

Radio Frequency – Electromagnetic Energy (RF-EME) Compliance Report



T-Mobile Proposed Facility

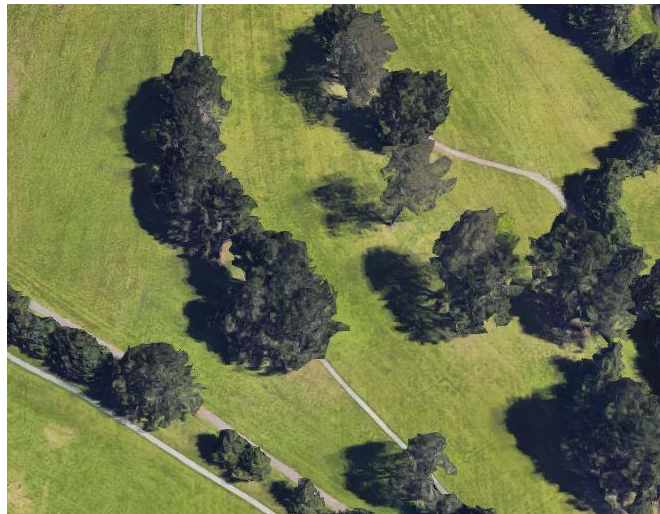
Site ID: CA-728I

US-CA-728I Widow White Creek

1710 Norton Drive, McKinleyville, California 95519

February 24, 2023

EBI Project Number: 6223000639



Report Findings: Compliant

Prepared by:



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I.0 Executive Summary

EnviroBusiness Inc. (dba EBI Consulting) has been contracted by T-Mobile to conduct radio frequency electromagnetic (RF-EME) modeling for T-Mobile Site CA-7281 located at 1710 Norton Drive in McKinleyville, California to determine RF-EME exposure levels from proposed T-Mobile wireless communications equipment at this site. As described in detail in Appendix B of this report, the Federal Communications Commission (FCC) has developed Maximum Permissible Exposure (MPE) Limits for general public exposures and occupational exposures. This report summarizes the results of RF-EME modeling in relation to relevant FCC RF-EME compliance standards for limiting human exposure to RF-EME fields. This report contains a detailed summary of the RF EME analysis for the site.

This document addresses the compliance of T-Mobile's proposed transmitting facilities independently at the site.

While access to this site is considered uncontrolled, the MPE analysis considers exposures with respect to both controlled (Occupational) and uncontrolled (General Public) limits.

The FCC's General Public or Occupational Limit is expressed as a percentage and each limit is reached at values meeting or exceeding 100% of the representative limit.

The Maximum Emissions Value is 9.3100% of the FCC's general public limit (1.8620% of the FCC's occupational limit) at the equipment shelter roof level. The proposed site is in compliance with Federal regulations regarding (radio frequency) RF Emissions.

At the nearest walking/working surfaces to the T-Mobile antennas on the equipment shelter roof level, the maximum power density generated by the T-Mobile antennas is approximately 9.3100% of the FCC's general public limit (1.8620% of the FCC's occupational limit). Based on worst-case predictive modeling, there are no areas at ground level related to the proposed antennas that exceed the FCC's occupational or general public exposure limits at this site. At ground level, the maximum power density generated by the antennas is approximately 6.2100% of the FCC's general public limit (1.2420% of the FCC's occupational limit).

Based on worst-case predictive modeling, there are no modeled exposures on any accessible equipment shelter roof level-walking/working surface related to T-Mobile's equipment in the area that exceed the FCC's occupational and/or general public exposure limits at this site. These predicted exposures are identified at the equipment shelter roof level in the horizontal transmission path of the antennas. Only those accessing this equipment shelter roof level or those elevated to this plane will encounter the exposures identified above.

Signage is not required at the site as presented in Attachment I. The site is compliant with FCC rules and regulations.

2.0 MPE Calculations

Calculations were completed for the proposed T-Mobile Wireless antenna monotree facility located at 1710 Norton Drive in McKinleyville, California using the equipment information listed below. All calculations were performed per the specifications under FCC Office of Engineering & Technology (OET) Bulletin 65, "Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields" (OET-65). Because of the short wavelength of PCS services, the antennas require line-of-site paths for good propagation and are typically installed a distance above ground level. Antennas are constructed to concentrate energy towards the horizon, with as little energy as possible scattered towards the ground or the sky. This design, combined with the low power of PCS facilities, generally results in no possibility for exposure to approach Maximum Permissible Exposure (MPE) levels, with the exception of areas in the immediate vicinity of the antennas.

In accordance with T-Mobile's RF Exposure policy, EBI performed theoretical modeling using RoofMaster™ software to estimate the worst-case power density at the site rooftop and ground-level resulting from operation of the antennas. Using the computational methods set forth in OET-65, RoofMaster™ calculates power density in a scalable grid based on the contributions of all RF sources characterized in the study scenario. At each grid location, the cumulative power density is expressed as a percentage of the FCC limits. Manufacturer antenna pattern data is utilized in these calculations. RoofMaster™ models consist of the Far Field model as specified in OET-65 and an implementation of the OET-65 Cylindrical Model (Sula9). The models utilize several operational specifications for different types of antennas to produce a plot of spatially-averaged power densities that can be expressed as a percentage of the applicable exposure limit.

For this report, EBI utilized antenna and power data provided by T-Mobile and compared the resultant worst-case MPE levels to the FCC's general public/uncontrolled exposure limits outlined in OET Bulletin 65. EBI has performed theoretical worst-case modeling using RoofMaster™ to estimate the maximum potential power density from each proposed antenna based on worst-case assumptions for the number of antennas and power. All radios at the proposed installation were considered to be running at full power and were uncombined in their RF transmission paths per carrier prescribed configuration. Modeling for Ericsson AIR 6449 and similar SON antennas is based on worst-case assumptions that include all beams transmitting simultaneously. This is to ensure that all areas of potential concern are taken into consideration. As such, the results are conservative in nature and reflect potentially higher levels of RF emissions compared to actual on-air conditions. It is recommended that areas of concern be confirmed with onsite measurements once the facility is active.

The assumptions used in the modeling are based upon information provided by T-Mobile in the supplied drawings.

There are no collocated carriers on the monotree.

The data for all T-Mobile antennas used in this analysis is shown in Section 3.0. Actual antenna gains for each antenna were used per manufacturer's specifications. All calculations were done with respect to the FCC's general public/uncontrolled threshold limits.

Based on information provided by T-Mobile, access to this site is considered uncontrolled.

3.0 Antenna Inventory

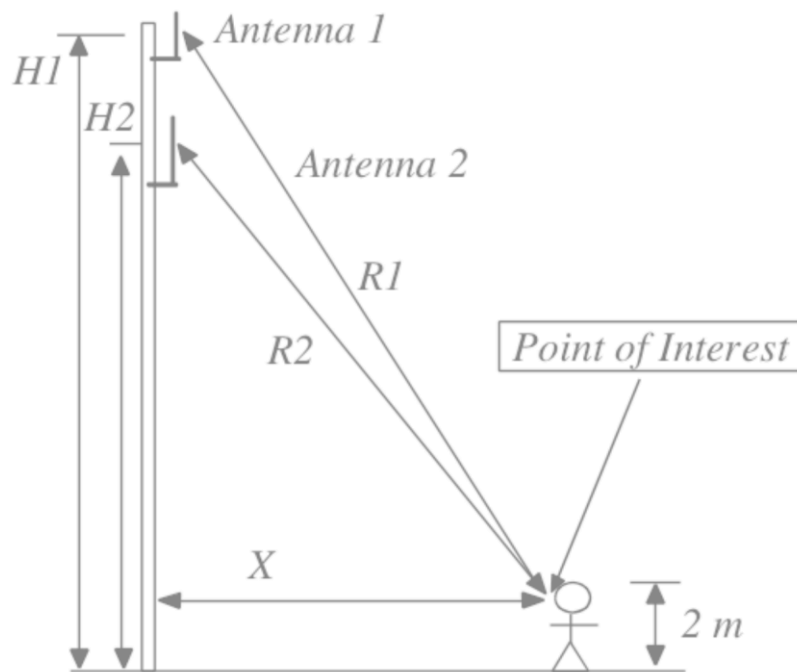
Carrier	Sector	Antenna Number	Technology	Antenna Make	Antenna Model	Azimuth (°)	Centerline Height (feet) Above Nearest Walking Surface	Centerline Height (feet) Above Ground Level
T-Mobile	A	1	LTE	RFS	APXVAALL24_43-U-NA20 02DT 700	0	81.0	91.0
T-Mobile	A	1	NR	RFS	APXVAALL24_43-U-NA20 02DT 600	0	81.0	91.0
T-Mobile	A	1	LTE	RFS	APXVAALL24_43-U-NA20 02DT 2100	0	81.0	91.0
T-Mobile	A	1	LTE	RFS	APXVAALL24_43-U-NA20 02DT 1900	0	81.0	91.0
T-Mobile	A	1	NR	RFS	APXVAALL24_43-U-NA20 02DT 1900	0	81.0	91.0
T-Mobile	A	2	LTE	ERICSSON	SON_AIR6419 B4I LTE TB 02.09.21 2500 TMO	0	81.0	91.0
T-Mobile	A	2	NR	ERICSSON	SON_AIR6419 B4I NR TB 02.09.21 2500 TMO	0	81.0	91.0
T-Mobile	A	2	LTE	ERICSSON	SON_AIR6419 B4I LTE BrM 2500 TMO	0	81.0	91.0
T-Mobile	A	2	NR	ERICSSON	SON_AIR6419 B4I NR BrM 2500 TMO	0	81.0	91.0
T-Mobile	A	3	LTE	RFS	APXVAALL24_43-U-NA20 02DT 700	0	81.0	91.0
T-Mobile	A	3	NR	RFS	APXVAALL24_43-U-NA20 02DT 600	0	81.0	91.0
T-Mobile	A	3	LTE	RFS	APXVAALL24_43-U-NA20 02DT 2100	0	81.0	91.0
T-Mobile	A	3	LTE	RFS	APXVAALL24_43-U-NA20 02DT 1900	0	81.0	91.0
T-Mobile	A	3	NR	RFS	APXVAALL24_43-U-NA20 02DT 1900	0	81.0	91.0
T-Mobile	A	4	LTE	ERICSSON	SON_AIR6419 B4I LTE TB 02.09.21 2500 TMO	0	81.0	91.0
T-Mobile	A	4	NR	ERICSSON	SON_AIR6419 B4I NR TB 02.09.21 2500 TMO	0	81.0	91.0
T-Mobile	A	4	LTE	ERICSSON	SON_AIR6419 B4I LTE BrM 2500 TMO	0	81.0	91.0
T-Mobile	A	4	NR	ERICSSON	SON_AIR6419 B4I NR BrM 2500 TMO	0	81.0	91.0
T-Mobile	B	5	LTE	RFS	APXVAALL24_43-U-NA20 02DT 700	120	81.0	91.0
T-Mobile	B	5	NR	RFS	APXVAALL24_43-U-NA20 02DT 600	120	81.0	91.0
T-Mobile	B	5	LTE	RFS	APXVAALL24_43-U-NA20 02DT 2100	120	81.0	91.0
T-Mobile	B	5	LTE	RFS	APXVAALL24_43-U-NA20 02DT 1900	120	81.0	91.0
T-Mobile	B	5	NR	RFS	APXVAALL24_43-U-NA20 02DT 1900	120	81.0	91.0
T-Mobile	B	6	LTE	ERICSSON	SON_AIR6419 B4I LTE TB 02.09.21 2500 TMO	120	81.0	91.0
T-Mobile	B	6	NR	ERICSSON	SON_AIR6419 B4I NR TB 02.09.21 2500 TMO	120	81.0	91.0
T-Mobile	B	6	LTE	ERICSSON	SON_AIR6419 B4I LTE BrM 2500 TMO	120	81.0	91.0
T-Mobile	B	6	NR	ERICSSON	SON_AIR6419 B4I NR BrM 2500 TMO	120	81.0	91.0
T-Mobile	B	7	LTE	RFS	APXVAALL24_43-U-NA20 02DT 700	120	81.0	91.0
T-Mobile	B	7	NR	RFS	APXVAALL24_43-U-NA20 02DT 600	120	81.0	91.0
T-Mobile	B	7	LTE	RFS	APXVAALL24_43-U-NA20 02DT 2100	120	81.0	91.0
T-Mobile	B	7	LTE	RFS	APXVAALL24_43-U-NA20 02DT 1900	120	81.0	91.0
T-Mobile	B	7	NR	RFS	APXVAALL24_43-U-NA20 02DT 1900	120	81.0	91.0
T-Mobile	B	8	LTE	ERICSSON	SON_AIR6419 B4I LTE TB 02.09.21 2500 TMO	120	81.0	91.0
T-Mobile	B	8	NR	ERICSSON	SON_AIR6419 B4I NR TB 02.09.21 2500 TMO	120	81.0	91.0
T-Mobile	B	8	LTE	ERICSSON	SON_AIR6419 B4I LTE BrM 2500 TMO	120	81.0	91.0
T-Mobile	B	8	NR	ERICSSON	SON_AIR6419 B4I NR BrM 2500 TMO	120	81.0	91.0
T-Mobile	C	9	LTE	RFS	APXVAALL24_43-U-NA20 02DT 700	240	81.0	91.0
T-Mobile	C	9	NR	RFS	APXVAALL24_43-U-NA20 02DT 600	240	81.0	91.0
T-Mobile	C	9	LTE	RFS	APXVAALL24_43-U-NA20 02DT 2100	240	81.0	91.0
T-Mobile	C	9	LTE	RFS	APXVAALL24_43-U-NA20 02DT 1900	240	81.0	91.0

Carrier	Sector	Antenna Number	Technology	Antenna Make	Antenna Model	Azimuth (°)	Centerline Height (feet) Above Nearest Walking Surface	Centerline Height (feet) Above Ground Level
T-Mobile	C	10	LTE	ERICSSON	SON_AIR6419 B4I LTE TB 02.09.21 2500 TMO	240	81.0	91.0
T-Mobile	C	10	NR	ERICSSON	SON_AIR6419 B4I NR TB 02.09.21 2500 TMO	240	81.0	91.0
T-Mobile	C	10	LTE	ERICSSON	SON_AIR6419 B4I LTE BrM 2500 TMO	240	81.0	91.0
T-Mobile	C	10	NR	ERICSSON	SON_AIR6419 B4I NR BrM 2500 TMO	240	81.0	91.0
T-Mobile	C	11	LTE	RFS	APXVAALL24_43-U-NA20 02DT 700	240	81.0	91.0
T-Mobile	C	11	NR	RFS	APXVAALL24_43-U-NA20 02DT 600	240	81.0	91.0
T-Mobile	C	11	LTE	RFS	APXVAALL24_43-U-NA20 02DT 2100	240	81.0	91.0
T-Mobile	C	11	LTE	RFS	APXVAALL24_43-U-NA20 02DT 1900	240	81.0	91.0
T-Mobile	C	11	NR	RFS	APXVAALL24_43-U-NA20 02DT 1900	240	81.0	91.0
T-Mobile	C	12	LTE	ERICSSON	SON_AIR6419 B4I LTE TB 02.09.21 2500 TMO	240	81.0	91.0
T-Mobile	C	12	NR	ERICSSON	SON_AIR6419 B4I NR TB 02.09.21 2500 TMO	240	81.0	91.0
T-Mobile	C	12	LTE	ERICSSON	SON_AIR6419 B4I LTE BrM 2500 TMO	240	81.0	91.0

4.0 FCC Rules and Regulations and Guidelines from OET 65

When considering the contributions to field strength or power density from other RF sources, care should be taken to ensure that such variables as reflection and re-radiation are considered. In cases involving very complex sites, predictions of RF fields may not be possible, and a measurement survey may be necessary. The process for determining compliance for other situations can be similarly accomplished using the techniques described in this section and in Supplement A to this bulletin that deals with radio and television broadcast operations. However, as mentioned above, measurements may be necessary at very complex sites.

In the simple example shown in the below diagram, it is desired to determine the power density at a given location X meters from the base of a tower on which are mounted two antennas. One antenna is a CMRS antenna with several channels, and the other is an FM broadcast antenna. The system parameters that must be known are the total ERP for each antenna and the operating frequencies (to determine which MPE limits apply). The heights above ground level for each antenna, $H1$ and $H2$, must be known in order to calculate the distances, $R1$ and $R2$, from the antennas to the point of interest.

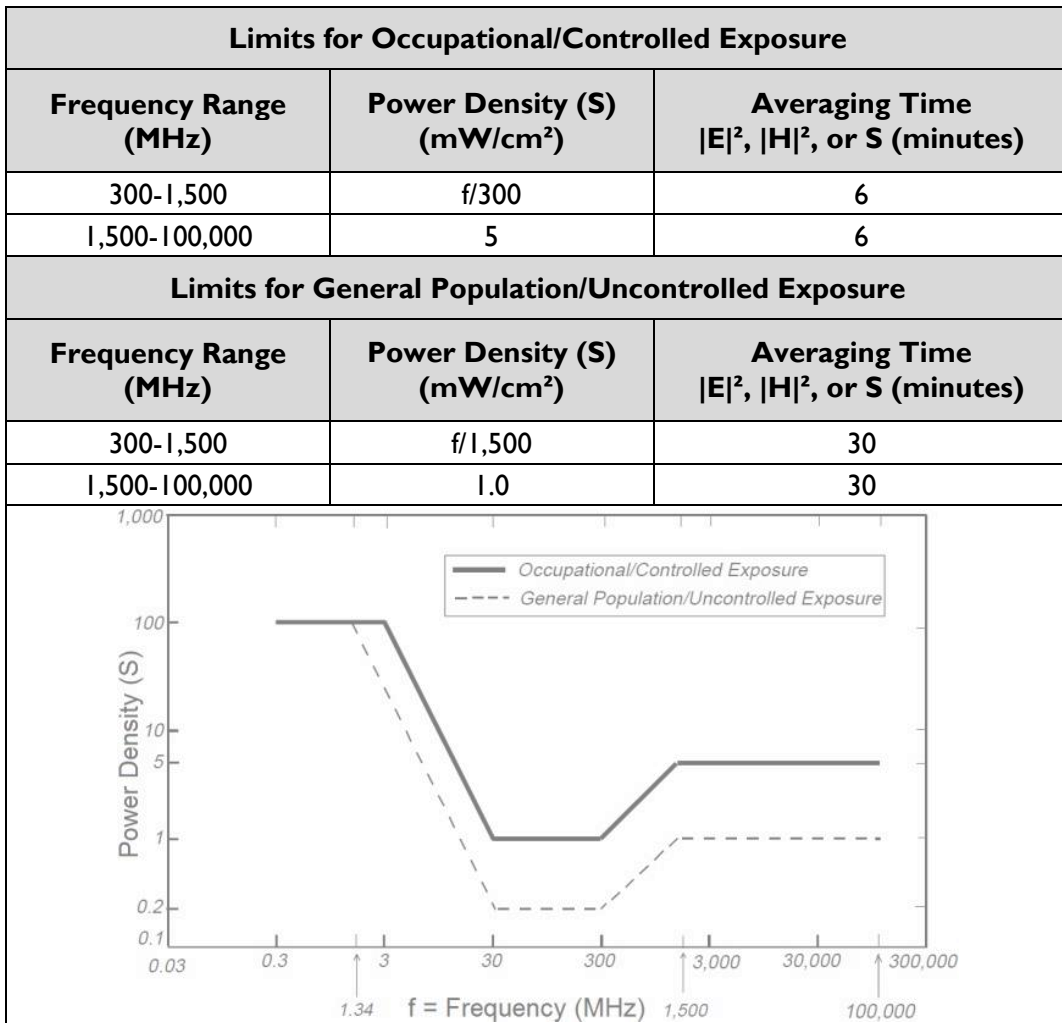


This summarizes the policies, guidelines, and requirements that were adopted by the FCC on August 1, 1996, amending Part 1 of Title 47 of the Code of Federal Regulations, and further amended by action of the Commission on August 25, 1997 (see 47 CFR Sections 1.1307(b), 1.1310, 2.1091 and 2.1093, as amended from FCC "OET Bulletin 65"). Commission actions granting construction permits, licenses to transmit or renewals thereof, equipment authorizations or modifications in existing facilities, require the preparation of an Environmental Assessment (EA), as described in 47 CFR Section 1.1311, if the particular

facility, operation or transmitter would cause human exposure to levels of radiofrequency (RF) electromagnetic fields in excess of these limits. For exact language, see the relevant FCC rule sections.

The FCC-adopted limits for Maximum Permissible Exposure (MPE) are generally based on recommended exposure guidelines published by the National Council on Radiation Protection and Measurements (NCRP) in "Biological Effects and Exposure Criteria for Radiofrequency Electromagnetic Fields," NCRP Report No. 86, Sections 17.4.1, 17.4.1.1, 17.4.2 and 17.4.3. Copyright NCRP, 1986, Bethesda, Maryland 20814. In the frequency range from 100 MHz to 1500 MHz, exposure limits for field strength and power density are also generally based on the MPE limits found in Section 4.1 of, "IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz," ANSI/IEEE C95.1-1992, Copyright 1992 by the Institute of Electrical and Electronics Engineers, Inc., New York, New York 10017, and approved for use as an American National Standard by the American National Standards Institute (ANSI). The exposure guidelines are based on thresholds for known adverse effects and they incorporate a significant margin of safety. The federal health and safety agencies such as: the Environmental Protection Agency ("EPA"), the Food and Drug Administration ("FDA"), the National Institute on Occupational Safety and Health ("NIOSH") and the Occupational Safety and Health Administration ("OSHA") have also been actively involved in monitoring and investigating issues related to RF exposure.

The formulas used in RoofMaster™ for calculating Power density are based on FCC "OET Bulletin 65", Section 2: PREDICTION METHODS, August 1997, Edition 97-01. Power density is converted to Maximum Permissible Exposure Limits (MPE Limits) based on Limits of General Population/Uncontrolled Exposure and Limits of Occupational/Controlled Exposure presented in the following table generated from Appendix A of "OET Bulletin 65."



5.0 Safety Recommendations


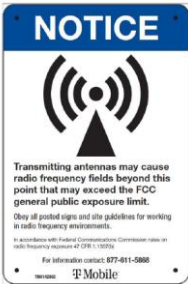



5.1 OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION (OSHA) REQUIREMENTS

OSHA requires that those in the Occupational classification must complete training in RF Safety, RF Awareness, and Utilization of Personal Protective Equipment. OSHA also provides the following options for Hazard Prevention and Control:

Hazard Prevention	Control
<ul style="list-style-type: none"> Utilization of good equipment Enact control of hazard areas Limit exposures Employ medical surveillance and accident response 	<ul style="list-style-type: none"> Employ Lockout/Tag out Utilize personal alarms & protective clothing Prevent access to hazardous locations Develop or operate an administrative control program

5.2 RF SIGNAGE AND BARRIERS

All RF signs should be obeyed at all times.

Guidelines		Blue Notice Sign		
Yellow Caution Sign		Orange Warning Sign		Red Danger Sign
				

If there are workers in an area with a sign that they do not understand, they can call the NOC Number at 877-611-5868 for guidance.

6.0 FCC Limits

6.1 CONTRIBUTION TO CO-LOCATED AREAS

Any wireless operator that contributes 5% or greater of the MPE limit in an area that is identified to be greater than 100% of the MPE limit is responsible for taking corrective actions to bring the site into compliance. All co-located sites should have a separate 5% modeling that shows only T-Mobile antennas transmitting. This separate modeling indicates T-Mobile's contribution in all areas that is recognized to be greater than 100% of MPE limits.

6.2 OCCUPATIONAL LIMITS

Apply in situations in which persons are exposed as a consequence of their employment, provided those persons are fully aware of the potential for exposure and can exercise control over their exposure. Limits for occupational/controlled exposure also apply in situations when an individual is transient through a location where occupational/controlled limits apply provided he or she is made aware of the potential for exposure.

6.3 GENERAL POPULATION LIMITS

Apply in situations in which the general public may be exposed, or in which persons that are exposed as a consequence of their employment may not be fully aware of the potential for exposure or cannot exercise control over their exposure. (those without significant and documented RF Safety & Awareness training)

6.4 CONTROLLED ENVIRONMENT

Applies to environments that are restricted or "controlled" in order to prevent access from members of the General Population classification.

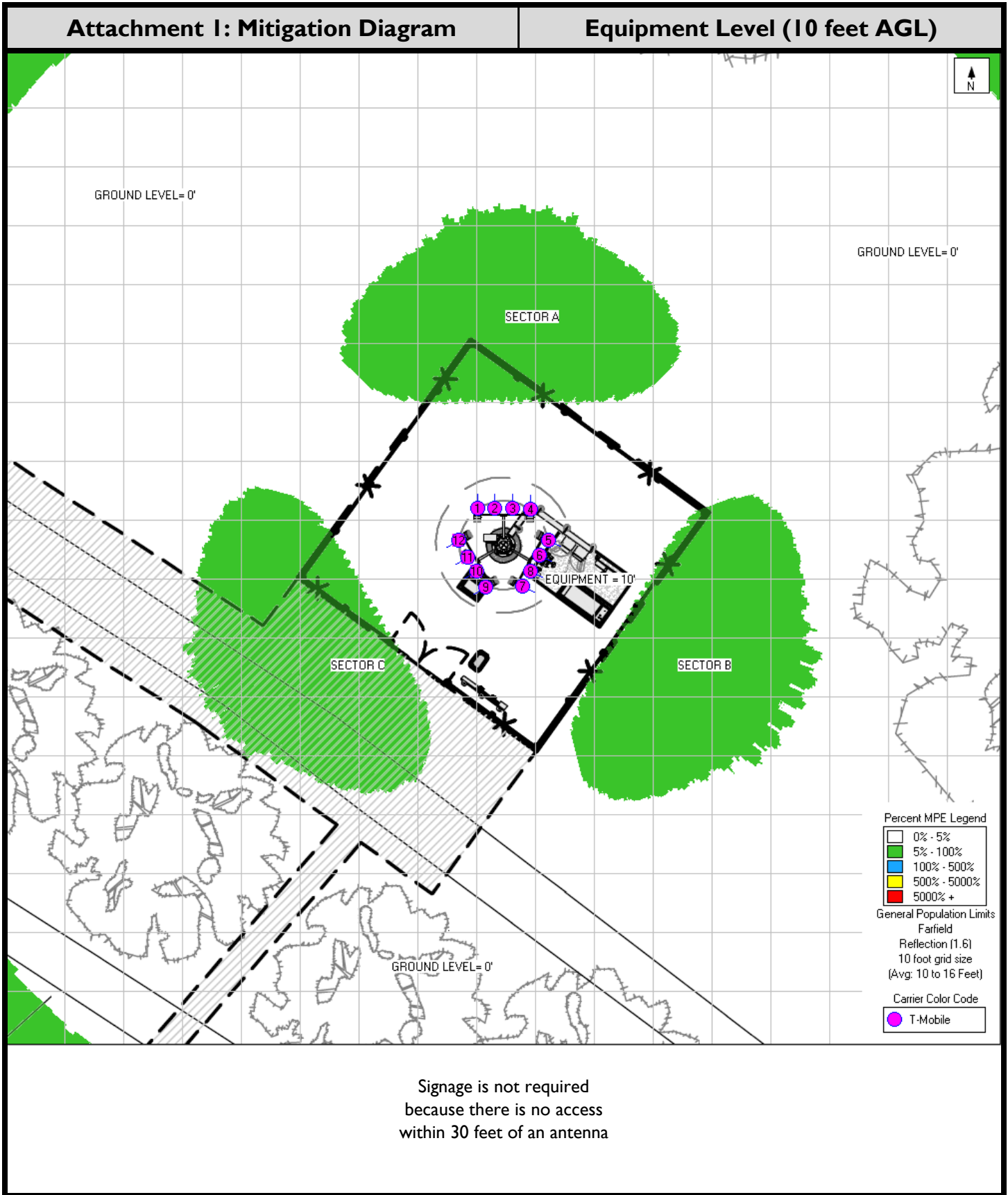
6.5 UNCONTROLLED ENVIRONMENT

Applies to environments that are unrestricted or "uncontrolled" that allow access from members of the General Population classification.

6.6 GENERIC VALUES

The use of "Unknown" for an operator means the information regarding the carrier, their FCC license and / or antenna information was not available. Generic values are used as an estimation for Effective Radiated Power (ERP) and antenna characteristics for unknown antennas.

7.0 Mitigation Diagram



8.0 Summary

All calculations performed for this analysis yielded results that were within the allowable limits for exposure to RF Emissions. Based on predictive modeling, there are no modeled exposures on any accessible equipment shelter roof level-walking/working surface related to T-Mobile's equipment in the area that exceed the FCC's occupational and/or general public exposure limits at this site. These predicted exposures are identified at the equipment shelter roof level in the horizontal transmission path of the antennas.

There are no collocated carriers on the monotree.

The anticipated maximum contribution from each sector of the proposed T-Mobile facility is 9.3100% of the allowable FCC established general public limit (1.8620% of the FCC occupational limit). This was determined through calculations along a radial from each sector taking full power values into account as well as actual vertical plane antenna gain values per the manufacturer-supplied specifications for gain. Based on worst-case predictive modeling, there are no areas at ground level related to the proposed antennas that exceed the FCC's occupational or general public exposure limits at this site. At ground level, the maximum power density generated by the antennas is approximately 6.2100% of the FCC's general public limit (1.2420% of the FCC's occupational limit).

A site is considered out of compliance with FCC regulations if there are areas that exceed the FCC exposure limits and there are no RF hazard mitigation measures in place. Any carrier which has an installation that contributes more than 5% of the applicable MPE must participate in mitigating these RF hazards. For this facility, the calculated values were within the allowable 100% threshold standard per the federal government.

Exposures are found when individuals are accessing or are elevated to the relevant walking/working surface on the horizontal plane. Antennas are constructed to concentrate energy toward the horizon, with as little energy as possible scattered toward the ground or the sky.

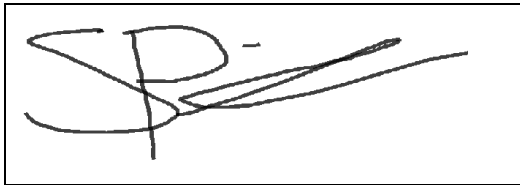
Signage is not required because there is no access within 30 feet of an antenna. To reduce the risk of exposure and/or injury, EBI recommends that access to the monotree or areas associated with the active antenna installation be restricted and secured where possible. Barriers are recommended for installation when possible to block access to the areas in front of the antennas that exceed the FCC general public and/or occupational limits. Barriers may consist of rope, chain, or fencing. Painted stripes should only be used as a last resort. There are no barriers recommended at this site. Barriers are not recommended for installation because there are no exceedances on any walking/working surface.

9.0 Certification

Preparer Certification

I, Sam Parkins, state that:

- I am an employee of EnviroBusiness Inc. (d/b/a EBI Consulting), which provides RF-EME safety and compliance services to the wireless communications industry.
- I have successfully completed RF-EME safety training, and I am aware of the potential hazards from RF-EME and would be classified “occupational” under the FCC regulations.
- I am fully aware of and familiar with the Rules and Regulations of both the Federal Communications Commissions (FCC) and the Occupational Safety and Health Administration (OSHA) with regard to Human Exposure to Radio Frequency Radiation.
- I have been trained on RF-EME modeling using RoofMaster™ modeling software.
- I have reviewed the data provided by the client and incorporated it into this Site Compliance Report such that the information contained in this report is true and accurate to the best of my knowledge.

A rectangular box containing a handwritten signature in black ink. The signature is stylized and appears to be 'SP' followed by a horizontal line and a diagonal stroke.

Reviewed and Approved by:



sealed 24feb2023

Michael McGuire
Electrical Engineer
mike@h2dc.com

Note that EBI's scope of work is limited to an evaluation of the Radio Frequency – Electromagnetic Energy (RF-EME) field generated by the antennas and broadcast equipment noted in this report. The engineering and design of the building and related structures, as well as the impact of the antennas and broadcast equipment on the structural integrity of the building, are specifically excluded from EBI's scope of work.