, even if the cells/structures are initially installed in a manner that avoids tree conflicts, trees do not respect these artificial boundaries and their limbs undoubtedly will need to be pruned and/or removed over time to maintain the sight line. When this occurs, how will the city pay for these additional pruning/removal treatments? Will they be conducted according to professional standards? And what will the long-lasting impacts be, not just to the tree(s) in question, but to the overall tree canopy which the city is working so diligently to increase?

In closing, strong considerations must be given to the potential impacts of these structures on both street trees and adjacent private property trees, in addition to determining who will conduct long-term maintenance of trees in/around these cells and what costs will be incurred. Further, we feel it imperative that a greater public voice be sought on the potential impacts of these structures, given the strong affinity that the public holds towards D.C.'s street trees.

5G: Great risk for EU, U.S. and International Health! Compelling Evidence for Eight Distinct Types of Great Harm Caused by Electromagnetic Field (EMF) Exposures and the Mechanism that Causes Them

Written and Compiled by Martin L. Pall, PhD
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Washington State University
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martin_pall@wsu.edu 503-232-3883 May 17, 2018

Summary:

We know that there is a massive literature, providing a high level of scientific certainty, for each of eight pathophysiological effects caused by non-thermal microwave frequency EMF exposures. This is shown in from 12 to 35 reviews on each specific effect, with each review listed in Chapter 1, providing a substantial body of evidence on the existence of each effect. Such EMFs:

1. Attack our nervous systems including our brains leading to widespread neurological/neuropsychiatric effects and possibly many other effects. This nervous system attack is of great concern.
2. Attack our endocrine (that is hormonal) systems. In this context, the main things that make us functionally different from single celled creatures are our nervous system and our endocrine systems – even a simple planaria worm needs both of these. Thus the consequences of the disruption of these two regulatory systems is immense, such that it is a travesty to ignore these findings.
3. Produce oxidative stress and free radical damage, which have central roles in essentially all chronic diseases.
4. Attack the DNA of our cells, producing single strand and double strand breaks in cellular DNA and oxidized bases in our cellular DNA. These in turn produce cancer and also mutations in germ line cells which produce mutations in future generations.
5. Produce elevated levels of apoptosis (programmed cell death), events especially important in causing both neurodegenerative diseases and infertility.
6. Lower male and female fertility, lower sex hormones, lower libido and increased levels of spontaneous abortion and, as already stated, attack the DNA in sperm cells.
7. Produce excessive intracellular calcium [Ca2+]i and excessive calcium signaling.
8. Attack the cells of our bodies to cause cancer. Such attacks are thought to act via 15 different mechanisms during cancer causation.

There is also a substantial literature showing that EMFs also cause other effects including life threatening cardiac effects (Chapter 3). In addition substantial evidence suggests EMF causation of very early onset dementias, including Alzheimer's, digital and other types of dementias (Chapter 3); and there is evidence that EMF exposures in utero and shortly after birth can cause ADHD and autism (Chapter 5).

Each of these effects is produced via the main mechanism of action of microwave/lower frequency EMFs, activation of voltage-gated calcium channels (VGCCs) (Chapter 2). Each of them is produced via what are called downstream effects of VGCC activation. It follows from this that we have a good understanding not only that these effects occur, but also how they can occur. The extraordinary sensitivity of the VGCC voltage sensor to the forces of the EMFs tells us that the current safety guidelines allow us to be exposed to EMF levels that are something like

The European Commission has done nothing to protect European citizens from any of these very serious health hazards and the U.S. FDA, EPA and National Cancer Institute have done nothing to protect American citizens. The U.S. FCC has been much worse than that, acting vigorously with wanton disregard for our health.

Preface

The document that follows was, in its original form, sent to many of the authorities of the European Union, in conjunction with other documents sent to the same people by a group of European scientists. It was in response two documents that were, in turn, written by Mr. Ryan and Dr. Vinciūnas responding to a large group of European and other international scientists expressing great concern about the safety of 5G. I was asked by the leaders of the group of scientists to write my own response to those two documents. Mr. Ryan made the statement that "There is consistent evidence presented by national and international bodies (International Commission on Non Ionising Radiation Protection - ICNIRP, Scientific Committee on Emerging and Newly Identified Health Risks (SCENIHR) that exposure to electromagnetic fields does not represent a health risk, if it remains below the limits set by Council Recommendation 1999/519/EC1." In fact, that is not either the ICNIRP or SCENIHR position – their position, and similar positions have been taken by the U.S. FCC, FDA and the National Cancer Institute, is that the evidence is inconsistent or conflicting and therefore, in their view, no conclusions can be drawn. Some of these organization have also stated that there is no known mechanism by which effects can be produced. What is shown below is that there is a vast amount of evidence in the independent scientific literature that conflicts with both the conclusion about lack of demonstrated effects and the conclusion about lack of mechanism.

The European Commission, according to the Ryan and Vinciūnas documents and the U.S. National Cancer Institute, according to their web site, are each depending on the SCENIHR 2015 document to make judgments about EMF effects. Consequently, the reliability of SCENIHR 2015 is an essential element in determining the reliability of both of their assessments.

The document that is presented below, differs from the document that was emailed to EU authorities in three different ways: 1. The original document was sent as an email with multiple attachments. In this document attachments are simply provided as citations. The current document is a stand-alone document. 2. Some material is inserted to discuss positions taken by the U.S. FCC, FDA and National Cancer Institure, so as to be particularly relevant to the U.S. situation. 3. Substantial additional evidence is also provided.

The revised document contains seven chapters followed by a citation list for the entire document:

the first set of litters; further exposure produced dose-dependent complete or almost complete sterility that was found to be largely irreversible. When we have a technology that is universally present in these technologically advanced countries, that we know impacts reproduction, and reproduction has already dropped well below replacement levels, and we may be facing a catastrophic and irreversible decline in reproduction and there are more and more plans to expose us still further, don't you think that we should take note of the science? Mr. Ryan and Dr. Vinciūnas seem to be saying not at all. (Please note that the U.S. FCC and FDA also completely ignore this existential threat)

3. Neurological/neuropsychiatric effects (25 reviews). My own paper on this [3] and two earlier reviews cited in it found that there are whole series of repeatedly found EMF effects which have also become extremely widespread complaints in our technologically advanced societies, namely: sleep disturbance/insomnia; fatigue/tiredness; headache; depression/depressive symptoms; lack of concentration/attention/cognitive dysfunction; dizziness/vertigo; memory changes; restlessness/tension/anxiety/stress/agitation; irritability. These findings are not just based on epidemiological findings but are also based on profound impacts of EMFs, at levels well within our safety guidelines, on brain structure and function and also on the mechanism of non-thermal EMF action discussed below. When we have these neuropsychiatric effects becoming more and more common in technologically advanced societies all over the world, and *we know each of these is caused EMF exposures*, shouldn't we take note of this relationship?
4. Apoptosis/cell death (13 reviews). The two most important consequences of large increases in apoptosis (programmed cell death) are in causation of the neurodegenerative diseases and lowered reproduction although there are others.
5. Oxidative stress/free radical damage (19 reviews). Oxidative stress has roles in all or almost all chronic diseases. It is reported to have essential roles in producing the reproductive effects and the attacks on cellular DNA and may also have roles in producing the neurological effects and some of the cancer-causing effects shown to be produced here by EMF exposures.
6. Widespread endocrine (that is hormonal) effects (12 reviews). The steroid hormone levels drop with EMF exposure, whereas other hormone levels increase with initial exposure. The neuroendocrine hormones and insulin levels often drop with prolonged EMF exposure, possibly due to endocrine exhaustion.
7. Increases in intracellular calcium ([Ca2+]i) levels following EMF exposure (15 reviews). Calcium signaling also increases following EMF exposure.
8. Cancer causation (35 reviews). Brain cancer, salivary cancer, acoustic neuromas and two other types of cancer go up with cell phone use. People living near cell phone towers have increased cancer rates. Other types of EMFs are each implicated. Short wave radio, radio ham operators and people exposed to radar all are reported to have increased cancer incidence. Perhaps most telling, heavy-long term cell phone users have the highest incidence of brain cancer and have predominantly cancer increases on the ipsilateral side of the head (the side they use their cell phones), as opposed to the contralateral side. I have a paper [7], focused not on whether EMFs cause cancer but rather on ***how*** they can cause cancer. The paper shows that "downstream effects" of the main target of the EMFs in the cells of our bodies, can cause cancer in 15 different ways, including increases in cancer initiation, promotion and progression. Progression effects include both tissue invasion and metastasis. Each of these cancer causation effects are caused via mechanisms produced by downstream effects of the main non-thermal EMF mechanism, as discussed in Chapter 2.
9. Therapeutic effects of such EMFs. Such EMFs when focused on a specific region of the body where there is some dysfunction and when used at specific intensities, can have therapeutic effects. In my 2013 paper [4], I cited 12 different reviews where EMF

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Each of these reviews, typically cite from 5 to over 100 primary literature citations, each showing that non-thermal EMF exposures produce the effect under which they are listed. It follows from this, that there are not only 11 or more reviews documenting each of these effects, but there is also a massive primary literature documenting these effects as well. It follows from this that the ICNIRP, FCC and International Safety Guidelines, which are entirely based only on thermal effects are inadequate and there have been petitions and other statements of international groups of scientists expressing great concern about this. *It follows that the ICNIRP, FCC and International safety guidelines are completely unscientific and cannot be relied upon to protect our safety.*

Chapter 2: How Each Such EMF Effect Is Produced via Voltage-Gated Calcium Channel Activation: Role of the Voltage Sensor in Producing the Extraordinary Sensitivity to EMF Effects

The Pall, 2013 [4] study showed that in 24 different studies (there are now a total of 26 [5]), effects of low-intensity EMFs, both microwave frequency and also lower frequency EMFs, could be blocked by calcium channel blockers, drugs that are specific for blocking voltage-gated calcium channels (VGCCs). There were 5 different types of calcium channel blockers used in these studies each thought to be highly specific, each structurally distinct and each binding to a different site on the VGCCs. *In studies where multiple effects were studied, all studied effects were blocked or greatly lowered by calcium channel blockers.* These studies show that EMFs produce diverse non-thermal effects via VGCC activation in many human and animal cells and even in plant cells where some similar calcium channels are involved [6]. Furthermore, many different effects shown to be produced in repeated studies by EMF exposures, including the effects discussed above, can each be produced by downstream effects of VGCC activation, via increased intracellular calcium [Ca2+]i, as discussed below.

Various EMFs act via VGCC activation, as shown by calcium channel blocker studies. These include microwave frequency EMFs, nanosecond pulse EMFs, intermediate frequency EMFs, extremely low frequency EMFs and even static electrical fields and static magnetic fields.

It is important to discuss why the VGCCs are so sensitive to activation by these low-intensity EMFs. Each of the VGCCs have a voltage sensor which is made up of 4 alpha helixes, each designated as an S4 helix, in the plasma membrane. Each of these S4 helixes has 5 positive charges on it, for a total of 20 positive charges making up the VGCC voltage sensor [5,8]. Each of these charges is within the lipid bilayer part of the plasma membrane. The electrical forces on the voltage sensor are extraordinarily high for three distinct reasons [5,8]. 1. The 20 charges on the voltage sensor make the forces on voltage sensor 20 times higher than the forces on a single charge. 2. Because these charges are within the lipid bilayer section of the membrane where the dielectric constant is about $1/120^{th}$ of the dielectric constant of the aqueous parts of the cell, the law of physics called Coulomb's law, predicts that the forces will be approximately 120 times higher than the forces on charges in the aqueous parts of the cell. 3. Because the plasma membrane has a high electrical resistance whereas the aqueous parts of the cell are highly

potassium and chloride channels and also one class of plant channel, with each of these channels having a similar voltage-sensor regulating its opening. One can put those observations together with the powerful findings from the physics, that the electrical forces on the voltage-sensor are stunningly strong, something like 7.2 million times stronger than the forces on the singly charged groups in the aqueous phases of the cell. Now you have a stunningly powerful argument that the voltage sensor is the predominant direct target of the EMFs.

3. The most important study on this subject, was published by Tekieh et al [16]. It showed that microwave frequency EMFs directly activate the VGCCs in isolated membranes. A variety of microwave frequencies were used in these studies and each such frequency produced VGCC activation in a completely cell-free system. This study clearly shows that the EMF activation of the VGCCs is direct and not due to some indirect regulatory effect.

How then does the estimated sensitivity of the voltage-sensor, about 7.2 million times greater forces than the forces on singly charged groups, compare with previous estimates of levels of EMF exposure needed to produce biological effects? The ICNIRP 2009 [17] safety guidelines allowed for 2 to 10 W/m^2 exposure, depending upon frequency. In contrast, the Bioinitiative Working Group 2007 [18] proposed a precautionary target level of 3 to 6 $\mu W/m^2$ or about a million-fold lower, using a safety factor of 10. If one uses a more commonly used safety factor of 50 to 100, then the 7.2 million-fold sensitivity of the voltage-sensor, predicted by the physics, falls right in the middle of the Bioinitiative Working Group 2007 calculations. So again, it can be argued that the physics and the biology are pointing in the same direction, in this case pointing to the same approximate range of sensitivity.

You may be wondering why I am spending so much time and space going through each of these studies. The answer is that a well over a trillion dollar (or trillion euro) set of industries, the telecommunications industry, has been putting out propaganda for over two decades, arguing that there cannot be a mechanism of action of these non-thermal EMFs to produce biological effects; and that these EMFs are too weak to do anything and that only thermal effects are documented. It is essential to dot every **i** and cross every **t** with regard to the main mechanism of action of non-thermal effects. That is exactly what has been done here.

How Can the Diverse Effects of Such EMF Exposures Be Produced by VGCC Activation?

	these explanations may be oversimplified. One additional mechanism that may be important in producing lowered fertility is that VGCC activation and consequent high [Ca2+]i levels is known to have a key role in avoiding polyspermy. Consequently, if this response is triggered before any fertilization of an egg has occurred, it may prevent any sperm from fertilizing and egg.
Neurological/ neuropsychiatric effects	Of all cells in the body, the neurons have the highest densities of VGCCs, due in part to the VGCC role and [Ca2+]i role in the release of every neurotransmitter in the nervous system. Calcium signaling regulates synaptic structure and function in 5 different ways, each likely to be involved here. Oxidative stress and apoptosis are both thought to have important roles. Lowered sleep and increased fatigue are likely to involve lowered nocturnal melatonin and increased nocturnal norepinephrine.
Apoptosis	Apoptosis can be produced by excessive Ca2+ levels in the mitochondria and by double strand breaks in cellular DNA; it seems likely that both of these mechanisms are involved following EMF exposure. A third mechanism for triggering apopotosis, endoplasmic reticulum stress (see bottom row in this Table), may also be involved.
Cellular DNA damage	Cellular DNA damage is produced by the free radical breakdown products of peroxynitrite directly attacking the DNA [7].
Changes in non-steroid hormone levels	The release of non-steroid hormones is produced by VGCC activation and [Ca2+]i elevation. The immediate effects of EMF exposures is to increase hormone release and to raise, therefore, hormone levels. However many hormone systems become "exhausted" as a consequence of chronic EMF exposures. The mechanism of exhaustion is still uncertain, but it may involve oxidative stress and inflammation.
Lowered steroid hormone	Steroid hormones are synthesized through the action of cytochrome P450 enzymes; activity of these hormones is inhibited by binding of high levels of nitric oxide (NO) leading to lowered hormone synthesis.
Calcium overload	Produced by excessive activity of the VGCCs; secondary calcium overload is produced by oxidative stress activation of TRPV1, TRPM2 and possibly some other TRP receptors, opening the calcium channel of these receptors.
Heat shock protein induction	There is a large literature showing that excessive [Ca2+]i induces very large increases in heat shock proteins. This is thought to be produced by complex calcium signaling changes involving the endoplasmic reticulum, mitochondria and the cytosol and also involving excessive [Ca2+]i producing increasing protein misfolding [21-23]. It should be noted that some calcium is essential for proper protein folding in the endoplasmic reticulum such that only excessive calcium leads to misfolding and consequent endoplasmic reticulum stress.

Each of the seven established EMF effects, discussed above, can be generated through the mechanisms outlined in Fig. 1, as shown by Table 1. An eighth, heat shock protein induction can also be so explained (Table 1). Several other such effects, including EMF causation of

uses any of these independent reviews to assess EMF effects. This whole area is discussed in much more detail in Chapter 5, below.

Chapter 3. Strong Evidence for Cumulative and Irreversible EMF Effects

Two questions that must be raised about the effects of these low-intensity EMFs producing biological effects is are they cumulative and are they reversible? I am aware of several different types of evidence for cumulative effects and also for irreversible effects.

Three of the human occupational exposure studies from the 1970's reviewed in the Raines, National Aeronautics and Space Administration (NASA) study [26], showed that effects increased substantially with increasing time of exposure to a particular type and intensity of EMF. While these three studies each show cumulative effects but they provide no data on possible irreversibility of these neurological/neuropsychiatric effects. However the largest review of such occupational exposures (Hecht [28]) does provide substantial evidence on the cumulative nature and irreversibility of these neurological/neuropsychiatric effects.

Hecht [28] reviewed 60 different studies of occupational exposures that were done between 1960 and 1990 in the Soviet Union and East Germany. These were occupational exposure studies of over 3500 people, who were exposed to microwave frequency EMFs at intensities of less than $1/1000^{th}$ of our safety guidelines. These studies [28] found that these EMFs produced neuropsychiatric effects similar to those found in my much more recent study [3], listed in Chapter 1 as well as on cardiac effects. Neither the neuropsychiatric findings nor the cardiac findings were unique however. Similar neuropsychiatric effects have been found to be caused by low intensity EMF exposures [27,29-34]. Cardiac effects have also been found in humans [26,29,30,32,34,35] similar to those found by Hecht [28].

Hecht [28] reports that exposures at those very low intensities for up to 3 years produced increased sympathetic nervous system activity, apparently in response to the EMF stress, following the classic stress sequence described by Hans Selye in 1953. No other effects were apparent during this circa 3 year period. However longer exposure produced observable neurological/neuropsychiatric and cardiac effects as well as other effects which were initially modest. Exposures of 3 to 5 years typically produced effects that could be largely reversed after 2 to 3 years in a no-EMF exposure environment. Hecht states that "if detected early, effective therapy is possible." However longer than 4 to 5 years exposures produced more severe effects which did not reverse when the persons were subsequently put into a no-EMF exposure environment. These and other effects continued to worsen with 10 years of exposure or longer. This cumulative nature of such EMF exposures was noted in two earlier reviews cited by Hecht et al [36,37]. These studies, then, provide very large amounts of evidence both for the cumulative nature of these neuropsychiatric effects, as well as the apparent irreversibility of these effects as they become more severe. Hecht also notes that "decline in health status increasingly amplifies EMF effects." This a pattern of increasing apparent sensitivity produced by previous exposure is similar to that described in the Western literature on electromagnetic hypersensitivity (EHS), something that Hecht recognizes [28]. EHS something that is discussed very briefly below in this section.

There are strong similarities between the Hecht [28] findings on microwave frequency EMFs in humans and the impacts of such EMFs on cellular and organ histology in rodents, as were reviewed in Tolgskaya and Gordon [38] and discussed in Pall [3]. In rodents, initially non-thermal exposures over periods of 1 to 2 months produced modest changes in structure of the brain and of the neurons. When such exposures ceased, most of the structural changes

the middle of an athletic competition of apparent sudden cardiac death, which may, therefore be possibly caused by EMF exposures [39]. Some of these individuals have been saved from death [39] and subsequently found to be suffering from bradycardia and arrhythmias. Another type of cardiac effect is that when apparent EHS people are exposed to Wi-Fi, cell phone, cell phone tower or smart meter radiation, they are reported to suffer from heart palpitations. Each of these four types of cardiac effects, tachycardia, arrhythmias, bradycardia and heart palpitations involve aberrations in the electrical control of the heartbeat. How can these be produced?

The heartbeat is controlled by pacemaker cells in what is called the sino-atrial node of the heart. Those pacemaker cells have been shown to have very high densities of the T-type VGCCs which may make these cells particularly susceptible to direct effects of the EMFs (recall that EMFs act via VGCC activation). The T-type and the L-type VGCCs have essential roles in controlling the heartbeat. It follows that EMF exposures, acting directly on the pacemaker cells of the heart, can produce tachycardia responses. Furthermore, gene mutations in a VGCC gene that produce increased VGCC activity can produce both tachycardia and arrhythmia in young babies carrying those mutations; these young children die of sudden cardiac death at a very young age. How then do we get bradycardia? Bradycardia is produced when EMFs chronically impact the sino-atrial node, such that the dysfunction involved in heart failure, which is very complex, produces dysfunction of the pacemaker cells of the heart, producing bradycardia [40].

It follows from this that EMF-produced bradycardia and chronic arrhythmias are likely to be caused by heart-failure-like changes that particularly impact the sino-atrial node of the heart, including the tissue remodeling found in heart failure. This model has been confirmed by the findings of Liu et al [41], who found that pulsed microwave frequency EMF produced tissue remodeling that specifically impacted the sino-atrial node of the heart with remodeling changes similar to those found in heart failure [40]. Heart failure develops in a cumulative fashion and, based on current medicine at least, is an irreversible process involving tissue remodeling and a large number of other biochemical and physiological changes [41]. It seems likely, therefore, that the EMF effects on the heart are both cumulative and irreversible.

You will recall, from the discussion at the beginning of Chapter 1, that there are 18 reviews documenting that EMF produces lowered fertility. These act via diverse mechanisms. These include tissue remodeling changes in the testis, lowered sperm count and sperm quality, lowered female fertility including ovary remodeling and oocyte apoptosis, lowered estrogen, progesterone and testosterone levels (that is sex hormone levels), increased spontaneous abortion incidence, and lowered libido. We already have sperm count drops to below 50% of normal in every technologically advanced country on earth [1]. We also have fertility drops to well below replacement levels in every technologically advanced country on earth, with one exception. Clinical observations argue that while there are sometimes technical fixes that allow some reproduction, infertility appears to be inherently irreversible. The Magras and Xenos [2] in mice, also discussed in Chapter 1 shows that radiofrequency radiation exposures well below our safety guidelines, produce immediate drops in mouse reproduction in the first litter. Further exposures to the same EMF levels produced a crash in reproduction essentially to zero, a crash that appeared to be essentially irreversible.

We don't know that humans will behave very similarly to mice. We do know that the EMFs produce the diverse effects on human reproduction listed in the previous paragraph. My prediction is that even if exposures level off where they are now, we will start seeing crashes in reproduction within about 5 years. If we go ahead with 5G, that crash may be almost instantaneous.

Four rodent studies support an EMF role in Alzheimer's disease. A series of short pulses of EMFs in young rats, produced the following in the equivalent of middle aged rats: elevated brain Aβ and oxidative stress; lowered cognition and memory [52,53]. 900 MHz exposures produces oxidative stress, increased Aβ and lowered miR-107, all found in Alzheimer's disease brains [52-55]. There are many animal studies showing roles for [Ca2+]i through both VGCCs and RYRs in causing Alzheimer's disease in rodent models; these include studies with calcium channel blockers and studies of transgenic mice with varying VGCC and RYR expression. Very low EMF exposures can produce, however, protective responses [56,57]; this is not surprising because EMF therapy is thought to act via NO signaling and protein kinase G (see Fig.1, Chapter 2) and this pathway is reported to protect from Alzheimer's disease. Epidemiological studies have shown that exposure of humans of 50/60 Hz EMFs, which also act via VGCC activation, can cause elevated Alzheimer's disease incidence [58,59]. Interestingly, a 1997 article in Microwave News, discussing two such epidemiological findings on EMFs and Alzheimer's disease in humans, found that occupational exposures to EMFs produced as much as a four-fold increase in Alzheimer's disease [59A]. That same article [59A] suggested a similar mechanism to the mechanism suggested here, namely that increased [Ca2+]i following EMF exposure produces increases in Aβ. In conclusion, a wide range of studies support the view that low intensity microwave frequency exposures acting via VGCC activation and [Ca2+]i, can produce increases in Aβ and other causal factors of Alzheimer's disease in humans and in animals and EMFs have been shown to produce Alzheimer's effects in rats.

These various findings on EMFs and Alzheimer's disease, the increasingly early onset of dementias and the occurrence of digital dementias, all suggest we may have another very high level threat caused by EMF exposures, possibly involving cumulative EMF effects and leading to severe, irreversible brain damage.

Chapter 4 EMFs Including Wi-Fi May Be Particularly Damaging to Young People

Most arguments that have been made that microwave frequency EMFs may be much more damaging to young children have centered on the much smaller skulls and skull thickness in young children, increasing the exposure of their brains to EMFs [60, 61]. However there are other arguments to be made. EMFs have been shown to be particularly active in producing effects on embryonic stem cells [62-71]. Because such stem cells occur at much higher cell densities in children, with stem cell densities the highest in the fetus and decreasing with increasing age [62, 63], impacts on young children are likely to be much higher than in adults. The decreased DNA repair and increased DNA damage following EMF exposure, in conjunction with the increased cell division in young children, strongly suggest that young children may be increasingly susceptible to cancer following such exposures [62-64, 71]. Two reviews discussed in the next chapter provide further evidence on higher cancer susceptibility of children. EMF action on stem cells may also cause young children to be particularly susceptible to disruption of brain development [66,71], something that may be relevant to autism causation.

It is my belief that the role of [Ca2+]i in synapse development is also relevant to the possible EMF causation of autism. The Hecht review of Soviet occupational exposure studies [28] reports that "younger persons show a greater sensitivity to electromagnetic fields than adults." These are all very problematic issues and we cannot rule out the possibility that there are other problematic issues as well. Redmayne and Johansson [72] reviewed the literature showing that there are age-related effects, such that young people are more sensitive to EMF effects. It follows from these various findings that the placement of Wi-Fi into schools around the country and the not uncommon placing of cell phone towers on schools may well both be a high level threats to the health of our children as well being a threat to teachers and any very sensitive fetuses teachers

multifaceted falsehoods that Speit et al [74] tried to repeat the earlier studies of Schwarz et al [75], that they were unable to repeat those Schwarz et al [75] studies and that they used identical methodology to that used by Schwarz et al [75]. In addition to those three are four underlying falsehoods – namely that the two studies used very different methodologies, notably differing in the cell type studied, differing in the frequency used, differing widely in the in pulsations used and differing in the use of an exposure chamber. *Each of these falsehoods are SCENIHR's not Speit et al [74]'s, each of them can be easily seen to be false by even a superficial reading of these two papers.*

As you might guess, there is a major story behind all of this. The very low intensity exposure used in the Schwarz et al [75] study produced large numbers of DNA breaks, larger than that produced by 1600 chest X-rays. This conclusion can be made by comparing the results of Schwarz et al [75] with the earlier study of Lutz and Adlkofer [76]. From this comparison, it seems clear that non-ionizing radiation similar to 3G radiation can be much more dangerous to the DNA of our cells than is a similar energy of ionizing radiation. When this was found, the industry went into attack mode, attacking the two Professors who collaborated in [75], Prof. Franz Adlkofer in Germany and Prof. Hugo Rüdinger in Austria. The first couple of years of these attacks have been described in some detail on pp 117-131 in Dr. Devra Davis' book Disconnect [77]. Before the SCENIHR 2015 document was drafted, it was clear that the publishers who had published Adlkofer's and Rüdinger's work, not just the Schwarz et al [75] study but other papers by the same research group, had long since rejected the industry propaganda claims. In addition. Adlkofer had won a lawsuit in the German courts against his main accuser. He has subsequently since won a second such lawsuit. The last paragraph on p.89 in SCENIHR 2015 is word for word industry propaganda. What is clear is that SCENIHR is wittingly or unwittingly serving as a propagandist for the industry in and that process, SCENIHR has no difficulty in putting forth seven obvious, individually important falsehoods.

One question that needs to be raised is how is it possible for microwave frequency EMFs to produce much more cellular DNA damage than a comparable energy level of ionizing radiation? Both ionizing radiation and microwave/lower frequency EMFs act via free radicals to attack the DNA. If you examine Fig. 1, Chapter 2, you will see how low intensity microwave frequency EMFs can act (p. 20). The free radicals that attack the DNA are breakdown products peroxynitrite.. The sequence of events leading to those free radicals starts, of course with the extraordinarily high sensitivity of the VGCC voltage sensor to the electrical forces of the EMFs that open the VGCC calcium channels. Following that there are three steps in the process leading to peroxynitrite elevation *each of which have high levels of amplification*. The first of these is that when the VGCC channels are open, they allow the influx of about a million calcium ion per second into the cell. The second amplification is that elevated intracellular calcium [Ca2+]i activates the synthesis of both nitric oxide (NO) and superoxide. The third amplification is that the formation of peroxynitrite is proportional to the product of nitric oxide concentration *times* the superoxide concentration. When you have three sequential amplification mechanisms, you can get a very large response, in this case free radical attack on cellular DNA, from a very small initial signal. That is where much of the existential crises are coming are from, with EMFs threatening the survival of every technologically advanced country on earth.

Going back to falsehoods perpetrated by SCENIHR regarding Speit/Schwarz, here are two possible interpretations for those seven falsehoods. One is that SCENIHR is simply an industry propaganda organ. The second is that we have a group of scientists (SCENIHR) who are largely incompetent and that it is just coincidence that these seven falsehoods serve the industry propaganda case. Either of these interpretations completely destroy the claims of confidence in

	the effect of RF-EMW on male reproductive system.	
[80] Makker K, Varghese A, Desai NR, Mouradi R, Agarwal A. 2009 Cell phones: modern man's nemesis? Reprod Biomed Online 18:148-157.	Effects of cell phone exposure on the cardiovascular system, sleep and cognitive function, as well as localized and general adverse effects, genotoxicity potential, neurohormonal secretion and tumour induction. The proposed mechanisms by which cell phones adversely affect various aspects of human health, and male fertility in particular, are explained, and the emerging molecular techniques and approaches for elucidating the effects of mobile phone radiation on cellular physiology using high-throughput screening techniques, such as metabolomics and microarrays, are discussed. A novel study is described, which is looking at changes in semen parameters, oxidative stress markers and sperm DNA damage in semen samples exposed in vitro to cell phone radiation.	Nothing. Review is not cited and not discussed.
[81] Ruediger HW. 2009 Genotoxic effects of radiofrequency electromagnetic fields. Pathophysiology. 16:89-102.	101 publications are exploited which have studied genotoxicity of radiofrequency electromagnetic fields (RF-EMF) in vivo and in vitro. Of these 49 report a genotoxic effect and 42 do not. In addition, 8 studies failed to detect an influence on the genetic material, but showed that RF-EMF enhanced the genotoxic action of other chemical or physical agents. Variation in results may in part be explained by the different cellular systems and from the variety of analytical methods being used. Taking altogether there is ample evidence that RF-EMF can alter the genetic material of exposed cells in vivo and in vitro and in more than one way. This genotoxic action may be mediated by microthermal effects in cellular structures, formation of free radicals, or an interaction with DNA-repair mechanisms.	Nothing. Review is not cited and not discussed.
[82] Phillips JL, Singh NP, Lai H. 2009 Electromagnetic fields and DNA damage. Pathophysiology 16:79-88.	A major concern of the adverse effects of exposure to non-ionizing electromagnetic field (EMF) is cancer induction. Since the majority of cancers are initiated by damage to a cell's genome, studies have been carried out to investigate the effects of electromagnetic fields on DNA and chromosomal structure. Additionally, DNA damage can lead to changes in cellular functions and cell death. Single cell gel electrophoresis, also known as the 'comet assay', has been widely used in EMF research to determine DNA damage, reflected as single-strand breaks, double-strand breaks, and crosslinks. Studies have also been carried out to investigate chromosomal conformational changes and micronucleus formation in cells after exposure to EMF. This review describes the comet assay and its utility to qualitatively and quantitatively assess DNA damage, reviews studies that have	Nothing. Review is not cited and not discussed.

	expression, DNA damages, apoptosis. Practical steps must be done for reasonable limitation of excessive EMR exposure, along with the implementation of new safety limits of mobile telephony devices radiation, and new technological decisions, which would take out the source of radiation from human brain.	
[85] Carpenter DO. 2010 Electromagnetic fields and cancer: the cost of doing nothing. Rev Environ Health 25:75-80.	Concern of health hazards from EMFs has increased as the use of cell phones and other wireless devices has grown in all segments of society, especially among children. While there has been strong evidence for an association between leukemia and residential or occupational exposure to ELF EMFs for many years, the standards in existence are not sufficiently stringent to protect from an increased risk of cancer. For RF EMFs, standards are set at levels designed to avoid tissue heating, in spite of convincing evidence of adverse biological effects at intensities too low to cause significant heating. Recent studies demonstrate elevations in rates of brain cancer and acoustic neuroma only on the side of the head where individuals used their cell phone. Individuals who begin exposure at younger ages are more vulnerable. These data indicate that the existing standards for radiofrequency exposure are not adequate. While there are many unanswered questions, the cost of doing nothing will result in an increasing number of people, many of them young, developing cancer.	Nothing. Review is not cited and not discussed.
[86] Giuliani L, Soffritti M (Eds). 2010 NON-THERMAL EFFECTS AND MECHANISMS OF INTERACTION BETWEEN ELECTROMAGNETIC FIELDS AND LIVING MATTER, RAMAZZINI INSTITUTE EUR. J. ONCOL. LIBRARY Volume 5, National Institute for the Study and Control of Cancer and Environmental Diseases "Bernardino Ramazzini" Bologna, Italy 2010, 400 page monograph.	Contains entire articles on: 1. Influence of mobile phone radiation on cognitive function. 2. Impact of DECT cordless phone radiation on heart rate variability and on the autonomic nervous system. 3 & 4. Two articles on the impact of radiofrequency radiation on the blood-brain barrier. 5 & 6. Two articles on microwave/radiofrequency radiation and cancer causation. 7. Epidemiological studies of EMF impact on human reproduction.	Nothing. Review is not cited and not discussed.
[87] Khurana, V. G., Hardell, L., Everaert,	We identified a total of 10 epidemiological studies that assessed for putative health effects of mobile phone	Nothing. Review is not

	decarboxylase activation under exposure to low intensity MW confirm a stress impact of this factor on living cells. We also address the issue of standards for assessment of biological effects of irradiation. It is now becoming increasingly evident that assessment of biological effects of non-ionizing radiation based on physical (thermal) approach used in recommendations of current regulatory bodies, including the International Commission on Non-Ionizing Radiation Protection (ICNIRP) Guidelines, requires urgent reevaluation. We conclude that recent data strongly point to the need for re-elaboration of the current safety limits for non-ionizing radiation using recently obtained knowledge. We also emphasize that the everyday exposure of both occupational and general public to MW radiation should be regulated based on a precautionary principles which imply maximum restriction of excessive exposure.	
[91] Yakimenko IL, Sidorik EP, Tsybulin AS. 2011 [Metabolic changes in cells under electromagnetic radiation of mobile communication systems]. Ukr Biokhim Zh (1999). 2011 Mar-Apr;83(2):20-28.	Review is devoted to the analysis of biological effects of microwaves. The results of last years' researches indicated the potential risks of long-term low-level microwaves exposure for human health. The analysis of metabolic changes in living cells under the exposure of microwaves from mobile communication systems indicates that this factor is stressful for cells. Among the reproducible effects of low-level microwave radiation are overexpression of heat shock proteins, an increase of reactive oxygen species level, an increase of intracellular Ca2+, damage of DNA, inhibition of DNA reparation, and induction of apoptosis. Extracellular-signal-regulated kinases ERK and stress-related kinases p38MAPK are involved in metabolic changes. Analysis of current data suggests that the concept of exceptionally thermal mechanism of biological effects of microwaves is not correct. In turn, this raises the question of the need to revaluation of modern electromagnetic standards based on thermal effects of non-ionizing radiation on biological systems.	Nothing. Review is not cited and not discussed.
[92] Gye MC, Park CJ. 2012 Effect of electromagnetic field exposure on the reproductive system. Clin Exp Reprod Med 39:1-9. doi.org/10.5653/cerm. 2012.39.1.1 . Clin Exp Reprod Med 39:1-9. doi.org/10.5653/cerm.	The safety of human exposure to an ever-increasing number and diversity of electromagnetic field (EMF) sources both at work and at home has become a public health issue. To date, many *in vivo* and *in vitro* studies have revealed that EMF exposure can alter cellular homeostasis, endocrine function, reproductive function, and fetal development in animal systems. Reproductive parameters reported to be altered by EMF exposure include male germ cell death, the estrous cycle, reproductive endocrine hormones, reproductive organ weights, sperm motility, early embryonic development, and pregnancy success. At	Nothing. Review is not cited and not discussed.

	BLOOD-BRAIN BARRIER SECTION 11: EVIDENCE FOR BRAIN TUMORS AND ACOUSTIC NEUROMAS SECTION 12: EVIDENCE FOR CHILDHOOD CANCERS (LEUKEMIA) SECTION 13: EVIDENCE FOR EFFECTS ON MELATONIN: ALZHEIMER'S DISEASE AND BREAST CANCER SECTION 14: EVIDENCE FOR BREAST CANCER PROMOTION SECTION 15: EVIDENCE FOR DISRUPTION BY THE MODULATING SIGNAL SECTION 16: PLAUSIBLE GENETIC AND METABOLIC MECHANISMS FOR BIOEFFECTS OF VERY WEAK ELF MAGNETIC FIELDS ON LIVING TISSUE SECTION 17 EVIDENCE BASED ON EMF MEDICAL THERAPEUTICS SECTION 18: FERTILITY AND REPRODUCTION EFFECTS OF EMF SECTION 19: FETAL AND NEONATAL EFFECTS OF EMF SECTION 20: FINDINGS IN AUTISM CONSISTENT WITH EMF AND RFR	
[4] Pall, ML. 2013. Electromagnetic fields act via activation of voltage-gated calcium channels to produce beneficial or adverse effects. J Cell Mol Med 17:958-965. doi: 10.1111/jcmm.12088.	The direct targets of extremely low and microwave frequency range electromagnetic fields (EMFs) in producing non-thermal effects have not been clearly established. However, studies in the literature, reviewed here, provide substantial support for such direct targets. Twenty-three studies have shown that voltage-gated calcium channels (VGCCs) produce these and other EMF effects, such that the L-type or other VGCC blockers block or greatly lower diverse EMF effects. Furthermore, the voltage-gated properties of these channels may provide biophysically plausible mechanisms for EMF biological effects. Downstream responses of such EMF exposures may be mediated through Ca(2+) /calmodulin stimulation of nitric oxide synthesis. Potentially, physiological/therapeutic responses may be largely as a result of nitric oxide-cGMP-protein kinase G pathway stimulation. A well-studied example of such an apparent therapeutic response, EMF stimulation of bone growth, appears to work along this pathway. However, pathophysiological responses to EMFs may be as a result of nitric oxide-peroxynitrite-oxidative stress pathway of action. A single such well-documented example, EMF induction of DNA single-strand breaks in cells, as measured by alkaline comet assays, is reviewed here. Such single-strand breaks are	This was cited. Sole statement is: "(see Pall, 2013 for a review of studies suggesting effects through voltage-gated calcium channels)." None of the important implications listed on the left are used in any way in the rest of the SCENIHR 2015 document See text for further discussion..

	scription factor NF-κB. The microenvironment that exists during chronic inflammation can contribute to cancer progression. The data support the proposition that long term HF-EMF exposure associated with improper use of cell phones can potentially cause cancer.	
[97] Hardell L, Carlberg M. 2013 Using the Hill viewpoints from 1965 for evaluating strengths of evidence of the risk for brain tumors associated with use of mobile and cordless phones. Rev Environ Health 28:97-106. doi: 10.1515/reveh-2013-0006.	BACKGROUND: Wireless phones, i.e., mobile phones and cordless phones, emit radiofrequency electromagnetic fields (RF-EMF) when used. An increased risk of brain tumors is a major concern. The International Agency for Research on Cancer (IARC) at the World Health Organization (WHO) evaluated the carcinogenic effect to humans from RF-EMF in May 2011. It was concluded that RF-EMF is a group 2B, i.e., a "possible", human carcinogen. Bradford Hill gave a presidential address at the British Royal Society of Medicine in 1965 on the association or causation that provides a helpful framework for evaluation of the brain tumor risk from RF-EMF. METHODS:All nine issues on causation according to Hill were evaluated. Regarding wireless phones, only studies with long-term use were included. In addition, laboratory studies and data on the incidence of brain tumors were considered. RESULTS: The criteria on strength, consistency, specificity, temporality, and biologic gradient for evidence of increased risk for glioma and acoustic neuroma were fulfilled. Additional evidence came from plausibility and analogy based on laboratory studies. Regarding coherence, several studies show increasing incidence of brain tumors, especially in the most exposed area. Support for the experiment came from antioxidants that can alleviate the generation of reactive oxygen species involved in biologic effects, although a direct mechanism for brain tumor carcinogenesis has not been shown. In addition, the finding of no increased risk for brain tumors in subjects using the mobile phone only in a car with an external antenna is supportive evidence. Hill did not consider all the needed nine viewpoints to be essential requirements. CONCLUSION:Based on the Hill criteria, glioma and acoustic neuroma should be considered to be caused by RF-EMF emissions from wireless phones and regarded as carcinogenic to humans, classifying it as group 1 according to the IARC classification. Current guidelines for exposure need to be urgently revised.	Nothing. Review is not cited and not discussed. The Hill criteria are THE well-accepted way of analyzing biological plausiblility of epidemiologic al evidence. It is unacceptable for SCENIHR not to consider this review when attempting to analyze epidemiologic al evidence of EMF cancer causation.
[98] Hardell L, Carlberg M, Hansson Mild K. 2013 Use of	The International Agency for Research on Cancer (IARC) at WHO evaluation of the carcinogenic effect of RF-EMF on humans took place during a 24-31 May	This paper is cited and discussed

radiation from cellular and cordless phones is a probable human carcinogen. Pathophysiology 20:123-129.	examined mobile phone users for periods of time that are too short to detect an increased risk of brain cancer, while others have misclassified exposures by placing those with exposures to microwave radiation from cordless phones in the control group, or failing to attribute such exposures in the cases. In 2011, the World Health Organization, International Agency for Research on Cancer (IARC) advised that electromagnetic radiation from mobile phone and other wireless devices constitutes a "possible human carcinogen," 2B. Recent analyses not considered in the IARC review that take into account these methodological shortcomings from a number of authors find that brain tumor risk is significantly elevated for those who have used mobile phones for at least a decade. Studies carried out in Sweden indicate that those who begin using either cordless or mobile phones regularly before age 20 have greater than a fourfold increased risk of ipsilateral glioma. Given that treatment for a single case of brain cancer can cost between $100,000 for radiation therapy alone and up to $1 million depending on drug costs, resources to address this illness are already in short supply and not universally available in either developing or developed countries. Significant additional shortages in oncology services are expected at the current growth of cancer. No other environmental carcinogen has produced evidence of an increased risk in just one decade. Empirical data have shown a difference in the dielectric properties of tissues as a function of age, mostly due to the higher water content in children's tissues. High resolution computerized models based on human imaging data suggest that children are indeed more susceptible to the effects of EMF exposure at microwave frequencies. If the increased brain cancer risk found in young users in these recent studies does apply at the global level, the gap between supply and demand for oncology services will continue to widen. Many nations, phone manufacturers, and expert groups, advise prevention in light of these concerns by taking the simple precaution of "distance" to minimize exposures to the brain and body. We note that brain cancer is the proverbial "tip of the iceberg"; the rest of the body is also showing effects other than cancers.	

Of these 22 reviews, 19 are found in the PubMed database, the most widely used medical database in the world, so there is no excuse for not discussing these 19, but only two of them were discussed (see below). With regard to the eight different types of effects that I consider established non-thermal EMF effects, each of them were reviewed in multiple studies described in Table 3 as follows: Cancer 12 reviews [78,82,83-87,90,94,96-98]; Oxidative stress/free

health. The same is true for all of the other effects where they similarly fail to cite large numbers of obviously relevant reviews, each arguing for various health effects produced by EMF exposures.

Two other findings from these reviews are important in assessing EMF cancer causation. Refs. [85 and 99] each provide evidence that younger people are more susceptible to cancer causation by EMFs than are adults. SCENIHR takes the opposite view but cannot argue credibly without considering those who differ. The other finding found in [97] is that the epidemiological evidence on cancer causation by microwave frequency EMFs satisfies most of the Hill criteria. The Hill criteria are THE well-accepted criteria that allow one to distinguish chance associations from causal roles in epidemiology. Because epidemiology is the main basis for the arguments that SCENIHR makes against the conclusion that EMFs cause cancer, it is essential that SCENIHR carefully examine the Hill criteria. They fail to do so. They also ignored this study where these criteria were examined and where it was concluded that the majority of the Hill criteria argue that EMFs do cause cancer. This again, undercuts any claim that SCENIHR has carefully considered critically important findings with regard to EMF health effects.

There are several places in the SCENIHR 2015 document, where they state that no mechanisms have been identified by which claimed effects of EMFs can be produced. These can be found by searching the SCENIHR 2015 document using "mechanism" as the search term. However [4] clearly states that the VGCC activation mechanism triggered by EMF exposure can produce, via this mechanism, cellular DNA damaging effects, can produce therapeutic effects and can produce oxidative stress effects. It can be seen, therefore that SCENIHR has no problem making repeated claims that have been falsified by information that they presumably have examined. It also can be seen from this, that even in the cases where SCENIHR cites and very briefly discusses a review that disagrees with them, one can have no assurance that the information is used by SCENIHR in its assessment of health impacts. The causation of cellular DNA damage by EMFs acting via VGCC activation also has important implications with regard to cancer causation. Because almost all cases of cancer start with mutagenic DNA damage in the cell destined to become a cancer cell, this shows how EMFs can initiate the process of carcinogenesis.

It is clear that the SCENIHR 2015 document neither cited nor discussed 20 out of 22 reviews that have documented non-thermal effects of EMFs. In addition, the most important findings of the two that were cited in the document were ignored in the document as well. Therefore SCENIHR has systematically avoided discussing the most important implications of reviews that fell into the time frame they purport to have studied and disagreed with SCENIHR on the existence of important effects. The question can be raised, however, as to whether the SCENIHR has done a better job in its consideration of primary literature citations. To answer that question, I am using a database of important primary literature, regarding effects of cell phone EMFs that we are commonly exposed to.

23 Genuine Cell Phone Studies, Each of Which Should Be Discussed in SCENIHR 2015, 20 of Which Are Not.

Panagopoulos et al [100] showed that whereas 46 out of 48 studies on genuine cell phone radiation showed health-related effects, the majority of studies on simulated cell phones reported no statistically significant effects. They [100] interpreted the difference of results as having been caused by the lowered pulsation rate of the "simulated" cell phone exposures. While I am sure that is part of the explanation, there may be other possible differences that are discussed later in this chapter.

	CONCLUSION: Given the results of the present study, we speculate that RF-EMR from mobile phones negatively affects semen quality and may impair male fertility.	
2. Gul A, Celebi H, Uğraş S. 2009 The effects of microwave emitted by cellular phones on ovarian follicles in rats. Arch Gynecol Obstet 280:729-733. doi: 10.1007/s00404-009-0972-9.	The aim of this study was to investigate whether there were any toxic effects of microwaves of cellular phones on ovaries in rats. METHODS: In this study, 82 female pups of rats, aged 21 days (43 in the study group and 39 in the control group) were used. Pregnant rats in the study group were exposed to mobile phones that were placed beneath the polypropylene cages during the whole period of pregnancy. The cage was free from all kinds of materials, which could affect electromagnetic fields. A mobile phone in a standby position for 11 h and 45 min was turned on to speech position for 15 min every 12 h and the battery was charged continuously. On the 21st day after the delivery, the female rat pups were killed and the right ovaries were removed. The volumes of the ovaries were measured and the number of follicles in every tenth section was counted. RESULTS: The analysis revealed that in the study group, the number of follicles was lower than that in the control group. The decreased number of follicles in pups exposed to mobile phone microwaves suggest that intrauterine exposure has toxic effects on ovaries. CONCLUSION: We suggest that the microwaves of mobile phones might decrease the number of follicles in rats by several known and, no doubt, countless unknown mechanisms.	Not cited and not discussed by SCENIHR.
3. Imge EB, Kiliçoğlu B, Devrim E, Cetin R, Durak I. 2010 Effects of mobile phone use on brain tissue from the rat and a possible protective role of vitamin C - a preliminary study. Int J Radiat Biol 86:1044-1049. doi: 10.3109/09553002.2010.501838.	To evaluate effects of mobile phone use on brain tissue and a possible protective role of vitamin C. MATERIALS AND METHODS: Forty female rats were divided into four groups randomly (Control, mobile phone, mobile phone plus vitamin C and, vitamin C alone). The mobile phone group was exposed to a mobile phone signal (900 MHz), the mobile phone plus vitamin C group was exposed to a mobile phone signal (900 MHz) and treated with vitamin C administered orally (per os). The vitamin C group was also treated with vitamin C per os for four weeks. Then, the animals were sacrificed and brain tissues were dissected to be used in the analyses of malondialdehyde (MDA), antioxidant potential (AOP), superoxide dismutase, catalase (CAT), glutathione peroxidase (GSH-Px), xanthine oxidase, adenosine deaminase (ADA) and 5'nucleotidase (5'-NT). RESULTS: Mobile phone use caused an inhibition in 5'-NT and CAT activities as compared to the control group. GSH-Px activity and the MDA level were also found to be reduced in the mobile phone group but not significantly. Vitamin C caused a significant increase in the activity of GSH-Px and non-significant increase in the activities of 5'-NT,	Not cited and not discussed by SCENIHR.

Sangwan S, Badotra P. 2011 Exposure to cell phone radiations produces biochemical changes in worker honey bees. Toxicol Int. 2011 Jan;18(1):70-2. doi: 10.4103/0971-6580.75869.	phone radiations on various biomolecules in the adult workers of Apis mellifera L. The results of the treated adults were analyzed and compared with the control. Radiation from the cell phone influences honey bees' behavior and physiology. There was reduced motor activity of the worker bees on the comb initially, followed by en masse migration and movement toward "talk mode" cell phone. The initial quiet period was characterized by rise in concentration of biomolecules including proteins, carbohydrates and lipids, perhaps due to stimulation of body mechanism to fight the stressful condition created by the radiations. At later stages of exposure, there was a slight decline in the concentration of biomolecules probably because the body had adapted to the stimulus.	and not discussed by SCENIHR.
7. Favre D. 2011 Mobile phone-induced honeybee worker piping. Apidologie 42:270-279.	Electromagnetic waves originating from mobile phones were tested for potential effects on honeybee behavior. Mobile phone handsets were placed in the close vicinity of honeybees. The sound made by the bees was recorded and analyzed. The audiograms and spectrograms revealed that active mobile phone handsets have a dramatic impact on the behavior of the bees, namely by inducing the worker piping signal. In natural conditions, worker piping either announces the swarming process of the bee colony or is a signal of a disturbed bee colony.	Not cited and not discussed by SCENIHR.
8. Cammaerts MC, Debeir O, Cammaerts R. 2011. Changes in Paramecium caudatum (protozoa) near a switched-on GSM telephone. Electromagn Biol Med. 2011 Mar;30(1):57-66. doi: 10.3109/15368378.2011.566778.	The protozoan Paramecium caudatum was examined under normal conditions versus aside a switched-on GSM telephone (900 MHz; 2 Watts). Exposed individuals moved more slowly and more sinuously than usual. Their physiology was affected: they became broader, their cytopharynx appeared broader, their pulse vesicles had difficult in expelling their content outside the cell, their cilia less efficiently moved, and trichocysts became more visible. All these effects might result from some bad functioning or damage of the cellular membrane. The first target of communication electromagnetic waves might thus be the cellular membrane.	Listed under literature identified but not cited. SCENIHR knew about this paper but decided not to discuss it.
9. Çam ST, Seyhan N. 2012 Single-strand DNA breaks in human hair root cells exposed to mobile phone radiation. Int J Radiat Biol 88:420-424. doi: 10.3109/09553002.2012.666005.	To analyze the short-term effects of radiofrequency radiation (RFR) exposure on genomic deoxyribonucleic acid (DNA) of human hair root cells. SUBJECTS AND METHODS: Hair samples were collected from eight healthy human subjects immediately before and after using a 900-MHz GSM (Global System for Mobile Communications) mobile phone for 15 and 30 min. Single-strand DNA breaks of hair root cells from the samples were determined using the 'comet assay'. RESULTS: The data showed that talking on a mobile phone for 15 or 30 min significantly increased ($p < 0.05$) single-strand DNA breaks in cells of hair roots close to the phone. Comparing the 15-min and 30-min data using the paired t-	Not cited and not discussed by SCENIHR.

telephone and the protective effects of the antioxidants vitamins C and E. Clinics 67:785-792	radiation on the testes. MATERIALS AND METHODS: The treatment groups were exposed to an electromagnetic field, electromagnetic field plus vitamin C (40 mg/kg/day) or electromagnetic field plus vitamin E (2.7 mg/kg/day). All groups were exposed to the same electromagnetic frequency for 15, 30, and 60 min daily for two weeks. RESULTS: There was a significant increase in the diameter of the seminiferous tubules with a disorganized seminiferous tubule sperm cycle interruption in the electromagnetism-exposed group. The serum and testicular tissue conjugated diene, lipid hydroperoxide, and catalase activities increased 3-fold, whereas the total serum and testicular tissue glutathione and glutathione peroxidase levels decreased 3-5 fold in the electromagnetism-exposed animals. CONCLUSION: Our results indicate that the adverse effect of the generated electromagnetic frequency had a negative impact on testicular architecture and enzymatic activity. This finding also indicated the possible role of vitamins C and E in mitigating the oxidative stress imposed on the testes and restoring normality to the testes.	SCENIHR knew about this paper but decided not to discuss it.
12. Aldad TS, Gan G, Gao X-B, Taylor HS. 2012 Fetal radiofrequency radiation from 800-1900 MH-rated cellular telephone affects neurodevelopment and behavior in mice. Scientific Rep 2, article 312.	Neurobehavioral disorders are increasingly prevalent in children, however their etiology is not well understood. An association between prenatal cellular telephone use and hyperactivity in children has been postulated, yet the direct effects of radiofrequency radiation exposure on neurodevelopment remain unknown. Here we used a mouse model to demonstrate that in-utero radiofrequency exposure from cellular telephones does affect adult behavior. Mice exposed in-utero were hyperactive and had impaired memory as determined using the object recognition, light/dark box and step-down assays. Whole cell patch clamp recordings of miniature excitatory postsynaptic currents (mEPSCs) revealed that these behavioral changes were due to altered neuronal developmental programming. Exposed mice had dose-responsive impaired glutamatergic synaptic transmission onto layer V pyramidal neurons of the prefrontal cortex. We present the first experimental evidence of neuropathology due to in-utero cellular telephone radiation. Further experiments are needed in humans or non-human primates to determine the risk of exposure during pregnancy.	Was cited and discussed, see text.
13. Liu C, Gao P, Xu SC, Wang Y, Chen CH, He MD, Yu ZP, Zhang L, Zhou Z. 2013 Mobile phone radiation induces mode-dependent	A mouse spermatocyte-derived GC-2 cell line was exposed to a commercial mobile phone handset once every 20 min in standby, listen, dialed or dialing modes for 24 h. DNA damage was determined using an alkaline comet assay. RESULTS: The levels of DNA damage were significantly increased following exposure to MPR in the listen, dialed and dialing modes. Moreover, there	Not cited and not discussed by SCENIHR.

phones on fasting blood glucose. Int J Occup Med Environ Health 26:235-241. doi: 10.2478/s13382-013-0107-1.	phones on fasting blood glucose in Wistar Albino rats. MATERIALS AND METHODS: 40 Male Albino rats (Wistar Strain) were divided into 5 equally numerous groups. Group A served as the control one, group B received mobile phone radiation for less than 15 min/day, group C: 15-30 min/day, group D: 31-45 min/day, and group E: 46-60 min/day for a total period of 3 months. Fasting blood glucose was determined by using Spectrophotometer and serum insulin by Enzyme-linked Immunosorbent Assay (ELISA). The Homeostatic Model (HOMA-B) was applied for the assessment of β-cell function and (HOMA-IR) for resistance to insulin. RESULTS: Wister Albino rats exposed to mobile phone radiation for longer than 15 min a day for a total period of 3 months had significantly higher fasting blood glucose ($p < 0.015$) and serum insulin ($p < 0.01$) compared to the control group. HOMA-IR for insulin resistance was significantly increased ($p < 0.003$) in the groups that were exposed for 15-30 and 46-60 min/day compared to the control rats. CONCLUSION:The results of the present study show an association between long-term exposure to activated mobile phones and increase in fasting blood glucose and serum insulin in Albino rats.	
16. Tsybulin O, Sidorik E, Brieieva O, Buchynska L, Kyrylenko S, Henshel D, Yakymenko I. 2013 GSM 900 MHz cellular phone radiation can either stimulate or depress early embryogenesis in Japanese quails depending on the duration of exposure. Int J Radiat Biol 89:756-763. doi: 10.3109/09553002.2013.791408.	Our study was designed to assess the effects of low intensity radiation of a GSM (Global System for Mobile communication) 900 MHz cellular phone on early embryogenesis in dependence on the duration of exposure. MATERIALS AND METHODS: Embryos of Japanese Quails were exposed in ovo to GSM 900 MHz cellular phone radiation during initial 38 h of brooding or alternatively during 158 h (120 h before brooding plus initial 38 h of brooding) discontinuously with 48 sec ON (average power density 0.25 μW/cm(2), specific absorption rate 3 μW/kg) followed by 12 sec OFF intervals. A number of differentiated somites were assessed microscopically. Possible DNA damage evoked by irradiation was assessed by an alkaline comet assay. RESULTS: Exposure to radiation from a GSM 900 MHz cellular phone led to a significantly altered number of differentiated somites. In embryos irradiated during 38 h the number of differentiated somites increased ($p < 0.001$), while in embryos irradiated during 158 h this number decreased ($p < 0.05$). The lower duration of exposure led to a significant ($p < 0.001$) decrease in a level of DNA strand breaks in cells of 38-h embryos, while the higher duration of exposure resulted in a significant ($p < 0.001$) increase in DNA damage as compared to the control. CONCLUSION: Effects of GSM 900 MHz cellular phone radiation on early embryogenesis can be either stimulating or deleterious depending on the duration of exposure.	Listed under literature identified but not cited. SCENIHR knew about this paper but decided not to discuss it.

following EMF exposures. What is particularly important in this study is that high levels of two different antioxidants, vitamin C and vitamin E, were each shown to produce substantial protection of the testis structure from the EMF effects while partially normalizing the oxidative stress elevation. What this clearly shows is that the oxidative stress causes the testis tissue disruption. So we don't just have evidence for two effects, testis disruption and oxidative stress but we have strong evidence that one causes the other. It is exactly these connections that are essential for the progression of the science!

13 is another study not discussed by SCENIHR which is particularly important. It looks at cell phone radiation DNA damage produced in a mouse spermatocyte-derived cell line. What it finds is that DNA damage is particularly high when the cell phone is in the dialed or dialing mode, as opposed to a listen mode. They also state that the radiation levels in the three modes correspond, at least roughly, to the DNA damage effects seen. They also show that pretreatment with melatonin (which is known to have antioxidant effects) greatly lowers the DNA damage produced by the cell phone EMF exposures. This is similar to the study discussed immediately above because it again shows that one effect, DNA damage is produced by another effect, namely oxidative stress/free radical elevation. You will recall that as discussed in Chapter 2, cellular DNA damage following EMF exposure is produced by the attacks by on the DNA by peroxynitrite derived free radicals. This study provides confirmation for that mechanism.

#14 is another study not discussed by SCENIHR which is also particularly important. It looks at the impact of cell phone radiation on kidney structure of rats, using six different measures of kidney structure. There were two groups of rats that were exposed to cell phone radiation which were both compared with each other and with normal unexposed control rats. The two exposed groups differed from each other in one group the kidney structure was assessed immediately following the 20 day exposure period. The second exposure group was also exposed for 20 days but was given 20 days subsequently with no exposure to see if the kidney structure spontaneously recovered. There was no recovery seen in the second group, showing that the kidney damage was effectively irreversible. In Chapter 3, several tissue remodeling type effects produced by EMF exposure appeared to be irreversible. Study #14 may add an additional such effect to that list.

#15 is another study not discussed by SCENIHR which is also particularly important. In this study control (unexposed) rats were compared with rats exposed to cell phone radiation for: less than 15 minutes per day, 15 to 30 minutes per day, 31 to 45 minutes per day or 45 to 60 minutes per day. Rats exposed to over 15 minutes per day of cell phone radiation showed type 2 diabetes onset-like effects, with higher fasting glucose levels and higher serum insulin levels. This appears to be, therefore a study showing important hormone dysfunction. It should be noted that the same research group has found similar changes in people living near cell phone towers [101]. Consequently, this is still another situation where findings in experimental animal studies appear to be directly applicable to humans.

Of the papers that were discussed, it is my opinion that the Aldad et al paper (#12, Table 4) is perhaps the most important. The paper starts out discussing the very large increase in ADHD that we have had in recent years, an increase which suggests that one or more environmental changes must be involved. This paper is from a distinguished laboratory, Hugh Taylor's laboratory at Yale, and was published in one of the highly respected Nature journals and the paper, at this writing has been cited 89 times, showing a high level of scientific interest in it. The paper showed that prenatal exposure of pregnant mice to cell phone radiation produced three highly statistically significant changes in the adult mice. These were a decrease in measured memory function, increase in hyperactivity and increase in anxiety. They also showed that there was a dose dependent decrease in an important neurological parameter, the frequency of miniature

elderly subjects but not for the young ones. This might point to a GSM-EMF related inter-hemispheric synchronization of alpha rhythms as a function of physiological aging." Another related study (#by the same research group was also cited and discussed SCENIHR 2015 [73] as follows: "Vecchio et al. (2012a) used the same study design to investigate an exposure effect in patients with epilepsy. Data from 10 patients were compared to results from 15 age- matched controls from previous studies. Patients showed a statistically significant higher inter-hemispheric coherence of temporal and frontal alpha-rhythms under exposure as compared to control subjects. According to the authors, these results might indicate a GSM exposure effect on inter-hemispheric synchronization of the dominant (alpha) EEG rhythms in epileptic patients."

What do I have to say about the two Vecchio studies? They are both based on an earlier 2007 study which showed that increased EEG coherence between the two hemispheres of the brain was produced by genuine cell phone EMF exposure. What the 2010 study (#5 in Table 4) shows is that the EMF-induced increased coherence is much higher in older adults than it is in younger adults. What the 2012 study (#10 in Table 4) shows is that the EMF-induced coherence seen in people with epilepsy is also much higher than in people without epilepsy. These three studies then provide large amounts of evidence for a neurological effect of cell phone radiation that is influenced by two variables, age and epilepsy. These findings should be looked at the context of the 23 reviews, listed in Chapter 1, each showing that EMFs produce both neurological and/or neuropsychiatric impacts on the brain. Here we have still another neurological effect, one that is influenced by age and epileptic condition. There are, then three important findings in these studies. One is that while we have had quite lot of evidence showing that children are more sensitive to EMF effects than adults, this is the first clear finding, to my knowledge, that suggests that older people may be more sensitive to a neurological effect. The linkage to epilepsy should not be surprising as some EHS people are reported to have seizures triggered by very low intensity EMF exposures. Finally, the communication between the two hemispheres of the brain has been known for over half a century to be through what is called the corpus callosum, a structure deeply buried in the middle of the brain, linking the two hemispheres. These effects increasing the coherence between the two hemispheres are probably produced, therefore, through the impact of the EMFs on the corpus callosum. That implies, in turn, that the EMFs act much more deeply in the brain than the industry claims is possible.

The problem with SCENIHR is that it lives in a totally fictional universe where none of those EMF effect reviews exist or at least none of them have any relevance to the SCENIHR world. Neither of the two Vecchio et al studies, discussed in the previous two paragraphs, are used by SCENIHR [73] to make any conclusions about EMF effects or lack thereof – they are only cited in the quote that I gave you. We know that because because the citations are by author's last name and are, therefore easily searchable. Similarly, the Aldad et al (#12) study discussed two paragraphs further up, was also never cited except in the quotation given. So none of these three papers are used to assess any effects of EMFs or lack of effects. The same thing is true of the two reviews from Table 3 that were cited and discussed in [73]. They also were only cited in the quoted section and are never used to assess EMF effects or the mechanism of EMF action. As previously noted, there are several statements in SCENIHR 2015 [73] regarding lack of any available mechanism to explain claimed EMF effects, something that is directly contradicted by one of those cited and discussed reviews [4]. The consequence of all of that is that we have two very large and very consequential bodies of literature, the reviews on EMF effects and the literature on genuine cell phone radiation effects, which are entirely missing from any SCENIHR 2015 [73] conclusion.

Is There Another Systematic Effort by Industry to Corrupt the Literature that Has Been Followed to Some Extent by SCENIHR?

Summary of Flaws in SCENIHR 2015

The first set of flaws, is that SCENIHR is perfectly willing to make statements which they know or should have known are false. The most egregious example of this is the Speit/Schwarz controversy described at the beginning of this chapter where there are seven clear falsehoods *created by SCENIHR*, each of which greatly strengthens the telecommunications industry propaganda positions. There are many others, described in this chapter that are substantive, but less egregious than the Speit/Schwarz falsehoods.

There is a vast literature, both in the review literature and in the primary literature studies, that disagrees strongly with the SCENIHR positions and is completely ignored by SCENIHR. In a few cases, such studies are cited and very briefly discussed by SCENIHR but then they have no impact on the assessments that SCENIHR makes in the SCENIHR 2015 document [73]. In most cases, they are neither cited nor discussed. The situation here is similar to an organization that has two sets of books, the fake books that are used in public and then a genuine set of books that includes all of the data that are too inconvenient to be included in the fake set of books.

The finally, we have three additional considerations which interact with each other to produce the completely bogus logic used by SCENIHR and by other organizations that have taken positions similar those taken by SCENIHR. One of those considerations comes from our knowledge that pulsation pattern, cell type, polarization and frequency can all influence biological effects and that there are exposure windows that produce much larger effects than are seen with either lower or higher intensities. Our knowledge of these factors mean that it is possible for the telecommunications industry to foster any number of studies where it is unlikely that statistically significant evidence of effects will be seen. I have presented examples where this may have been done. One of the most bizarre things about the SCENIHR 2015 document [73] is that there is a sentence on p. 101 where they state "In some of these cases, the effect seemed to be dependent on the cell type investigated and by the electromagnetic parameters applied (frequency, modulation)." Modulation and pulsation are the same thing. They know about these three factors and therefore, they know that these factors may explain differences in results obtained by different studies. But they still falsely assume that such differences imply inconsistencies in results and falsely assume that it makes sense to simply count apparent positive and apparent negative studies as a way of assessing whether there are effects or not.

SCENIHR has often falsely stated that these studies show no effects as opposed to lack of statistical significance of any effects. SCENIHR 2015 document has 125 places where such bogus claims of "no effect" are found. They repeatedly claim the literature is inconsistent but studies done under different conditions are *not* inconsistent because they are more likely to be due to genuine biological heterogeneity of responses. The false logic described here is used, in turn, to support another highly pervasive false logic. I've documented where SCENIHR has simply counted numbers of studies showing so many findings of effects and some other number of findings of "no effect." But these numbers are meaningless, when the studies are done under different conditions and where the "no effect" numbers can easily be inflated by studies designed to produce such results. They are also, of course, meaningless, when large numbers of studies that show effects are eliminated by SCENIHR by the simple process of pretending they don't exist. You can see from this, that the entire logical framework behind the SCENIHR 2015 [73] document is completely bogus.

Lastly, before going on to the situation in the U.S. and with 5G, there is one other thing I want to state here. In 2005, Dr. Jared Diamond published a book [111] entitled "Collapse: How

Dr. Henry Lai from the University of Washington and a collaborator, NP Singh were using the alkaline comet assay, discussed earlier in this document to measure single stranded breaks in cellular DNA. They found a substantial elevation of the levels following low level EMF exposure in late1994. Before that finding had even been published, they found that they were targets of a severe attack from the telecommunications industry. A key document providing evidence of this was what was called the "War-Gaming" memo [113], where an executive named Norm Sandler, head of the Corporate Communications Department of Motorola (at that time the largest cell phone company) sent the memo to Michael Kehs of a public relations campaign in Washington DC (dated Dec. 13, 1994), describing their planned response to these at that time, unpublished findings. The memo stated that "While this work raises some interesting questions about possible biological effects, it is our understanding that there are too many uncertainties—related to the methodology employed, the findings that have been reported and the science that underlies them—to draw any conclusions about its significance at this time. Without additional work in this field, there is absolutely no basis to determine whether the researchers found what they report finding—or that the results have anything at all to do with DNA damage or health risks, especially at the frequencies and power levels of power levels of wireless communication devices.

In discussing the frequency differentiation issue, we should be able to say that Lai-Singh and Sarkar were not conducted at cellular (that is cell phone) frequencies."

(My comments are as follows: It is true that Lai/Singh used a different frequency from that used by cell phones. So the industry was correct about that. But the findings also show that the industry claims that there cannot be any non-thermal effects are wrong, and that may be more important. Singh had a reputation of being a genuine international expert on comet assays, so I doubt that methodology was a problem. If this had nothing to do with DNA damage or health risks, Motorola would not be worrying about these findings. There were at that time (1994) previously published studies of EMF effects on cellular DNA including the concurrent Sarkar findings and including findings of chromosome breaks and rearrangements reported in [30]).

Further down, the memo: "I think we have sufficiently war-gamed the Lai-Singh issue, assuming that SAG (Scientific Advisory Group, a group linked to the telecom industry) and the CTIA (the umbrella telecom lobbying, publicity and legal organization) have done their homework. We want to run this by George Carlo and fill him in on contacts we have made."

Under Excerpts from Confidential Working Draft #3. Question and Response:

Q. How can Motorola downplay the significance of the Lai study when one of your own expert consultants is on record telling Microwave News that the results—if replicated—could throw previous notions of RF safety into question?
R. It is not a question of downplaying the significance of the Lai study. In his comments to Microwave News, Dr. Sheppard raised the key question: Can it be replicated and interpreted? We will wait and see."
(My comments: Replication needed to be done, so that was a valid point. The interpretation was and is clear – it is that EMF exposures produce large increases in the numbers of single strand breaks in the cellular DNA.)

"Action Planned: In addition to response materials prepared by SAG (see attached copies) we will work with SAG to identify appropriate experts to comment in general on the science of DNA research, in addition to any experts SAG may be able to recommend to publicly comment on one or both of these particular studies.

Prof. Gandhi became concerned about the fact that both the head size and skull thickness of SAM was greater than that of most men and essentially all women and children and consequently began modeling a typical woman and typical 10 year old child, When he did that he found that the cell phone EMF exposures to the brain were much too high, even based on their own standards, standards that were and are only based on heating. The timing of these events was from 1975 through 1996. I will be quoting on what occurred subsequently. I have received permission from Dr. Devra Davis to make these quotes from pages 81 through 88 of her book Disconnect [77]. I will use a different font for those quotes so that you can see them easily.

Based on the new work he had produced, Gandhi called for a revision of the safety standards that regulated cell phones. The industry was stunned. For years, Gandhi had been one of those on whom they had counted. If Gandhi's work went uncontested, it would mean that children, women and men with smaller heads could not safely use some electronic devices or that these devices would have to be redesigned to emit less radio frequency radiation. The industry's first response was to cut off all of Gandhi's funding.

Going to p. 86 from [77]:

Gandhi explained that something has gone very wrong with standard setting in the United States in the past few years.

"Starting in the late 1980s, I chaired the committee to set standards for radio-frequency exposures before all cell phones ever existed. About a decade ago, C.K. Chou, then at the City of Hope Hospital, replaced me. Within two years, Chou had moved. He became a senior executive with Motorola—a clear conflict of interest. The committee that advises as to cell phone standards is supposed to be independent and had never before been led by someone from the very industry it advises. Under Chou's leadership, the committee relaxed standards for cell phones as of 2005. Having spent my entire life developing models of the brain, I know how things work. I also know that what we have done here is to ratchet up exposures, without actually telling people we have done so. Today's standards for cell phones have more than doubled the amount of radio-frequency radiation allowed into the brain."

The next quote starts at 2002, before the more than doubling of those radiation standards (pp. 87-88 from [77]).

By 2002 the gloves were off and the industry made it clear to Gandhi that they would take him on directly. Gandhi remembers being told by an industry colleague who was once a student and friend, "If you insist on publishing these papers saying that children get more exposed than adults and saying our test procedure is not valid, you can expect that we will not fund you."

Gandhi replied, "I am a university professor. I don't need your money."

Next industry tried to place an article by Chou critiquing Gandhi's models in the journal of which Gandhi had been editor and chief and in which he had published dozens of articles, and asked that either his (that is Gandhi's) article criticizing the grounds for setting standards be removed, or that they be allowed to publish Chou's rejoinder.

may have been sufficient to encourage the telecommunications industry to follow a similar, although, in my opinion, much more aggressive pathway.

One question that can be asked is whether there are any major international political figures who appear to have a good understanding of the EMF/health issue? When I was asked that question, I was able to come up with only one person. That person is President Vladimir Putin of Russia. This inference comes from an interview of Dr. Dietrich Klinghardt, who practices in Seattle, by Dr. Joseph Mercola, that occurred in December 2017, an interview that was entirely focused on EMF health effects [117]. In that context Dr. Klinghardt states that a lecture that Putin gave to the Russian assembly said, "We do not need to go to war with America. America is committing collective suicide by the way they are using electricity. We just have to wait until they are all in the psychiatric hospital." When I saw that, I asked myself whether it is plausible that Vladimir Putin has a deep understanding of the neuropsychiatric effects of the EMFs? And then I thought, of course, Vladimir Putin was the head of the KGB when the latter studies reviewed by Dr. Karl Hecht [28] were being done in the Soviet Union. The most important effects that were shown to be produced by the EMFs, in those studies, were the neuropsychiatric effects. Furthermore, the Putin statement apparently shows not only a substantial understanding of those effects but also the fact that they are cumulative and become irreversible, as shown in those studies [28] and in other studies discussed in Chapter 4. One thing that I would add is that President Putin apparently practices what he preaches. He avoids smart phones [118].

It is my opinion, that the CIA and other international intelligence agencies should examine these issues very carefully to assess whether they see the kinds of threats that I see. Those agencies are very good at obtaining information from various sources and determining probable threats to national and international security. It should not be difficult to come to an assessment, especially because some of us have done much of the work that needs to be done. The threat here is self-inflicted, it is not caused by any foreign power or set of powers. But it is the most serious national or international security threat that we have faced, in my opinion, with the exception of nuclear annihilation.

Propaganda:

In the initial days of the controversy regarding cell phones, in 1993, the industry developed a huge public relations effort in the face of lawsuits and adverse press reports impacting the industry. Paul Staiano, President of Motorola General Systems stated in a 1993 ABC 20/20 interview [119] that, "Forty years of research and more than ten thousand studies have proved that cellular phones are safe." So I asked how many studies of cell phone safety or lack there of had been published by the end of 1993. The way I did that was to search in the PubMed database under (cell phones or cellular phones or mobile phones). I found about 11,000 hits, roughly 99% of them having nothing to do with health safety, and then looked at the few studies that had been published before the end of 1993. The only study I found that had any connection with health or safety, was one on driving safety while using a cellular phone, giving equivocal results with regard to driving safety. So there, were apparently no studies done on cell phone safety at that time. Furthermore, even if there had been any studies, they could not possibly show that "cellular phones are safe." At most they might show that there was no statistically significant evidence of an effect but that only shows that you have not proven an effect, not that you have proven the opposite. It can be seen, therefore, that this propaganda statement is complete nonsense. Furthermore, we know that the Panagopoulos et al [100] review, showed that 46 out of 48 genuine cell phone studies that they reviewed showed effects. So the facts are exactly opposite of the industry propaganda on this. If this was the beginning of propaganda in the U.S. let's look at something much more recent.

Have There Been Individual Research Studies Designed to Fail and Therefore Corrupt the Scientific Literature?

The first example, that I am aware of, where false science has been produced to supposedly show that an important EMF observation was unrepeatable also came from the U.S. It was described in Dr. Davis' book [77]. Dr. Allen H. Frey (pronounced Fry) published a paper in 1975 in Annals of the New York Academy of Science showing that low intensity pulsed EMF exposures produced a breakdown of the blood-brain barrier, the barrier in the blood vessels in the brain and the brain tissue that protects the brain from toxic chemicals and also infectious agents. The methodology that he used was to inject the fluorescent dye fluorescein into the blood (IV) and then use its fluorescence to detect whether and to what extent it penetrates into the brain tissue from the blood. A subsequent paper was published in 1978 [123], using similar methodology *except* that the fluorescein instead of being injected into the blood, was injected by intraperitoneal (IP) injection. When a compound is injected IP, it enters the blood only slowly over a substantial period of time, so that when one does a short term experiment looking at penetration through the blood-brain barrier, essentially nothing is seen. This was a transparent attempt to claim that the studies of Dr. Frey had been repeated with negative results, but the Frey studies had not be replicated.

I am aware of many papers that were flawed like the seven studies of simulated Wi-Fi, discussed near the end of Chapter 5 that were each touted by Foster and Moulder [110]. Let me remind you of what the flaws were in those seven studies. Firstly, each of them used EMFs that were the correct frequency for Wi-Fi but differed in pulsation from genuine Wi-Fi. Each of these studies used a reverberation exposure chamber which is predicted to decrease effects by both decreasing the polarization of the EMFs and increasing the destructive interference of the EMFs. They also used tiny numbers of animals for each study group, such that any statistics would have very low power. Finally, Foster and Moulder claimed each of them showed "no effect" when one can only at best claim there was no statistically significant evidence of an effect. Given the tiny numbers, the lack of statistical significance is of very little importance. I find that this pattern has been followed in a substantial number of additional studies.

What I want to discuss here is a paper that had each of those four properties but had several additional flaws, as well. I am aware of three legal proceedings in the U.S., where the industry side of that case touted the paper to be discussed, as being a particularly strong one. This paper by Ziemann et al [124] is entitled "Absence of genotoxic potential of 902 MHz (GSM) and 1747 MHz (DCS) wireless communication signals: In vivo two-year bioassay in B6C3F1 mice. In other words, the title claims that the 902 MHz frequency, studied and the 1747 MHz frequency also studied in the paper cannot cause DNA damage or other types of genotoxicity."

On p. 456 of Ziemann et al [124], the authors make clear that they are studying the effects of simulated cell phone radiation, not actual cell phone radiation. You will recall that Panagopoulos et al [110] found that almost all studies of genuine cell phone radiation found effects whereas less than half of simulated cell phone studies showed effects. This raises an important question about why Ziemann et al [124] opted to study simulated cell phone radiation. Much of the funding of the Ziemann et al paper (see pp. 462-463) came from industry sources. Funding source is not a flaw but it is a reason to look at the paper particularly closely. 2. The Ziemann et al [124] study used a stainless steel exposure chamber similar to the reverberation chambers discussed in Chapter 5 of this document. The chamber is predicted, to produce lower effects because of lowered polarization and increased destructive interference 3. The study is described as being a two year study of radiation effects. However the cells examined for micronuclei (their marker for genotoxicity (cellular DNA damage)), were mouse erythrocytes (red blood cells), and such

Carlo was, at that time the soon to be retiring head of the WTR, which was the CTIA/telecommunications industry research arm. In the letters to the heads of the telecommunications industry companies, Carlo discusses the types of evidence arguing that cell phones do apparently cause cancer and that they do cause DNA damage to our cellular DNA. The DNA damage, suggested that the apparent cancer causation was real. Carlo continues the letter as follows [125]:

"Today, I sit here extremely frustrated and concerned that appropriate steps have not been taken by the wireless industry to protect consumers during this time of uncertainty about safety." Continuing further down, Carlo adds:

"Alarmingly, indications are that some segments of the industry have ignored the scientific findings suggesting potential health effects, have repeatedly and falsely claimed that wireless phones are safe for all consumers including children, and have created an illusion of responsible follow up by calling for and supporting more research. The most important measures of consumer protection are missing: complete and honest factual information to allow informed judgment by consumers about assumption of risk; the direct tracking and monitoring of what happens to consumers who use wireless phones; and, the monitoring of changes in the technology that could impact health.

I am especially concerned about what appear to be actions by a segment of the industry to conscript the FCC, the FDA and WHO with them in following a non-effectual course that will likely result in a regulatory and consumer backlash."

This is an important letter for several reasons. After October 7, 1999 the heads of the telecommunications companies or, for that matter anyone else at those companies, could no longer legitimately claim that they did not know there were serious health concerns with cell phones, with targeting cell phones to young children, or with increasing allowable cell phone exposure radiation. The last of these was done a few years later, as you have already seen.

The concerns Carlo expresses about the FCC (Federal Communications Commission) and the FDA (U.S. Food and Drug Adminstration) are particularly important in the U.S., because both the FCC and the FDA had already been given important regulatory roles when the Carlo letter was written. The FCC had been given the power of regulating the location of cell phone towers by the 1996 telecommunications act, which also *prohibited, as I understand it, any state or local government from protecting their people's health by regulating cell phone tower positioning*. In other words, the 1996 telecommunications act *de facto* stated that the U.S. Federal government valued telecommunication industry profits over every single health impact of microwave frequency radiation, *no matter how serious* it is, to the American people. There have been several subsequent pieces of legislation that have made the situation still worse. The FDA had been given the power to regulate radiation emissions from cell phones and other devices that emit microwave/radiofrequency radiation, with cell phone regulation apparently being shared with the FCC.

What Can We Say About the FCC?

There was a very informative document about the FCC published by the Safra Institute for Ethics at Harvard University [127] entititled "Captured Agency: How the Federal Communications Commission Is Dominated by the Industries It Presumably Regulates." One of the sections in that document shows why both the FCC role and the telecommunications industry role were so important with regard to the 1996 telecommunications act:

At relatively low levels of exposure to RF radiation, i.e., levels lower than those that would produce significant heating, the evidence for production of harmful biological effects is ambiguous and unproven. Such effects, if they exist, have been referred to as "non-thermal" effects. A number of reports have appeared in the scientific literature describing the observation of a range of biological effects resulting from exposure to low levels of RF energy. However, in most cases, further experimental research has been unable to reproduce these effects. Furthermore, since much of the research is not done on whole bodies (in vivo), there has been no determination that such effects constitute a human health hazard. It is generally agreed that further research is needed to determine the generality of such effects and their possible relevance, if any, to human health. In the meantime, standards-setting organizations and government agencies continue to monitor the latest experimental findings to confirm their validity and determine whether changes in safety limits are needed to protect human health. (Back to Index)

CAN PEOPLE BE EXPOSED TO LEVELS OF RADIOFREQUENCY RADIATION THAT COULD BE HARMFUL?

Studies have shown that environmental levels of RF energy routinely encountered by the general public are typically far below levels necessary to produce significant heating and increased body temperature. However, there may be situations, particularly in workplace environments near high-powered RF sources, where the recommended limits for safe exposure of human beings to RF energy could be exceeded. In such cases, restrictive measures or mitigation actions may be necessary to ensure the safe use of RF energy. (Back to Index)

CAN RADIOFREQUENCY RADIATION CAUSE CANCER?

Some studies have also examined the possibility of a link between RF exposure and cancer. Results to date have been inconclusive. While some experimental data have suggested a possible link between exposure and tumor formation in animals exposed under certain specific conditions, the results have not been independently replicated. Many other studies have failed to find evidence for a link to cancer or any related condition. The Food and Drug Administration has further information on this topic with respect to RF exposure from mobile phones at the following Web site: FDA Radiation-Emitting Products Page . (Back to Index)

Let's look at the first paragraph. In the third and fourth sentence, they state that there have been non-thermal effects reported but then say that "in most cases they have not been reproduced." Is that true? No. The 79 reviews listed in Chapter 1 have each found repeated studies documenting one or more of the EMF effects. You can't get a review published without multiple studies. And the fact that so many of these effects have been repeatedly reviewed, over many years shows that similar patterns of evidence have been found over long periods of time. *The FCC provides not one iota of evidence on its claims, despite the fact that such a claim of inability to reproduce findings absolutely requires extensive documentation to be scientifically valid. This difference in documentation, means that any one of those 79 reviews listed in Chapter 1 is vastly more scientific in showing the falsity of the FCC statement than is the FCC statement itself, which is completely undocumented.*

The actions produced by such VGCC activation go mainly through the excessive intracellular calcium levels produced by such activation. Excessive calcium acts via three main pathways to produce effects in the body. Therapeutic effects are produced through the nitric oxide signaling pathway whereas many pathophysiological effects are produced by the peroxynitrite/oxidative stress pathway. Excessive calcium signaling also produces pathophysiological effects. Numerous effects produced following non-thermal EMF exposures can be produced by these pathways including oxidative stress, cellular DNA damage, cancer, widespread neuropsychiatric effects, breakdown of the blood brain barrier, lowered male and female fertility and various endocrine (that is hormonal) changes.

It has long been known that pulsed EMFs are usually much more biologically active than are non-pulsed (or continuous wave) EMFs and this difference appears to be consistent with the VGCC mechanism. Because all wireless communication devices communicate via pulsations, such devices may be of special concern.

Three concerns were expressed with regard to 5G: 1. The stronger absorption of the very high frequencies involved require the setting up of vast numbers of antennae, making it essentially impossible to avoid damaging exposures. 2. The stronger absorption suggests that these EMFs may be particularly active in activating the VGCC voltage sensor. 3. The very high level and complexity of pulsations also may make for much more biological damage via VGCC activation.

There was substantial discussion of the need for biological safety testing. That discussion focused on the using cells in culture that have high densities and different types of VGCCs. Responses can be monitored by either monitoring intracellular calcium levels or by measuring nitric oxide production using a nitric oxide electrode.

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We had what would be considered in diplomatic circles a good and productive meeting, but since that time the FCC has doubled down on their positions, pushed much further on 5G, leading us to the mega-crisis situation which we are faced with now. Instead of actually testing 5G radiation biologically for safety, using the methods that were discussed in that meeting, the FCC has instead opted to put out tens of millions of 5G antennae without any biological safety testing of genuine 5G radiation. That is the insanity that we are in.

What About the FDA?

The Food and Drug Administration (FDA) was given the power to regulate devices that emit microwave frequency EMFs. This was not an unreasonable decision, given that the FDA was already regulating the safety of medical devices, where one can argue that there are similar challenges involved. The FDA was given this responsibility without any additional funding. So obviously, it was and is distinctly limited in what it can do.

What the FDA did was to issue a Letter of Intent for Proposed Collaboration in Mobile Phone Research between the Food and Drug Administration and the Cellular Telecommunications

According to current data, the FDA believes that the weight of scientific evidence does not show an association between exposure to radiofrequency from cell phones and adverse health outcomes. Still, there is a consensus that additional research is warranted to address gaps in knowledge, such as the effects of cell phone use over the long-term and on pediatric populations.

There was a similar statement made by the FCC, in previous section, and also similar statement was made by Samsung, one of world's largest producers of cell phones which reads a follows [132]:

Over the past 15 years, scientists have conducted hundreds of studies looking at the biological effects of radio frequency energy emitted by cell phones. While some researchers have reported biological changes associated with RF energy, these studies have failed to be replicated. The majority of studies published have failed to show an association between between exposure to radio frequency from a cell phone and health problems.

Neither the FDA statement nor the Samsung statement give us any idea what possible effects are being considered here, what literature was used for such a consideration. These statements are completely undocumented and therefore must be viewed as being unscientific. In Chapter 1, 79 reviews were given that each showed the existence of one or more effects. Eignt different of effects were each documented in from 12 to 35 reviews. Such reviews must be extensively documented or one cannot get them published. Any one of those reviews provides, therefore, a much stronger argument for presence of one or more effects than do the FDA, FCC and Samsung statements put together arguing for the opposite. One thing that is strange about the FDA statement is that they are talking specifically about cell phones even though they are tasked with regulating safety on all such microwave/radiofrequency devices. What I have done below is to put together the 16 reviews which are completely or largely focused on cell phone radiation effects so that we can see what specific effects have been found to be caused by cell phone radiation. I will summarize those effects below.

Table 5: Reviews on Cell Phone Effects and the Effects Found in Each

Review on Cell Phone Effects	Effects Found
La Vignera S, Condorelli RA, Vicari E, D'Agata R, Calogero AE. 2012 Effects of the exposure to mobile phones on male reproduction: a review of the literature. J Androl 33:350-356.	Multiple effects on male reproduction
Makker K, Varghese A, Desai NR, Mouradi R, Agarwal A. 2009 Cell phones: modern man's nemesis? Reprod Biomed Online 18:148-157.	Cellular DNA damage, neurological/neuropsychiatric effects, apoptosis
Yakymenko IL, Sidorik EP, Tsybulin AS. 1999 [Metabolic changes in cells under electromagnetic radiation of mobile communication systems]. Ukr Biokhim Zh (1999), 2011 Mar-Apr:20-28.	Apoptosis, increased oxidative stress, increased intracellular calcium
K Sri N. 2015 Mobile phone radiation: physiological & pathophysiological considerations. Indian J Physiol Pharmacol 59:125-135.	Male infertility, cellular DNA damage, lowered melatonin, increased stress protein expression
Nazıroğlu M, Yüksel M, Köse SA, Özkaya MO. 2013 Recent reports of Wi-Fi and mobile phone-induced	Oxidative stress, male and female reproductive signaling dysfunction

frequency-radiation-cancer/ (Accessed Sept. 9, 2017)	support the view that cell phones do cause cancer

The effects of specifically cell phone radiation that have been found in these reviews (Table 5) include: lowered male reproductive function, lowered female reproductive function, increased cellular DNA damage, neurological/neuropsychiatric effects, increased stress protein synthesis, increased intracellular calcium, apoptosis, lowered melatonin, oxidative stress, cancer (10 reviews) and specifically increased ipsilateral cancer (3 reviews). So there are 11 different cell phone effects where there is substantial enough evidence to warrant publication in one or more review articles. Each of these effects has been shown to occur in response to other microwave frequency EMFs and therefore should be considered to be caused by EMFs more broadly.

The summary of Table 4, Chapter 5, the genuine cell phone primary literature studies that fell into the 2009-2013 time frame, started as follows: "If you look through the studies described in Table 4, you will see multiple studies in oxidative stress/free radical damage, on changes in tissue structure (sometimes called remodeling), on cellular DNA damage, on male fertility (and also one on female fertility), on behavioral changes and on neurological changes. There is also one study on insulin/type 2 diabetes (hormonal effect). It follows from this that five of the effects that were extensively documented in large numbers of reviews (Chapter 1) are further demonstrated to be produced by cell phone radiation in these studies. In addition the tissue remodeling and proteomic changes discussed in Chapter 3 are also further demonstrated here."

It can be seen from Tables 4 & 5 and the preceding two paragraphs, that there is a vast amount of literature on repeatedly found effects of cell phone radiation, effects which make a mockery of the *completely undocumented and non-specific* FDA claims to the contrary.

Let's look at another part of the FDA statement which also shows similarities to statements made elsewhere [131]:

The biological effects of radiofrequency energy should not be confused with the effects from other types of electromagnetic energy.

Very high levels of electromagnetic energy, such as is found in X-rays and gamma rays can ionize biological tissues. Ionization is a process where electrons are stripped away from their normal locations in atoms and molecules. It can permanently damage biological tissues including DNA, the genetic material.

The energy levels associated with radiofrequency energy, including both radio waves and microwaves, are not great enough to cause the ionization of atoms and molecules. Therefore, RF energy is a type of non-ionizing radiation. Other types of non-ionizing radiation include visible light, infrared radiation (heat) and other forms of electromagnetic radiation with relatively low frequencies.

This is almost identical to another Samsung statement and also to an FCC statement that I have not copied. Here is the Samsung statement [133]:

The biological effects of RF energy should not be confused with the effects from other types of electromagnetic energy.

The FDA may have had a long history of playing fast and loose with the truth. For example, Microwave News article published in 2003, provides this account of what occurred at the FDA in 1993 [134]:

1993 FDA Memo Data "Strongly Suggest" Microwaves Can Promote Cancer.

In the spring of 1993 at the height of the public concern over cell phone brain tumor risks, the Food and Drug Adminstration (FDA) biologists concluded [134] that the available data "strongly suggest" that microwaves can "accelerate the development of cancer." This assessment is from an internal agency memo recently obtained by Microwave News under the Freedom of Information Act.

"Of approximately eight chronic animal experiments known to us, five resulted in increased numbers of malignancies, accelerated progression of tumors, or both" wrote Drs. Mays Swicord and Larry Cress of FDA's Center for Devices and Radiological Health (CDRH) in Rockville, MD. They also pointed to other evidence from laboratory (in vitro) studies which supported cancer risk.

Yet in its public statements at that time, the agency played down these findings [134]. For instance in a Talk Paper issued in early February, the FDA stated that there was "limited evidence that suggests that lower levels (of microwaves) might cause adverse effects."

"A few studies suggest that (microwave) levels (from cellular phones) can accelerate the development of cancer in laboratory animals," the FDA added [134], "but there is much uncertainty among scientists about whether these results apply to the use of cellular phones."

I have three comments. Firstly, if you look at the 35 citations in the list on cancer causation in Chapter 1, you will see that there are 8 citations (#s 2-7 & 15 & 19) which provide similar evidence of stimulation of tumor promotion, four of which (#s 3-6) were published around 1993, the time of the FDA memo and public statement described above. Therefore, there was a substantial literature including peer-reviewed primary literature and review articles which produced similar conclusions to those of the FDA internal memo. The importance of the memo is that the FDA knew about these findings and opted to cover them up.

Secondly if you compare the rhetoric in the 1993 memo with the first quote from the current FDA web site quoted in this section, you will see some striking similarities. They both first refer to "a few studies" which are not identified, followed by raising uncertainties and then finally raising doubt as to whether these findings apply to cell phone radiation. The pattern of the FDA rhetoric has not changed much in 25 years.

If one includes the middle statement also quoted from the FDA web site, we have three FDA statements each of which downplays any biological effects and each of which are strongly rebutted by extensive peer-reviewed independent scientific literature. I'm not sure we can say the FDA has been corrupted by the industry, but what we can say is that it has been functioning as if it has been corrupted for 25 years.

In mid-2009 Margaret A. Hamburg, the new commissioner of the FDA, and Joshua M. Sharfstein, her principal deputy commissioner, published a commentary article in the New England Journal of Medicine [135] which included the following:

continuous wave) EMFs. A second is that the EMFs act by putting forces on the voltage sensor of the VGCCs, opening these calcium channels and allowing excessive calcium ions to flow into the cell. The voltage sensor is extraordinarily sensitive to those electrical forces, such that the safety guidelines are allowing us to be exposed to EMFs that are something like 7.2 million times too high.

The reason that the industry has decided to go to the extremely high frequencies of 5G is that with such extremely high frequencies, it is possible to carry much more information via much more pulsation than it is possible to carry with lower frequencies even in the microwave range. We can be assured, therefore, that 5G will involve vastly more pulsation than do EMFs that we are currently exposed to. It follows from that, that any biological safety test of 5G must use the very rapid pulsations including whatever very short term spikes may be present, that are to be present in genuine 5G. There is an additional process that is planned to be used in 5G: phased arrays (https://en.wikipedia.org/wiki/Phased_array). Here multiple antenna elements act together to produce highly pulsed fields which are designed for 5G, to produce increased penetration. 5G will entail particularly powerful pulsations to be used, which may, therefore, be particularly hazardous.

The only data we have, to my knowledge, on millimeter wave frequencies of 5G used *non-pulsed EMFs in the millimeter frequency range of 5G, not genuine 5G*. Such millimeter waves have been shown to produce a number of downstream effects of VGCC activation. One millimeter wave study showed that it activated both the VGCCs and also the voltage-gated potassium channels, suggesting that it worked via the voltage sensor, as do other EMFs [136]. Any such data tells us almost nothing about how biologically active genuine very highly pulsed 5G will be. I take it that from their statements, that both Mr. Ryan and Dr. Vinciūnas are ready to put out 10s of millions of 5G antennae to afflict every single person in the EU with 5G radiation without even a single biological test of safety of genuine 5G. In the U.S., the FCC has taken a much worse position. The FCC is not only willing to allow such completely untested exposures but has also been has been aggressively pushing to promote installation of 5G antennae, such that antennae are already being installed in parts of the U.S. In a world where shocking behavior has become less and less shocking, I consider EU and U.S. views and actions to be shocking. The U.S. situation is mass insanity. I would have hoped that the Europeans, who think of themselves as being much more thoughtful than Americans, would have been genuinely more thoughtful.

Why does 5G need such high numbers of antennae? It is because the 5G radiation is much more absorbed as it enters various materials. The approach is to use many more antennae with one found every few houses, such that 5G can sufficiently penetrate local walls. Such absorption usually involves the interaction with electrically charged groups, such that such high absorption is likely to involve placing forces on electrically charged groups. Because such forces are the way in which EMFs activate the VGCCs, it seems highly likely, therefore, that 5G radiation will be particularly active in VGCC activation.

In summary, then, 5G is predicted to be particularly dangerous for each of four different reasons: 1. The extraordinarily high numbers of antennae that are planned. 2. The very high energy outputs which will be used to ensure penetration. 3. The extraordinarily high pulsation levels. 4. The apparent high level interactions of the 5G frequency on charged groups presumably including the voltage sensor charged groups.

Now what the telecommunications industry argues is that 5G radiation will be mostly absorbed in the outer 1 or 2 mm of the body, such that they claim that we don't have to worry about the effects. There is some truth to that, but there are also some caveats that make any conclusions

adults. Therefore, they may be a special risk for impacts of 5G, because of great increases in the regeneration of the electrical fields. Here one can think of all kinds of possibilities. Let me suggest two. We may have a gigantic (sorry about using that word again) epidemic of spontaneous abortion due the teratogenic effects. Another possibility is that instead of autism being one birth in 38, however horrendous that is, it could be one out of two, or even a majority of births. I don't know that these will happen, but these are the kinds of risks we are taking and there are many others one can think of. Putting in tens of millions of 5G antennae without a single biological test of safety has got to be about the stupidest idea anyone has had in the history of the world.

This brings us back to the earlier point. The only way to do 5G safety testing is to do genuine 5G biological safety testing. I have published on how this can be done relatively easily at relatively low cost and have, as you saw in the Chapter 6, told the FCC how this can be done. Those tests must be done by organizations completely independent of industry and that leaves out both ICNIRP and SCENIHR and a lot of other organizations.

Now we will get into the precautionary principle which is specially relevant to the EU but may have lessons for all of us.

Dr. Vinciūnas' last full paragraph reads as follows: "The recourse to the EU's precautionary principle to stop distribution of 5G products appears too drastic a measure. We need first to see how this technology will be applied and how the scientific evidence will evolve. Please be assured that the Commission will keep abreast of the scientific evidence in view of safeguarding the health of European citizens at the highest level possible and in line with its mandate."

Article 191 defines the **Precautionary Principle** as follows:

"According to the European Commission the precautionary principle may be invoked when **a phenomenon, product or process may have a dangerous effect**, identified by a **scientific and objective evaluation**, **if this evaluation does not allow the risk to be determined with sufficient certainty**.

Recourse to the principle belongs in the general framework of **risk analysis** (which, besides risk evaluation, includes risk management and risk communication), and more particularly in the context of **risk management** which corresponds to the decision-making phase.

The Commission stresses that the precautionary principle may only be invoked in the event of a potential risk and that it can never justify arbitrary decisions.
The precautionary principle may only be invoked when the **three preliminary conditions** are met:

identification of potentially adverse effects;
evaluation of the scientific data available;
the extent of scientific uncertainty."

The question now is what about 5G? We have with 5G strong suspicions of similar or much more severe risk of effects documented elsewhere in this document. We have no biological safety testing of genuine 5G radiation. Therefore, we have no risk analysis or risk management because we have no risk assessment whatsoever on 5G. So here we have Dr. Vinciūnas arguing that the request for precautionary principle application is premature. But it is not the request for

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Washington, DC 20016

Comments on Small Cell Guidelines for October 15, 2018 Public Space Committee Hearing

Thank you for the opportunity to provide comment regarding the proposed placement of Small Cells. I have lived in Washington DC for 43 years and presently live in American University Park across the way from Maryland.

At the outset I would like to request that before any action is taken, permit granted or design approval occurs, that an environmental impact statement be done on the proposal. Aside from the aesthetic concerns that have been raised in materials and the press, I have attached an article that raises health issues from such placement. http://emwatch.com/cell-tower-health-risks/

There are questions from reading the materials provided on-line as to whether the placement would be on the streets or the alleyways given the presence of streetlights in each. And whether the placement would be on new poles or existing poles. And how many carriers would be entitled to participate and place devices on the poles. I'm of the impression that this is not a community of interests that get along so poles are likely not going to be shared. Does that mean a separate new pole for each provider? And who decides who gets to use the existing infrastructure?

There appears to be an inherent subsidy occurring that expands beyond the traditional phone service that roams into use areas such as new technology for self-driving cars. Who are the other potential beneficiaries of this effort over the next five years?

Where is the citizen/taxpayer right to just say no? We came to live here not for those purposes. And the benefits and profits are occurring as the market place has gotten more competitive without a look at quality of life issues. And will this ultimately trickle down to an increase or decrease in property values and taxes?

And then what are the costs? Aside from potential health issues, the view-scape and land-use planning as a result of winners and losers in the game of location, not everyone is treated equal. How many poles might appear on a given average street or alley? And are Maryland residents benefitting from placement of poles across the way in DC?

What do you do about large buildings located in or near neighborhood areas? These may be office buildings, condominiums, schools, universities, Federal,

6. If poles are brought down by Acts-of-God or events such as car-wrecks, poles shall be replaced and become operational within a one-week period or service becomes free for six-months. Part of the justification for this idea is to make sure "inventory" is on hand for restoration of service. Preparedness planning.
7. The local ANC shall be provided an Annual Maintenance Report for poles in their area and also covering any planned changes in upgrades. The timing of the report shall be done as close to the end of the year as possible.
8. Companies shall produce and make available a map of all these pole placements so customers can be aware of "dark areas" without 5G Service that were not put in place for various reasons.
9. An annual service plan by each company for their 5G network shall be provided at the beginning of each year to the respective Committee of jurisdiction of the DC City Council and each ANC. And made public one month prior to justify any proposed rate increase.

10.The DC City Council shall review the program every 6 months for the first five (5) years and annually after that soliciting views form the ANC's and large users.

Finally, the issue of what the various companies should pay for access to the public rights-of-ways where the poles are located needs comment.

I would propose a shared risk where in year 1 DC receives 10 percent of the gross revenues generated where 1 percent of that amount would be given (divided) by DC to the ANC's each year in the respective pole located areas. Year 2, 20%, 3 30%, 4 40% and year 5 50%. After that the company (ies) gets to keep all the revenue.

DC would be required to spend part of that share of money in each Ward on public school technology programs (including after school tutoring) with new city and present technology companies along with establishing quarterly health and job fairs with technology partners. A goal could be every student graduates with a tablet or whatever the best device/technology is available when they finish school. This would require setting aside a certain percentage of that annual initial revenue to purchase such devices.

Thank you again for allowing for public comment and I look forward to seeing how you resolve my requests and move forward making DC a technology center.

SMALL CELL GUIDELINE COMMENTS

Alma Hardy Gates

October 2018

Members of the Public Space Committee:

These comments are my own and do not represent the opinion or view of ANC 3D.

For many, these guidelines are the first indication that the city is about to undergo a huge technological transformation to make way for ultra-fast internet that's ready for what comes next.[1]

It is wise for the District of Columbia to undertake a process for developing guidelines for small cell transmitter implementation throughout the city. That is a necessary first step. It is also wise that there is recognition of the unique nature of the District of Columbia and its carefully planned and safeguarded public spaces. Review by both the Commission of Fine Arts and the National Capital Planning Commission will be critical as the Public Space Committee moves forward with its proposed Small Cell Design Guidelines.

While the public realm extends beyond the boundaries of the L'Enfant Plan and its protected viewsheds; careful consideration must be paid to the proliferation of equipment, poles and towers in the city's many established neighborhoods. Also, our vulnerable populations, who have endured conditions associated with living near production, distribution and repair zones should not fall victim to a new set of guidelines which could foster another form of livability hardship.

In reviewing the proposed guidelines, it is noted that "information was shared by telecommunication providers, technical limitations, and requirements of Small Cell infrastructure standards and practices across the county, such as Denver, CO; Dublin, OH; Boston, MA; and, Lincoln, NE; and, that they have been informed through a best practices review of international cites in North America, Europe and Asia. One of the most valuable lessons learned from the eight-year zoning rewrite, and a reason the process took so long, was the attempt to implement flawed "best practices" from other cities. Some of those being used for the Small Cell Guidelines are the same cities which were used as examples for the zoning rewrite. There is only one nation's capital and its built environment is unique among

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[1] Verizon.com/5G

enforcement should guarantee that the public space will continue to enhance the quality of life for both residents and visitors. Is there any evidence on the effectiveness of current MLA's and are they enforced?

A Verizon advertisement in the Washington Post claims the carrier has "...secured the best ultra-wideband spectrum, and lots of it...for unrivaled speed and capacity, not just incremental improvements." The ad goes on to state, "[a]nd while other carriers are designing their 5G networks for phones, we have much wider ambitions. To seamlessly connect smart cities, vehicles, homes and other applications that will change the lives of people everywhere." While the proposed guidelines are useful, they are just that – *guidelines*. Individual carriers will have more control over these decisions because of actions taken by the FCC.

But, not all major cities are comfortable with what the FCC is proposing.

> A large number of U.S. cities, both big and small, voiced concerted and coordinated opposition to the FCC's proposal to streamline the deployment of small cells across the country...
>
> At the center of the issue is the federal government's attempts to override local government control over the installation of wireless equipment like small cells in neighborhoods around the country. The FCC essentially argues that some state and city rules are unnecessarily impeding the deployment of wireless infrastructure, including 5G. But a large number of U.S. cities are fighting back against that argument—contending that they should remain in charge of the costs and timelines associated with small cell deployments.[4]

While the current DDOT proposal is to install 4G technology, because that is the technology currently available, the real purpose of the push is to be 5G ready. The US, as noted in "Why Being First in 5G Matters," notes:

> Around the world, giant wireless-technology companies are coordinating with the governments to come up with winning strategies to implement 5G, the next generation of cellular networks that promise to deliver ultrafast speeds and open up a range of new applications...

[4] Dano, Mike. *FierceWireless*, 9/21/18, Major US Cities Revolt Against FCC's proposed small cell deployment rules.

> The U.S., China, South Korea and Japan are leading the early rounds. AT&T and Verizon plan city-by-city 5G launches starting later this year, while China expects national coverage by 2020…
>
> With 5G, manufacturers can more easily put chips in every part of the machines to let engineers know when a part needs repair or replacement…
>
> Some of this technology is available now on 4G, though devices must typically connect to a Wi-Fi network or smart-phone. 5G would let these devices be always internet-connected, as long as there is a cellular signal, and would theoretically let many more objects connect to cellular networks without slowing down traffic. 4G can connect up to 2,000 devices per square kilometer, while 5 G could support up to one million devices in the same area…
>
> The U.S. is likely to have the first working 5G networks by the end of this year, but only in a few cities. AT&T plans to launch in Dallas, Atlanta and other cities, while Verizon has picked Sacramento, CA and elsewhere.[5]

The District of Columbia is wise to ensure its place at the bargaining table when opportunity comes calling. Ensuring guidelines that address infrastructure implementation are in place makes good business sense. It is known that to meet the "demands" of 5G transmission, there will be a need for far more small cell transmitters than currently exist; and, that in spite of the fact the FCC recently relaxed regulations regarding pole sharing, there will be more poles. The fact guidelines are just being written, implies that none have been in place in the District of Columbia, although there is a considerable cell network in place already. How will existing equipment be addressed by the proposed guidelines? Will there be a pole for every carrier rather than requiring hoteling of transmitters at each site? Just how cluttered will the built environment become to accommodate 5G technology?

A recent FCC draft order on streamlining wireless infrastructure is addressed in a letter from Blair Leven, former Secretary to the FCC. Mr. Leven notes the economic and financial assumptions underlying the FCC's proposed restrictions on the ability of state and local governments to manage and obtain fair compensation

[5] Woo, Stu. 9/13/18, The Wall Street Journal, *Why Being First in 5G Matters*

While underground vaults might ensure there are fewer eyesores in residential communities, they bring with them the necessity for street and sidewalk repair when installed, as well as the need for access. These impacts are not addressed in the guidelines. And, will costs be passed along to consumers through an increase in fees charged on utility bills?

There is no mention in the proposed Guidelines of the city's tree canopy and whether the installation of equipment will require tree removal or heavy trimming. This is a serious consideration and a question of priority for "the City of Trees," which has witnessed the butchering and shortened life expectancy of trees as the result of Pepco's manicuring practices. Mayor Bowser has set forth the goal of the city reaching a 40 percent tree canopy by 2032, but that does not seem possible given this proposal. Not too long ago the city boasted an existing tree canopy that was considerably above the 14-year goal. Development throughout the city has diminished the tree canopy to current lows which should raise concern about the future impact of transmission poles throughout the city. To enable the survival of every tree that is currently in place and to ensure there is capacity for those that are to be planted annually to meet the 2032 goal, poles should not be placed within 15 feet of any existing tree or tree space.

Another major issue, about which there is insufficient research, and no mention is made in the proposed guidelines is the detrimental effects of cellular technology on human health. While the FCC has forbidden local jurisdictions from regulating antennas based on health impacts, and this is not an area within the purview of DDOT, it is unlikely DDOT will push back. Several articles seem to infer there may be health risks associated with the location of cell towers/transmitters and the frequency of human contact with them.[7]

The proliferation of cell tower/transmitters in the District of Columbia should raise concerns regarding their impact on human health. The District of Columbia needs to provide evidence there will be no effects of cellular transmission on human health as it intends to install numerous cell towers/transmitters. Who will be

[7] https://www.cancer.org/cancer/cancer-causes/radiation-exposure/cellular-phones.html
https://www.cancer.org/cancer/cancer-causes/radiation-exposure/cellular-phone-towers.html
https://www.safespaceprotection.com/emf-health-effects/cell-towers/
https://www.careerride.com/view/are-mobile-towers-in-residential-areas-harmful-26931.aspx

necessary for 5G technology; but, issues of major concern and importance remain unanswered. Rather than rush forward with a decision by the Public Space Committee, there needs to be a full public vetting at which time many of the questions raised in these comments can be fully addressed and answered; and, a path forward can be determined by informed decision makers.

Consideration of the installation of small cell towers in the city should be about more than its projected revenue stream. The effects on both the environment and human health need more than the provided guidelines.

The DDOT Draft Small Cell Guidelines are well written and clear as far as they go; however, they do not address some critical areas such as the numbers of transmission poles and the placement of equipment cabinets in residential areas; and, they lack guidance on the protection of the city's tree canopy. Most importantly, the guidelines do not address the effect of the proliferation of cell transmission on human health. If DDOT is taking the lead on preparations for a wider technology network, it needs to consider more than the ambitions of providers; and, to balance them against the full spectrum of benefits to and impacts on the residents of the District of Columbia.

Mention of the DC Public Service Commission, which should be the arm for regulation of these issues, is missing. What guidance has DDOT received from the Commission on the proposed guidelines? Lacking input from the Commission, the DC Council needs to pursue some oversight of this issue by scheduling a Council Roundtable where experts and residents can submit testimony to enable and ensure a more informed set of guidelines are implemented as information currently available on small cell implementation, from both the industry and other cities, makes it fairly clear DDOT will have little control over what and/or where it is installed in the District of Columbia.

Thank you for the opportunity to provide these comments,

Alma H. Gates

Alma H. Gates
ANC 3D05

5G Sm Cell Implementation in DC

Adele Ashkar <aashkar@gwu.edu>

Thu 10/4/2018 2:42 PM

To:Committee, Public Space (DDOT) <Public.SpaceCommittee@dc.gov>;

Dear Ms Roos and the Public Space Committee,

I am writing to register my concerns related to the proposed deployment of a network of cell transmitters on light poles throughout the District of Columbia.

My greatest worry is that the requirement for unimpeded communication between these new transmitters will result in great damage to and removal of street trees. I know that the District of Columbia has been steadfastly nurturing its street trees, and is committed to increasing tree canopy with help and support from its citizens and organizations like Casey Trees. There are so many public health reasons to maintain this commitment.

I beg you to take this into careful consideration before deciding on a best course of action for improving cell communications across the city.

Respectfully,

Adele N. Ashkar, FASLA

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Adele N. Ashkar, FASLA

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Marsha Lea <marsha@lea-landscapearchitect.com>

Thu 10/4/2018 9:48 AM

To:Committee, Public Space (DDOT) <Public.SpaceCommittee@dc.gov>;

Cc:Potomac Chapter ASLA <potomacchapterasla@gmail.com>;

I am vehemently opposed to the introduction of small cell towers into the street level streetscape in the District of Columbia. The health effects of these receptors is not clear at this point in time, technology will undoubtable advance potentially making this infrastructure obsolete, the visual impact on our public spaces and the extremely negative effect on street trees should not be acceptable. DDOT and other agencies in DC have worked hard to re-establish tree cover. The implementation of this infrastructure will quite quickly reverse the progress made to make our urban environment more sustainable. The heat island effect and the loss of street trees that contribute to storm water management will be compromised. I am only aware of this proposal through the American Society of Landscape Architects, my professional organization. This far reaching and impactful change to the public realm should be heard by more of the public in multiple public forums. I urge DDOT to delay any decision with respect to this proposal.

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small c infrastructure project quidelines

Marsha Lea <marsha@lea-landscapearchitect.com>

Thu 10/4/2018 9:48 AM

To Committee, Public Space (DDOT) <Public.SpaceCommittee@dc.gov>;

Cc:Potomac Chapter ASLA <potomacchapterasla@gmail.com>;

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STATEMENT OF CYNTHIA M. POLS
submitted to
PUBLIC SPACE COMMITTEE
of the
DISTRICT DEPARTMENT OF TRANSPORTATION
on
DDOT'S DRAFT SMALL CELL DESIGN GUIDELINES
October 5, 2018

My name is Cynthia Pols. I am a 38-year resident of the Kalorama neighborhood of Adams Morgan and live in one of my neighborhood's two historic districts—the Kalorama Triangle Historic District. I am submitting this statement in response to the District Department of Transportation's (DDOT) Draft Small Cell Design Guidelines dated August 24, 2018.

I am a member of the Kalorama Citizens Association (KCA), which nominated my immediate neighborhood (encompassed within the Kalorama Triangle Historic District) for designation in 1987 as an historic district. Some 20 years later, KCA successfully nominated the adjacent neighborhood (the Washington Heights Historic District) for designation as an historic district in 2006. Both neighborhoods are characterized by beautiful Victorian-era row houses on the side streets and large early 20th century apartment buildings located primarily on either side of Columbia Road, with side streets undisturbed by utility poles or any other utility-related intrusions other than an occasional small Comcast cabinet and gently lit by beautiful Washington Globe street lights.

We have battled hard over the years to preserve and protect the manmade beauty of our neighborhood and view the widespread deployment of small cell technology in our neighborhood as a real threat to its character, aesthetics, and charm. The Washington Globe street lights (also referred to by DDOT as Washington Upright Poles) that dot our side streets were developed under the guidance of the U.S. Commission of Fine Arts (CFA) and approved by the CFA in 1923 and

I also would like to remind this committee that the District government should be mindful of the mistakes of the past. In 1999 and 2000, a former administration granted permits to fiber optic companies to tear up the District's streets and sidewalks to deploy underground fiber optic lines in many parts of the District following the enactment of the Telecommunications Act of 1996 and the extravagant claims as to its promise of a bright, new fiber-dominated future. The "dotcom tech bubble" burst in spectacular fashion in early 2000 not too long after the bubble formed, with fiber optic companies vanishing from the face of the earth and vast quantities of fiber lines abandoned beneath the District's streets. The biggest loser was the District, which was left with a hefty tab for the damage to our streets and sidewalks. I have attached four articles from that period that document how fiber optic companies were able to secure licenses to dig in our streets from a compliant District government with little oversight and caused great damage to our streets as they pursued the short-lived telecom gold rush (*see* Exhibit 1).

Let us not repeat the mistakes of the past by traveling along a reactive path laid down by industry interests instead of blazing our own path by establishing proactive policies regarding the communications infrastructure of the future.

Before discussing some of my most pressing concerns about the proposed design guidelines, I would like to provide some context. Small cell technology consists of antennas for transmitting and receiving equipment that are placed at or toward the top of a pole and are typically about 3 feet in height. Small cell technology also includes "radio equipment" installed in cabinets such as radio transceivers that convert and process signals and associated power equipment. These cabinets can be installed underground, on the surface of the ground, or on poles. The MLA assumes that these cabinets can be as large as 28 cubic feet (meaning that they could be about 5 feet tall, 3 feet wide, and 2 feet deep).

II. FLAWS IN THE PROCESS

The MLA[1] states in ¶ 7 of its recitals that D.C. Code §§ 10-1141.01 - .07 authorizes the mayor or her designee (in this case DDOT) to impose such conditions on the issuance of permits as she "may require" for the placement of wireless facilities in the public right-of-way. In fact, District law does not provide the mayor with blanket authority to do as she pleases regarding rules for the deployment of wireless facilities in the public right-of-way as is implied by the MLA. Rather, District law requires the mayor (presumably acting through DDOT as her designee) to develop regulations and requires that those regulations directly address certain issues,[2] including:

- "[E]stablish[ing] categories of use and the extent to which public space, public rights of way, and public structures may be used"[3]
- Establishing and regulating a process for compensating the District for the impact, modification, or damage to the public-rights-of-way and other public property as a result of the permittee's actions, including possible user fees[4]
- Requiring the payment of a technology surcharge to the District[5]

These requirements were added to the District's code in 1997 and have been modified several times in the ensuing years, most notably in 2003 to add stronger language regarding the compensation to be paid to the District by users of the public right-of-way. These legal requirements were honored in the breach during the fiber optic deployment fiasco of 1999 and 2000. DDOT and OCTO's decisions to proceed with MLAs and design guidelines instead of conducting an open rulemaking proceeding raises concerns that we may be headed for a repeat of the dotcom tech bubble fiasco of the late 1990s.

[1] DDOT has already executed small cell MLAs with two telecommunications carriers (AT&T and Verizon) and two infrastructure providers (Crown Castle and Mobilitie). Two of the MLAs took effect on April 25 (Verizon and Crown Castle), a third took effect on May 25 (AT&T), and a fourth took effect on July 30 (Mobilitie).

[2] D.C. Official Code § 10-1141.04.

[3] D.C. Official Code § 10-1141.04(3).

[4] D.C. Official Code § 10-1141.04(4).

[5] D.C. Official Code § 10-1141.04(5).

III. SPECIFIC RECOMMENDATIONS

A. HOTELING (SHARED POLES)

The proposed design guidelines do not require or encourage "hoteling" by wireless providers. Hoteling is a basic component of the business model employed by the existing cell industry, including MLA licensee Crown Castle as well as other infrastructure providers like American Tower and SBA Communications. Under this business model, tower providers own many of the existing big cell towers and lease space on those towers to cell service providers like Verizon, AT&T, T-Mobile, and Sprint.

Just as is the case with large cell towers, the concept of hoteling could be extended to poles for small cell providers. With hoteling for small cell facilities, the pole would be a shared facility serving multiple providers, thereby reducing the number of new poles in the public right-of-way and the disruption associated with constructing new small cell networks. In the small cell context, the pole provider would build the pole and provide cabinet space on or near the pole to house the radio equipment of several service providers. The service providers' radio equipment in the cabinet would then be connected by a wire connection to a single antenna at or near the top of the pole. The pole's antenna would be equipped with many ports and capable of simultaneously delivering the signals of the wireless service providers whose equipment is installed in the cabinets associated with the pole. Crown Castle plans to implement the hoteling model in the District and has already reached agreements with both Sprint and T-Mobile to serve as the small cell infrastructure provider for those two cell carriers.

> ***Recommendation: To the extent possible, the new rules should require "hoteling" in the District to reduce the number of possible new poles, visual and physical clutter in the right-of-way, and disruption of the public right-of-way; at a minimum, the new rules should encourage hoteling by sharply reducing the per-blockface numerical limits for new poles and requiring coordination among wireless providers to share new poles and cabinets.***

The design guidelines include other provisions governing the number of small cell facilities that may be installed on each block. Under provisions of these guidelines applicable in historic districts, as many as four new poles could be installed on each side of the street for the longer blocks in my neighborhood (like Kalorama Road between Columbia Road and 18th Street and Wyoming Avenue between 19th and 18th Streets, which both top 700 feet in length). For these longer blocks, the design guidelines also require a distance of at least 105 feet between the new poles and limit the number of small cell facilities an individual wireless carrier may install on each block to two poles for each side of the block. My own street—Mintwood Place—is about 570 feet in length and would be eligible for three new poles on each side of the street but the minimum distance between new poles is reduced to just 90 feet and each carrier would be limited to one facility on each side of the block. Because Mintwood Place has only three Washington Globe street lights on each side of the streets, the design guidelines mean that there could be an equal number of new small cell poles that could be more than twice the height of the existing Washington Globe poles (*see* Exhibit 2 for photos of Washington Globe street poles on Mintwood Place and Biltmore Street in the Kalorama Triangle Historic District).

The DDOT design guidelines specify the number of new poles allowed per block as well as the required distances between poles and the carrier limits per block, with slightly more latitude provided outside of historic districts (Design Guidelines, Chart 2):

Blockface Length Intervals[1]	Number of Small Cell Facilities Permitted per Blockface[2] outside the Monumental Core and Historic Districts	Number of Small Cell Facilities Permitted per Blockface within the Monumental Core and Historic Districts	Minimum Distance between Facilities on same Blockface[3]	Minimum Distance between Facilities on same Blockface within the Monumental Core and Historic Districts	Limit per Carrier per Block[4]
0'-150'	1	1	N/A	N/A	1
151'-300'	2	1	60'	60'	1
301'-450'	3	2	60'	75'	1
451'-600'	4	3	60'	90'	1
601'-750'	5	4	60'	105'	2
Over 750'	6	5	60'	120'	2

[1]Block lengths should be measured along the edge of curb between the edge line extended of adjacent intersecting streets.

[2]This is inclusive of all types of installations and regardless of carrier.

[3]In other words, the minimum distance between two facilities sharing the same side of the block. Distance should be measured in a linear fashion along the edge of curb between the two facilities' center points.

[4]A block is defined as two opposing blockfaces.

Chart 2. Permissible Spacing and Frequency of Installations

providers are allowed to install new poles or add extensions to existing poles in the public right-of-way. Specifically, the design guidelines allow for the deployment of new poles that may be as tall as the greater of 10% taller than existing poles on the street or 31 feet (Design Guidelines § 5.3.4.2). Even more alarming, the MLA establishes the maximum pole height at 50 feet and even allows DDOT to waive that limit and permit even taller poles (MLA § 5.1.2), establishing a fundamental conflict between the MLA and the design guidelines and creating the legal basis for licensees to challenge attempts by DDOT to enforce the lower limits proposed in the design guidelines. Under the design guidelines' 31-foot standard, the new poles installed on side streets in historic districts could be as much as 17 feet taller (121% taller) than the existing Washington Globe poles, which are generally 14 or 15 feet tall (for a difference of 121% and 106% respectively in height) and, in a few cases, 18 feet tall (for a 72% difference in height).[8] The guidelines provide a troubling example of what a new small cell pole would look like in comparison to an existing 18-foot pole on a street served by Washington Globe poles:

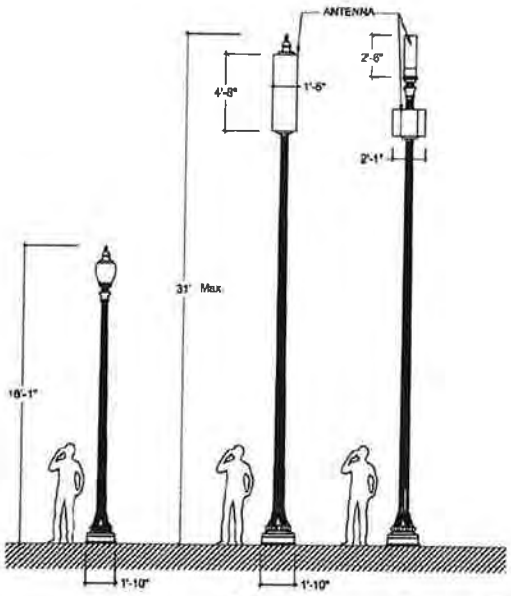


Illustration 3, Washington Standalone Pole

[8] Washington Globe poles can be 14, 15, or 18 feet tall. In my neighborhood, the poles on the side streets are almost all either 14 or 15 feet tall (*see* Exhibit 2).

C. NEW CABINETS

Small cell technology typically involves both an antenna and associated equipment in cabinets. Federal rules assume that small cell equipment occupies a large amount of space, defining small cells as consisting of cabinets of as large as 28 cubic feet (*e.g.*, just shy of 5 feet tall, 3 feet wide, and 2 feet deep) and antennas of up to 3 feet in height.[9] The MLAs have established a slightly smaller overall size of 28 cubic feet that encompasses both the antenna and the cabinets (MLA, § 1.18). It is not clear that either the FCC or the MLA size guidelines are proper or necessary since the examples of small cell technology provided by the four licensees in their September 6 submissions to DDOT show significantly smaller cabinets.

The design guidelines purport to require the underground installation of cabinets containing equipment in historic districts (instead of being hung on the pole or installed on a pedestal on the ground near the pole). However, the MLA allows DDOT to reject underground installations for a wide range of reasons (*see* MLA § 5.3 for the standards that must be met for DDOT to approve an underground installation) and also allows DDOT to approve ground-mounted cabinets in historic districts if it finds that the pedestal for the cabinet does not "detrimentally affect the historic nature of the area" (MLA § 5.3.5). The design guidelines clumsily imply that DDOT will also have the right to waive undergrounding requirements (Design Guidelines, Chart 1). For example, the design guidelines state that DDOT's Public Space Committee will decide whether to waive the undergrounding requirement but then goes on and states that "[a]dditional guidelines would have to be developed" (Design Guidelines, Chart 1, fn. 1) without providing a hint as to what those guidelines might entail and when the undergrounding requirement might be waivable.

[9] *See* 47 CFR § 1.6002(l) for eventual codification of these size limits (adopted by the FCC on September 26; to be published in the Federal Register in the not-too-distant future, which will then establish the effective date for these new FCC rules governing small cell cabinet size and other matters).

initial deployment plans in one of the highest levels of confidentiality available under District law (MLA § 4.1.2). DDOT may request a "deployment coordination" meeting but once again has no ability to require coordination among wireless providers (MLA § 4.2).

In terms of notifying ANCs and affected property owners, the MLAs and the design guidelines impose almost no obligations on the licensee. As part of the permit application process, DDOT has the discretion to require the permit applicant to notify adjacent landowners of the planned installation but is not actually obligated to require that this notice be provided to affected property owners (MLA § 5.4.3). The MLAs require the permit applicant to provide notice to the affected ANC and councilmember of the "first" planned wireless installment in a "neighborhood" before submitting the permit application to DDOT but do not require notice of any other planned installations in the neighborhood (MLA § 5.4.4).

In short, the MLA's main planning and notification provisions largely leave the District government, the ANCs, and the public on the sidelines, with little to no ability to intervene in the planning process to protect the public interest or even to enforce the design guidelines during the permitting process.

Recommendation: The rules should require all licensees to submit deployment plans to DDOT and OCTO for review and approval for consistency with District rules and to the affected ANCs for review and comment. Further, the rules should require that the licensee notify all property owners on the block affected by any planned installation.

2. The Guidelines' Location Preferences for Small Cell Installations

The design guidelines list "preferences" for where new small cells should be installed (Design Guidelines § 5.2.1) in the following order of preference:

- Unnamed alleys
- DC-owned street light poles with cobra heads and third-party poles on streets (third-party poles are existing poles owned by PEPCO or Verizon

Recommendation: The rules should require that all small cell permit applications include detailed plans that show all existing trees and their trunk diameters, street light poles, other poles, and the amenity zones on both sides of the affected block and the placement of the planned new pole(s) and cabinets in relationship to existing items in the right-of-way and adjacent areas.

IV. CONCLUSION

I have barely scratched the surface in identifying the problems with the MLAs and the draft design guidelines on a wide range of issues. There are many other issues like the expected construction in our streets and on our sidewalks associated with laying fiber optic connections to each small cell and building small cell networks. I hope that DDOT and other powers-that-be recognize the stakes associated with building the next generation of communications infrastructure and getting the ground rules right for this disruptive technology.

While I appreciate the hard work of DDOT and OCTO in starting this process, engaging with potential providers, and developing solid policy proposals in many areas, we are just at the very beginning of the process and decision-makers should not be reluctant to revisit issues or engage more fully with the public. 5G technology is still far down the road no matter what claims providers make as to their readiness to deploy the technology. Nothing that the District government does in this proceeding can or will accelerate the deployment of 5G technology as long as final 5G standards remain a moving target and manufacturers have yet to begin producing the equipment required to build, operate, and use 5G networks.

I would like to close by stressing the overarching importance of initiating a comprehensive rulemaking process that establishes baseline requirements for both license agreements and design standards and requires all licensees to comply in full with the District's updated rules. With a rulemaking process, the issues could be thoroughly vetted and the public provided the opportunity to help shape the ground rules for the next generation of information technology. And the flaws in

EXHIBIT 1

Washington Post articles (1999-2000)
Street damage caused by fiber optic companies

Rise in Underground Cables Tearing Up District Streets

STREETS, From A1

transportation director. "We don't want to be anti-business. But we've gone through a long period of disinvestment in the city's streets. As we now catch up, we need to make sure no one is going to come in after we've done work and shorten the useful life expectancy of those streets."

City officials can deny a permit if they believe work will be too disruptive, and they can fine or sanction companies for damaging streets. But so far, they have not used that authority because they are giving firms a chance to demonstrate that they will leave the streets in good shape, Burch said.

After it cuts into a street, a company must make a temporary patch, usually by pouring asphalt into the hole, until more extensive, permanent repairs can be done.

The temporary fixes have led to potholes and bumpy pavement throughout downtown, but, Burch said, "I'm not aware of any gross violations by the companies. The test will come when they start doing permanent repairs."

Drivers, pedestrians and businesses all have taken notice of the added digging. Fluorescent paint marks and thin slices in the pavement tag the spots for planned excavations, while troughs mark ongoing construction.

"It seems like there's some type of disruption every day," said Valentina Abney, 32, who has driven between her Northeast Washington home and downtown for six years.

The District government has been averaging about 9,000 applications a year from utility companies seeking permission to make repairs or install systems under the street. Last year, the number swelled to 15,000 applications, spiked by telecommunications companies. A single application can contain several pavement cuts.

"Any infrastructure you put in is going to be disruptive during installation," said James Trefil, a George Mason University professor who writes extensively about technology and science in cities. Yet, "a city whose streets aren't all torn up is on its way to death."

On any given day, the city office that approves permits has 20 pending applications from telecommunications companies, many several inches thick. One that recently was in the stack came from e.spire Communications Inc., which is asking to dig a 4,885-foot-long trench for eight blocks of L Street NW between 12th and 20th streets.

A maddening situation can occur when long neglected streets are repaired by the city, only to be reopened by a company. Constitution Avenue NW between 12th Street and Virginia Avenue was resurfaced last year, for example, but is being opened by e.spire to install local voice and data lines.

"People are going to look around and say, 'You dummies. Why are you doing this street again?' " Burch said. "I'm going to give people the companies' phone numbers."

The city attempts to coordinate installations and street rebuilding, Burch said, or to reroute lines around recently repaved streets. But it hasn't always been possible.

Burch said the provisions for temporary fixes and threats of penalties are tough. "We're exacting Draconian repair measures from these companies, and they know it." And some representatives of the telecommunications companies noted that under terms of their permits, the companies must pay to patch not only the trenches they dig but the entire lane if a road was recently repaved.

"We may disrupt some of the street, but we do put everything back, sometimes with a newer and better street," said Peggy Disney, a local spokeswoman for e.spire.

Disney said she was "perplexed" by Burch's pointed comments because improved communications capabilities enhance the city. "We're adding value to Washington's infrastructure. There's a huge demand for communications traffic, a need for Internet traffic," Disney said. "An end result of this is that a lot of companies will want to do business in D.C."

> "Any infrastructure you put in is going to be disruptive during installation. . . . a city whose streets aren't all torn up is on its way to death."
>
> — James Trefil, George Mason University professor

Price replied: "We are interested in the technology improvements and support economic development. But we also have to assure our residents that our road system can be maintained at a quality level."

What's distinctive about the telecommunications excavations—and troubling to city officials—is their size. "These are not what we call 'maintenance cuts,' " Price said. "They are coming in with widespread cuts across the city."

When Potomac Electric Power Co. or Washington Gas cuts the street for repairs or installations, their roughly 6-by-6-foot rectangular holes generally are confined to a specific location along one street. The telecommunications cuts are narrow—at no more than two-feet wide—but extend several blocks.

One of e.spire's approved permits requested a five-mile cut along North Capitol Street, the longest excavation the city has had other than Metro. Another request, from Starpower, troubles Burch. Starpower, a Pepco subsidiary, plans to install its network during the next two years below and above ground, including along several recently resurfaced streets.

"We'll comply completely and fully with the city's regulations," said Tony Peduto, Starpower's general manager. "Everything will be restored. This is short term pain for the opportunity for residents to have access to technology for the next 30 years."

The drive to install fiber-optic lines and offer service has some of the telecommunications companies pressing for quick permit approval, a demand that taxes a city office staff trimmed in recent years from 15 to six. "One guy said, 'I need a permit by next week or I'll get fired,' " Burch said.

City officials acknowledge they need to improve the permitting process, allowing companies to apply online, for example. "We're trying to be reasonable and flexible," Burch said, "but the people coming in for permits are all very, very nervous and annoying because they're here all the time."

Besides increasing permit fees, the District is weighing rental fees similar to the approach Metro takes in charging telecommunications companies that rent space in its train tunnels.

"The idea is to explore a fair charge for their use of the streets, to recapture the lost usefulness of the street due to all these cuts," said Erie Sampson, chief counsel for the D.C. public works department.

Prince George's County, Sampson noted, recently decided to charge telecommunications companies a percentage of their gross revenues to offset the use of public space. The industry fought the proposal and said it would object to the District following suit.

"If the city feels they aren't adequately compensated for the use of their right of way, there are existing mechanisms to recover costs, such as increasing the permit fees," said Stephen H. Clawson, a spokesman for AT&T, the leading opponent of the Prince George's fee.

Meanwhile, drivers, residents and businesses are guaranteed years of disorder as the networks are installed. On a recent day, digging on 21st Street NW between L and M took two of three southbound lanes from drivers. The slightest interruption—a taxicab dropping off a fare—created a 12-car backup.

"It's just part of being in D.C.," John Roman, 29, who commutes between Silver Spring and downtown. "Potholes everywhere and cars parked illegally. Construction is just one more headache."

D.C. to Tell Fiber-Optic Firms to Speed It Up

CABLE, *From A1*

phone, cable television and Internet services. The disruption has been made worse by the unlimited time that telecommunications companies were given to complete repairs to a street they had dug up, Burch said.

"We've had a lot of temporary repairs around the city that could have moved faster but didn't," Burch said. "What we're trying to do now is to move things along, make the time lines tighter."

Burch acknowledged, however, that the city will grant waivers to companies that cannot meet the city's new 120-day timetable because their work is too complicated.

An official for Starpower Inc., which has the most ambitious construction plan of any of the telecommunications companies and plans to dig up every street in the District, said that 120 days is usually a realistic time frame.

"It's a reasonable amount of time, but it depends on the length of cable you're laying," said Tony Peduto, general manager for Starpower. The company expects to lay 900 miles of cable by 2001 and has 40 crews spread across the city.

In all, nine telecommunications companies hold about 145 permits to lay pipe and fiber-optic cable beneath city streets, Burch said. He said about half of that work is complete.

[illegible]work, which began slowly [illegible]ing, has exploded and [illegible]eems everywhere. First, the [illegible]do orange markings appear overnight on the pavement, declaring a street's future in a code indecipherable to lay people. Then the pylons pop up, street parking is banned and the demolition begins.

Often, competing companies will attack the same street in succession, and the road becomes a serial victim—sliced open, patched up and then sliced open again with the next work crew. Cars, trucks and taxis are continually bobbing and weaving, rolling over metal plates, around blinking message boards, over holes.

"It's like a war zone," said Steve Cohen, 44, who nosed his Jeep out of a parking garage onto L Street NW yesterday near 17th Street, where the asphalt was missing in large chunks and the manhole covers stuck up menacingly through the naked concrete.

The road work has not yet hurt Cohen's Jeep. "Just my psyche," he said. "You're driving, and you feel like any moment you're going to fall through a steel plate or lose a wheel."

Peter Abrahams, 34, said the utility work left his 1993 Honda Accord with chipped paint and damage to the axle assembly. "It's just been a nightmare," said Abrahams, who commutes to L Street NW from Vienna. "My car sounds like a bag of bolts—it rattles, it shakes." He said he paid for the paint to be fixed because he didn't know whether he could make a claim against the contractor.

Burch said motorists who suffer car damage because of construction can either file a claim with the contractor or alert the mayor's office.

At the Embassy Mobil station on P Street NW, which offers a $120 "D.C. Streets Special" that includes a realignment, brakes check and tire rotation, manager Jon Harvath said one woman rolled in this week with a two-inch gash in her tire from driving over a metal plate covering a utility trench on 22nd Street. "There's definitely been a noticeable surge in sales," he said.

The bike messengers who work at the Metropolitan Delivery Corp. on Pennsylvania Avenue NW, not far from the White House, are feeling every bump, said Jimmy Snyder, the service's general manager. One messenger hit a pothole last month and slid in front of a car, ending up in the hospital with cuts and bruises, Snyder said.

To install pipe or wire, utility companies typically break through a two-inch top layer of asphalt and about 10 inches of concrete until they reach soil. They bury the conduit, then backfill the trench with dirt and put a thin layer of asphalt on top. That is the temporary patch, which is often rough and bumpy. At 22nd and L streets NW yesterday, the patch had become a sinkhole large enough to swallow half a car tire.

Later, the company hires a construction firm to dig up the temporary patch, fill it with concrete and cover it with a permanent asphalt.

Under the plan that Williams will announce today, utility companies will have 60 days from the time of permitting to install their pipe or wire, then 15 days to begin permanent repairs and 45 more days to finish those repairs and return the street to the condition in which it was found, Burch said.

The mayor also has instructed the companies to finish all their work downtown by Thanksgiving.

Burch said the city cannot refuse requests from competing companies to bury cable on the same street.

"Every jurisdiction is having the same problem," said Burch, who just attended a national conference called "Peaceful Coexistence Between the Communications Industry and the Department of Public Works."

Some jurisdictions have been more aggressive than the District in trying to impose new fees and rules on the companies, and courts have split on how far local governments can go.

When will the utility work calm down? "The answer is, we don't know," Burch said. "No one knows the size of the market. The mayor is concerned about it; we're all struggling. We acknowledge the rights of these companies to be in public space. And we're happy they're here, because it's an indication of economic vitality. But we have to find a way to control it in some way."

Staff writer Allan Lengel contributed to this report.

D.C. Urges Tech Firms To Coordinate Projects That Tear Up Streets

CABLE, *From B1*

courage them to work together, so that when a trench is open on a street, more than one work crew can lay cable at the same time. The city also will require that utility companies complete installation and restore a street to its original condition within 120 days after a permit is issued.

Some other cities and counties maintain stricter controls.

In Chicago, city officials sometimes have refused permits to utility companies that wanted to bury cable in a street that had just been resealed and resurfaced after excavations. "We've told them to go back to the drawing board and find an alternate route," said Carmen Iacullo, the city's deputy commissioner of transportation. Iacullo said that companies get 30 days to complete construction but that extensions are often granted.

Chicago has an Office of Underground Coordination, and as many as contractors have buried cable on a particular street at the same time.

The city also makes the utility companies pay for the right to use underground space, charging 2 percent of gross earnings generated in the city, Iacullo said.

San Francisco adopted an ordinance calling on companies to coordinate their digging up of the city's streets in order to minimize inconvenience to motorists. Denver has instructed utility companies to try to run lines down alleys or along rail rights of way to avoid downtown streets. In Boston, where workers are building a new highway beneath city streets as part of the nation's largest public works project, workers are burying fiber-optic cable at the same time to avoid the need to go back and reopen streets.

Closer to home, Montgomery County imposes a franchise fee of 5 percent of revenue and requires an "in-kind" contribution from the utility to the county, said Jerry Pasternak, special assistant to County Executive Douglas M. Duncan (D). The companies have 18 months to complete work.

ice George's County tried to charge a franchise fee for the use of the right of way—a move that was challenged by the utilities and is pending in appeals court, spokesman Reginald A. Parks said. The time lines for completing installation vary depending on the complexity of the project.

Tony Peduto, the general manager of Starpower, a telecommunications company that is installing 900 miles of fiber-optic cable in the District, welcomed the measures Williams announced yesterday. Peduto said his firm would be happy to coordinate its road work with its competitors if the city provided the information to make that possible. He noted that about 70 percent of Starpower's conduit is being installed above ground, on utility poles, and thus does not require digging.

Peduto said that although he understands the frustration felt by many motorists, the public should think of the street work the way they view the construction of an important new building.

"It's a price you pay today, but it will give residents of the city bandwidth and technology they can utilize for the next 50 years," he said. "When the MCI Center went up, were people inconvenienced? Sure. But now you've got a gem of a building and a revitalized downtown. With this work, people will have high-speed cable access, e-commerce from their own homes. That's where the real benefit is."

Complicating matters is the District's own $400 million road program, which calls for street resurfacing, sidewalk rebuilding and new curbs throughout most sections of the city between now and 2001. Vanessa Dale Burns, director of the D.C. Department of Public Works, said the city is taking steps to combine the road work and the cable installation.

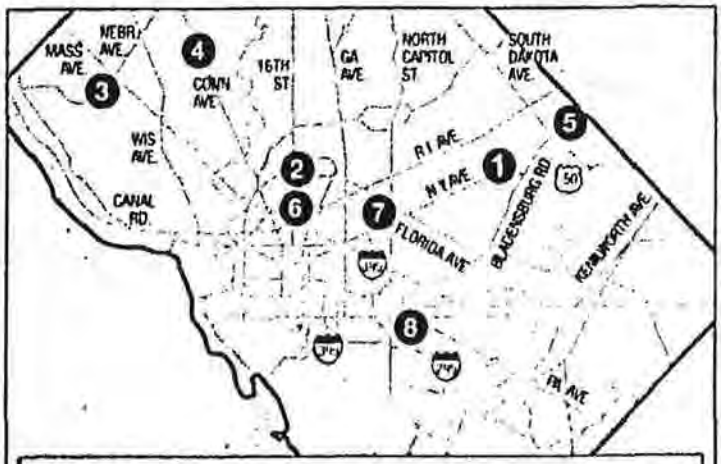
In addition to better managing utility work, Williams said, the city will improve the timing of traffic lights, hire 27 "traffic aides" to keep traffic moving through downtown intersections, crack down on illegally parked and abandoned vehicles and expand no-parking restrictions on main thoroughfares by a half-hour during the morning and evening rush periods.

BY TOM ALLEN—THE WASHINGTON POST

Public Works Director Vanessa Dale Burns, with Mayor Anthony A. Williams. Burns said D.C. is taking steps to combine road work and cable installation.

District Streets Take a Beating

Drivers in the District are becoming all too familiar with downtown streets being torn up for the placement of fiber-optic cables. The map below shows the eight busiest areas of construction in the city and which telecommunications company is doing the digging, according to the D.C. Department of Public Works.



Level 3 Communications Inc. sites

1. New York Ave. NE between Kendall St. and Montana Ave.
2. 16th St. NW between Fuller St. and R St.
3. Nebraska Ave. NW between Ward Circle and New Mexico Ave.
4. Connecticut Ave. NW between Albemarle St. and Van Ness St.
5. Bladensburg Rd. NE between Eastern Ave. and South Dakota Ave.
6. Rhode Island Ave. NW between Connecticut Ave. and Scott Circle.

Metromedia Fiber Network Inc. site

7. P Street NW between Third St. and North Capitol St.

E.spire site

8. Third, Fourth and C streets SW.

THE WASHINGTON POST

D.C. Official Puts Streets Director On Notice

STREETS, *From B1*

Yesterday, Burns agreed that city roads are in sorry shape. "The streets are bad; they are in bad shape," she said. "That is a result of the number of cuts we've had."

Critics, such as D.C. Council member Carol Schwartz (R-At Large), blame Burns and other city officials for not exercising tighter control over companies digging trenches for fiber-optic ca-

er cities, for instance, have required companies to coordinate their work so that fewer trenches are dug.

Many other cities also charge access or right-of-way fees, so telecommunications companies pay for occupying public space beneath a street. Although the D.C. Council approved such a fee in 1997, the city has yet to impose it. "I don't know why this administration is dragging its feet on this," Schwartz said.

Meanwhile, engineering studies show every utility trench dug in a street causes long-term damage. In 1996, consultants estimated that utility cuts shave 25 percent off the average 20-year life span of a city street and recommended that the District impose a long-term damage fee. But officials nixed the idea, instead moving millions of dollars in additional road maintenance costs onto city taxpayers.

"I don't think it's fair that District residents should foot the bill for repairing roads when, in fact, these high-tech companies are making boatloads of money," said Lon Anderson, spokesman for the Mid-Atlantic AAA.

D.C. officials could not provide an estimate of the amount of damage being done to city streets or even say how many of the city's 1,100 miles of streets are being sliced open for utility cables on any given day.

In 1996, more than 5,000 cuts were made in the District. Last year, 6,683 cuts were made, according to the Department of Public Works.

BY CRAIG HERNDON—THE WASHINGTON POST

Last fall, workers were tearing up pavement on New York Avenue at 16th Street NE to install fiber-optic cables. Last year, more than 6,000 cuts were made in D.C. streets, weakening them and slicing years off their life spans.

> "I don't know why this administration is dragging its feet on this."
>
> — Carol Schwartz (R-At Large)

Mintwood Place, October 4, 2018