RADIO FREQUENCY INTERFERENCE ANALYSIS REPORT

New J, LLC

Site ID: SPC007
Site Name: COE Rd
Assessment Purpose: New Colo

August 15, 2023

HUGO WILLIAM JUSTINIANO
STATE OF WASHINGTON
56049
REGISTERED
PROFESSIONAL ENGINEER

8/15/23
EXPIRES: 10/25/24

SiteSafe
A QUALTEK Company

Prepared By:
Site Safe, LLC
8618 Westwood Center Drive, Suite 315
Vienna, VA 22182
(703) 276-1100
Report Created By: Anthony Handley
Report Reviewed By: Hugo W. Justiniano, P.E.

No Harmful Interference affecting the existing carriers / operations on this structure is predicted as a result of New J, LLC's proposed collocation on this structure.

Table of Contents

1.0 Executive Summary **1**
2.0 Site Description **2**
2.1 Communications Systems 2
2.2 Antenna Systems 2
3.0 Transmitter Frequencies **3**
4.0 Receiver Frequencies **4**
5.0 Transmitter Noise Analysis **5**
6.0 Receiver Desensitization Analysis **6**
7.0 Intermodulation Interference Analysis **8**
7.1 Transmitter Generated Intermodulation Analysis 10
7.2 Receiver Generated Intermodulation Analysis 11
8.0 Transmitter Harmonic Output Interference Analysis **12**
9.0 Transmitter Spurious Output Interference Analysis **13**
10.0 Interference Power Level Summing Analysis **14**
11.0 Discussion and Recommendations **15**
12.0 Professional Certification **16**

1.0 Executive Summary

This report presents a radio frequency interference (RFI) analysis which was performed on the SPC007 - COE Rd site. The RFI analysis consists of transmitter noise, receiver desensitization, intermodulation, harmonic and transmitter spurious output interference. The report consists of Sections that provide details of the communications site, antenna systems, operational frequencies and each interference analysis mode.

A summary of the interference analysis results is depicted in the following Table.

Interference Analysis Mode	Type Mix	Status	Summary	Worst-Case Margin (dB)
Transmitter Noise	N/A	Passed	No Interference was predicted	36.6
Receiver Desensitization	N/A	Passed	No Interference was predicted	42.8
Transmitter Intermodulation	1 Tx	Passed	No Interference was predicted	N/A
Transmitter Intermodulation	2 Tx	Passed	No Interference was predicted	N/A
Transmitter Intermodulation	3 Tx	Passed	No Interference was predicted	N/A
Transmitter Intermodulation	4 Tx	Passed	No Interference was predicted	N/A
Transmitter Intermodulation	5 Tx	Passed	No Interference was predicted	N/A
Receiver Intermodulation	1 Tx	Passed	No Interference was predicted	N/A
Receiver Intermodulation	2 Tx	Passed	No Interference was predicted	N/A
Receiver Intermodulation	3 Tx	Passed	No Interference was predicted	N/A
Receiver Intermodulation	4 Tx	Passed	No Interference was predicted	N/A
Receiver Intermodulation	5 Tx	Passed	No Interference was predicted	N/A
Transmitter Harmonics	N/A	Passed	No Interference was predicted	N/A
Transmitter Spurious Output	N/A	Passed	No Interference was predicted	N/A
Interference Level Summing - C/(I+N)	N/A	Passed	No Interference was predicted	N/A

The analysis was performed with the setup options depicted in the Table below.

Analysis	Description
Receiver Performance	Receiver Sensitivity Threshold
Receiver Bandwidth	Receiver Dependent
Antenna Patterns Considered	No (Worst-Case)
Measured Antenna Isolation Data	No
Filters/Multicouplers Considered	Yes
Number of Simultaneous Transmitters Mixed	5
Highest Intermodulation Order Tested	7
Condense Intermodulation Hit Quantity	Yes - 1000/Order
TX IM Bandwidth Multiplication	Yes
Tx/Rx Systems Excluded	None
Site File Name	SPC007 - COE Rd.dta
Report File Name	SPC007 - COE Rd.docx
WirelessSiteRFI Software Version	10.1.20

2.0 Site Description

The communication systems located at this site are described in this section as well as the configuration of the antenna systems.

The site parameters are:

Site Name: SPC007 - COE Rd
Site Description: Self-Support Lattice Tower = 160' AGL
Address: Off Coe Road, Rosalia, WA 99170 (Spokane County)
Latitude: 47:19:46.76 N
Longitude: 117:26:41.71 W
Elevation: 2,604' AMSL
Notes: Broadlinc/New J plans to install antennas/equipment to operate in the 3.5 GHz, 6 GHz and 11 GHz frequency ranges. The final count will be (4) total antennas (New Colo).

2.1 Communications Systems

System	Provider	Technology	Frequency Band
1	Broadlinc/New J (Proposed)	4G LTE	3550 - 3700 MHz - CBRS
2	Broadlinc/New J (Proposed)	Microwave	5925 - 6875 MHz - 5 GHz Microwave
3	Broadlinc/New J (Proposed)	Microwave	10700 - 11700 MHz - 11 GHz Microwave
4	Broadlinc/New J (Proposed)	Microwave	10700 - 11700 MHz - 11 GHz Microwave
5	WQQW997 - SRECS	800 MHz Trunking	806 - 896 MHz - Land Mobile
6	WQOQ592 - SRECS	800 MHz Trunking	806 - 896 MHz - Land Mobile
7	WQPM588 - SRECS	Microwave	5925 - 6875 MHz - 5 GHz Microwave
8	WQPM588 - SRECS	Microwave	5925 - 6875 MHz - 5 GHz Microwave

2.2 Antenna Systems

Ant #	Mfg	Antenna Model	Gain (dBd)	Hgt (ft)	Orient (deg)	Sec-tor	Ant Use	Transmission Line Type	Line Loss (/100')	Line Length (ft)
1	KP Performance	KPP-3SX4-65	15.95	120	0	A	Dplx	1/2 in. Hybrid	0.001	6
2	KP Performance	KPP-3SX4-65	15.95	120	120	B	Dplx	1/2 in. Hybrid	0.001	6
3	KP Performance	KPP-3SX4-65	15.95	120	240	C	Dplx	1/2 in. Hybrid	0.001	6
4	RadioWaves	HP3-6	32.15	110	271.3		Dplx	1/2 in. Hybrid	0.01	140
5	RadioWaves	HP3-11	36.85	110	23.2		Dplx	1/2 in. Hybrid	0.01	140
6	RadioWaves	HP3-11	36.85	100	261.7		Dplx	1/2 in. Hybrid	0.01	130
7	RFI	OA40-41-DIN	9	154	360		Dplx	1-1/4 in. Foam	0.36	184
8	Sinclair	SC412-HF2LDF	11.5	154	360		Dplx	1-1/4 in. Foam	0.85	184
9	Sinclair	SC412-HF2LDF	11.5	154	360		Dplx	1-1/4 in. Foam	0.85	184
10	Sinclair	18' 8-Bay Dipole	9	152	360		Dplx	1-1/4 in. Foam	0.36	182
11	Commscope	HP6-65K	37.65	87	270.3		Dplx	Elliptical WG	0.01	117
12	Commscope	HP6-59K	36.75	49	106.4		Dplx	Elliptical WG	0.01	79

3.0 Transmitter Frequencies

Freq #	Ant #	Provider	Model	Technology	Channel Label	ID	Frequency	Power (Watts)	BW (kHz)
1	1	Broadlinc/New J (Proposed)	Leax Arkivator Telecom	4G LTE		A	3587.500000	1	20000
2	1	Broadlinc/New J (Proposed)	Leax Arkivator Telecom	4G LTE		B	3662.500000	1	20000
3	2	Broadlinc/New J (Proposed)	Leax Arkivator Telecom	4G LTE		C	3587.500000	1	20000
4	2	Broadlinc/New J (Proposed)	Leax Arkivator Telecom	4G LTE		D	3662.500000	1	20000
5	3	Broadlinc/New J (Proposed)	Leax Arkivator Telecom	4G LTE		E	3587.500000	1	20000
6	3	Broadlinc/New J (Proposed)	Leax Arkivator Telecom	4G LTE		F	3662.500000	1	20000
7	4	Broadlinc/New J (Proposed)	Cambium Networks	2+0 XPIC		G	6137.925500	1	60000
8	5	Broadlinc/New J (Proposed)	Cambium Networks	2+0 XPIC		H	11565.050000	1	160000
9	6	Broadlinc/New J (Proposed)	Cambium Networks	2+0 XPIC		I	11645.050000	1	80000
10	7	WQQW997 - SRECS	Generic	800 MHz Trunking		J	851.287500	100	8
11	7	WQQW997 - SRECS	Generic	800 MHz Trunking		K	851.762500	100	8
12	7	WQQW997 - SRECS	Generic	800 MHz Trunking		L	851.925000	100	8
13	7	WQQW997 - SRECS	Generic	800 MHz Trunking		M	852.250000	100	8
14	7	WQQW997 - SRECS	Generic	800 MHz Trunking		N	852.400000	100	8
15	7	WQQW997 - SRECS	Generic	800 MHz Trunking		O	852.712500	100	8
16	9	WQOQ592 - SRECS	Generic	800 MHz Trunking		P	851.012500	100	16
17	9	WQOQ592 - SRECS	Generic	800 MHz Trunking		Q	851.512500	100	16
18	11	WQPM588 - SRECS	Generic	Microwave		R	6555.000000	.40	30000
19	12	WQPM588 - SRECS	Generic	Microwave		S	6093.450000	.45	30000

4.0 Receiver Frequencies

Freq #	Ant #	Provider	Model	Technology	Channel Label	ID	Frequency	Sen (dBm)	BW (kHz)
1	1	Broadlinc/New J (Proposed)	Leax Arkivator Telecom	4G LTE		A	3587.500000	-102	20000
2	1	Broadlinc/New J (Proposed)	Leax Arkivator Telecom	4G LTE		B	3662.500000	-102	20000
3	2	Broadlinc/New J (Proposed)	Leax Arkivator Telecom	4G LTE		C	3587.500000	-102	20000
4	2	Broadlinc/New J (Proposed)	Leax Arkivator Telecom	4G LTE		D	3662.500000	-102	20000
5	3	Broadlinc/New J (Proposed)	Leax Arkivator Telecom	4G LTE		E	3587.500000	-102	20000
6	3	Broadlinc/New J (Proposed)	Leax Arkivator Telecom	4G LTE		F	3662.500000	-102	20000
7	4	Broadlinc/New J (Proposed)	Cambium Networks	2+0 XPIC		G	6389.965500	-55	60000
8	5	Broadlinc/New J (Proposed)	Cambium Networks	2+0 XPIC		H	11075.050000	-56	160000
9	6	Broadlinc/New J (Proposed)	Cambium Networks	2+0 XPIC		I	11155.050000	-56	80000
10	7	WQQW997 - SRECS	Generic	800 MHz Trunking		J	806.287500	-119	8
11	7	WQQW997 - SRECS	Generic	800 MHz Trunking		K	806.762500	-119	8
12	7	WQQW997 - SRECS	Generic	800 MHz Trunking		L	806.925000	-119	8
13	7	WQQW997 - SRECS	Generic	800 MHz Trunking		M	807.250000	-119	8
14	7	WQQW997 - SRECS	Generic	800 MHz Trunking		N	807.400000	-119	8
15	7	WQQW997 - SRECS	Generic	800 MHz Trunking		O	807.712500	-119	8
16	9	WQOQ592 - SRECS	Generic	800 MHz Trunking		P	806.012500	-119	16
17	9	WQOQ592 - SRECS	Generic	800 MHz Trunking		Q	806.512500	-119	16
18	11	WQPM588 - SRECS	Generic	Microwave		R	6725.000000	-72	30000
19	12	WQPM588 - SRECS	Generic	Microwave		S	6345.490000	-72	30000

5.0 Transmitter Noise Analysis

Transmitter noise interference occurs because a transmitter radiates energy on its operating frequency as well as frequencies above and below the assigned frequency. The energy that is radiated above and below the assigned frequency is known as sideband noise energy and extends for several megahertz on either side of the operating frequency. This undesired noise energy can fall within the passband of a nearby receiver even if the receiver's operating frequency is several megahertz away. The transmitter noise appears as "on-channel" noise interference and cannot be filtered out at the receiver. It is on the receiver's operating frequency and competes with the desired signal, which in effect, degrades the operational performance.

The analysis predicts each transmitter's noise signal level present at the input of each receiver. It takes into account the transmitter's noise characteristics, frequency separation, power output, transmission line losses, filters, duplexers, combiners, isolators, multi-couplers and other RF devices that are present in both systems. Additionally, the analysis considers the antenna separation space loss, horizontal and vertical gain components of the antennas as well as how they are mounted on the structure. The gain components are derived from antenna pattern data published by each manufacturer.

The analysis determines how much isolation is required, if any, to prevent receiver performance degradation caused by transmitter noise interference. The Table below depicts the results of this analysis. For each receiver, the transmitter that has the worst-case impact is displayed. The Signal Margin represents the margin in dB, before the receiver's performance is degraded. A negative number indicates that the performance is degraded and the value indicates how much additional isolation is required to prevent receiver performance degradation.

Receiver Provider	Receive Channel	Receive Frequency (MHz)	Transmitter Provider	Transmit Channel	Transmit Frequency (MHz)	Attn Required (dB)	Attn Provided (dB)	Signal Margin (dB)
Broadlinc/New J (Proposed)		6389.965500	Broadlinc/New J (Proposed)		6137.925500	22.4	100.8	78.4
Broadlinc/New J (Proposed)		11075.050000	Broadlinc/New J (Proposed)		11645.050000	21.4	58	36.6
Broadlinc/New J (Proposed)		11155.050000	Broadlinc/New J (Proposed)		11565.050000	21.4	58	36.6
WQQW997 - SRECS		806.287500	WQQW997 - SRECS		851.287500	58.6	154.6	96
WQQW997 - SRECS		806.762500	WQQW997 - SRECS		851.287500	58.7	154	95.3
WQQW997 - SRECS		806.925000	WQQW997 - SRECS		851.287500	58.8	153.9	95.1
WQQW997 - SRECS		807.250000	WQQW997 - SRECS		851.287500	58.9	153.8	94.9
WQQW997 - SRECS		807.400000	WQQW997 - SRECS		851.287500	59	153.8	94.8
WQQW997 - SRECS		807.712500	WQQW997 - SRECS		851.287500	59	153.9	94.9
WQOQ592 - SRECS		806.012500	WQOQ592 - SRECS		851.012500	58.6	162.2	103.6
WQOQ592 - SRECS		806.512500	WQOQ592 - SRECS		851.012500	58.7	161.2	102.4
WQPM588 - SRECS		6725.000000	WQPM588 - SRECS		6555.000000	9.4	100.8	91.4
WQPM588 - SRECS		6345.490000	WQPM588 - SRECS		6093.450000	8.9	100.8	91.9

No transmitter noise interference problems were predicted.

6.0 Receiver Desensitization Analysis

Receiver desensitization interference occurs when an undesired signal from a nearby "off-frequency" transmitter is sufficiently close to a receiver's operating frequency. The signal may get through the RF selectivity of the receiver. If this undesired signal is of sufficient amplitude, the receiver's critical voltage and current levels are altered and the performance of the receiver is degraded at its operating frequency. The gain of the receiver is reduced, thereby reducing the performance of the receiver.

A transmitter can be operating several megahertz away from the receiver frequency and/or its antenna can be located several thousand feet from the receiver's antenna and still cause interference.

The analysis predicts each transmitter's signal level present at the input of each receiver. It takes into account the transmitter's power output, frequency separation, transmission line losses, filters, duplexers, combiners, isolators, multi-couplers and other RF devices that are present in both systems. Additionally, the analysis considers the antenna separation space loss, horizontal and vertical gain components of the antennas as well as how they are mounted on the structure. The gain components are derived from antenna pattern data published by each manufacturer.

The analysis determines how much isolation is required, if any, to prevent receiver performance degradation caused by receiver desensitization interference. The Table below depicts the results of this analysis. For each receiver, the transmitter that has the worst-case impact is displayed. The Signal Margin represents the margin in dB, before the receiver's performance is degraded. A negative number indicates that the performance is degraded and the value indicates how much additional isolation is required to prevent receiver performance degradation.

Receiver Provider	Receive Channel	Receive Frequency (MHz)	Transmitter Provider	Transmit Channel	Transmit Frequency (MHz)	Attn Required (dB)	Attn Provided (dB)	Signal Margin (dB)
Broadlinc/New J (Proposed)		6389.965500	Broadlinc/New J (Proposed)		6137.925500	58	100.8	42.8
Broadlinc/New J (Proposed)		11075.050000	Broadlinc/New J (Proposed)		11645.050000	57	117	60
Broadlinc/New J (Proposed)		11155.050000	Broadlinc/New J (Proposed)		11565.050000	57	117	60
WQQW997 - SRECS		806.287500	WQQW997 - SRECS		852.712500	30.6	146.7	116.1
WQQW997 - SRECS		806.762500	WQQW997 - SRECS		852.712500	30.6	146.7	116.1
WQQW997 - SRECS		806.925000	WQQW997 - SRECS		852.712500	30.6	146.7	116.1
WQQW997 - SRECS		807.250000	WQQW997 - SRECS		852.712500	30.6	146.7	116.1
WQQW997 - SRECS		807.400000	WQQW997 - SRECS		852.712500	30.6	146.7	116.1
WQQW997 - SRECS		807.712500	WQQW997 - SRECS		852.712500	30.6	146.7	116.1
WQOQ592 - SRECS		806.012500	WQOQ592 - SRECS		851.512500	30.6	159.5	128.9
WQOQ592 - SRECS		806.512500	WQOQ592 - SRECS		851.512500	30.6	159.5	128.9
WQPM588 - SRECS		6725.000000	WQPM588 - SRECS		6555.000000	45	100.8	55.8

WQPM588 - SRECS		6345.490000	WQPM588 - SRECS		6093.450000	44.5	100.8	56.3

No receiver desensitization interference problems were predicted.

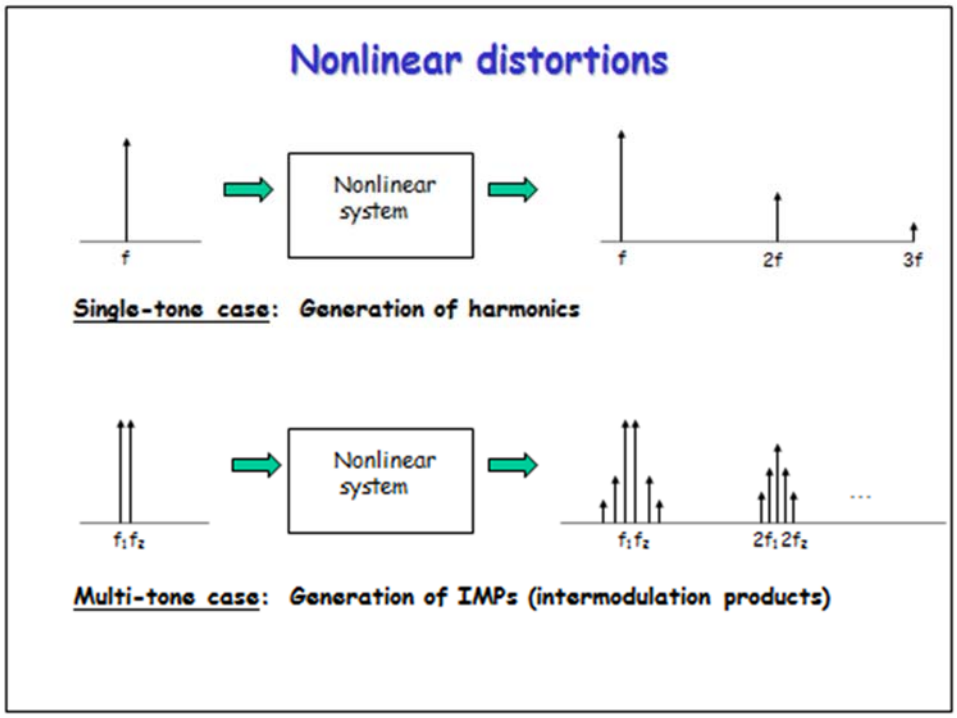
7.0 Intermodulation Interference Analysis

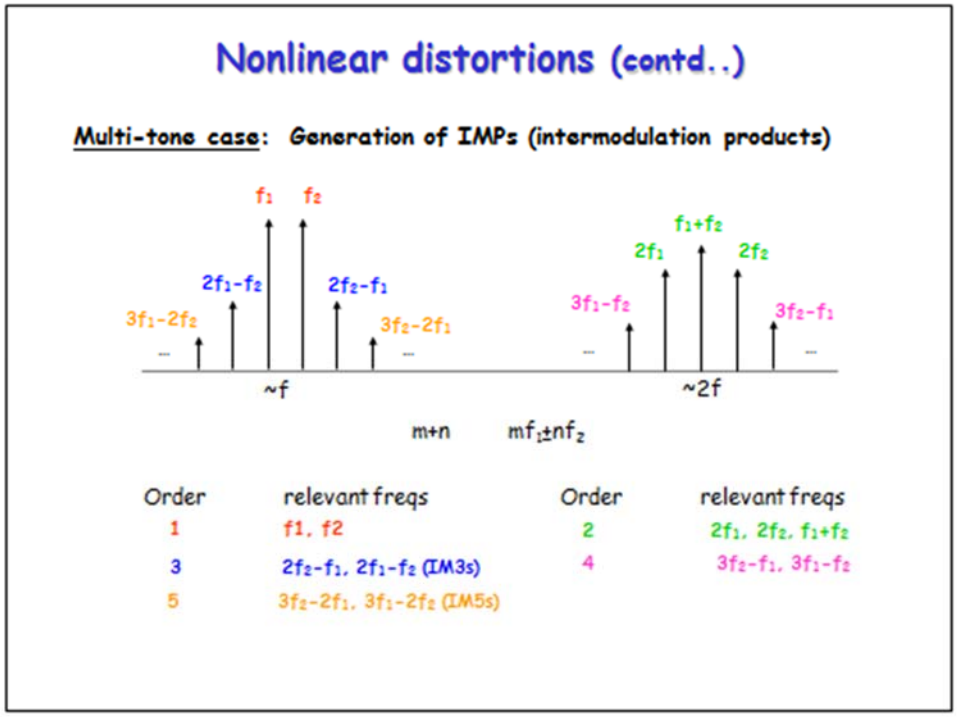
There are three basic categories of Intermodulation (IM) interference. They are receiver produced, transmitter produced, and "other" radiated IM. Transmitter produced IM is the result of one or more transmitters impressing a signal in the non-linear final output stage circuitry of another transmitter, usually via antenna coupling. The IM product frequency is then re-radiated from the transmitter's antenna. Receiver produced IM is the result of two or more transmitter signals mixing in a receiver RF amplifier or mixer stage when operating in a non-linear range.

"Other" radiated IM is the result of transmitter signals mixing in other non-linear junctions. These junctions are usually metallic, such as rusty bolts on a tower, dissimilar metallic junctions, or other non-linear metallic junctions in the area. IM products can also be caused by non-linearity in the transmission system such as antenna, transmission line, or connectors.

Communication sites with co-located transmitters, usually have RF coupling between each transmitter and antenna system. This results in the signals of each transmitter entering the nonlinear final output (PA) circuitry of the other transmitters. When intermodulation (IM) products are created in the output circuitry and they fall within the passband of the final amplifier, the IM products are re-radiated and may interfere with receivers at the same site or at other nearby sites. Additionally, these strong transmitter signals may directly enter a receiver and drive the RF amplifier into a nonlinear operation, or if not filtered effectively by the receiver input circuitry, these signals could mix in the nonlinear circuitry of the receiver front-end or mixer, creating IM products directly in the receiver.

The frequencies of IM mixing are known as nonlinear distortions. The images below depict how these IM products are derived when passing through a nonlinear junction/system.





Not all of the mixing possibilities are significant in creating interference signals. Some fall “out-of-band” of the receiver and the higher order IM products are usually weaker in signal strength.

7.1 Transmitter Generated Intermodulation Analysis

Intermodulation in transmitters occurs when a signal from another transmitter is impressed on the nonlinear final output stage circuitry, usually via antenna coupling. The power level of the IM product is determined by the power level of the incoming extraneous signal from another transmitter and by a conversion loss factor. The conversion loss factor takes into account the mixing efficiency of the transmitter's final output stage. Conversion loss differs with transmitter design, adjustment, frequency separation of the source signals, and with the order of the IM product.

The analysis calculates all possible IM product frequencies that could potentially interfere with receivers at the communications site based on each receiver's individual bandwidth. It then predicts each IM signal level present at the input of each affected receiver. For each IM frequency, the analysis considers all possible sources of IM generation in the transmitters. For example, if there are four transmitters involve, the analysis will calculate the IM signal level that would be generated in each transmitter. For this example, that would be four possible mixing conditions.

The analysis takes into account the transmitter's power output, modulation bandwidth, conversion losses, transmission line losses, filters, duplexers, combiners, isolators, multi-couplers and other RF devices that are present in each system. Additionally, the analysis considers the antenna separation space loss, horizontal and vertical gain components of the antennas as well as how they are mounted on the structure. The gain components are derived from antenna pattern data published by each manufacturer.

The analysis determines how much isolation is required to prevent receiver performance degradation for each IM interference signal that occurs. Receivers experiencing transmitter generated intermodulation interference are depicted in the following Table.

Tx 1 Source Mix		Tx 2 Source		TX 3 Source		Tx 4 Source		Tx 5 Source		Intermod Hit		Affected Receiver		Attn Need
ID	Tx Freq (MHz)	ID	Freq (MHz)	ID	Freq (MHz)	ID	Freq (MHz)	ID	Freq (MHz)	Freq (MHz)	Ord	ID	Freq (MHz)	
None														

No transmitter generated intermodulation interference problems were predicted.

7.2 Receiver Generated Intermodulation Analysis

Within a receiver, when two or more strong off-channel signals enter and mix in the receiver and one of the IM product frequencies created coincides with the receiver operating frequency, potential interference results. This internal IM mixing process takes place in the receiver's RF amplifier when it operates in a nonlinear range and/or in the first mixer, which, of course, has been designed to operate as a nonlinear device.

Receivers have a similar conversion loss type factor and receiver performance is commonly described in terms of conversion loss with respect to the 2A - B type products. Here, conversion loss is the ratio of a specified level of A and B to the level of the resulting IM product, when the product is viewed as an equivalent on-channel signal. Receiver conversion loss varies with input levels, AGC action, and product order.

The analysis calculates all possible IM product frequencies that could potentially interfere with receivers at the communications site based on each receiver's individual bandwidth. It then predicts each IM signal level present at the input of each affected receiver. For each IM frequency, the analysis considers that the IM signal is generated directly in the receiver.

The analysis takes into account the transmitter's power output, modulation bandwidth, conversion losses, transmission line losses, filters, duplexers, combiners, isolators, multi-couplers and other RF devices that are present in each system. Additionally, the analysis considers the antenna separation space loss, horizontal and vertical gain components of the antennas as well as how they are mounted on the structure. The gain components are derived from antenna pattern data published by each manufacturer.

The analysis determines how much isolation is required to prevent receiver performance degradation for each IM interference signal that occurs. Receivers experiencing receiver generated intermodulation interference are depicted in the following Table.

Tx 1 Source		Tx 2 Source		TX 3 Source		Tx 4 Source		Tx 5 Source		Intermod Hit		Affected Receiver		Attn Need
ID	Freq (MHz)	ID	Freq (MHz)	ID	Freq (MHz)	ID	Freq (MHz)	ID	Freq (MHz)	Freq (MHz)	Ord	ID	Freq (MHz)	
None														

No receiver generated intermodulation interference problems were predicted.

8.0 Transmitter Harmonic Output Interference Analysis

Transmitter harmonic interference is due to non-linear characteristics in a transmitter. The harmonics are typically created due to frequency multipliers and the non-linear design of the final output stage of the transmitter. If the harmonic signal falls within the passband of a nearby receiver and the signal level is of sufficient amplitude, it can degrade the performance of the receiver.

The analysis takes into account the transmitter's harmonic characteristics, output level, transmission line losses, filters, duplexers, combiners, isolators, multi-couplers and other RF devices that are present in each system. Additionally, the analysis considers the antenna separation space loss, horizontal and vertical gain components of the antennas as well as how they are mounted on the structure. The gain components are derived from antenna pattern data published by each manufacturer.

The analysis determines how much isolation is required to prevent receiver performance degradation for any harmonics that fall within a receiver's passband. Receivers experiencing transmitter harmonic interference are depicted in the following Table.

Transmitter		Harmonic		Affected Receiver		Attn Needed
ID	**Frequency (MHz)**	**Frequency (MHz)**	**Order**	**ID**	**Frequency (MHz)**	
None						

No transmitter generated harmonic interference problems were predicted.

9.0 Transmitter Spurious Output Interference Analysis

Transmitter spurious output interference can be attributed to many different factors in a transmitter. The generation of spurious frequencies could be due to non-linear characteristics in a transmitter or possibly the physical placement of components and unwanted coupling. If a spurious signal falls within the passband of a nearby receiver and the signal level is of sufficient amplitude, it can degrade the performance of the receiver.

The analysis takes into account a transmitter's spurious output specification, output levels, transmission line losses, filters, duplexers, combiners, isolators, multi-couplers and other RF devices that are present in each system. Additionally, the analysis considers the antenna separation space loss, horizontal and vertical gain components of the antennas as well as how they are mounted on the structure. The gain components are derived from antenna pattern data published by each manufacturer.

Note: With the modern design of transmitters, Spurious interference results are rare. Any results in this Report Section could be from Transmitter Noise or Receiver Desense issues. Refer to report Section 5 or 6. Once any TNRD issues are resolved, it should clear up any Spurious Issues being reported.

The analysis determines how much isolation is required to prevent receiver performance degradation for any transmitter spurious signals that fall within a receiver's passband. Receivers experiencing transmitter spurious output interference are depicted in the following Table.

Transmitter		**Affected Receiver**		**Attn Needed**
ID	**Frequency (MHz)**	**ID**	**Frequency (MHz)**	
None				

No transmitter generated spurious interference problems were predicted.

10.0 Interference Power Level Summing Analysis

This section of the report provides a summary of all interference power levels associated with each individual receiver at the site. This includes the sum of IM, transmitter wideband noise and receiver desensitization power levels. The carrier-to-noise (C/I + N) ratio for each receiver is based on the aggregate of interference power levels.

A negative (C/I + N) ratio indicates that the performance of the receiver is degraded and the value indicates how much additional isolation is required to prevent receiver performance degradation.

Even though the individual interference modes described above are not reported in other report sections, this analysis represents a worst-case interference scenario in which all transmitters at the site are simultaneously activated. However, the probability of this interference occurrence could be low since it depends on the utilization of the transmitters involved in the interference generation.

Receivers with a negative (C/I + N) ratio are depicted in the following Table.

Receiver		Interference Power Level (dBw)				
Channel Label	**Freq (MHz)**	**Tx Noise**	**Rx Desense**	**IM Power**	**Aggregate**	**C / (I+N)**
None						

11.0 Discussion and Recommendations

Sitesafe has done FCC research on this site and used this information whenever possible in this study.

Sitesafe has used generic antennas and/or equipment when specific details concerning antennas/equipment were not provided or found in our FCC research. Sitesafe has made assumptions for antenna systems when specific details were not provided or found in our FCC research.

All Spokane Regional Emergency Communications Systems (SRECS) active FCC licenses found for this location (WQQW997, WQOQ592, WQPM588) have been included in this analysis.

Conclusion: There is no indication that the proposed collocation by New J, LLC will cause any intentional harmful interference to the existing carriers / operations on this structure.

12.0 Professional Certification

Engineering Statement Re:

Potential for Interference to Existing Services

At

SPC007 - COE Rd, for New J, LLC

My signature on this study hereby certifies and affirms:

That I am an employee of QualTek Wireless, LLC, sister company to Site Safe, LLC (both under the parent company QualTek), in Vienna, Virginia, at which place the staff provides RF compliance services to clients in the wireless communications industry; and

That I have examined the technical information supplied by New J, LLC and their representatives relating to their intention to install antennas, transmitters and associated technical equipment on an existing communication site, on an existing tower/structure, currently identified as SPC007 - COE Rd; and

That the technical equipment to be installed by New J, LLC represents the state of the art and that it has been carefully designed to preclude the possibility of interference to other services which may not be included in this analysis, including the transmission and reception of broadcast AM, FM, and Television and other communications services, such as police, fire, utility and other public safety and public service facilities as well as private communications installations, such as cordless telephones, and Citizen's Band and Radio Amateur stations; and

That the equipment to be installed by New J, LLC meets or exceeds all Federal Communications Commission emission requirements to avoid interfering with other services and home/business equipment; and

That frequency information provided by New J, LLC concerning existing installations on this structure has been examined to estimate the potential for interference to existing operations, resulting from the introduction of the New J, LLC's operation; and

That this examination involved the computation of intermodulation products, transmitter harmonics, receiver desensitization, and transmitter spurious emissions produced by the combination of frequencies associated with existing services known to operate at the SPC007 - COE Rd site, and these frequencies, which could be used by others at the SPC007 - COE Rd site; and

That intermodulation products were computed (as a minimum) for the fundamental (f_0), second ($2\ f_0$) thru seventh ($7\ f_0$) harmonic components of frequencies at this site; and

That predicted products were not found to potentially cause intermodulation to New J, LLC's proposed operations or to the other licensees currently operating at the SPC007 - COE Rd site; and

That no additional isolation needs to be provided between antennas in the horizontal and vertical planes, and the attenuation along the nadir and zenith associated with vertical plane radiation patterns; and

That after examination of the levels of RF energy present at the SPC007 - COE Rd site, receiver sensitivity should not be degraded by either the existing operations or New J, LLC's proposed operations; and

That, if interference were to occur as a result of New J, LLC's operations, New J, LLC would be expected to recognize its responsibility to act promptly to take steps necessary to correct the interference, including, but not limited to, filtering and frequency coordination; and

In summary, it is stated here that there is not an indication that the installations being proposed by New J, LLC will create interference to their own operations, or the operations of any of the services currently operating at the SPC007 - COE Rd site. Even in the event that, upon installation of New J, LLC's equipment, interference was determined to exist, and New J, LLC's equipment was determined to be the actual interference source, frequency coordination and filtering would be New J, LLC's primary corrective course of action and should successfully eliminate the problem.

Certain generic technical assumptions regarding power settings, filtering, and equipment characteristics were made in preparing this analysis, as this technical information was not made available by the client.

Thank You for Using Sitesafe for Your RF Engineering Needs.