Wireless Network Site Survey

Pflugerville, Texas

2019

Overview of Sites:

- Hendrickson Tower
- Police Tower
- South Standpipe Tower
- Wilke Heatherwilde Tower
- Animal Control
- Bohl's Lift Station
- Boulder Ridge Lift Station
- Building Maintenance House
- City Hall
- Club Lift Station
- Coronado Lift Station
- Developmental Center
- Dunes Lift Station
- Eagle Point Lift Station
- Falcon Point Lift Station
- Highland Park Lift Station
- Kelly Lane Lift Station
- Lake Pump
- Library
- Littleblackhawk Lift Station
- Mud Valve 5
- Parks Department Administration
- Pfenning Pump Station
- Pfluger Crossing Lift Station
- Well Site 5
- Well Site 7
- Weiss Lane Lift Station
- Well Site 4
- Well Site 6
- Well Site 8

Scope of Work Overview

The objective of this project is to provide redundancy for city operations that utilize the current fiber network by also providing a high capacity wireless backhaul and wireless ability for the city's municipal operations such as emergency services, water/wastewater, and administration. The proposed network would allow the city to gain much more remote functionality while adding another layer of redundancy to the existing disparate fiber networks.

Each of the proposed sites was surveyed in person for required amenities that a wireless network would need to be deployed. These include:

- Power: AC or DC availability on site.
- Mounting: Where a wireless node or nodes can be installed while having clear line of sight to other nodes.
- Security: Does the site have the option to be secured from public access.
- LAN Access: Does the site have local wired access to the city's core network.
- Spectrum Analysis: Identify open RF channels for use in the 2.4GHz, 4.9GHz, and 5.8GHz spectrum. (CBRS/3.xGhz was also used as a design option while not being evaluated in the spectrum analysis as the bands in question would be licensed/lite-licensed at the time of deployment)

Summary

Throughout the city, 2.4GHz has been found to be used everywhere. While it could probably be used in limited capacity, it is not recommended. The UNI III band of 5.8GHz is relatively open with channel 149 and 157 found utilized at only a few sites. Channel 165 was not found to be used anywhere. 4.9GHz is known to be used by the GATORS system and was found to be used around only a few sites. 4.9GHz is reserved for public safety so approval would need to be had in order to use that spectrum. At the current planning stage, it is recommended that one 'private' band (3.x or 4.9) and one public band (5.8) be used in tandem.

All sites currently have power availability and only a few of them would need additional tower/mast deployment in order to have sufficient Line of Sight to a neighboring sites or towers. All of these details are reviewed on an individual basis in the following overview.
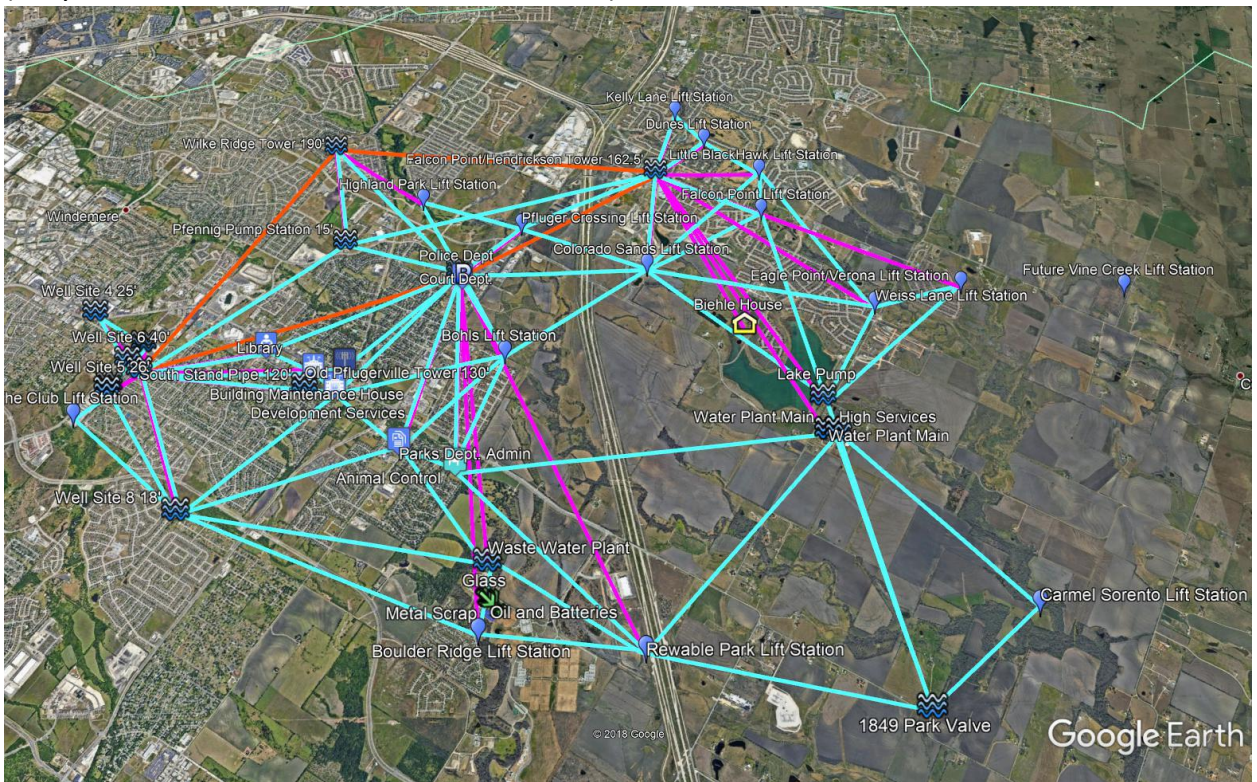
Backhaul Layout
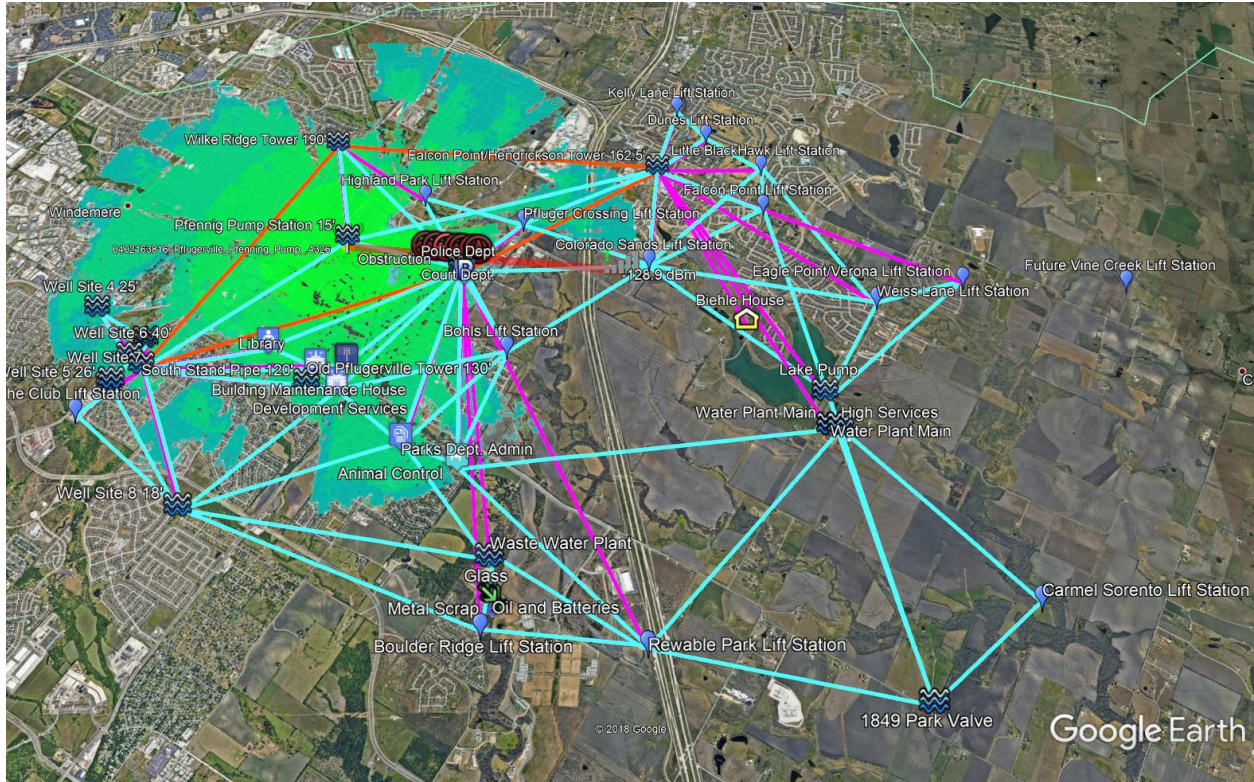(Licensed Gigabit Capable Point to Point Core Network)
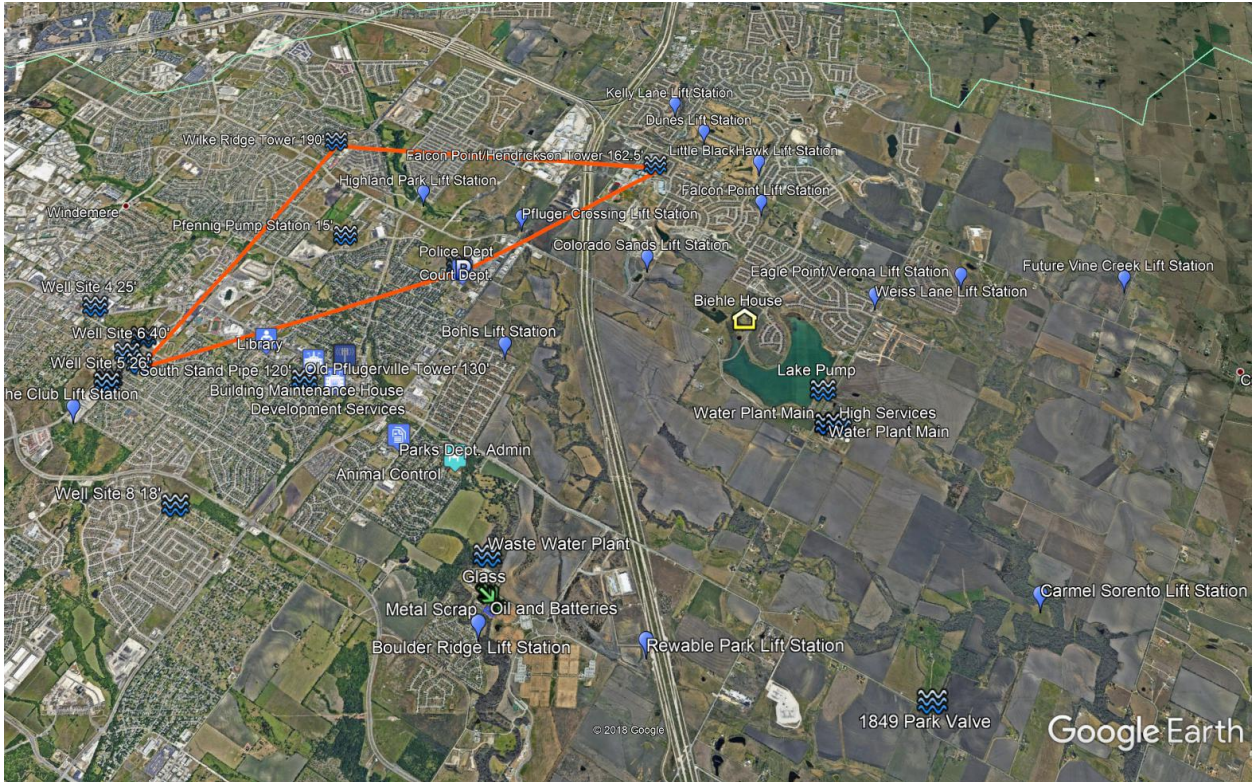
Design Option 1
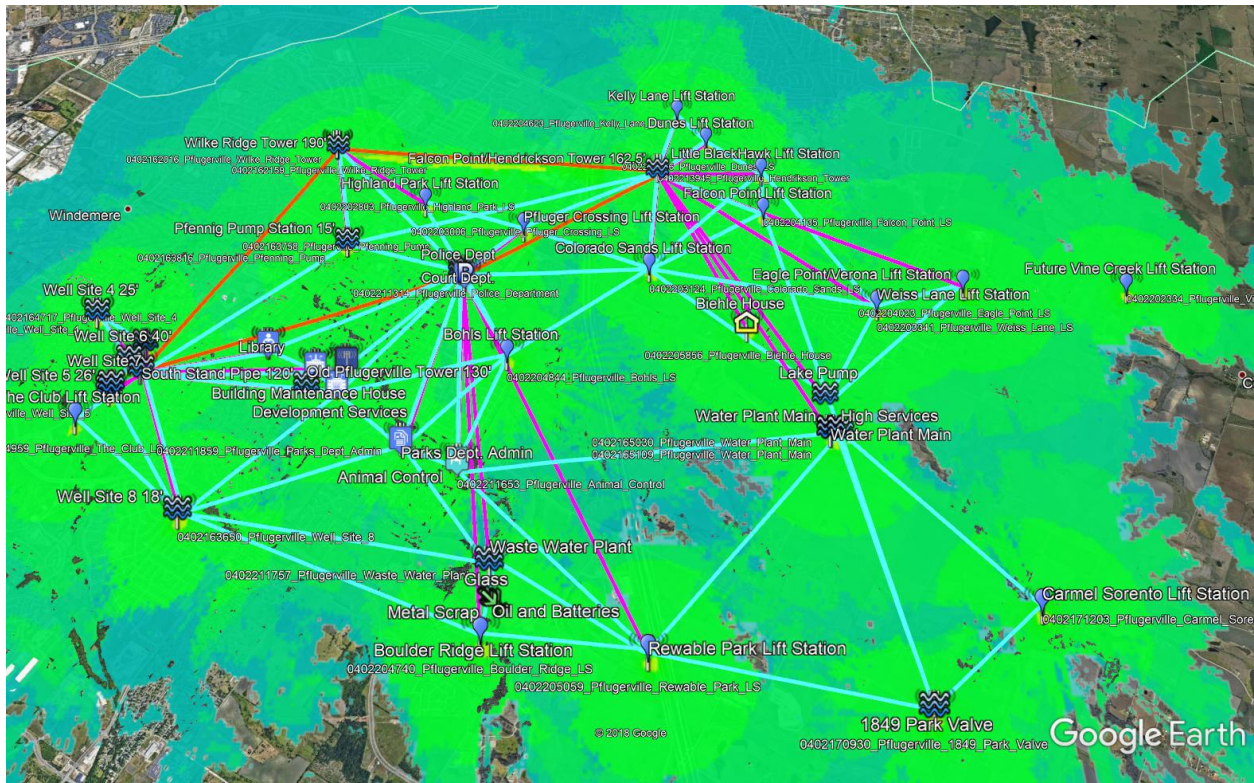(Point to Multi-Point Distribution Network)
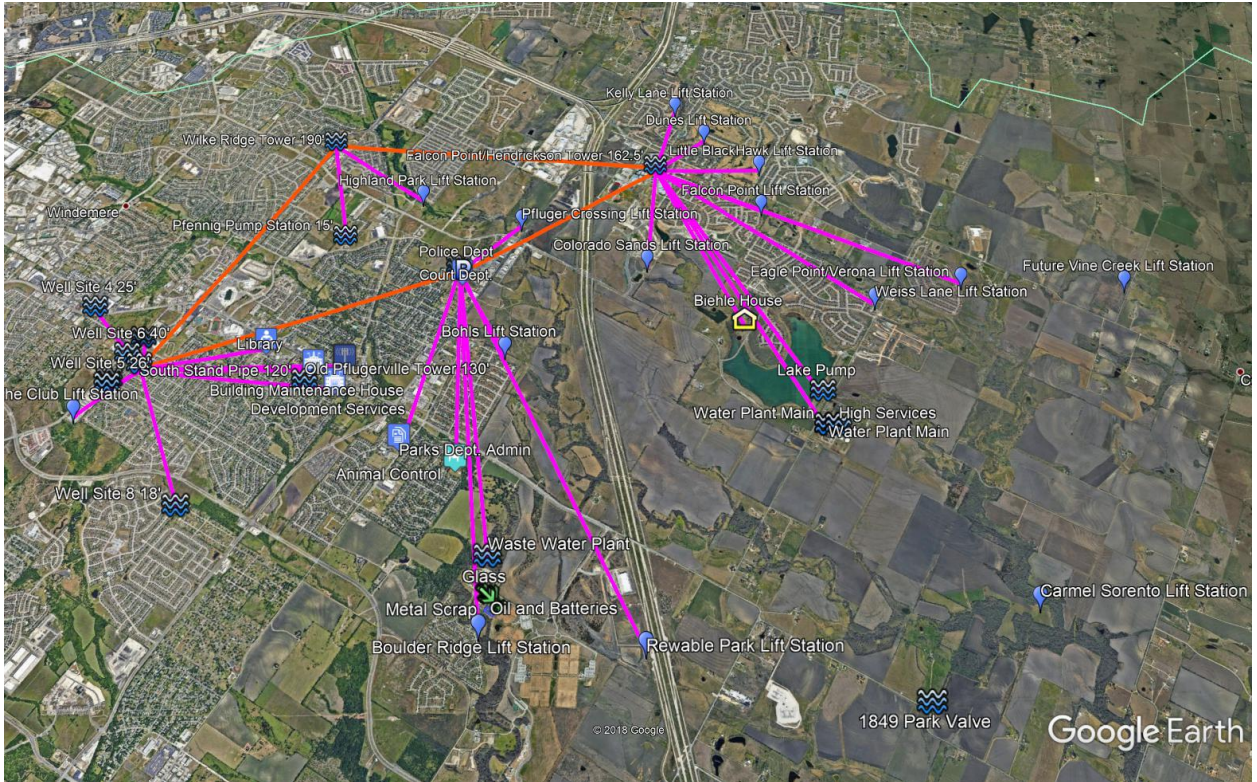
Design Option 2
(Fully Meshed Dual Band Distribution Network)

Propagation Study – Single Site Example at 5.8Ghz

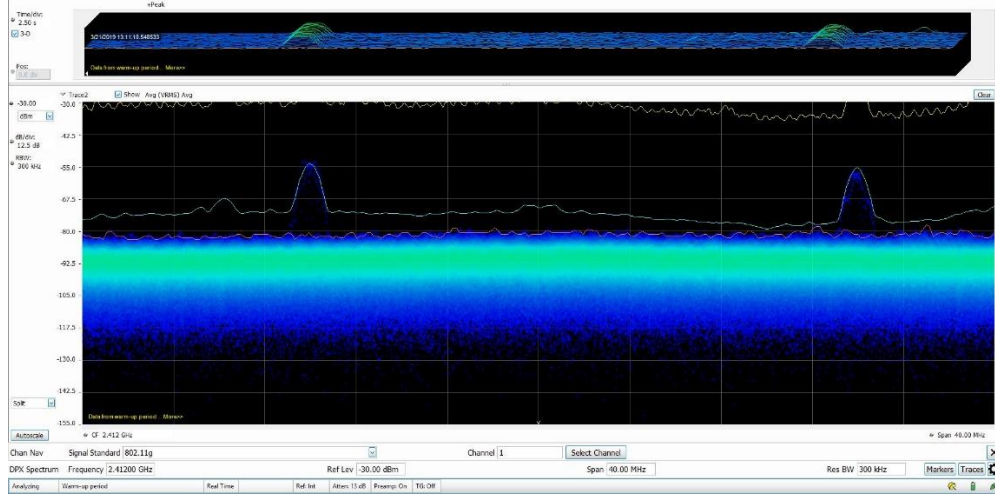## Propagation Study – Complete Coverage Example at 5.8Ghz

Hendrickson Tower

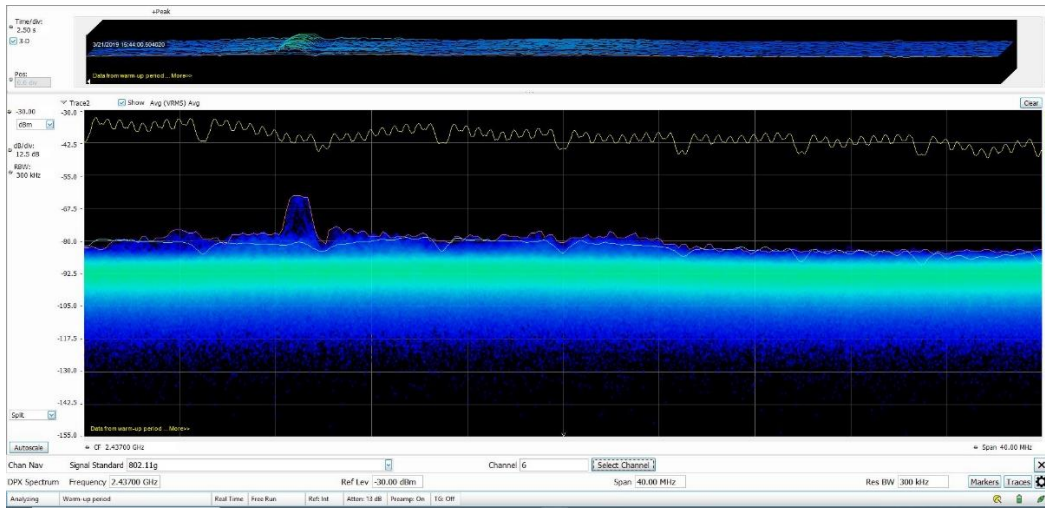|	
Available Power	Power is available.
Mounting Option	Mounting is available on the tower.
Security	This site is secured behind a locked fence and locked door.
LAN Access	There will be fiber run to this site.
Spectrum Analysis	2.4GHz is saturated. 5GHz channel 157 is used. 4.9GHz is open.

# Hendrickson Tower 2.4GHz Spectrum Analysis
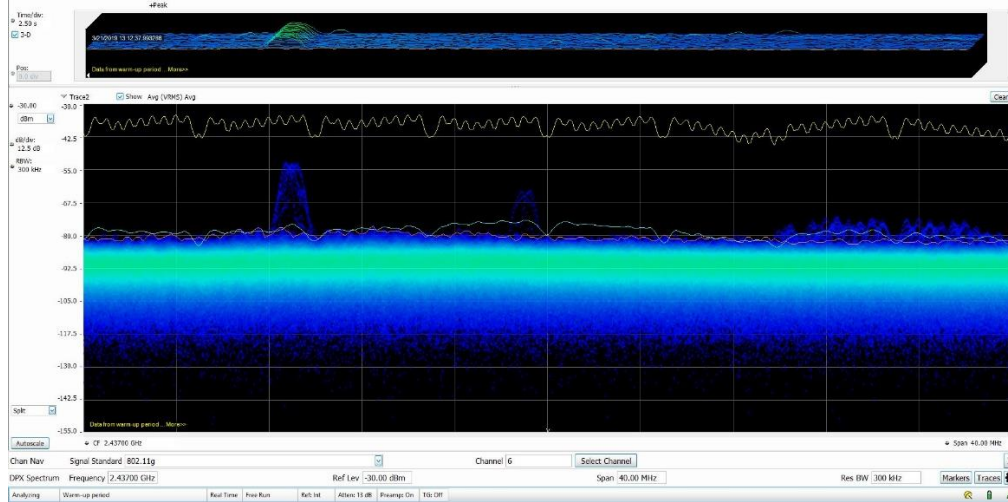
Channel 1

Channel 6
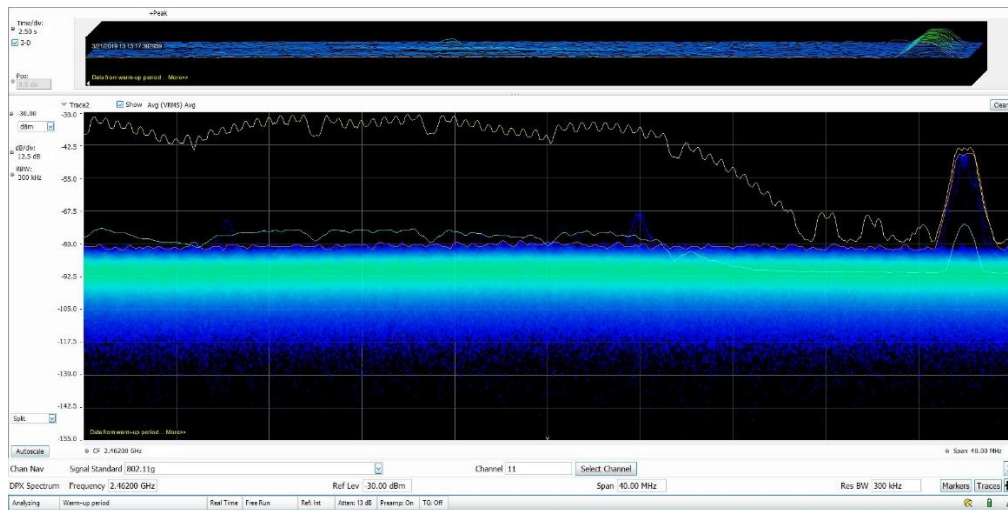
Channel 11

Hendrickson Tower 5.8GHz Spectrum Analysis
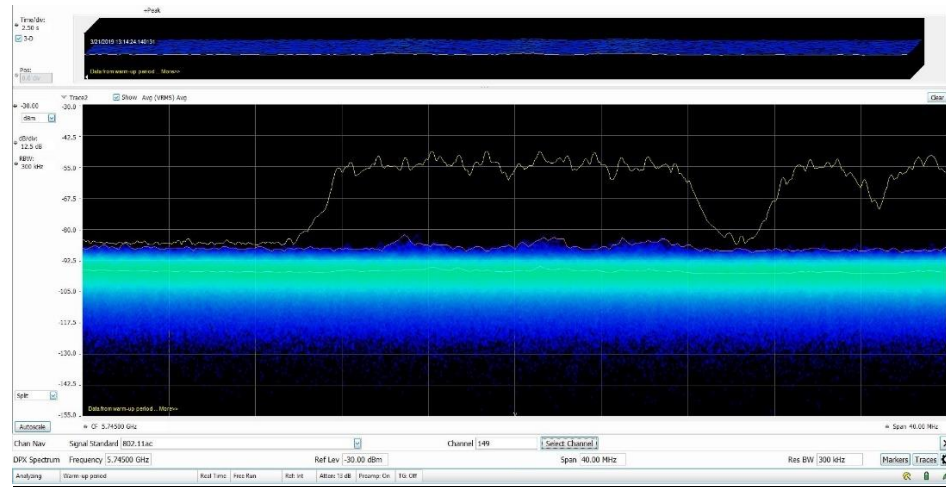
Channel 149
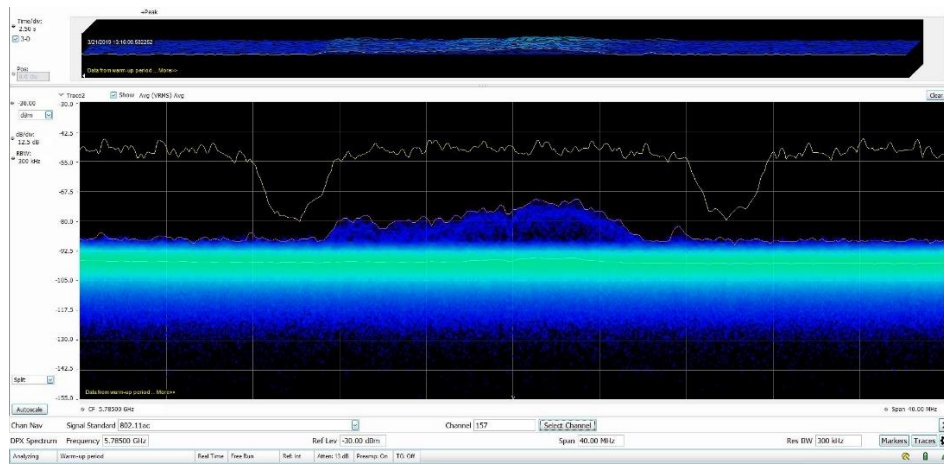
Channel 157

Channel 165
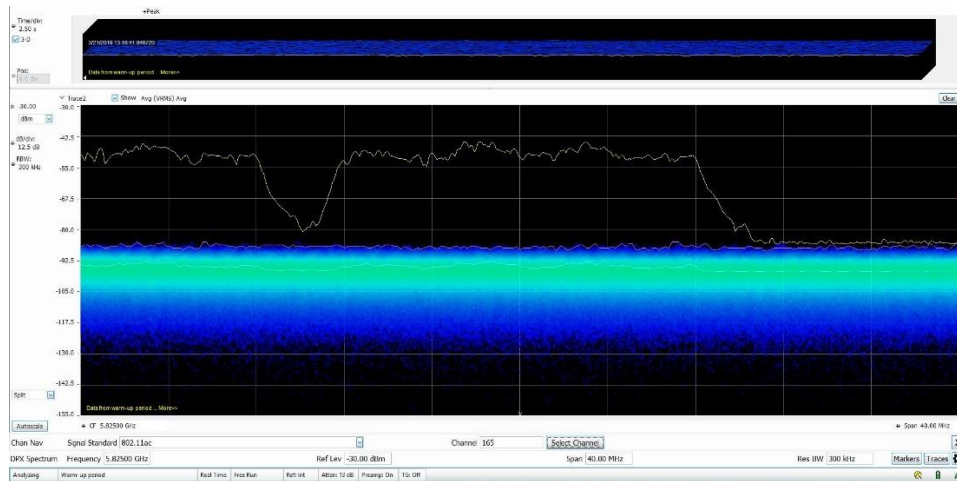
Hendrickson Tower 4.9GHz Spectrum Analysis

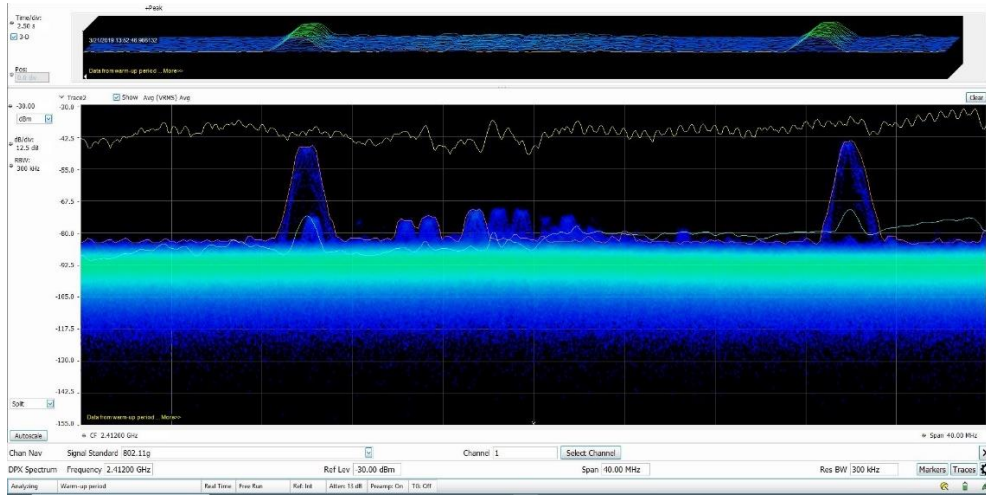## 4.94GHz
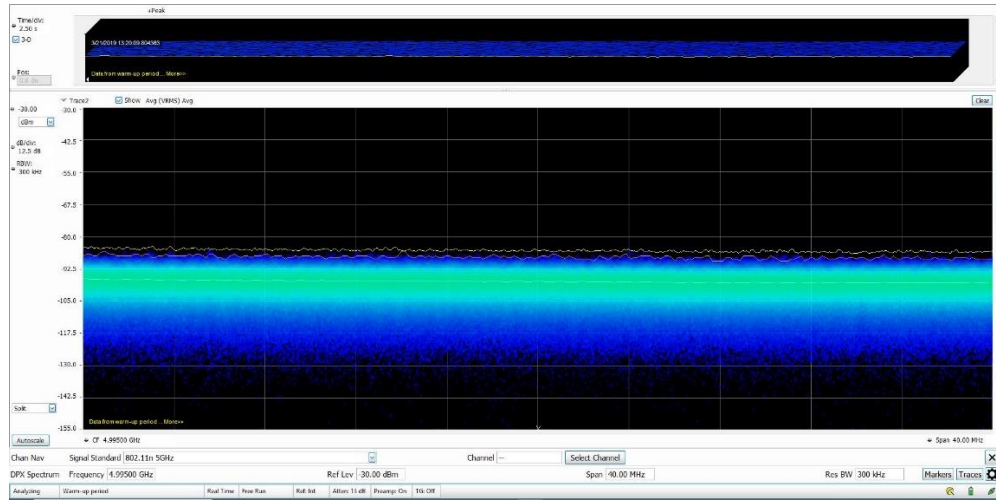
4.96GHz
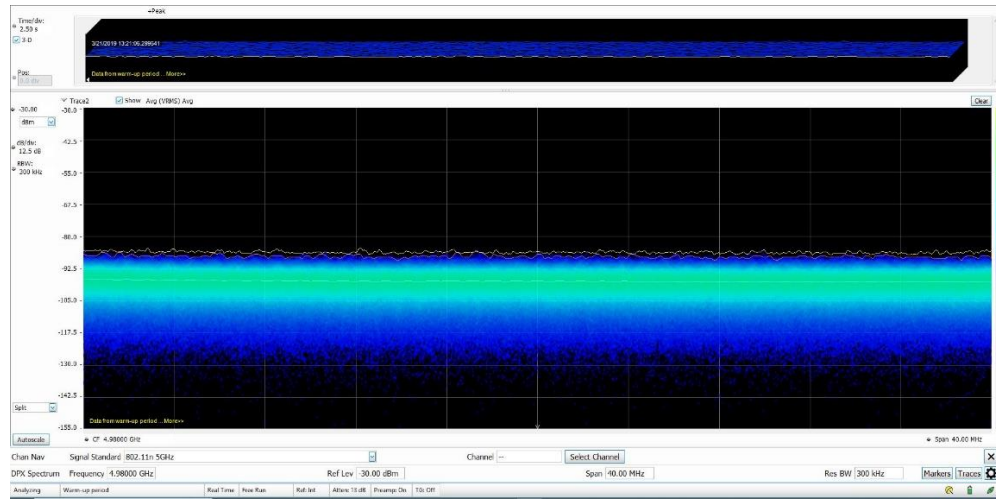
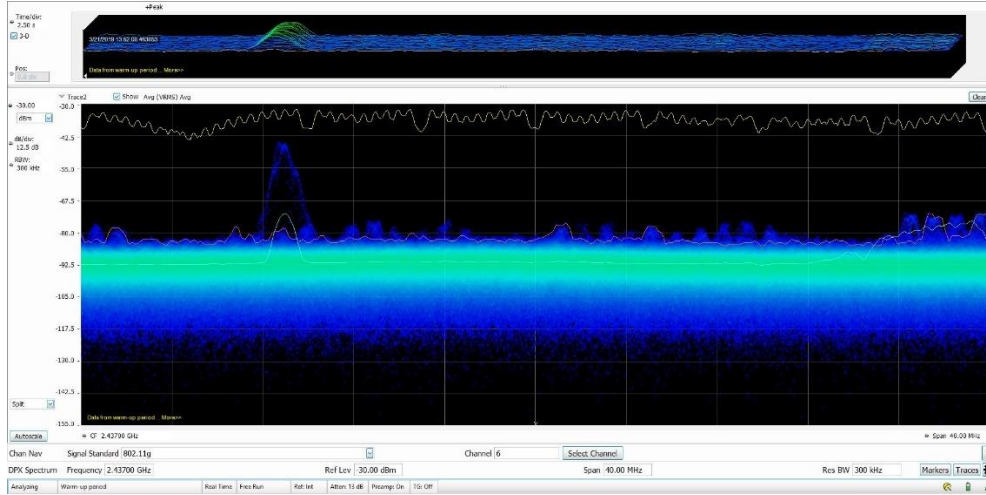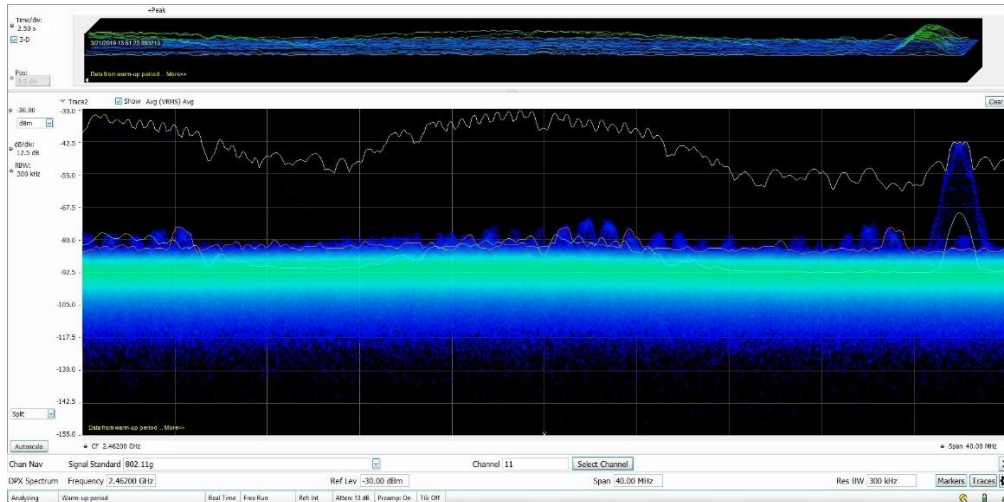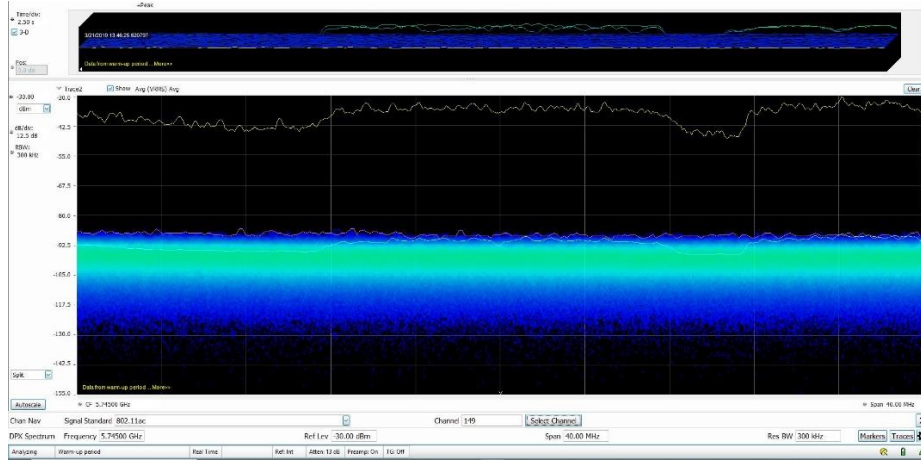## 4.99GHz

Police Tower

Available Power	Power is available.
Mounting Option	Mounting is available on the tower.
Security	This site is secured behind a locked fence and locked door.
LAN Access	There will be fiber run to this site.
Spectrum Analysis	2.4GHz is saturated. 5GHz channel 149 is used. 4.9GHz is used around 4.90GHz.

NO PICTURE ATTACHED DUE TO SECURITY CONCERNS

Police Tower 2.4GHz Spectrum Analysis
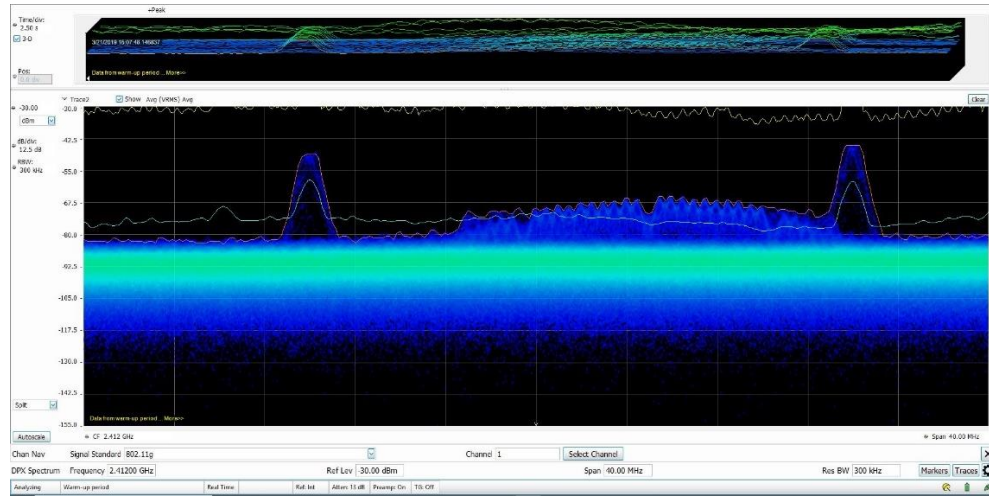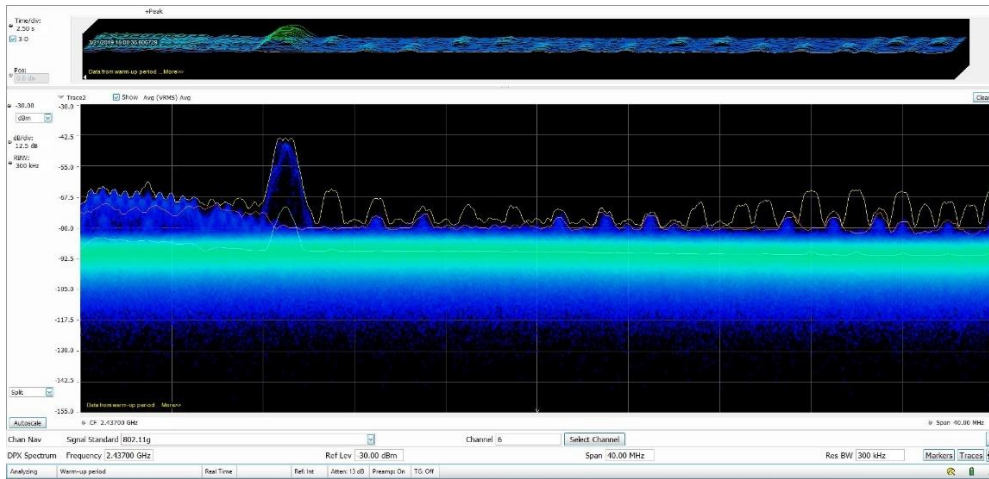
Channel 1

Channel 6
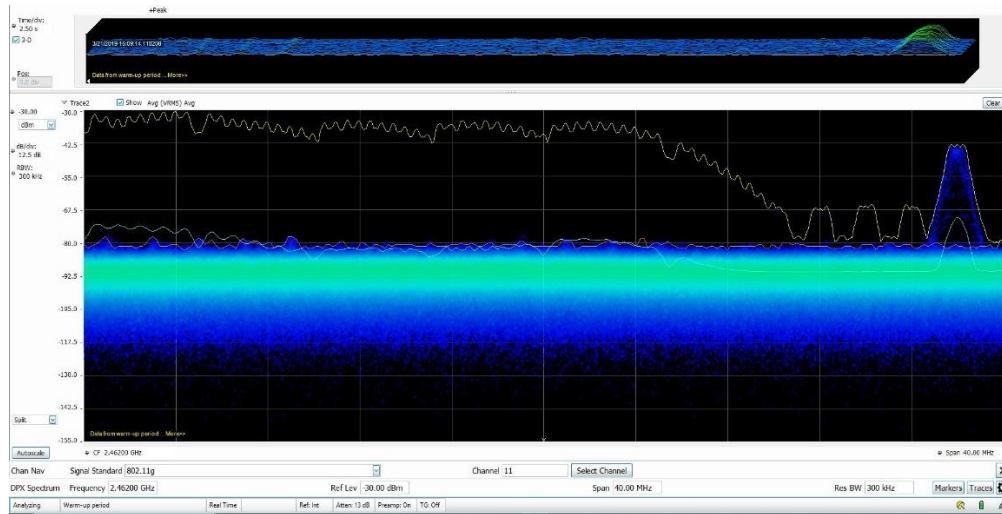
Channel 11

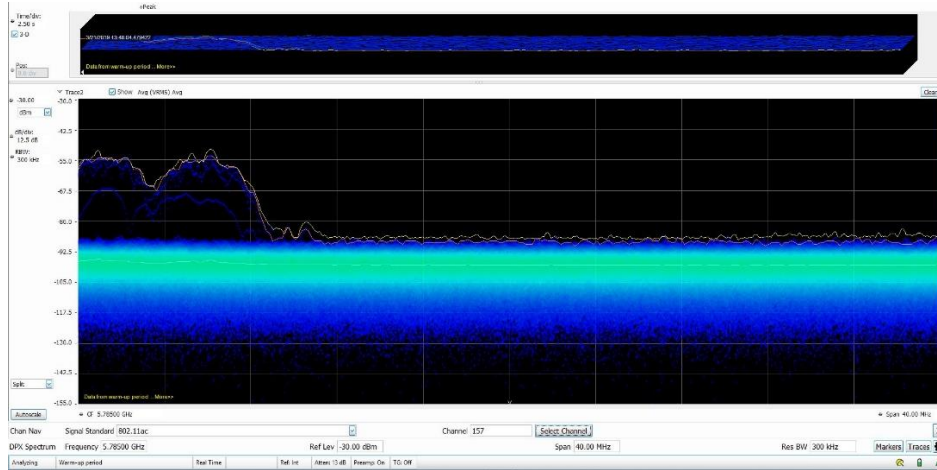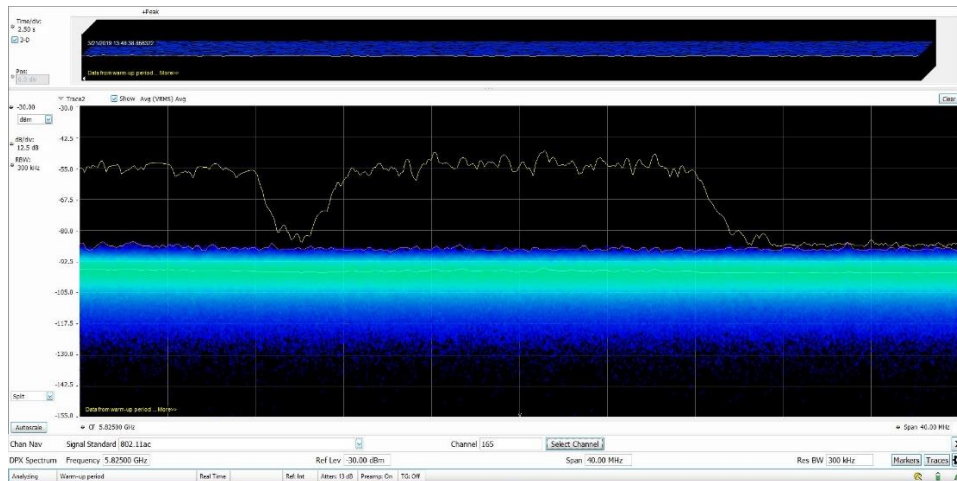## Police Tower 5.8GHz Spectrum Analysis
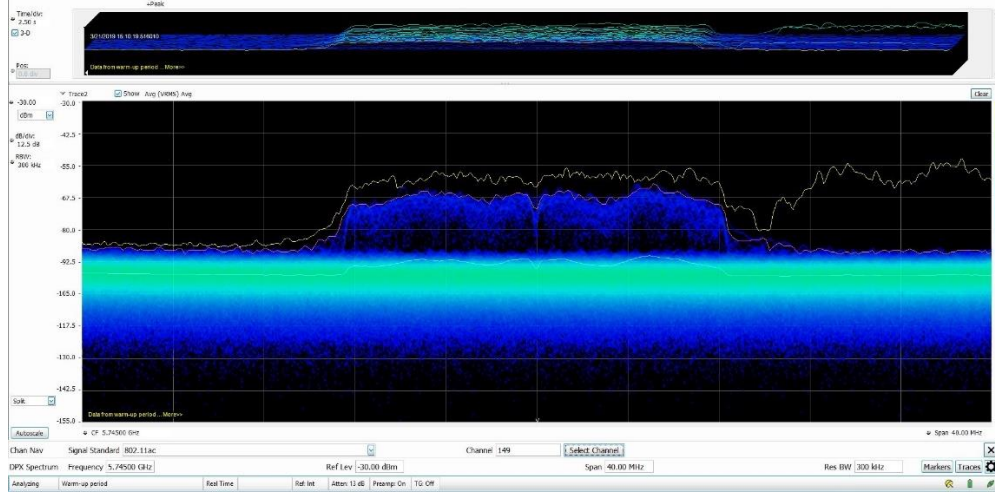
Channel 149
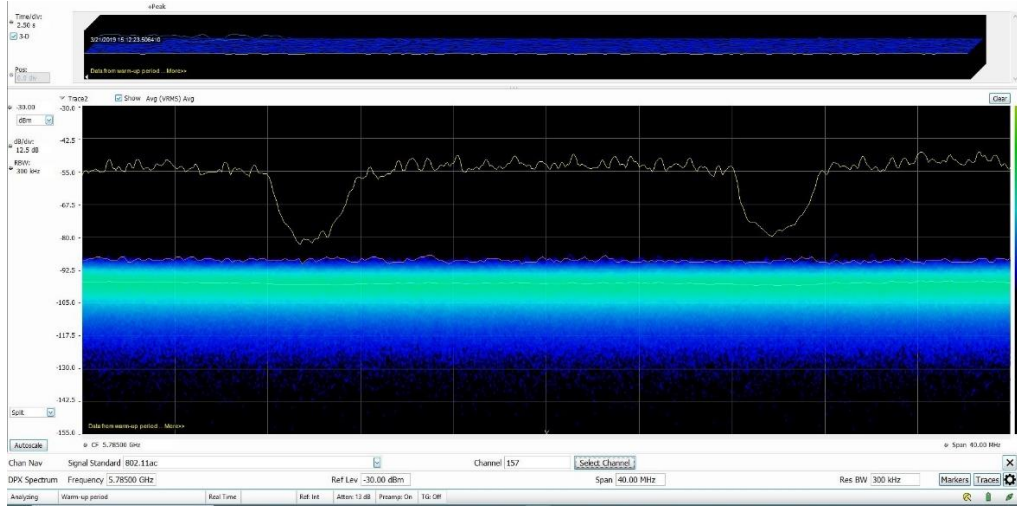
Channel 157

Channel 165
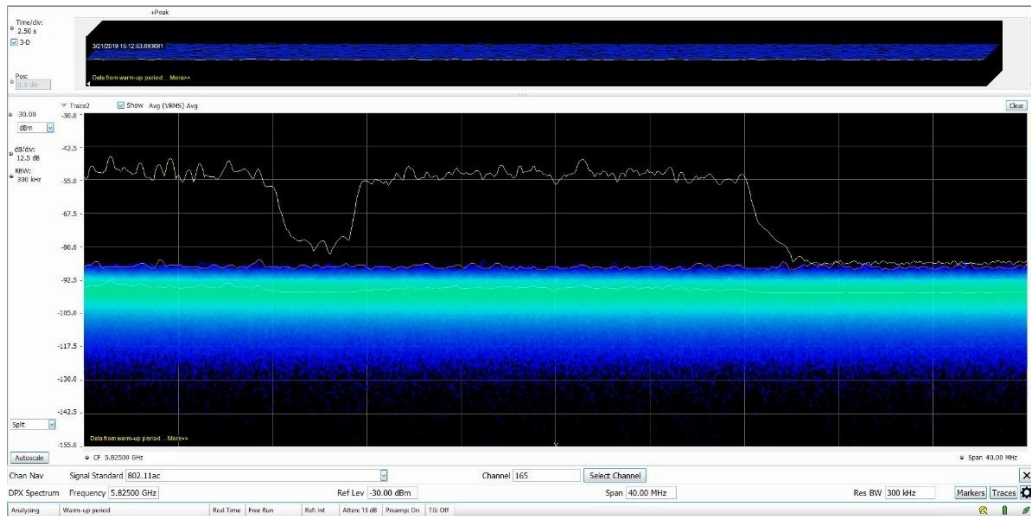
Police Tower 4.9GHz Spectrum Analysis

4.94GHz
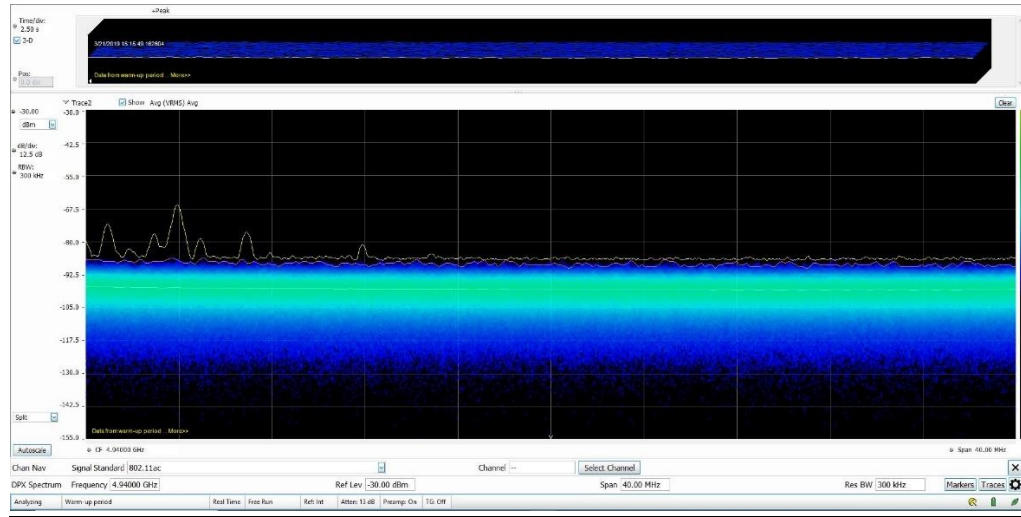
4.96GHz
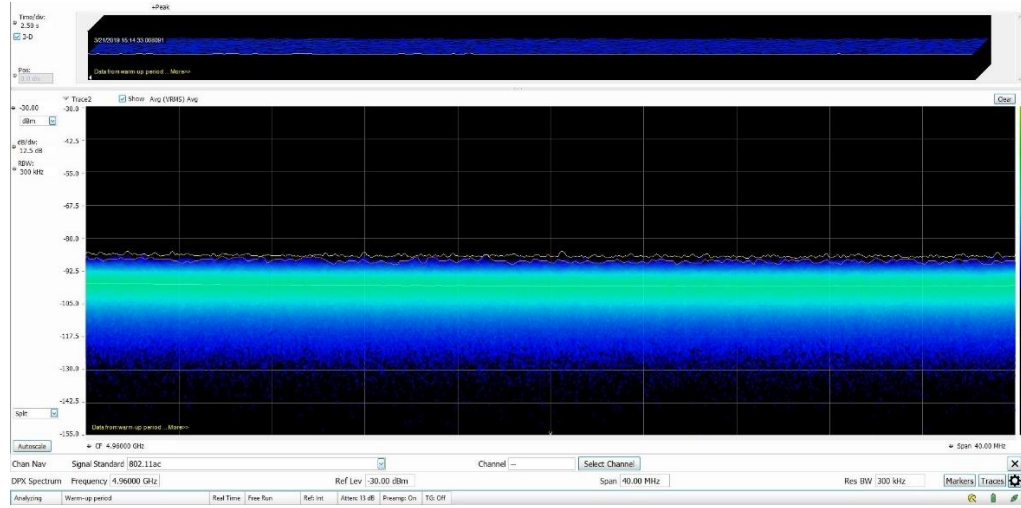
4.99GHz
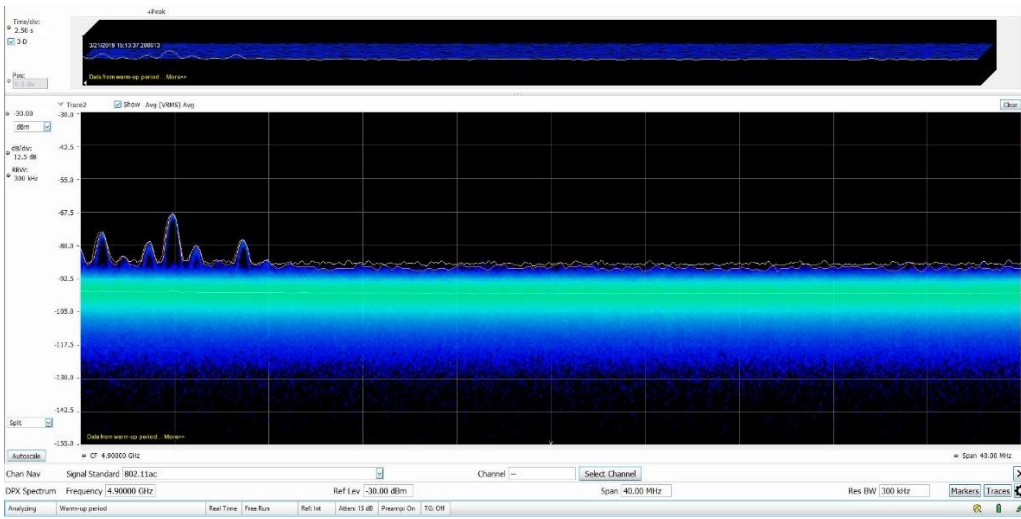
South Standpipe Tower
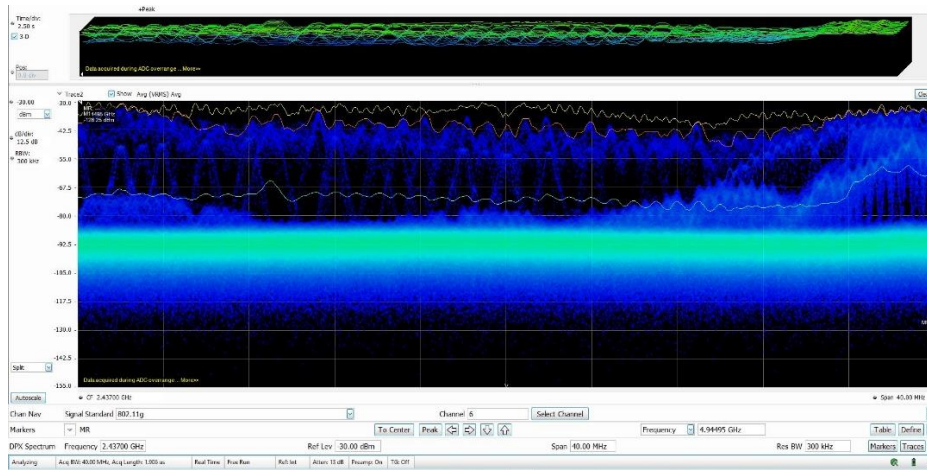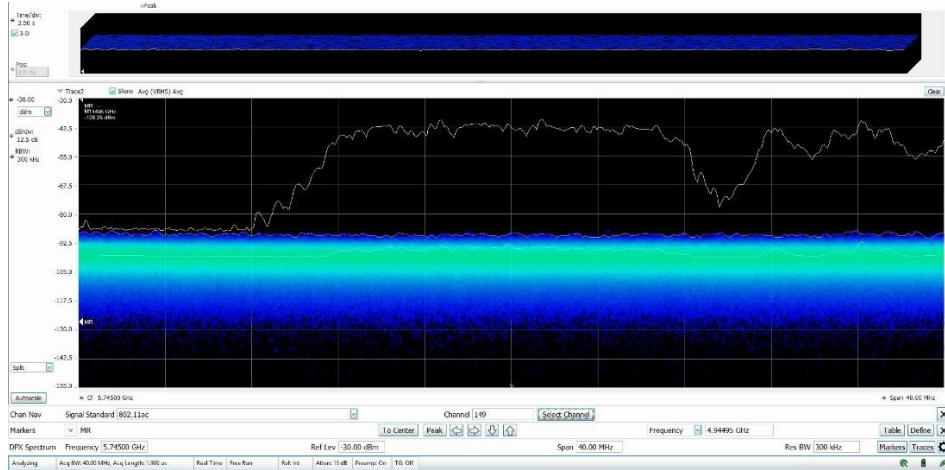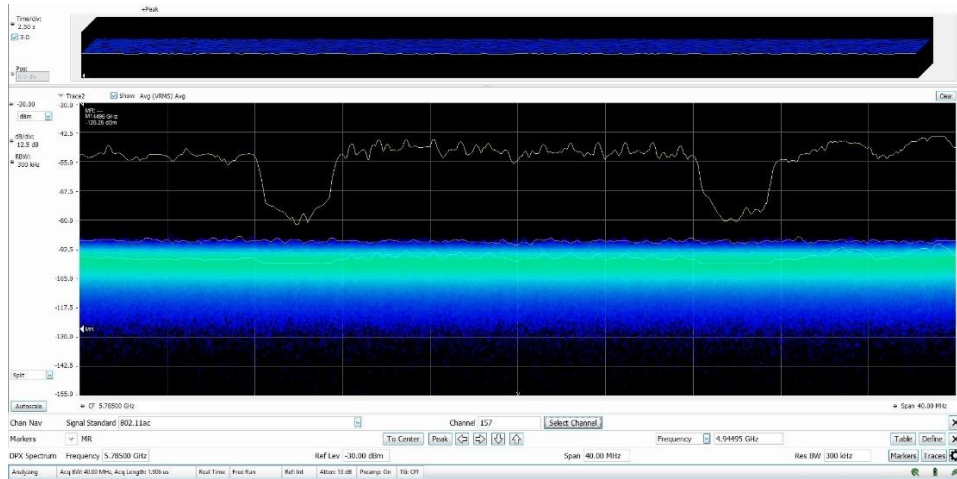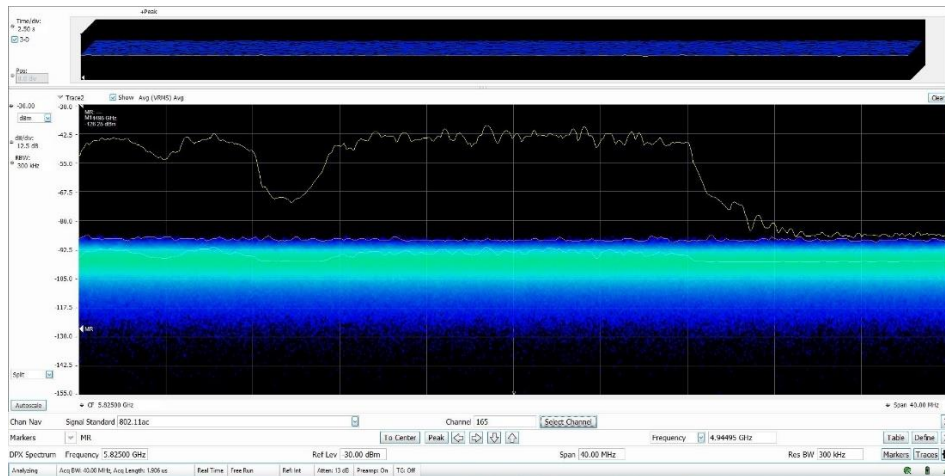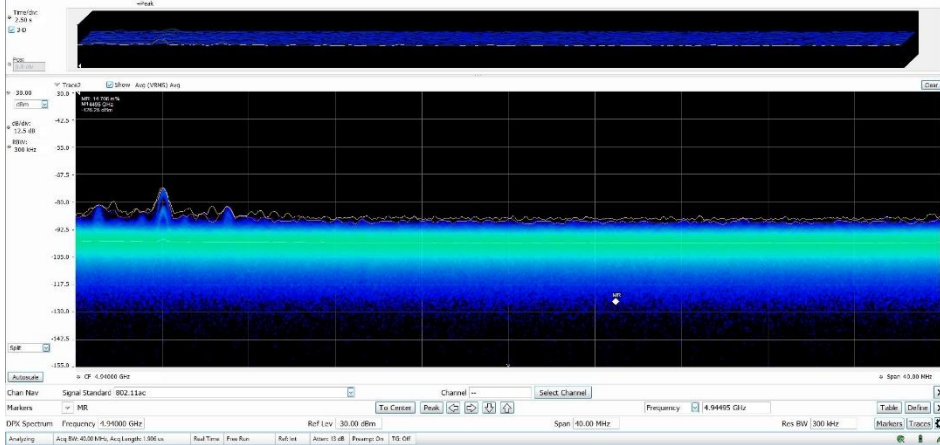
Available Power	Power is available.
Mounting Option	Mounting is available on the tower.
Security	This site is secured behind a locked fence and locked door.
LAN Access	There will be fiber run to this site.
Spectrum Analysis	2.4GHz is saturated. 5GHz channel 149 is used. 4.9GHz is not being used.

South Standpipe Tower 2.4GHz Spectrum Analysis
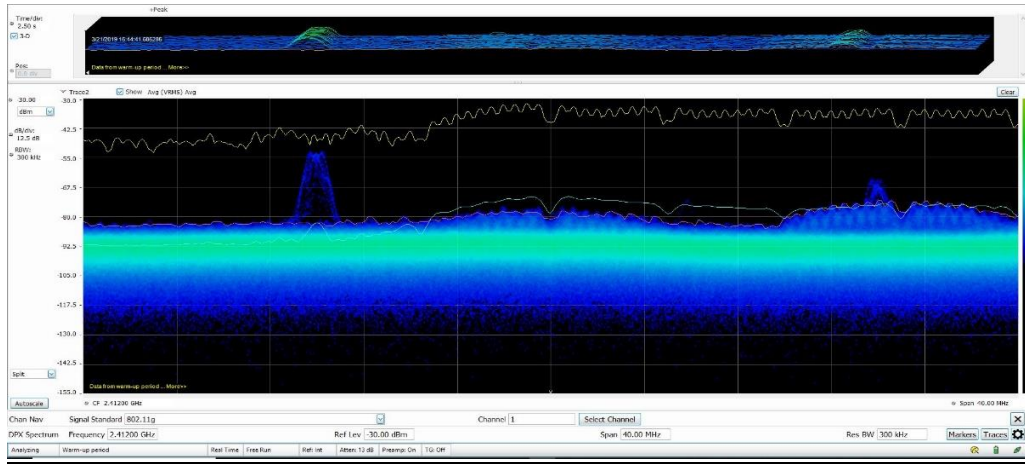
Channel 1

Channel 6
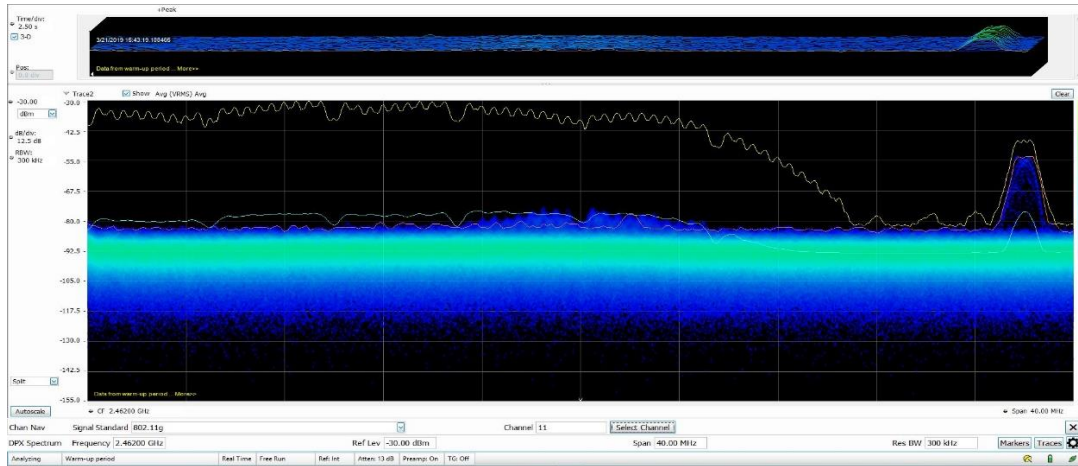
Channel 11

South Standpipe Tower 5.8GHz Spectrum Analysis
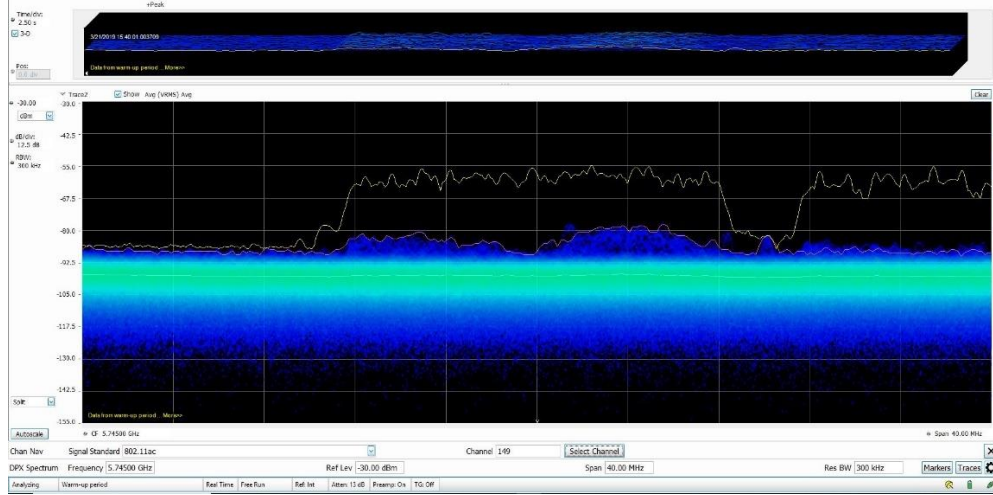
Channel 149
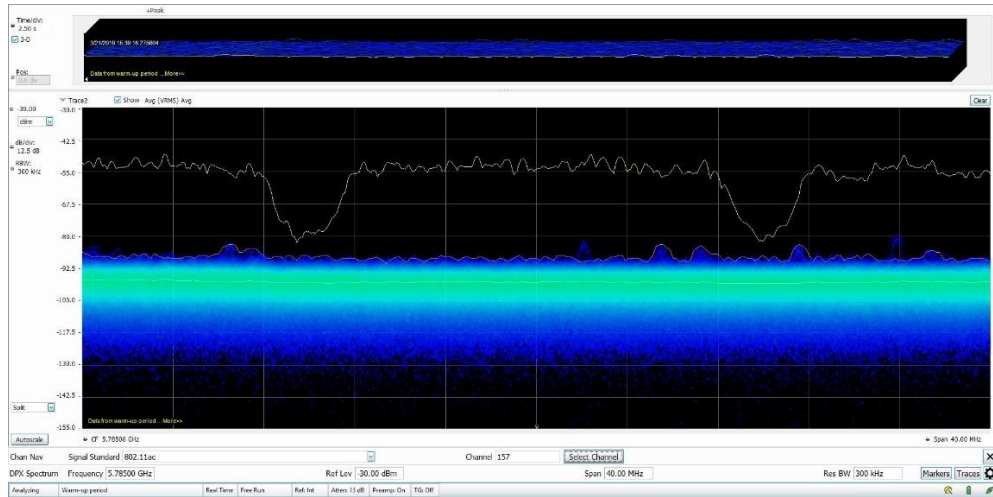
Channel 157

Channel 165
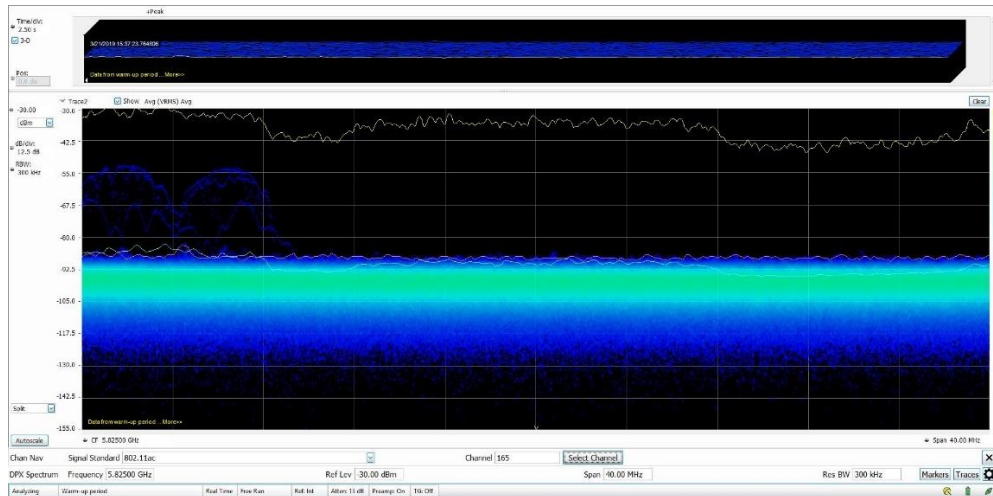
South Standpipe Tower 4.9GHz Spectrum Analysis

4.94GHz
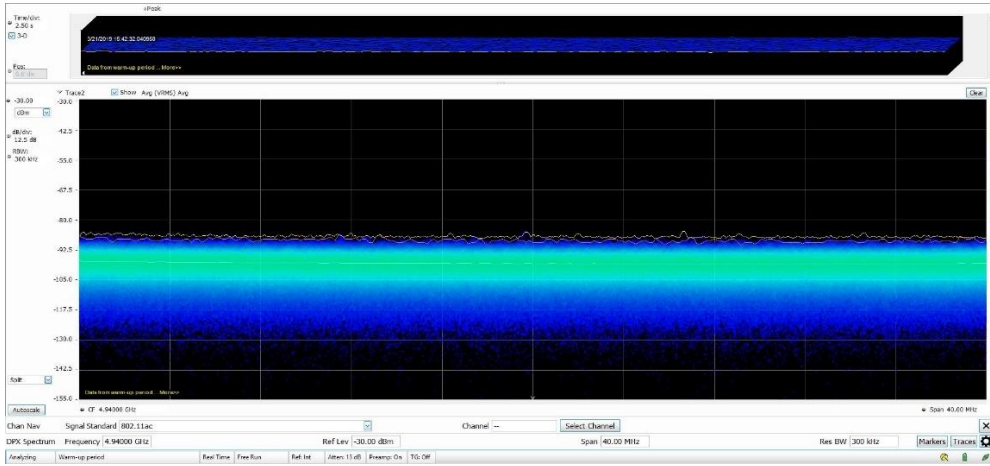
4.96GHz
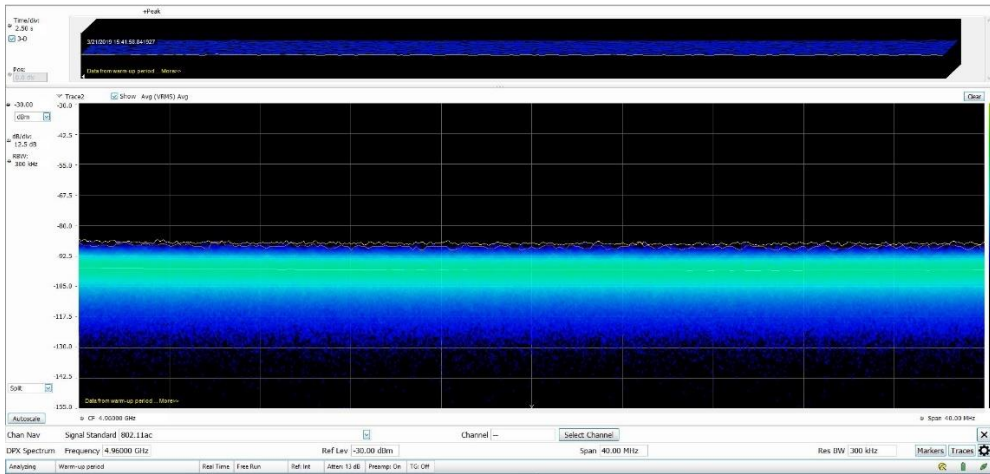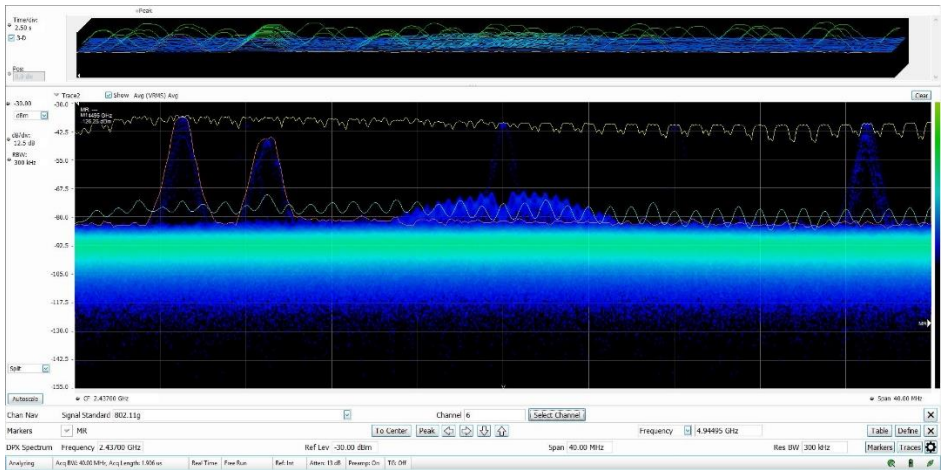

4.99GHz
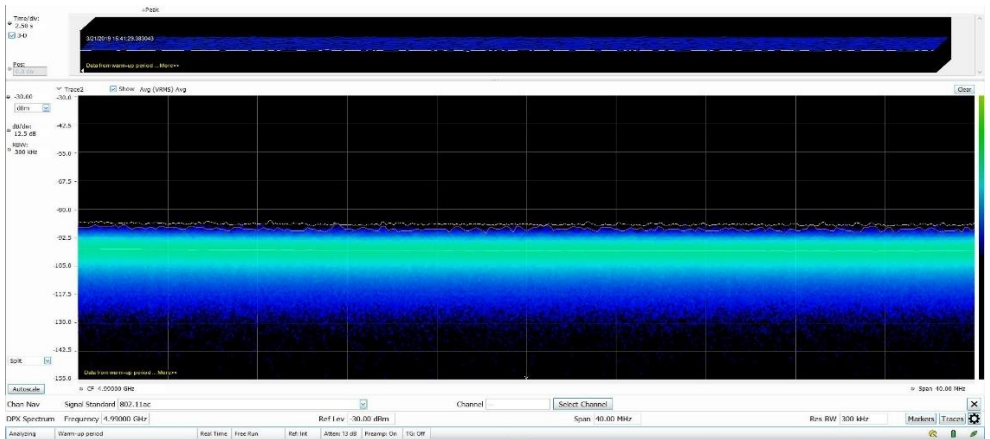
Wilke Heatherwilde Tower

Available Power	Power is available.
Mounting Option	Mounting is available on the tower.
Security	This site is secured behind a locked fence and locked door.
LAN Access	There will be fiber run to this site.
Spectrum Analysis	2.4GHz is saturated. 5GHz channel 149 is used. 4.9GHz is not being used.

Wilke Heatherwilde Tower 2.4GHz Spectrum Analysis

Channel 1

Channel 6

Channel 11

Wilke Heatherwilde Tower 5.8GHz Spectrum Analysis

Channel 149

Channel 157

Channel 165

Wilke Heatherwilde Tower 4.9GHz Spectrum Analysis

4.94GHz
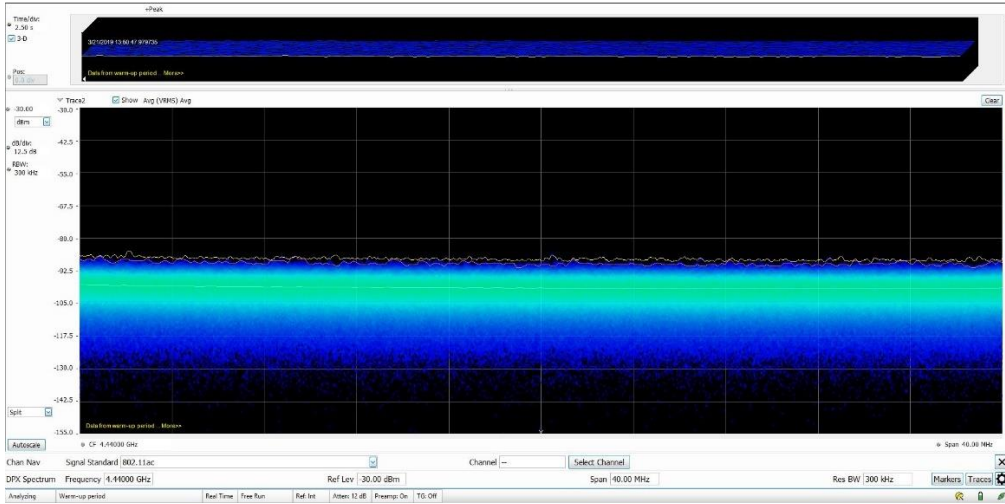
4.96GHz
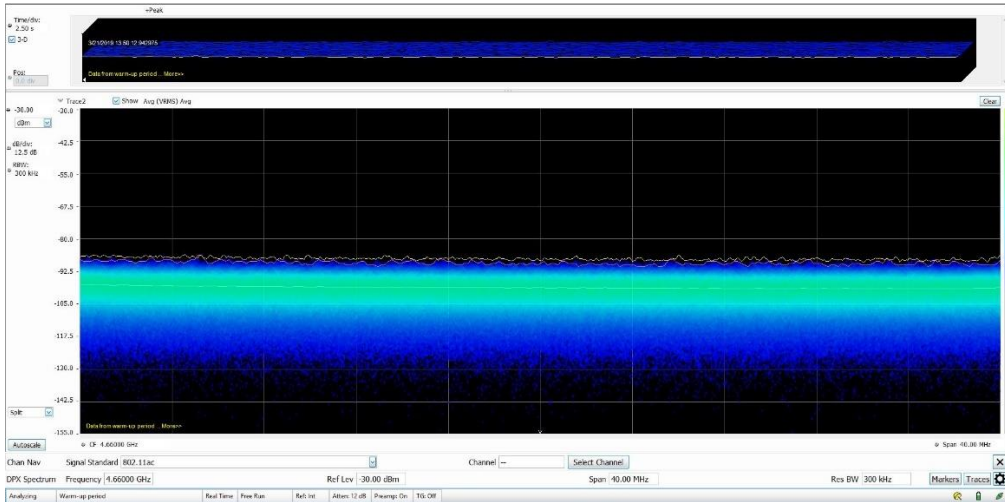
4.99GHz
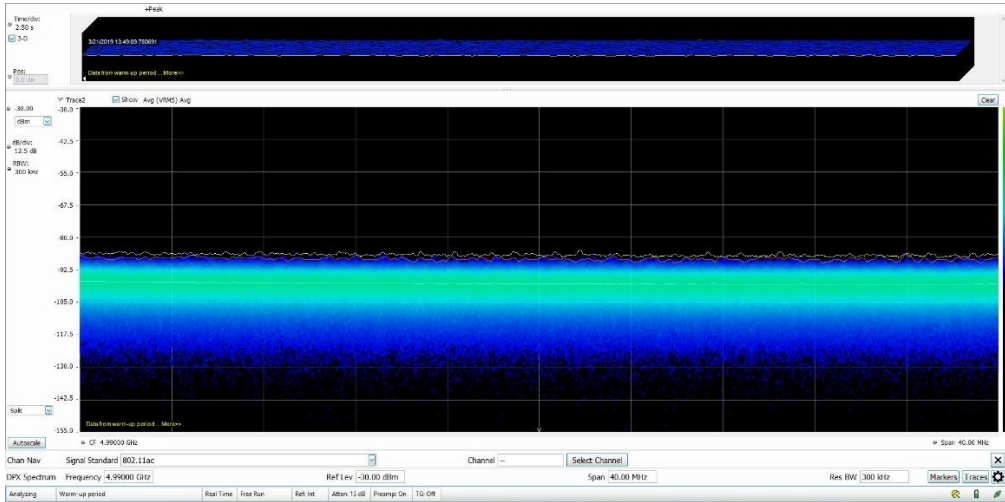
Animal Control

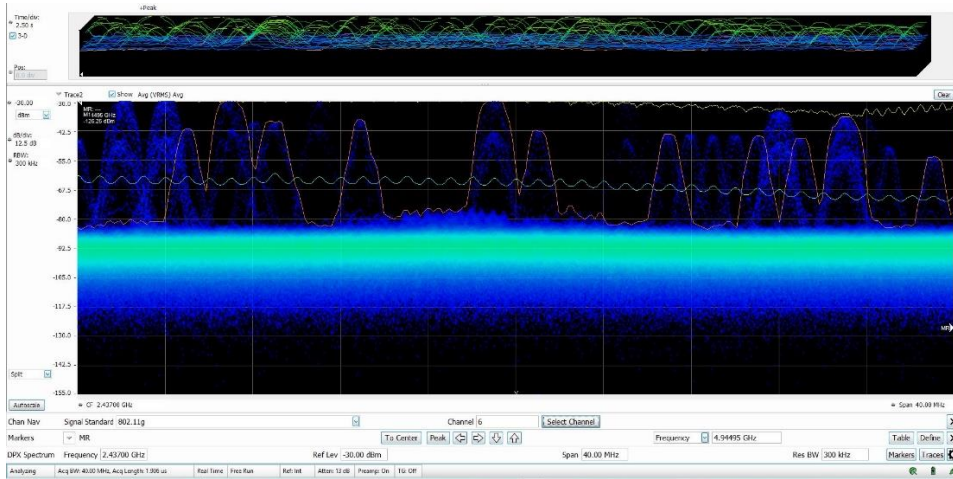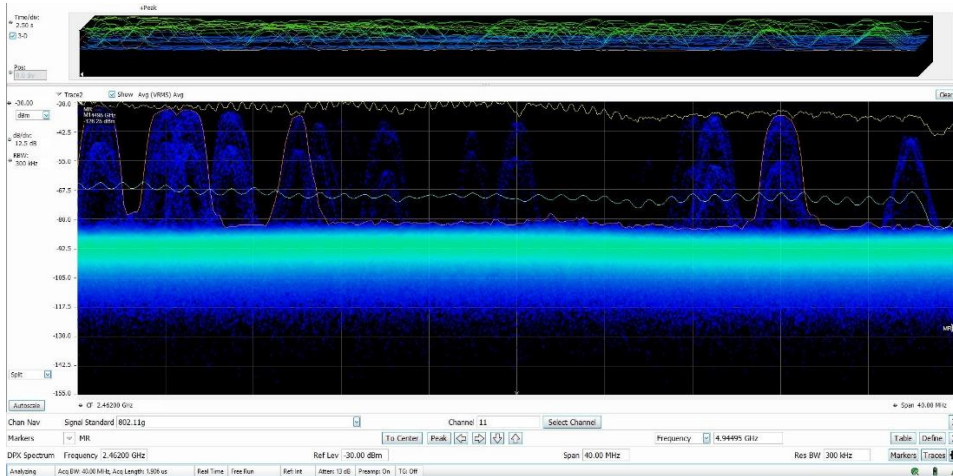|	
Available Power	Power is available.
Mounting Option	Mounting is not available currently.
Security	This site is two buildings that are locked.
LAN Access	There is not a direct connection to the city network.
Spectrum Analysis	2.4GHz is saturated. 5GHz is not being used. 4.9GHz is not being used.

# Animal Control 2.4GHz Spectrum Analysis
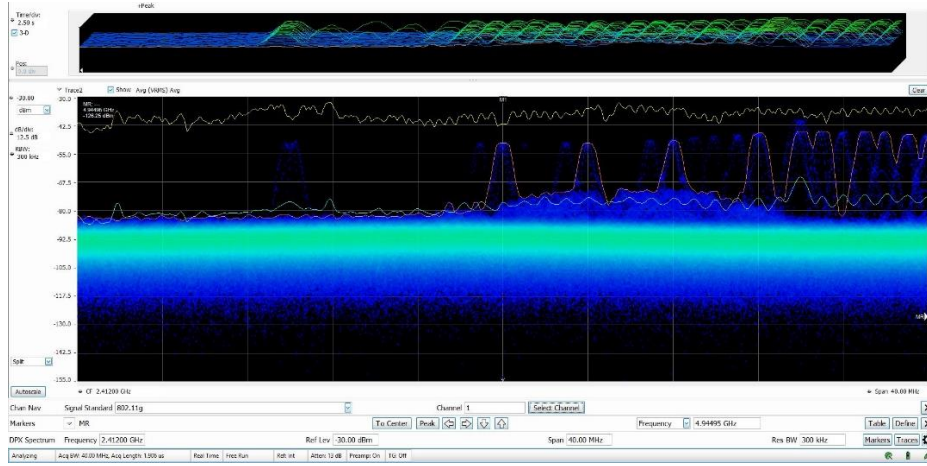
Channel 1

Channel 6
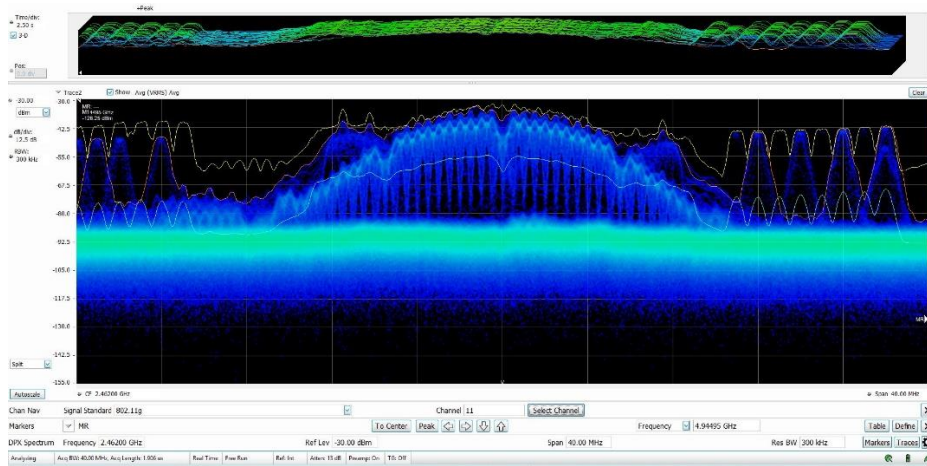
Channel 11

Animal Control 5.8GHz Spectrum Analysis

Channel 149

Channel 157

Channel 165

Animal Control 4.9GHz Spectrum Analysis

4.94GH

4.96GHz
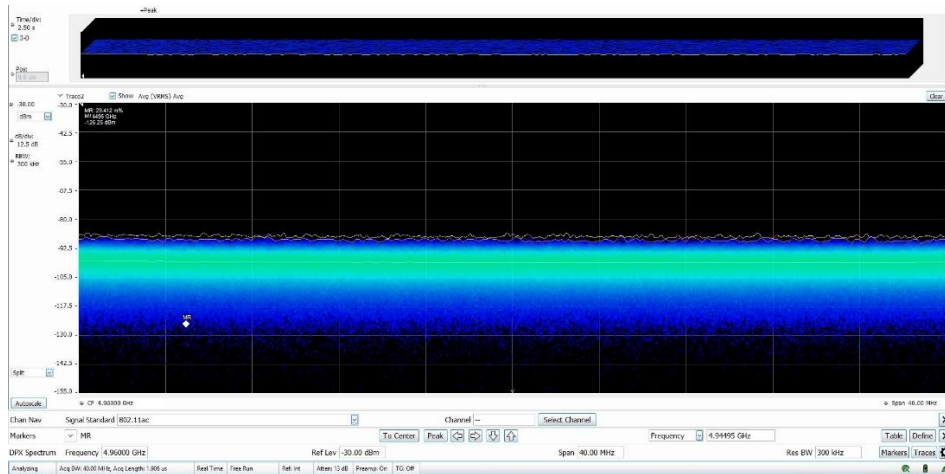
4.99GHz

Bohl's Lift Station

|	
Available Power	Power is available.
Mounting Option	Mounting is not available currently.
Security	This site is behind a locked fence.
LAN Access	There is not a direct connection to the city network.
Spectrum Analysis	2.4GHz is saturated. 5GHz is not being used. 4.9GHz is not being used.

Bohl's Lift Station 2.4GHz Spectrum Analysis
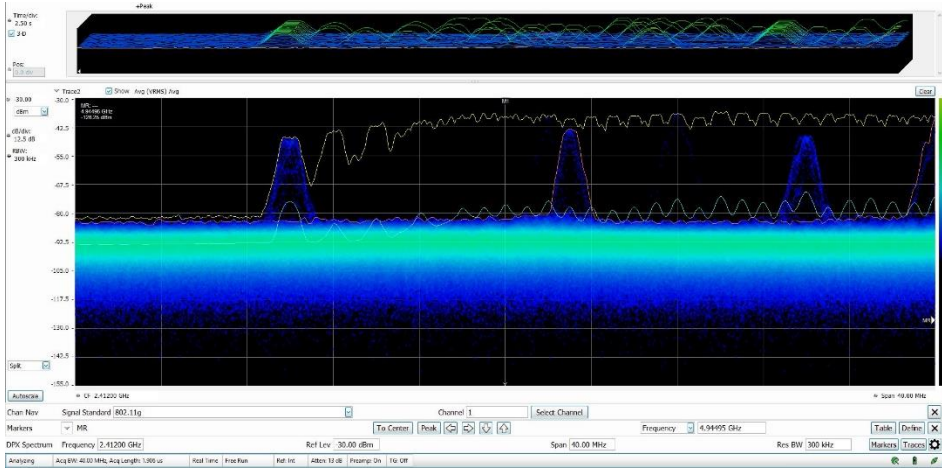
Channel 1

Channel 6
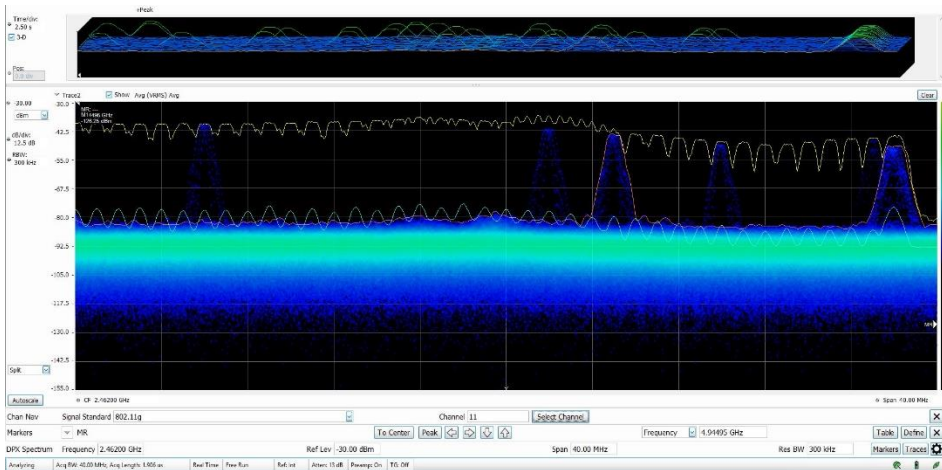
Channel 11

Bohl's Lift Station 5.8GHz Spectrum Analysis
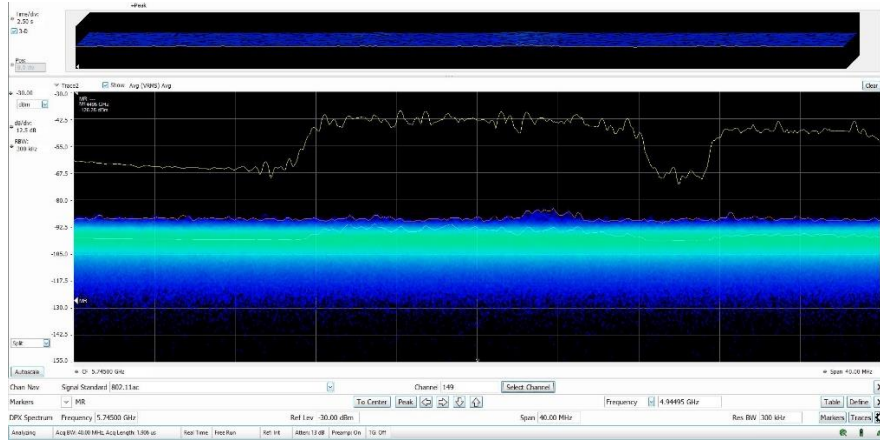
Channel 149
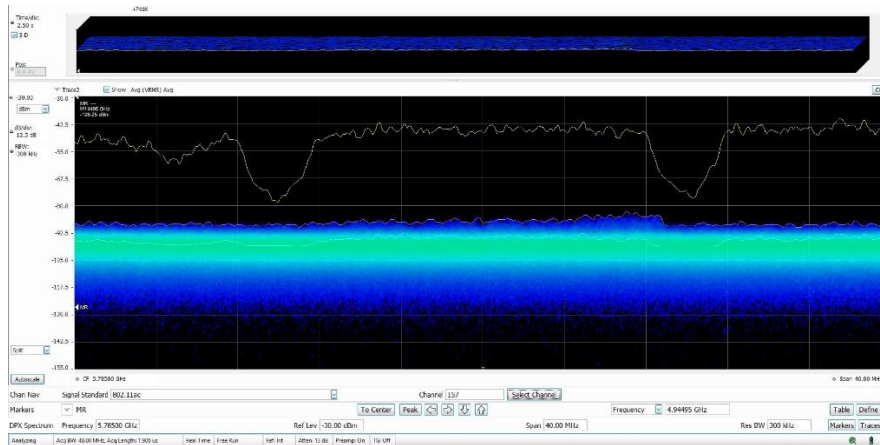
Channel 157

Channel 165
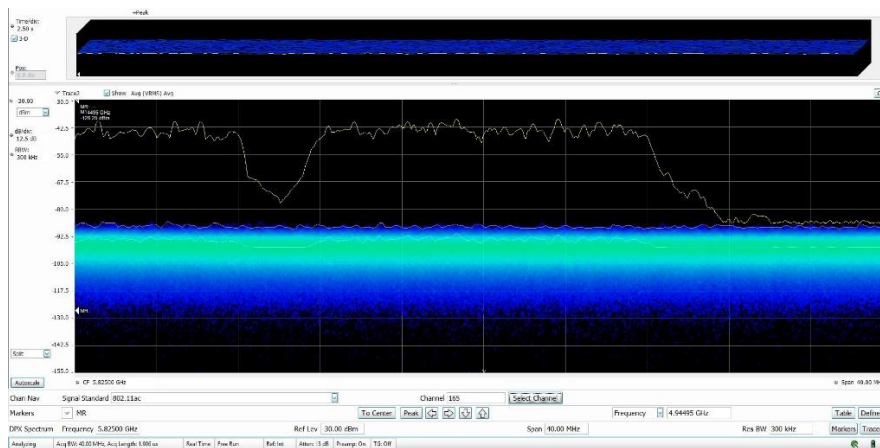
Bohl's Lift Station 4.9GHz Spectrum Analysis

4.94GHz
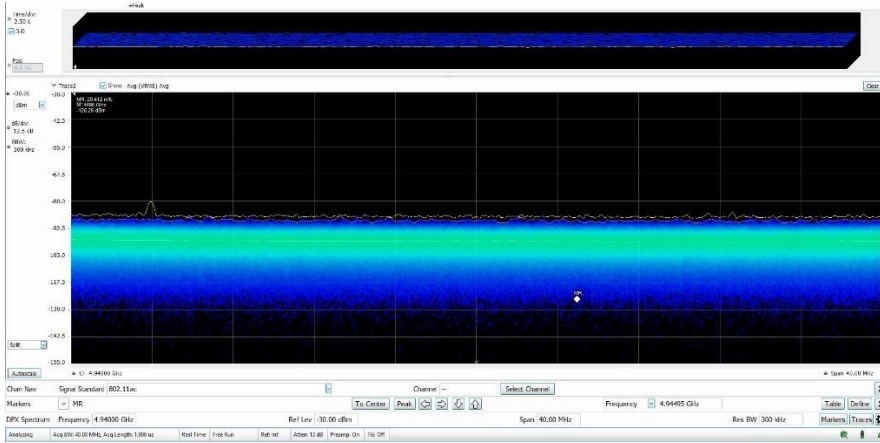
4.96GHz
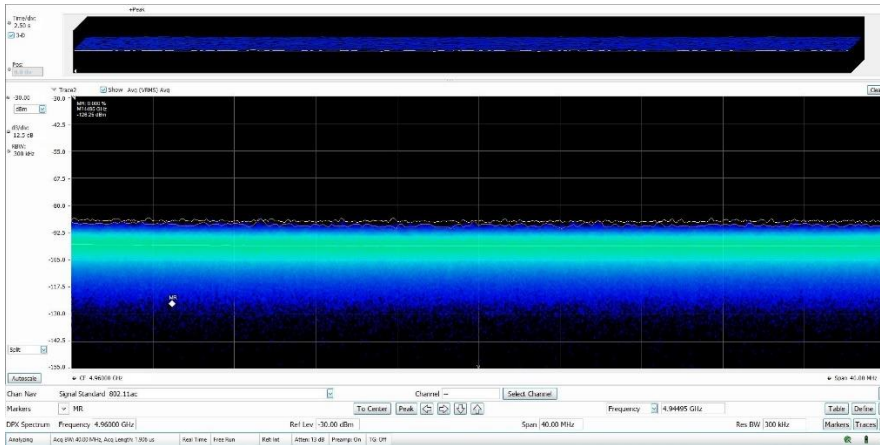
4.99GHz
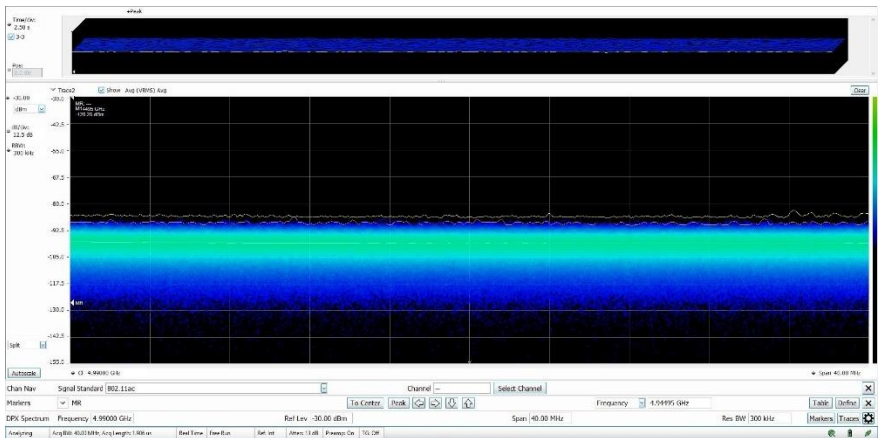
Boulder Ridge Lift Station

|	
Available Power	Power is available.
Mounting Option	Mounting is available on the onsite tower.
Security	This site is behind a locked fence.
LAN Access	There is not a direct connection to the city network.
Spectrum Analysis	2.4GHz is saturated. 5GHz is not being used. 4.9GHz is not being used.

Boulder Ridge Lift Station 2.4GHz Spectrum Analysis
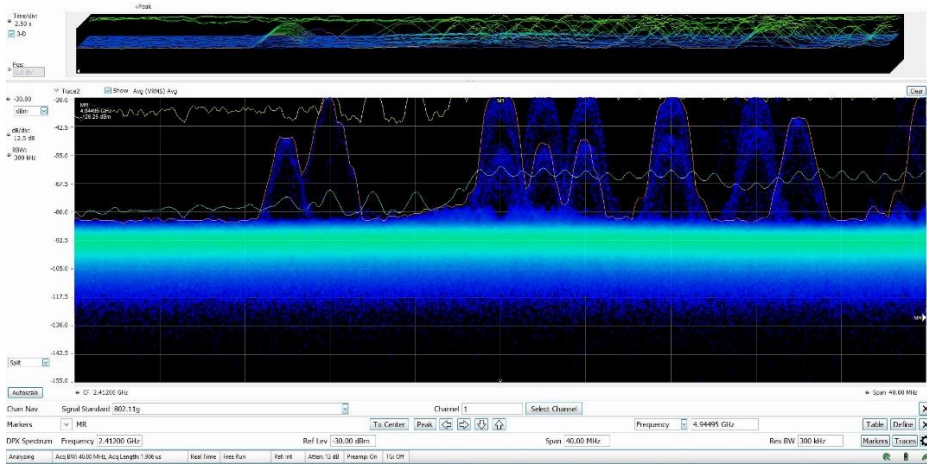
Channel 1

Channel 6

Channel 11

Boulder Ridge Lift Station 5.8GHz Spectrum Analysis
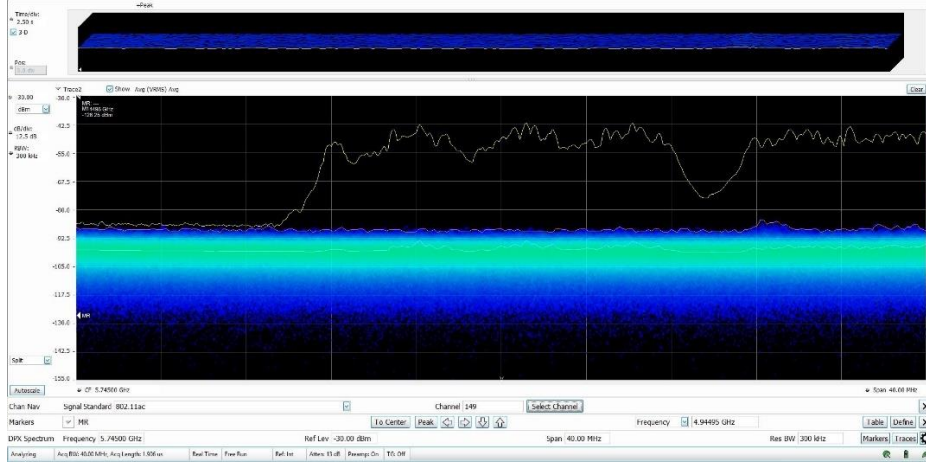
Channel 149
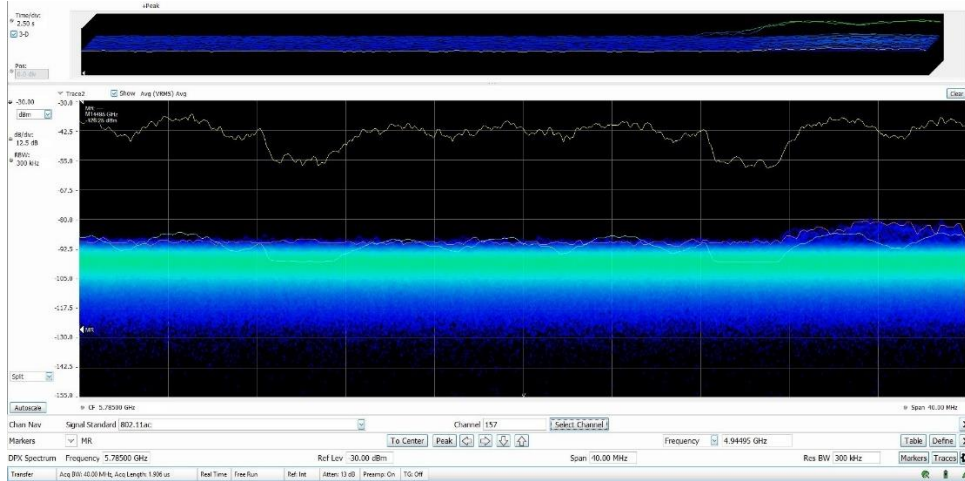
Channel 157

Channel 165
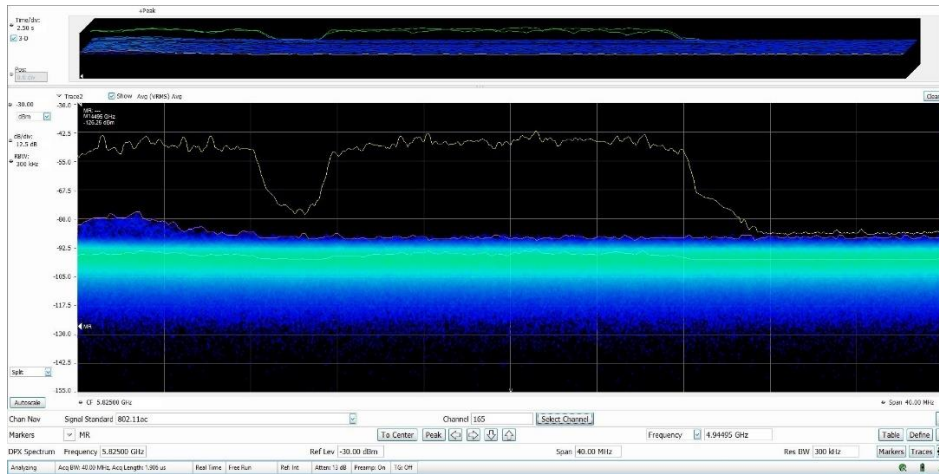
Boulder Ridge Lift Station 4.9GHz Spectrum Analysis

4.94GHz
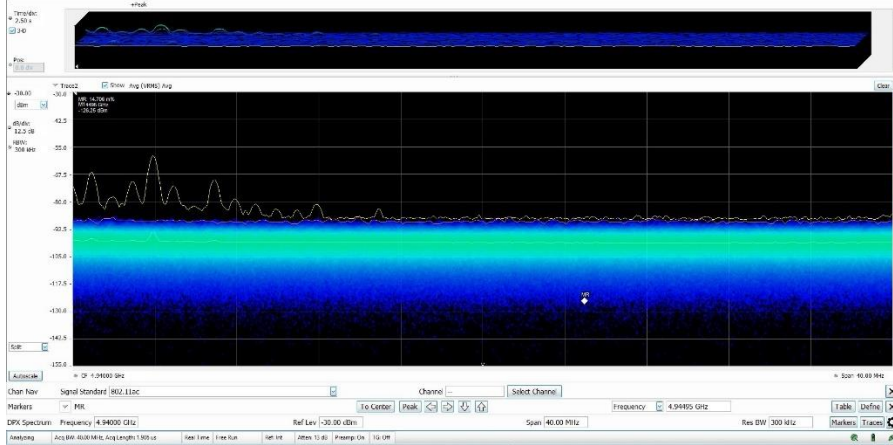
4.96GHz
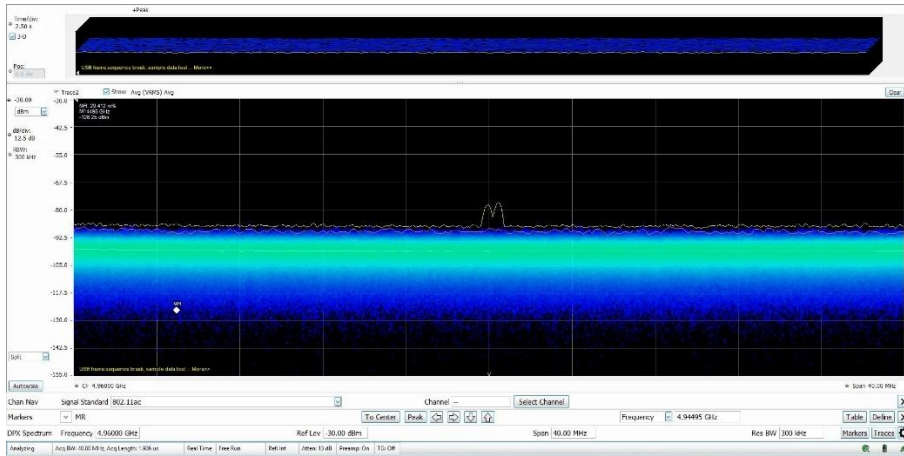
4.99GHz
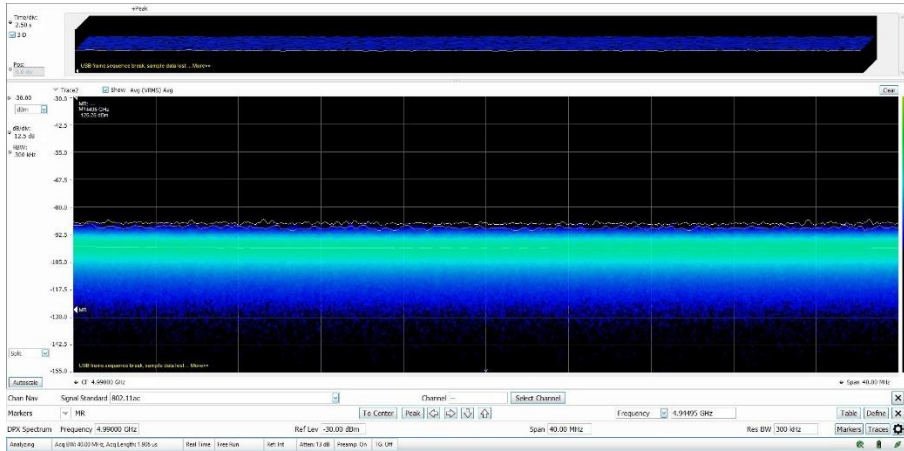
Building Maintenance House

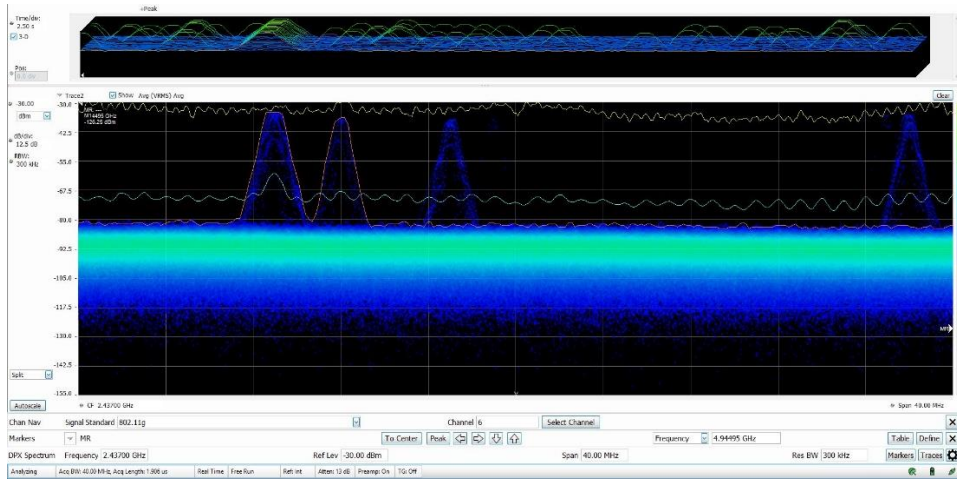| Available Power	Power is available.
Mounting Option	Mounting is not available currently.
Security	This site is a building that is locked.
LAN Access	There is not a direct connection to the city network.
Spectrum Analysis	2.4GHz is saturated. 5GHz is not being used. 4.9GHz is not being used.

Building Maintenance House 2.4GHz Spectrum Analysis
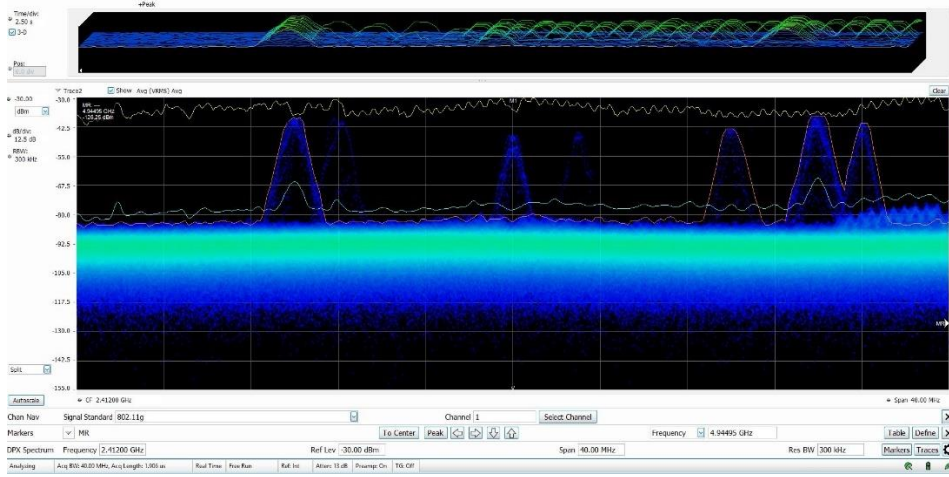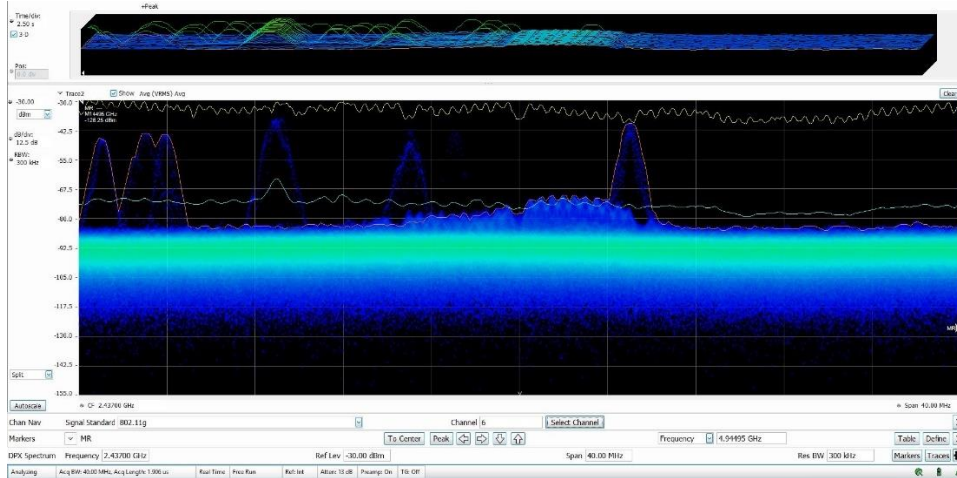
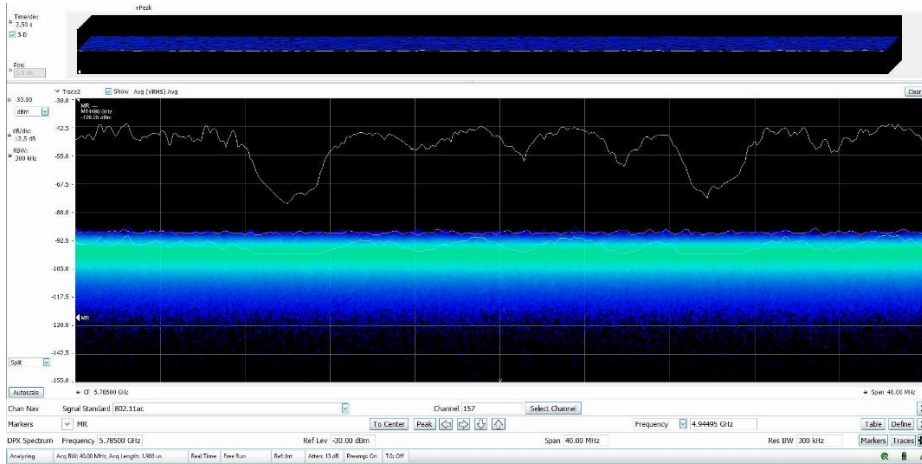## Channel 1

Channel 6
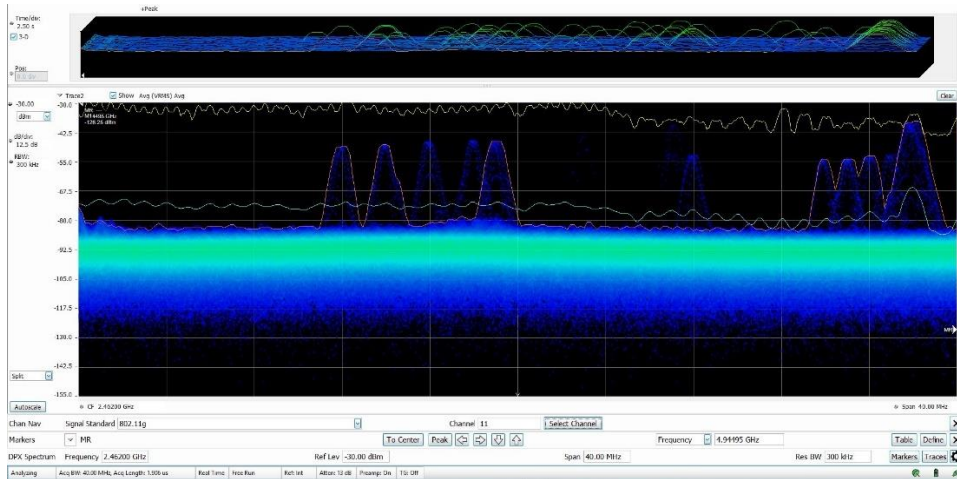
Channel 11

Building Maintenance House 5.8GHz Spectrum Analysis
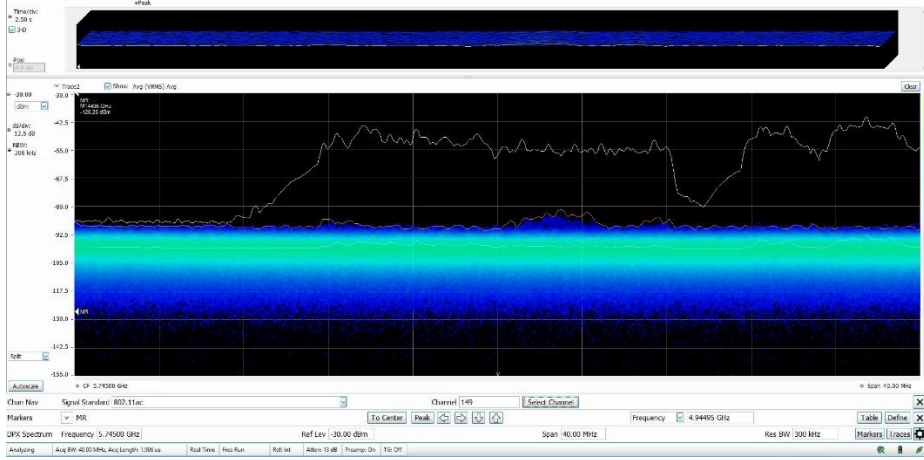
Channel 149
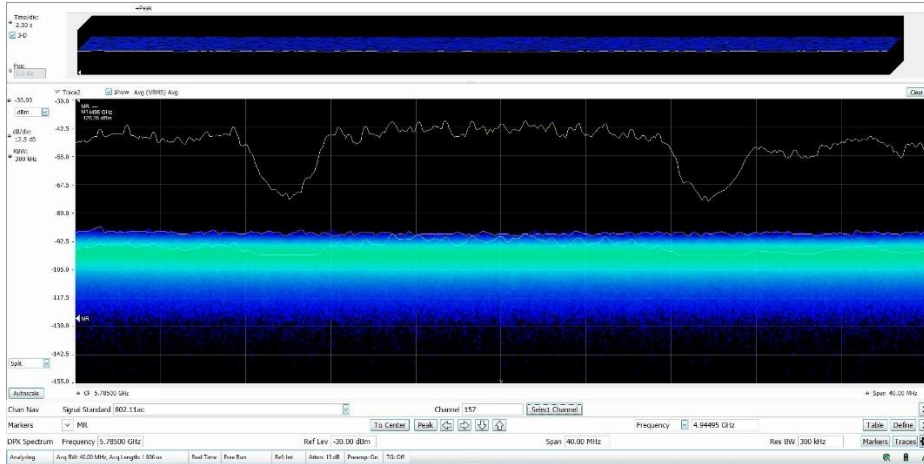
Channel 157

Channel 165
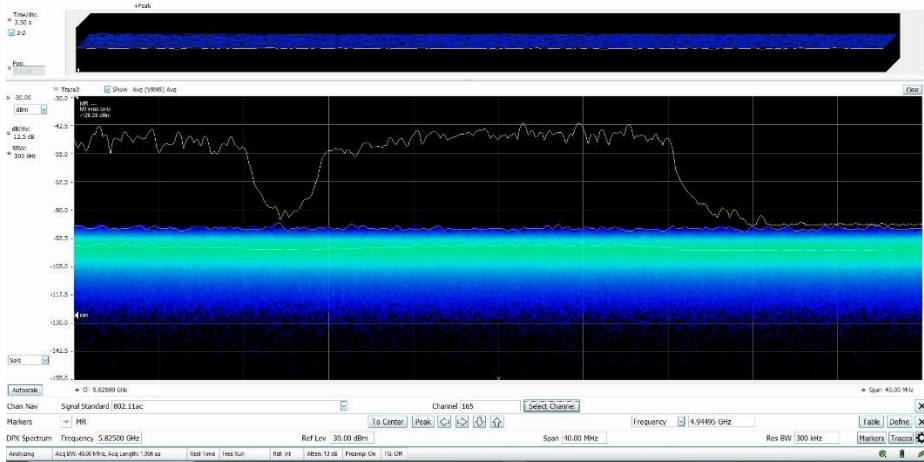
Building Maintenance House 4.9GHz Spectrum Analysis

4.94GHz
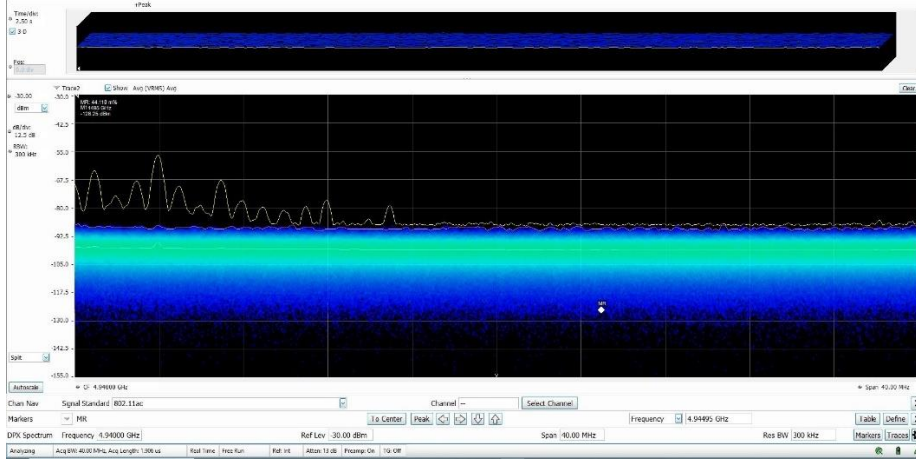
4.96GHz
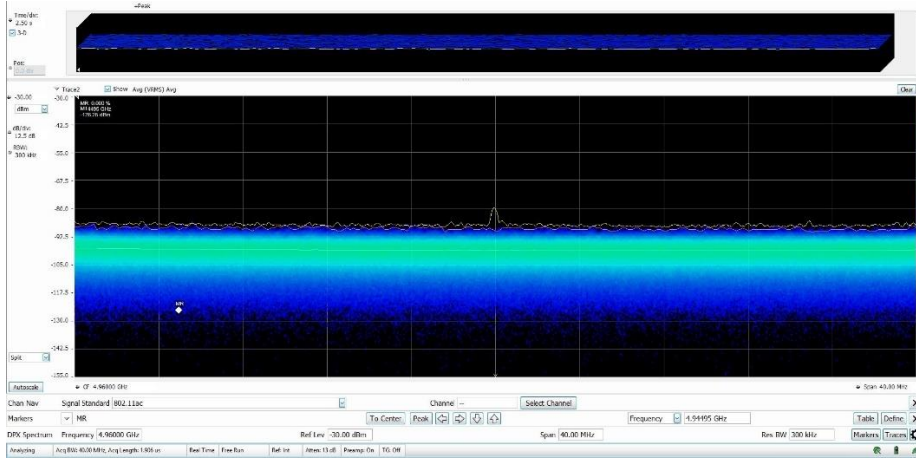
4.99GHz
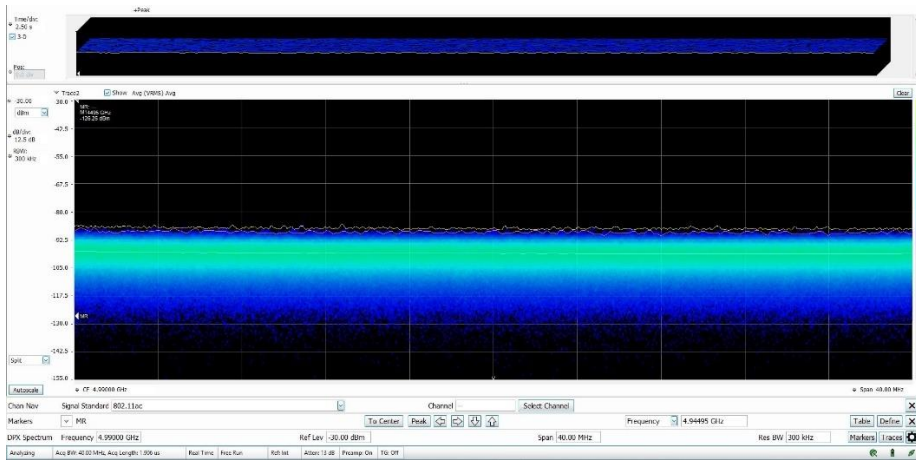
City Hall

Available Power	Power is available.
Mounting Option	Mounting is available on tower.
Security	This site is a building that is locked.
LAN Access	There is a direct connection to the city network.
Spectrum Analysis	2.4GHz is saturated. 5GHz is not being used. 4.9GHz is not being used.

City Hall 2.4GHz Spectrum Analysis
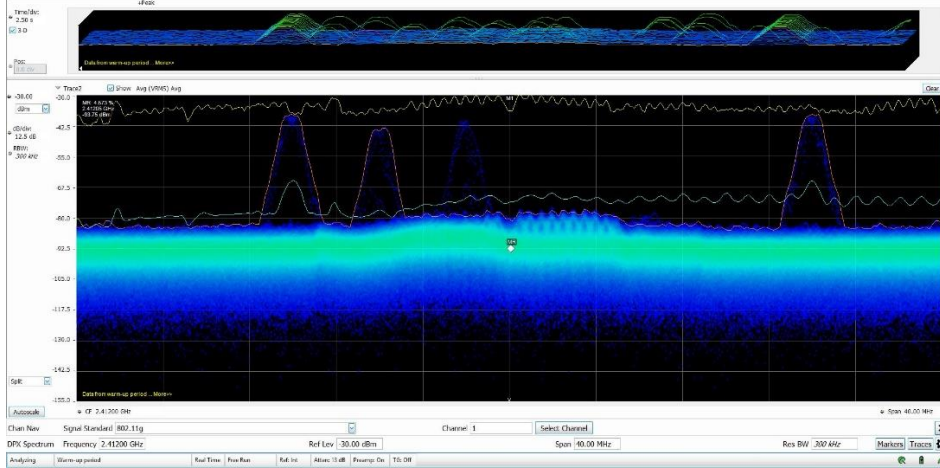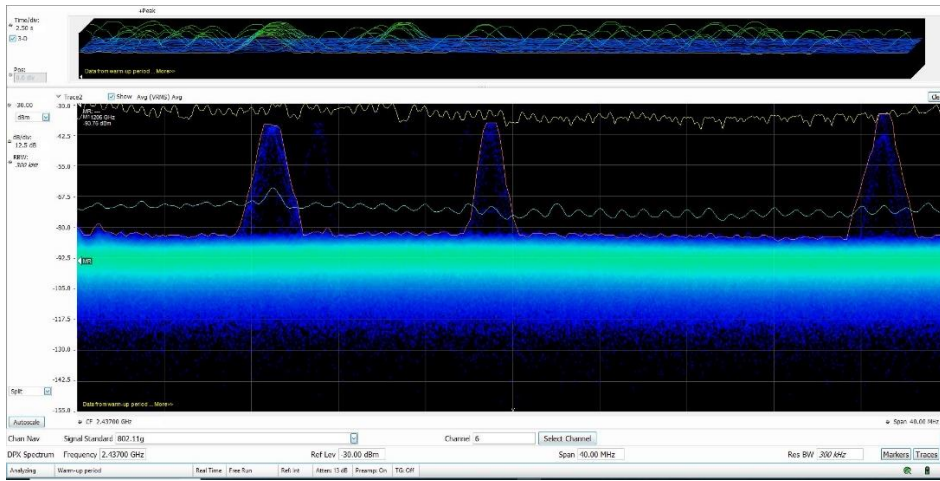
Channel 1

Channel 6
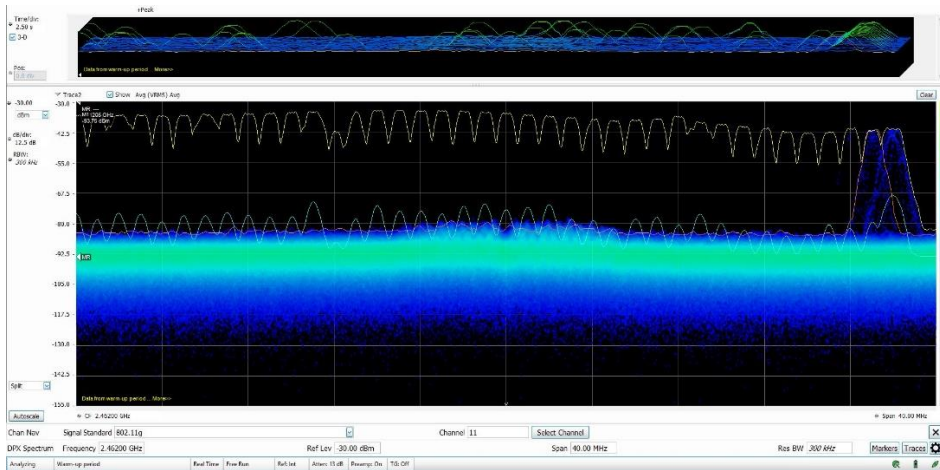
Channel 11

City Hall 5.8GHz Spectrum Analysis
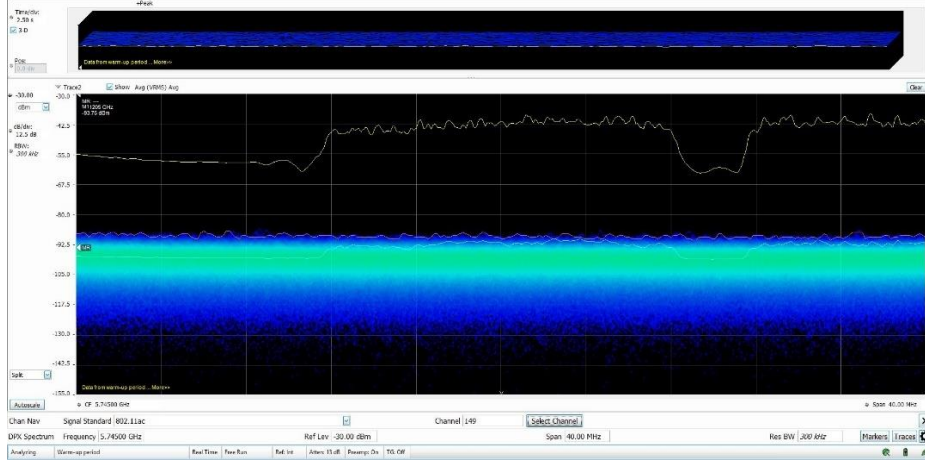
Channel 149
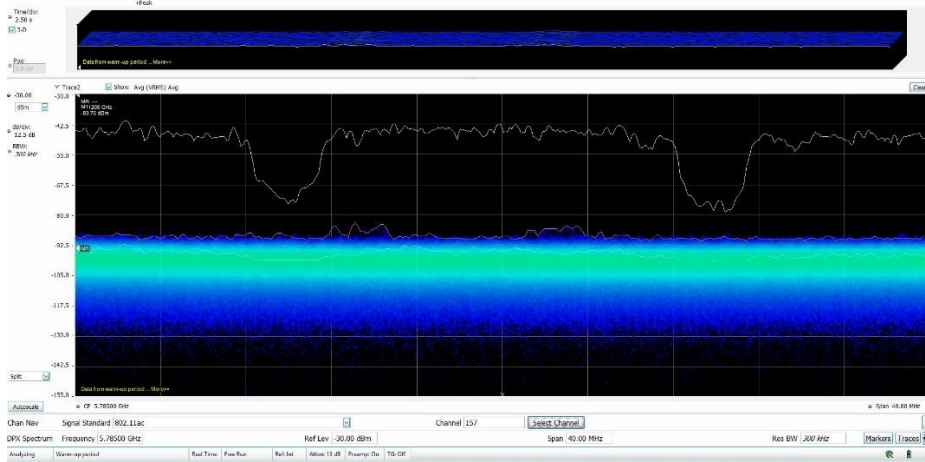
Channel 157

Channel 165
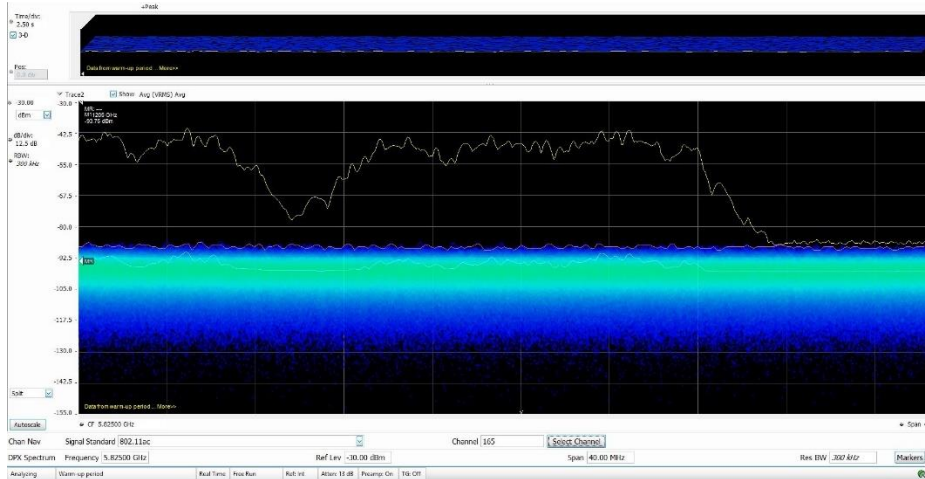
City Hall 4.9GHz Spectrum Analysis

4.94GHz
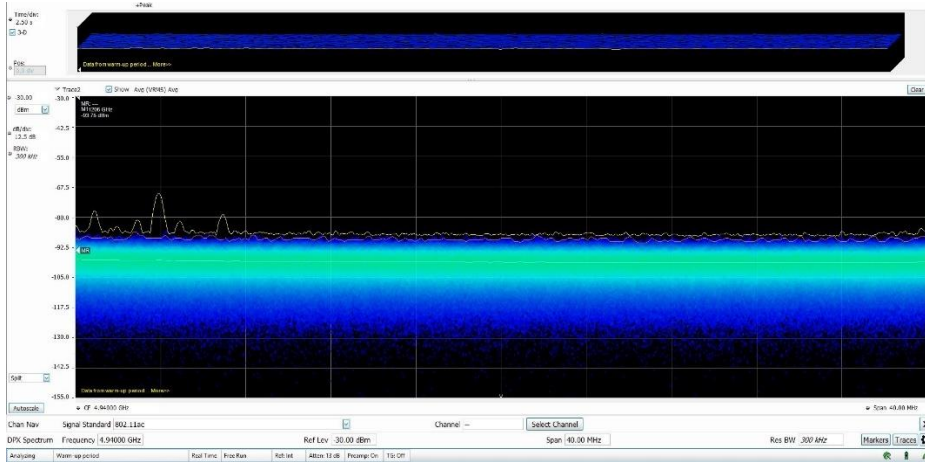
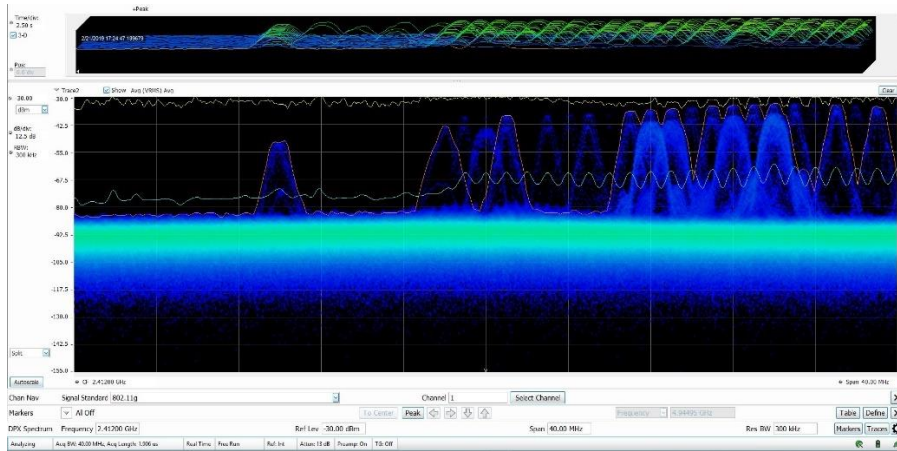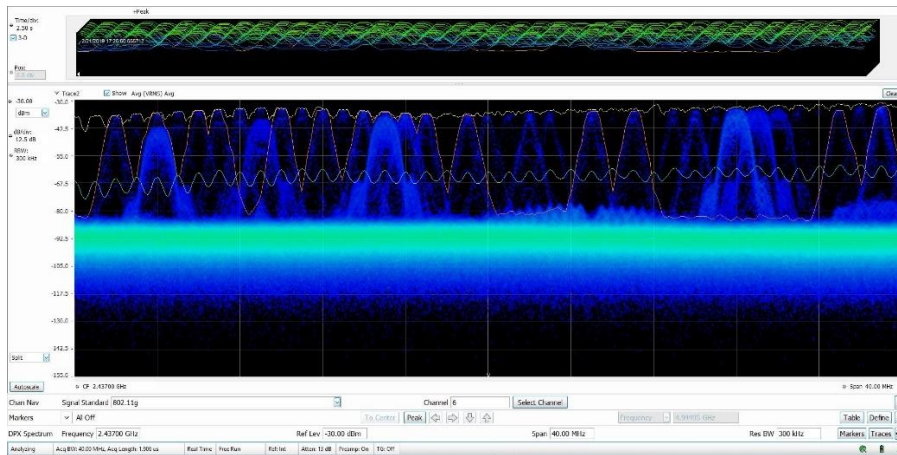

4.96GHz
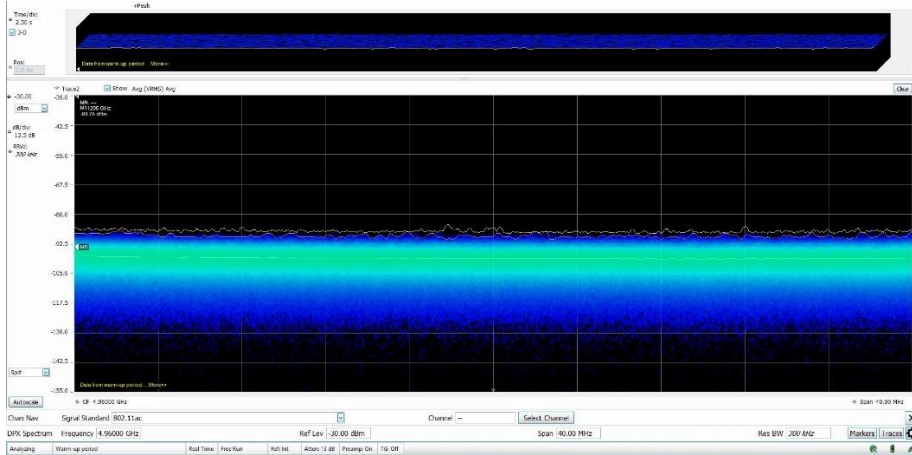
4.99GHz
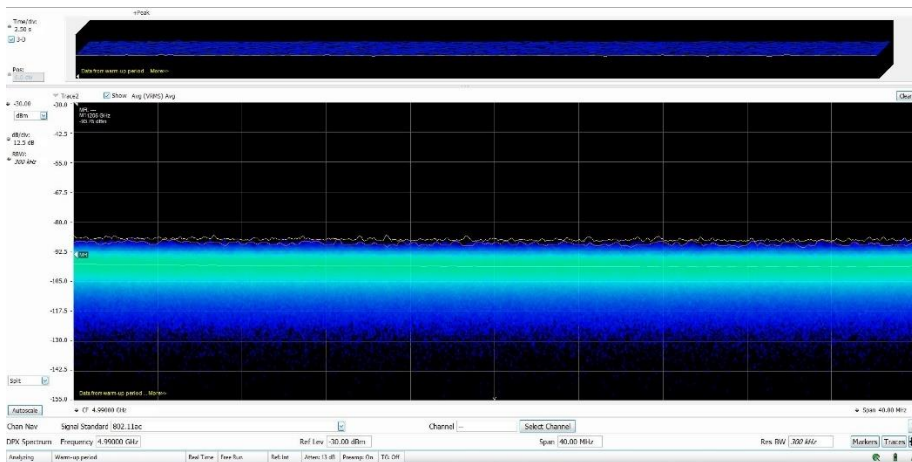
Club Lift Station

Available Power	Power is available.
Mounting Option	Mounting is not currently available.
Security	This site has a fence that is locked.
LAN Access	There is not a direct connection to the city network.
Spectrum Analysis	2.4GHz is saturated. 5GHz is not being used. 4.9GHz is not being used.

Club Lift Station 2.4GHz Spectrum Analysis
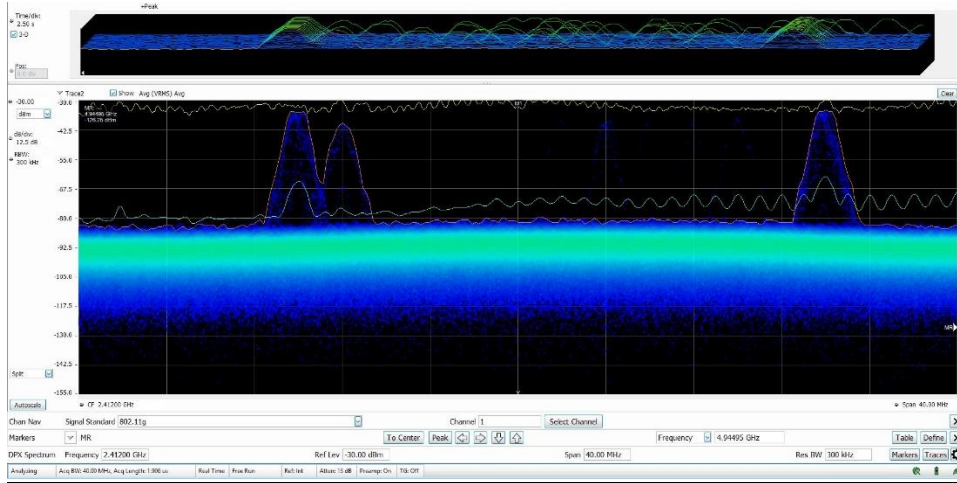
Channel 1

Channel 6
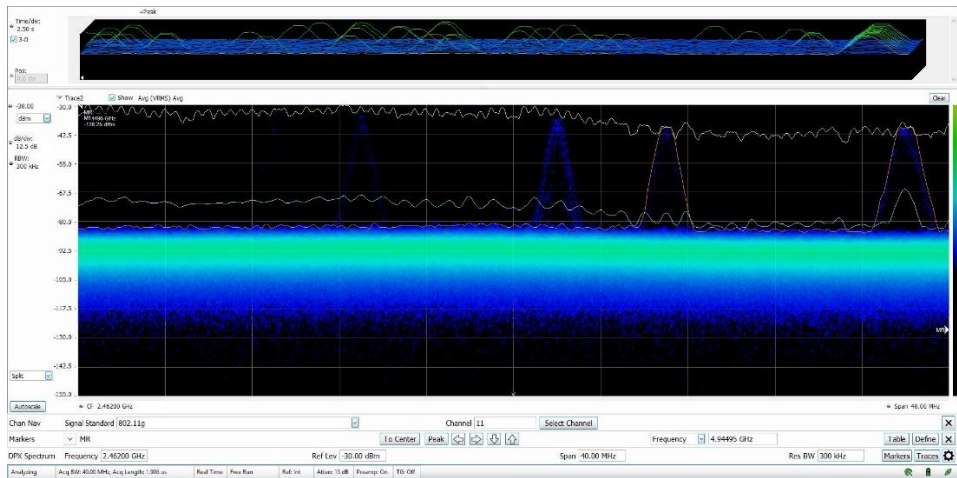
Channel 11

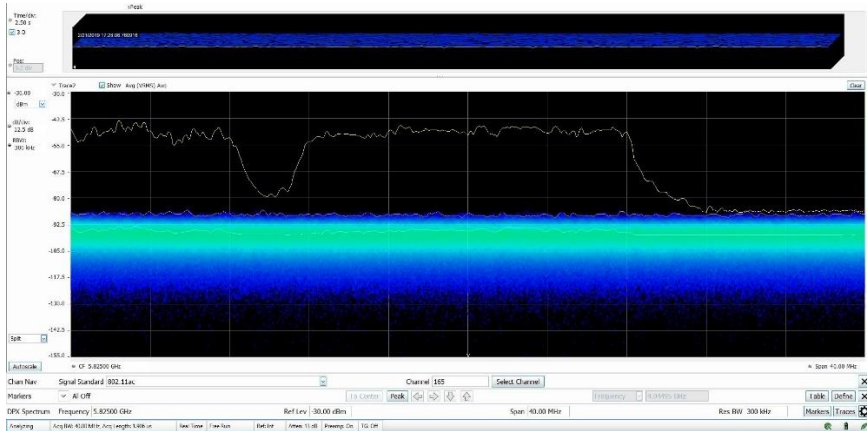# Club Lift Station 5.8GHz Spectrum Analysis
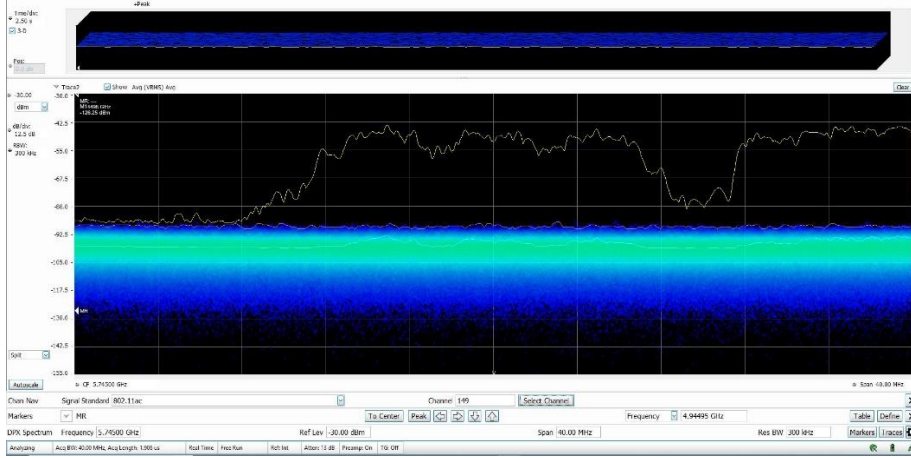
Channel 149

Channel 157

Channel 165
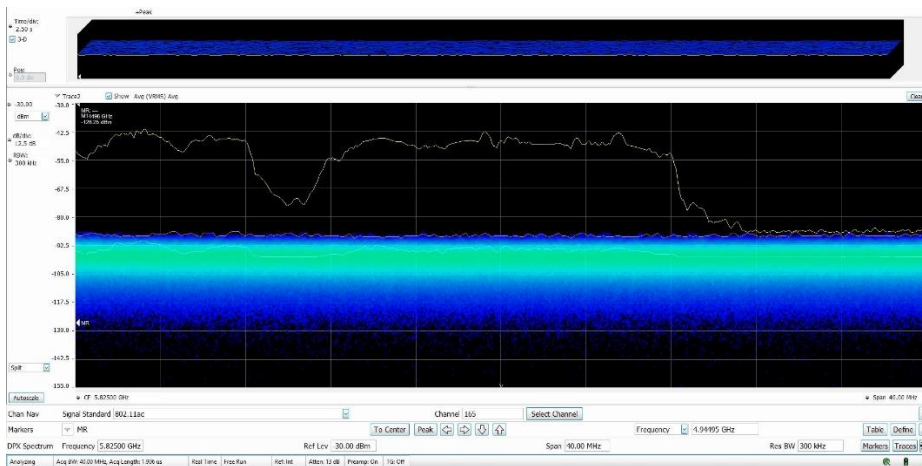
Club Lift Station 4.9GHz Spectrum Analysis

4.94GHz
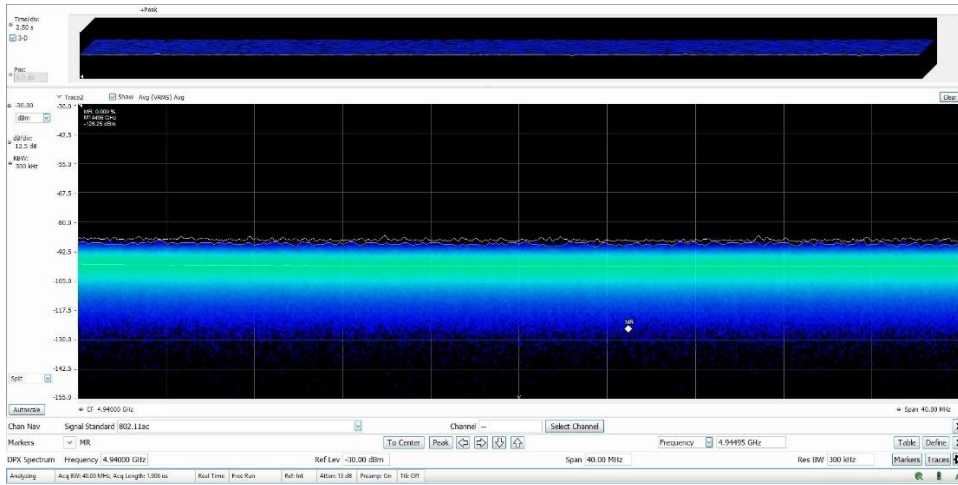
4.96GHz
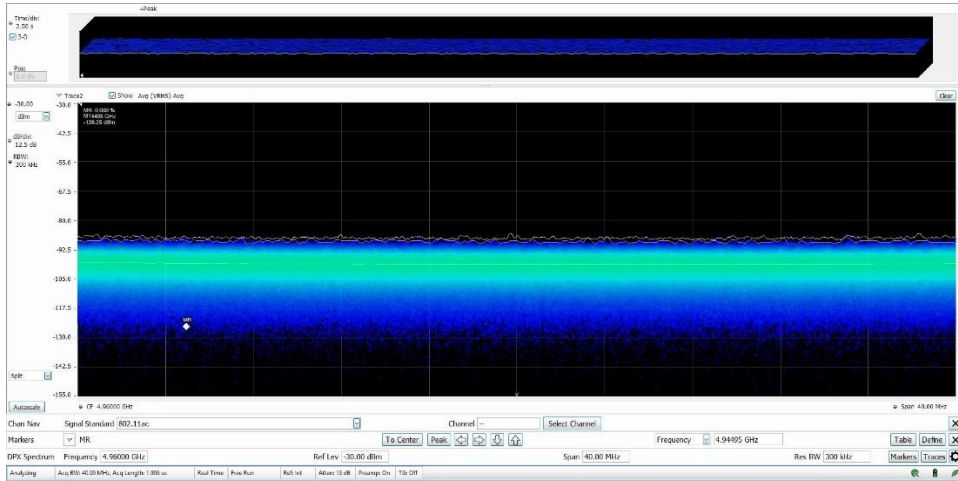
4.99GHz

Coronado Lift Station

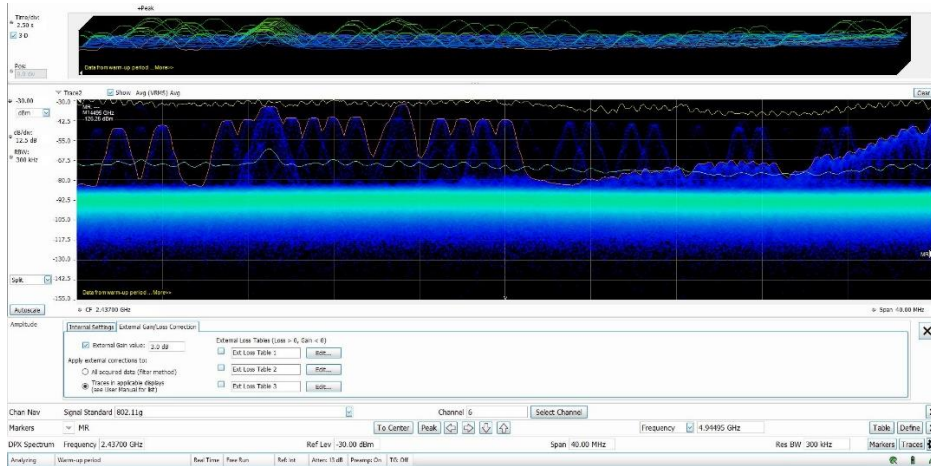|	
Available Power	Power is available.
Mounting Option	Mounting is not currently available.
Security	This site has a fence that is locked.
LAN Access	There is not a direct connection to the city network.
Spectrum Analysis	2.4GHz is saturated. 5GHz is not being used. 4.9GHz is not being used.

(No picture was taken. Area is behind a high fence and in a residential development.)

Coronado Lift Station 2.4GHz

Channel 1

Channel 6
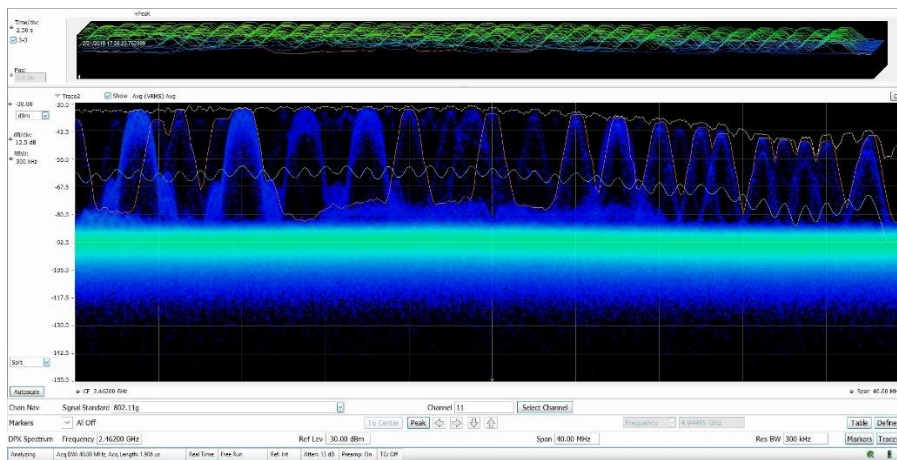
Channel 11

Coronado Lift Station 5.8GHz Spectrum Analysis
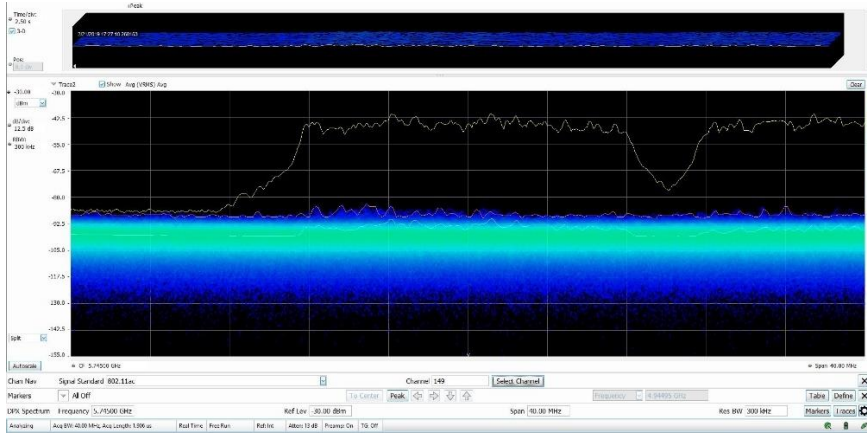
Channel 149
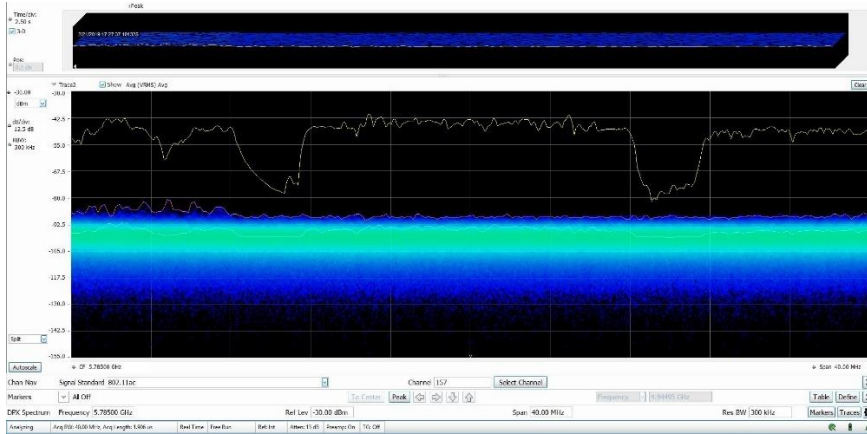
Channel 157

Channel 165

Coronado Lift Station 4.9GHz Spectrum Analysis

4.94GHz
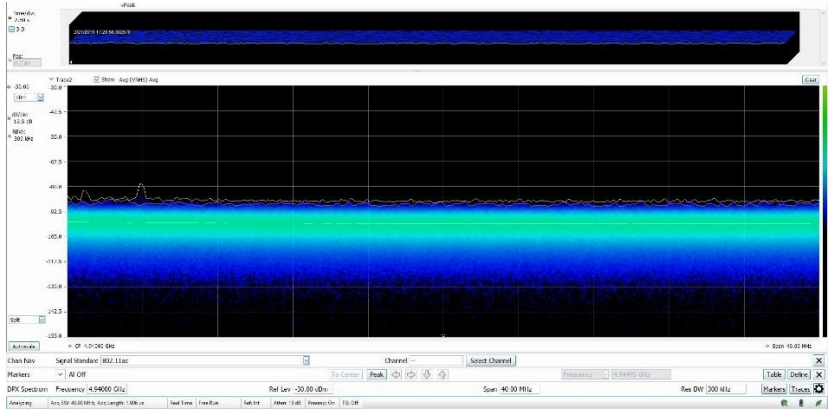
4.96GHz
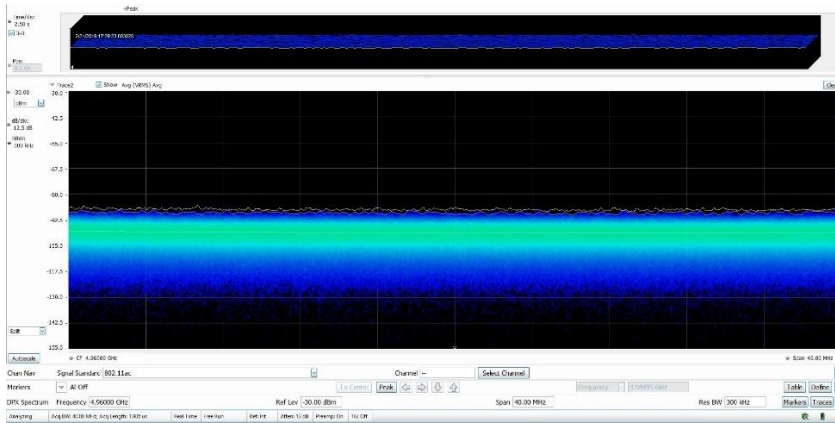
4.99GHz
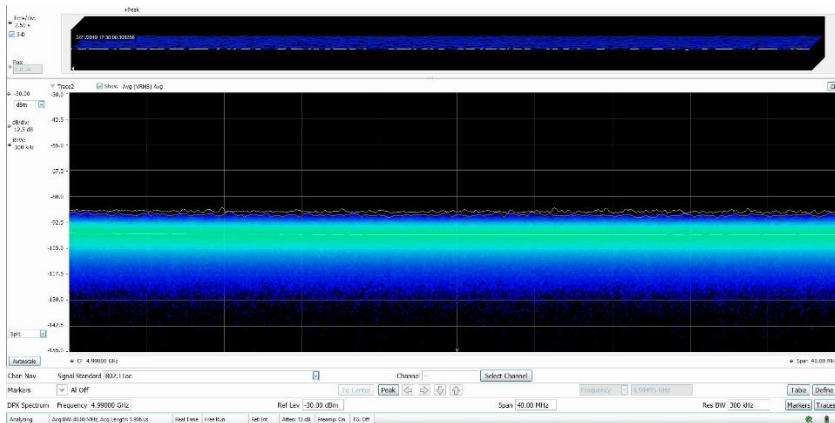
Developmental Center

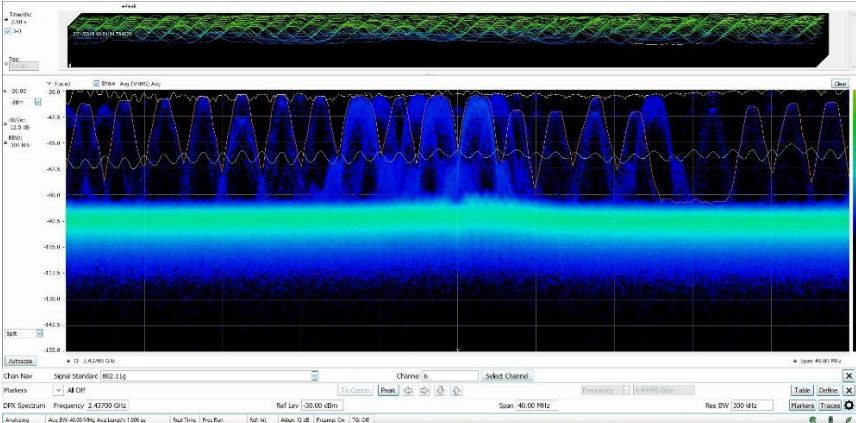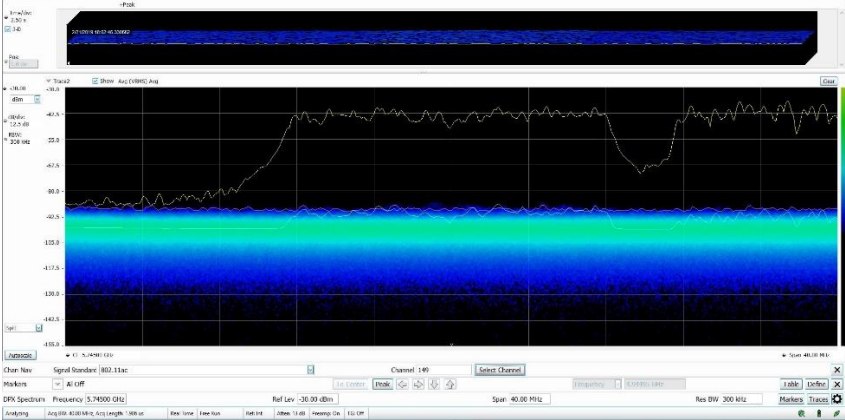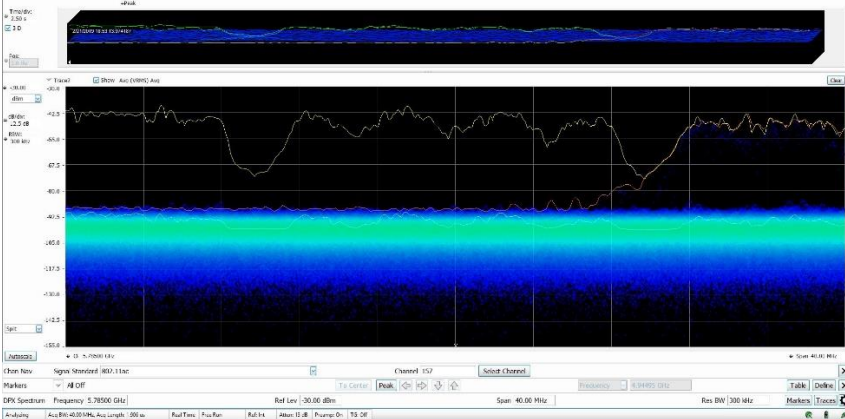| Available Power	Power is available.
Mounting Option	Mounting is not currently available.
Security	This site is a building that is locked.
LAN Access	There is not a direct connection to the city network.
Spectrum Analysis	2.4GHz is saturated. 5GHz is not being used. 4.9GHz is not being used.

Developmental Center 2.4GHz Spectrum Analysis
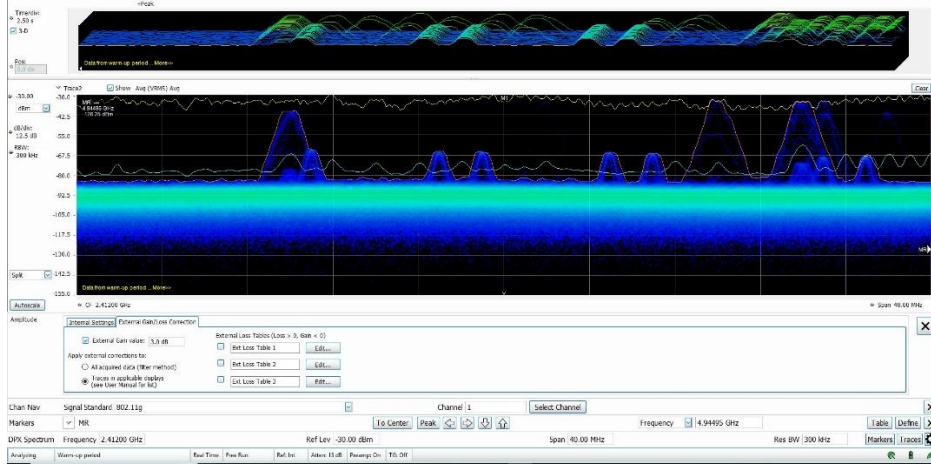
Channel 1

Channel 6
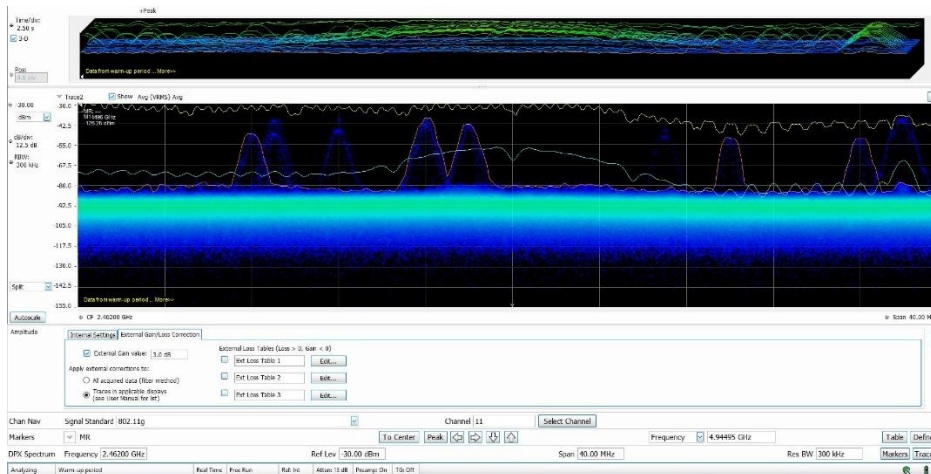
Channel 11

Developmental Center 5.8GHz Spectrum Analysis
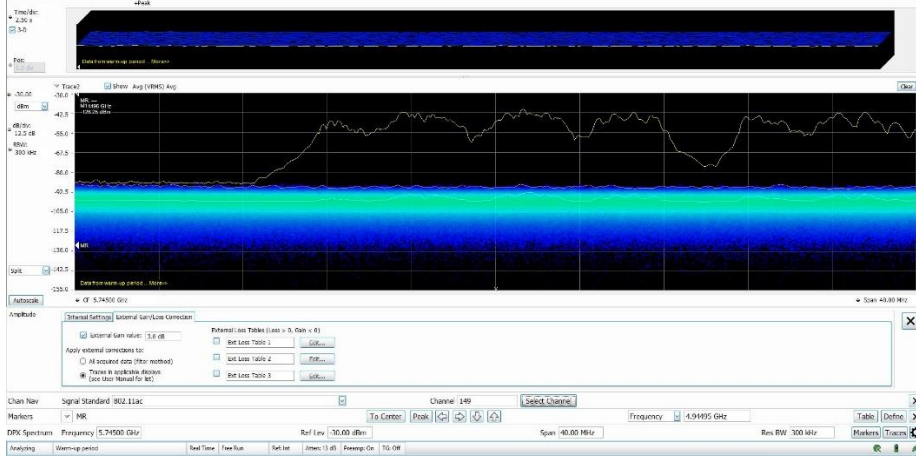
Channel 149
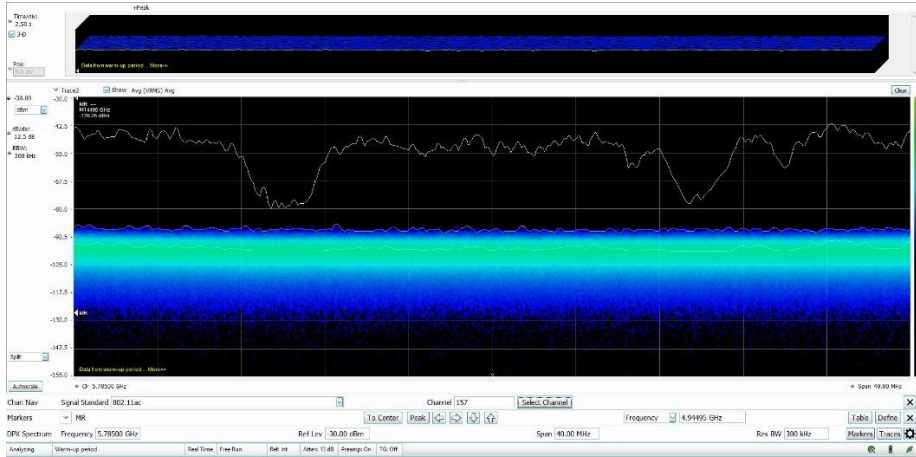
Channel 157

Channel 165
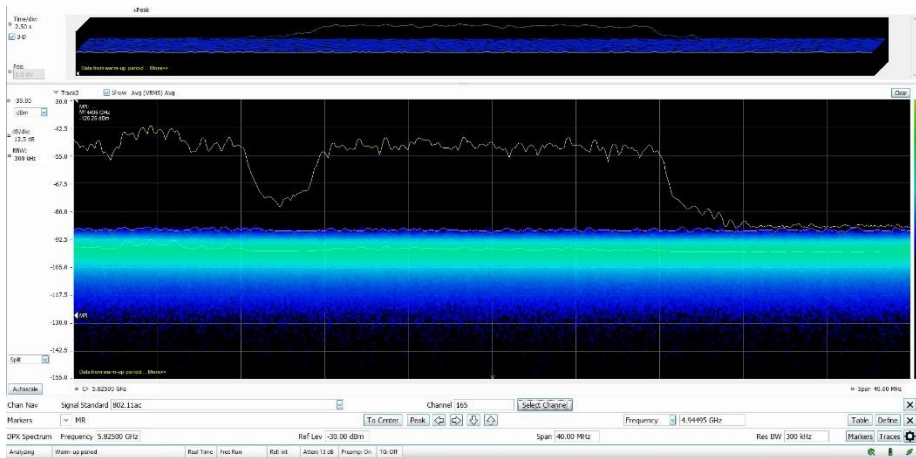
Developmental Center 4.9GHz Spectrum Analysis

4.94GHz
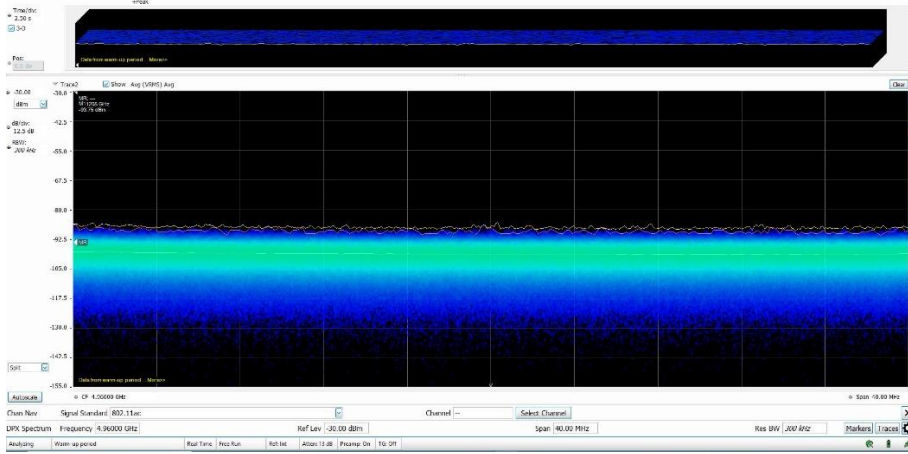
4.96GHz
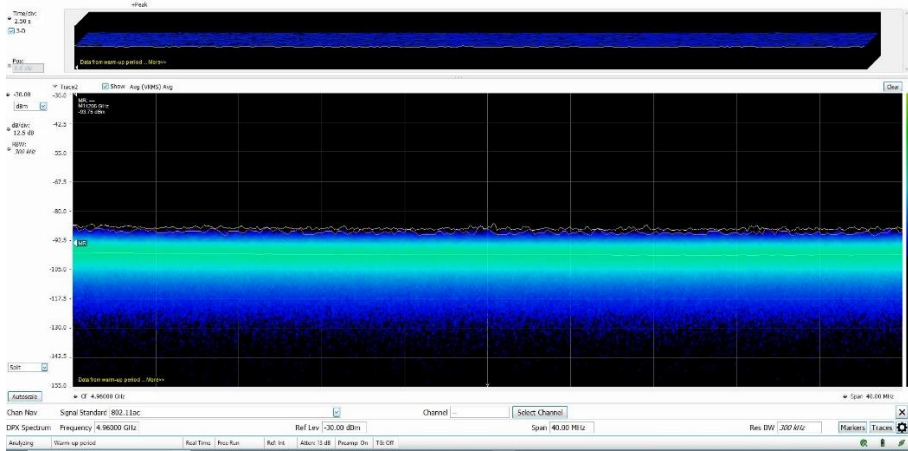
4.99GHz

Dunes Lift Station

|	
Available Power	Power is available.
Mounting Option	Mounting is not currently available.
Security	This site is a building that is locked.
LAN Access	There is not a direct connection to the city network.
Spectrum Analysis	2.4GHz is saturated. 5GHz is not being used. 4.9GHz is not being used.

(No picture was taken. This is in a residential neighborhood behind a high wall.)

Dunes Lift Station 2.4GHz Spectrum Analysis
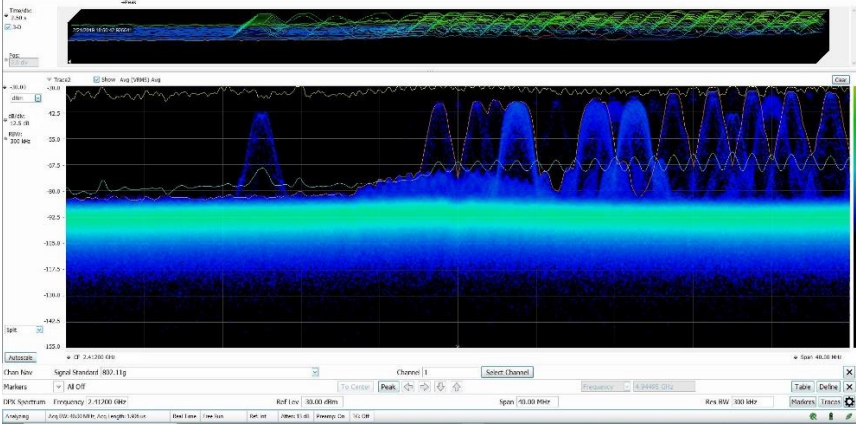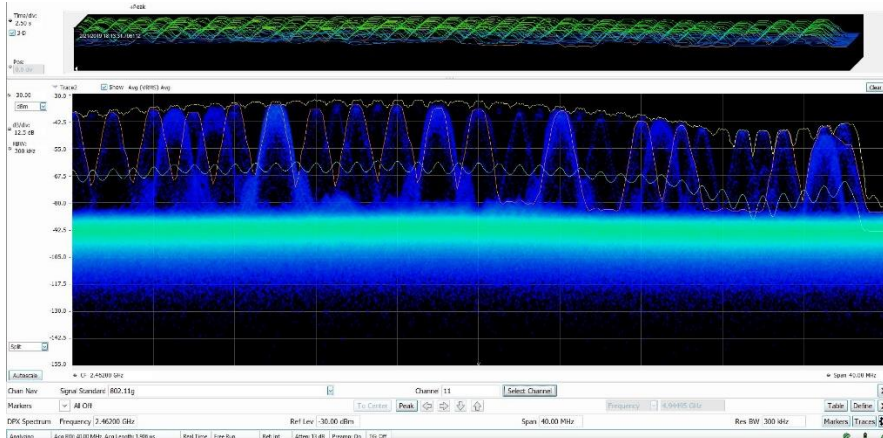
Channel 1
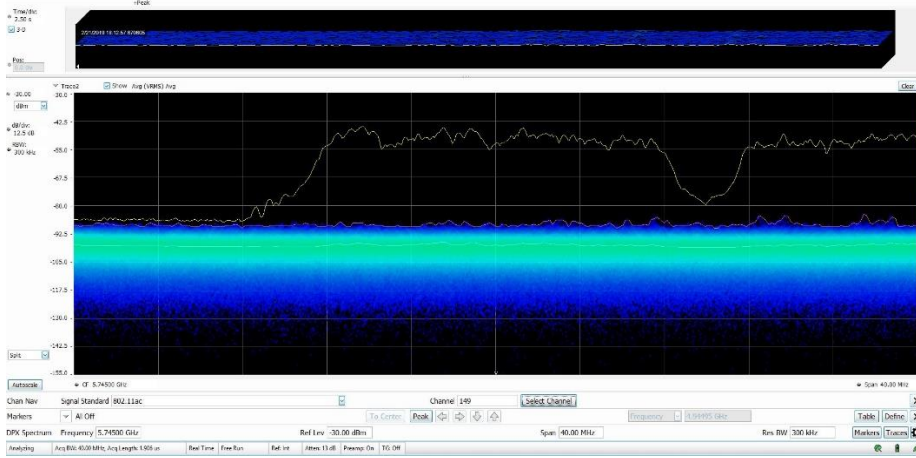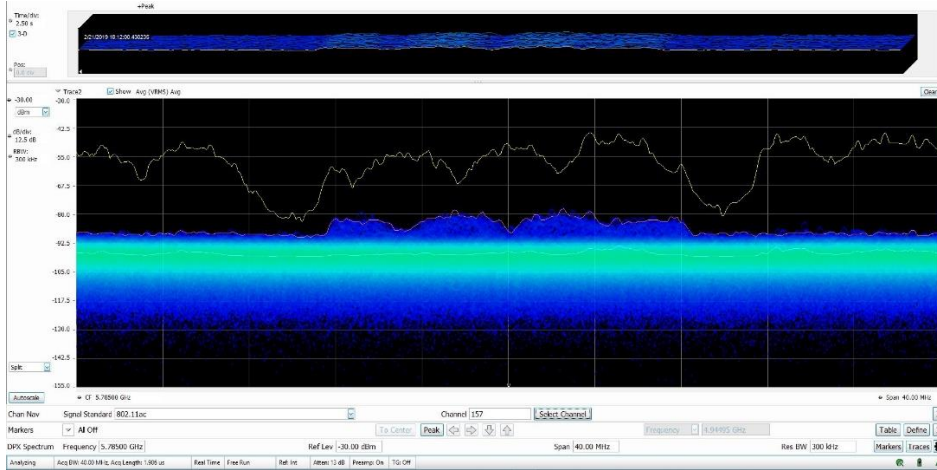

Channel 6
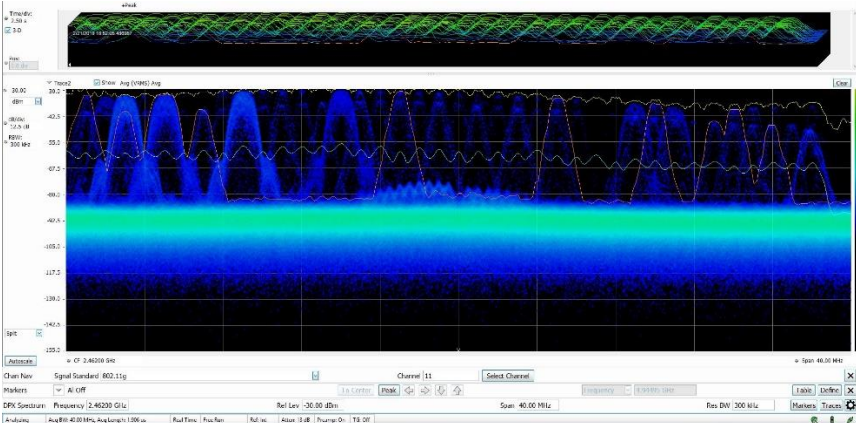
Channel 11

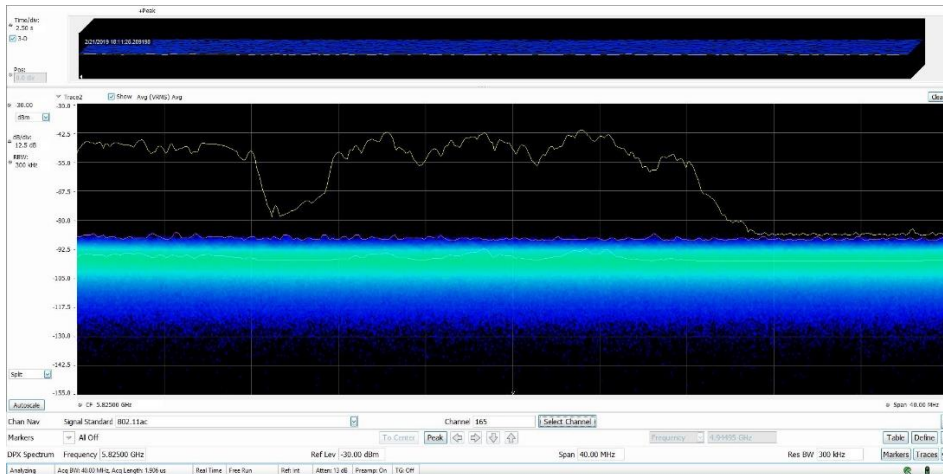# Dunes Lift Station 5.8GHz Spectrum Analysis

Channel 149

Channel 157

Channel 165
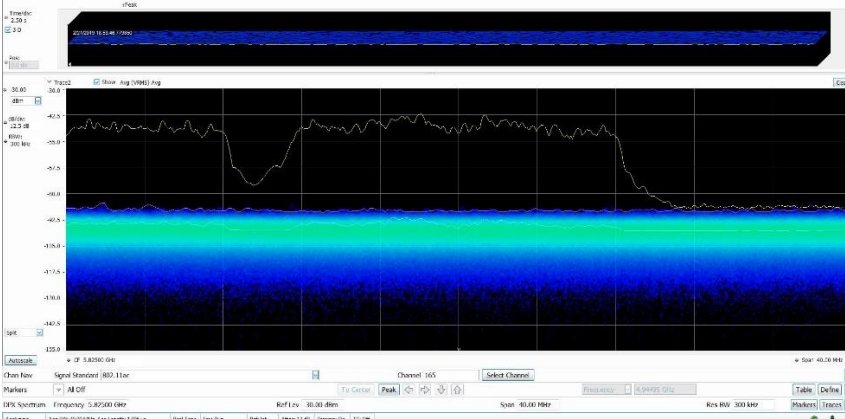
Dunes Lift Station 4.9GHz Spectrum Analysis

4.94GHz
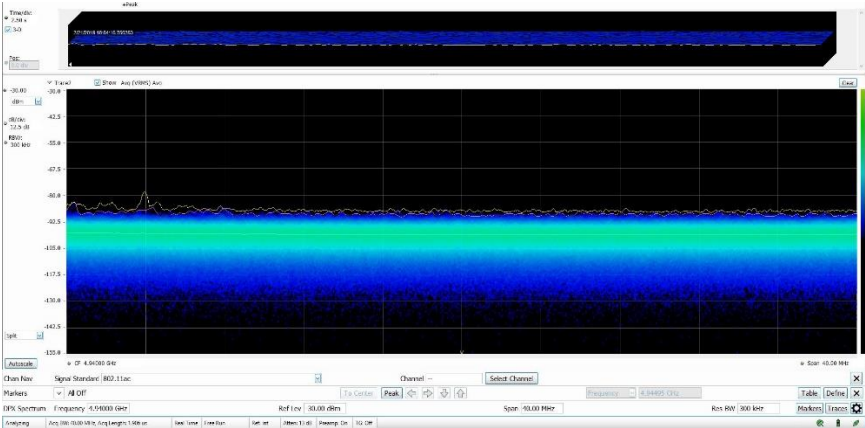
4.96GHz
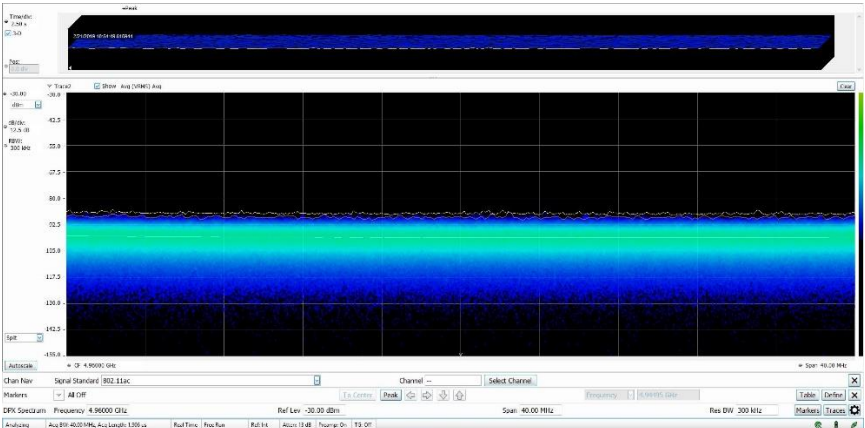
4.99GHz

Eagle Point Lift Station

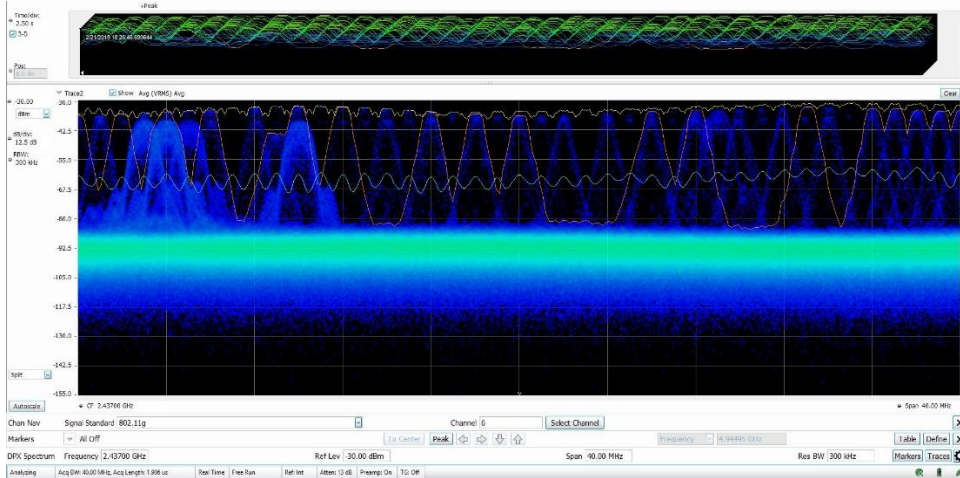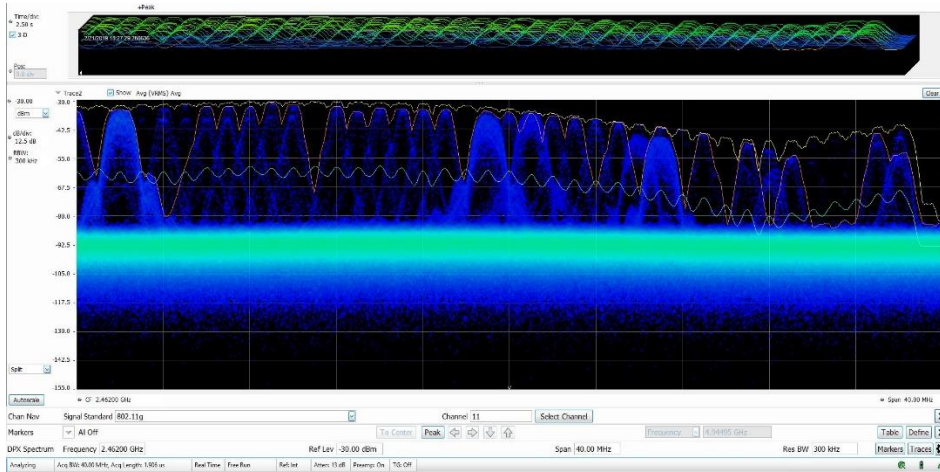|	
Available Power	Power is available.
Mounting Option	Mounting is not currently available.
Security	This site is behind a locked fence.
LAN Access	There is not a direct connection to the city network.
Spectrum Analysis	2.4GHz is saturated. 5GHz is not being used. 4.9GHz is not being used.

(No picture was taken. Site is behind a fence and in a residential area.)

Eagle Point Lift Station 2.4GHz Spectrum Analysis
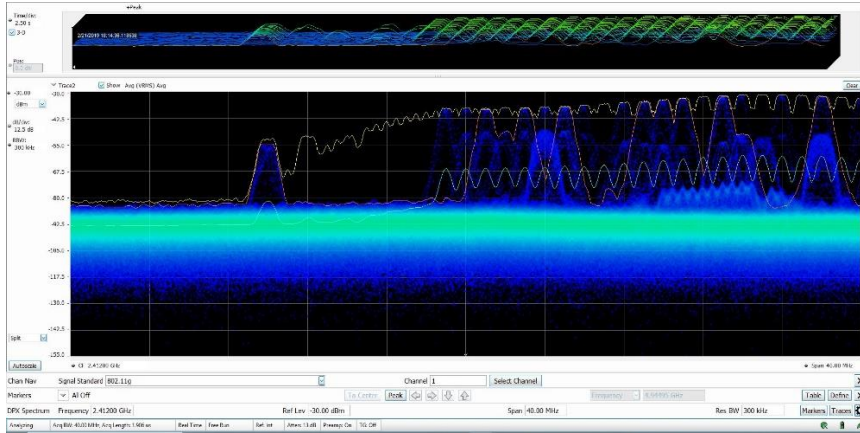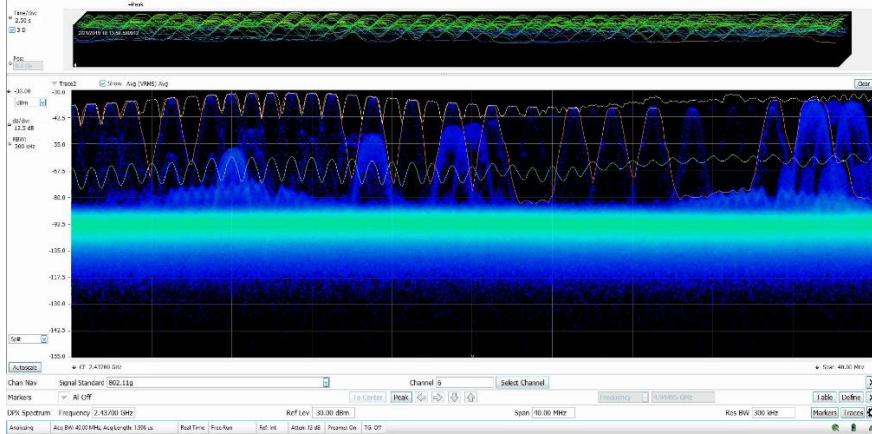
Channel 1
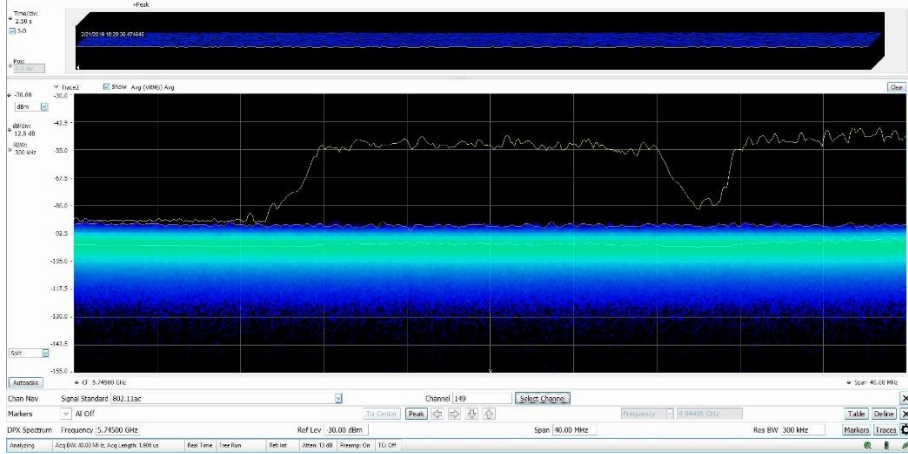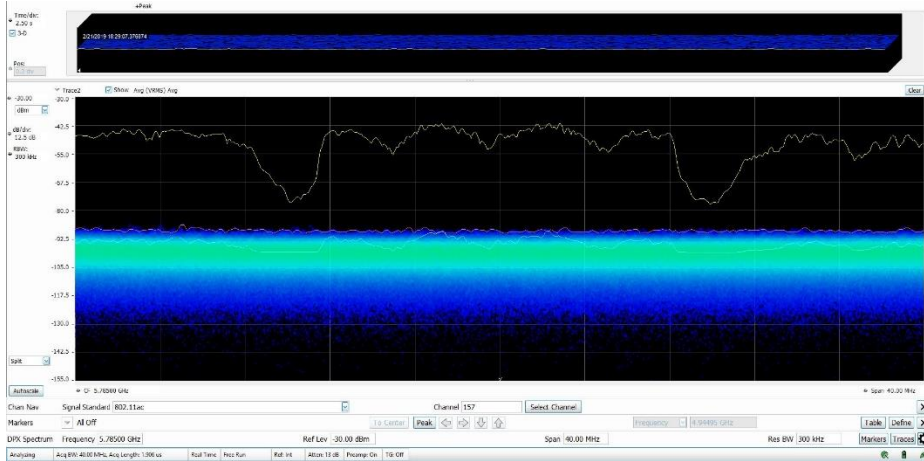

Channel 6

Channel 11

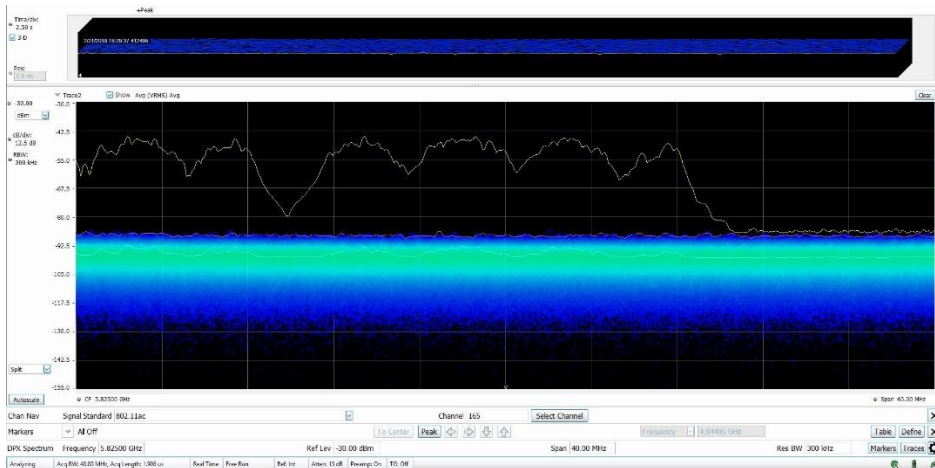# Eagle Point Lift Station 5.8GHz Spectrum Analysis

Channel 149

Channel 157

Channel 165

Eagle Point Lift Station 4.9GHz Spectrum Analysis

4.94GHz
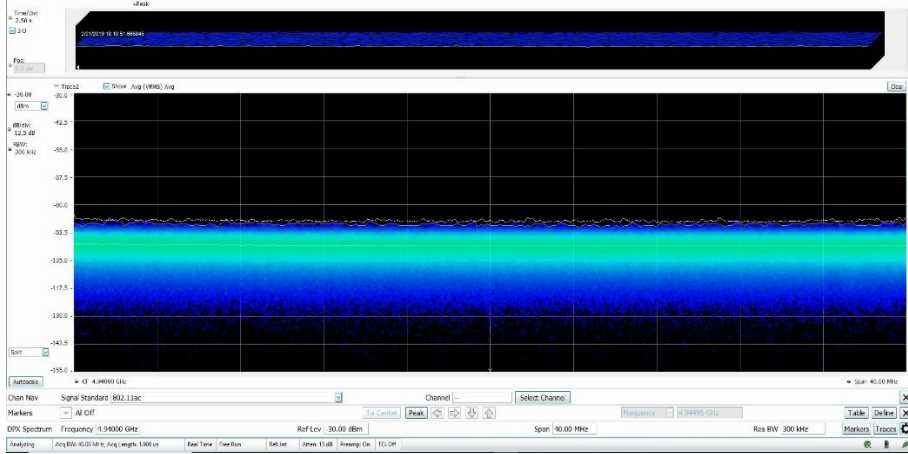
4.96GHz
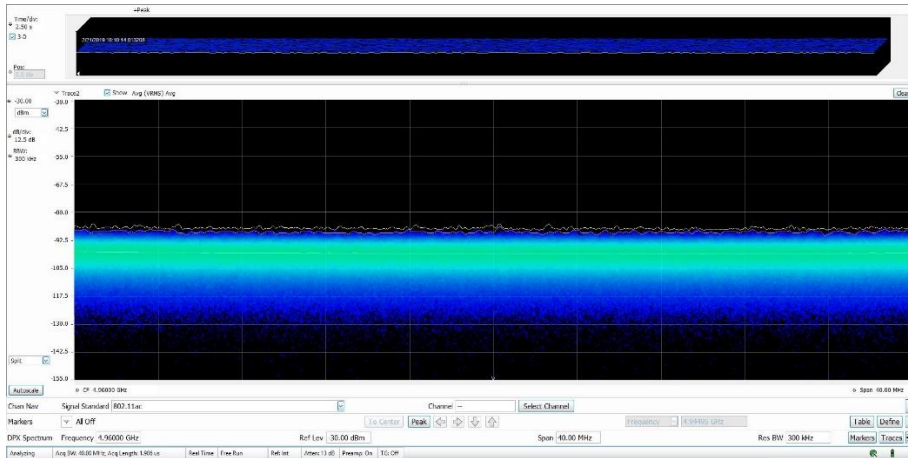
4.99GHz

Falcon Point Lift Station

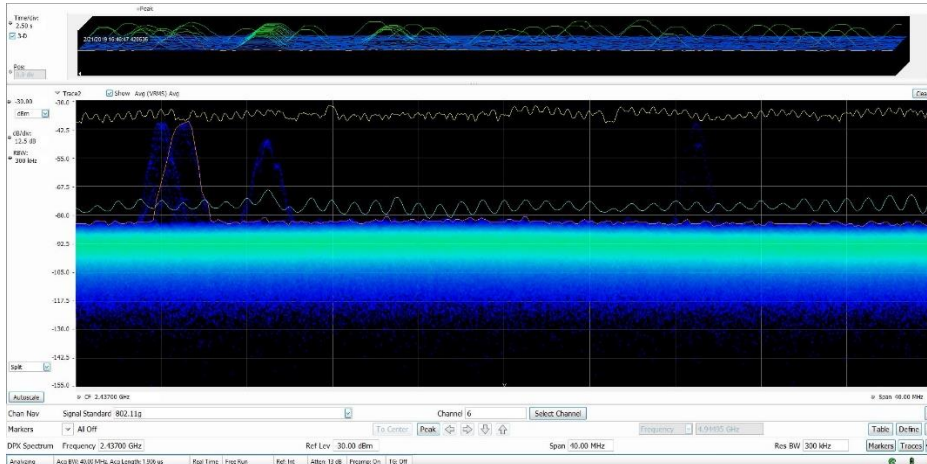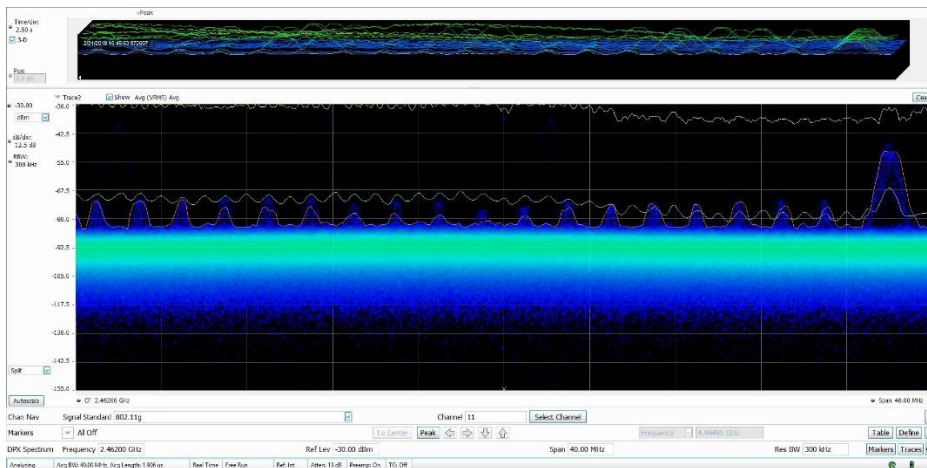|	
Available Power	Power is available.
Mounting Option	Mounting is available on current tower.
Security	This site is behind a locked fence.
LAN Access	There is not a direct connection to the city network.
Spectrum Analysis	2.4GHz is saturated. 5GHz is not being used. 4.9GHz is not being used.

# Falcon Point Lift Station 2.4GHz Spectrum Analysis
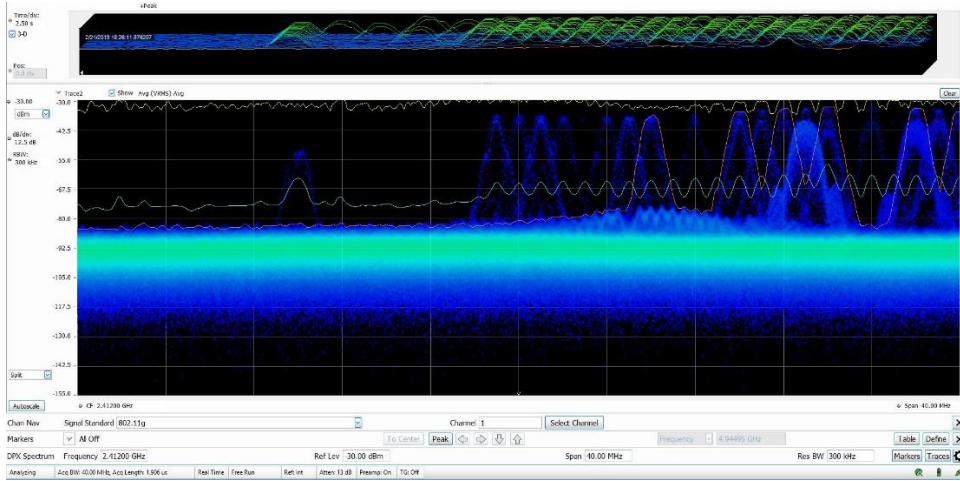
Channel 1

Channel 6
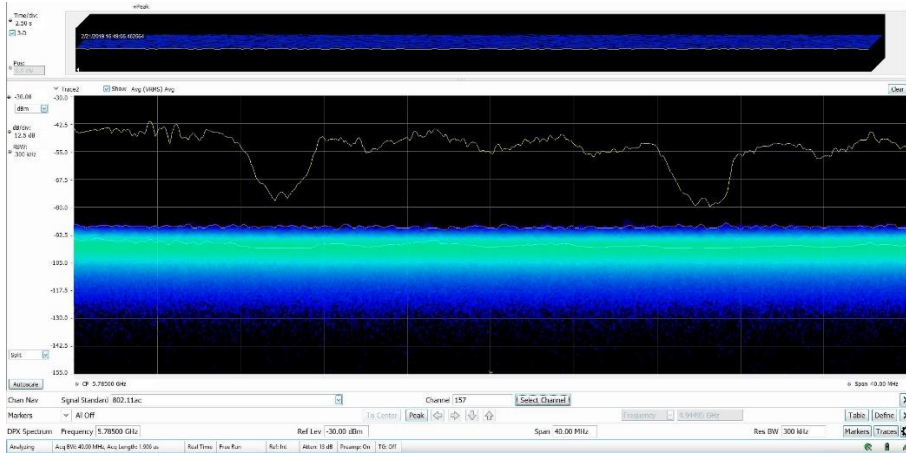

Channel 11

Falcon Point Lift Station 25.8GHz Spectrum Analysis

Channel 149

Channel 157

Channel 165

Falcon Point Lift Station 4.9GHz Spectrum Analysis

4.94GHz
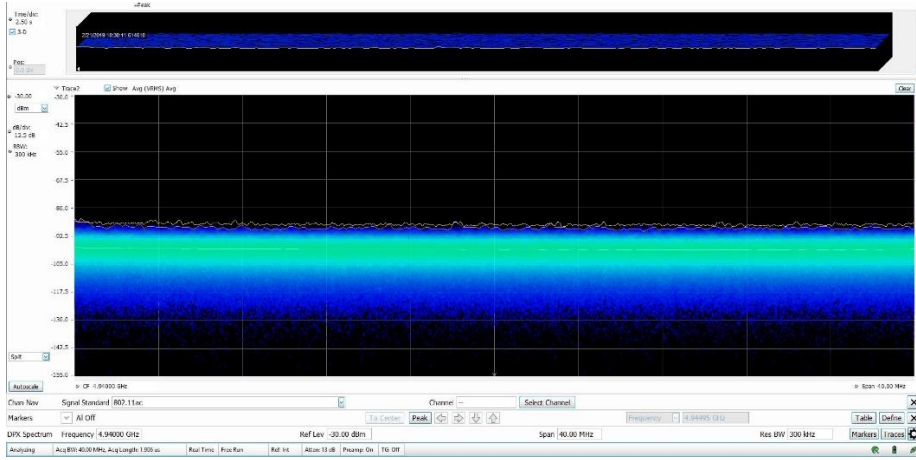
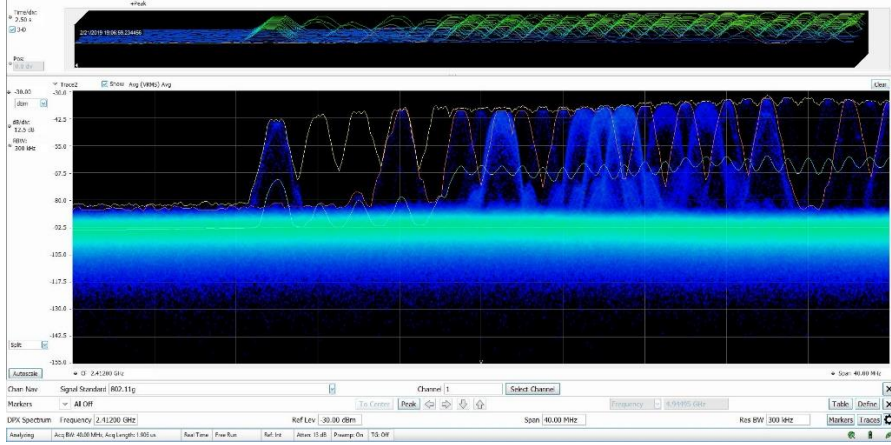## 4.96GHz
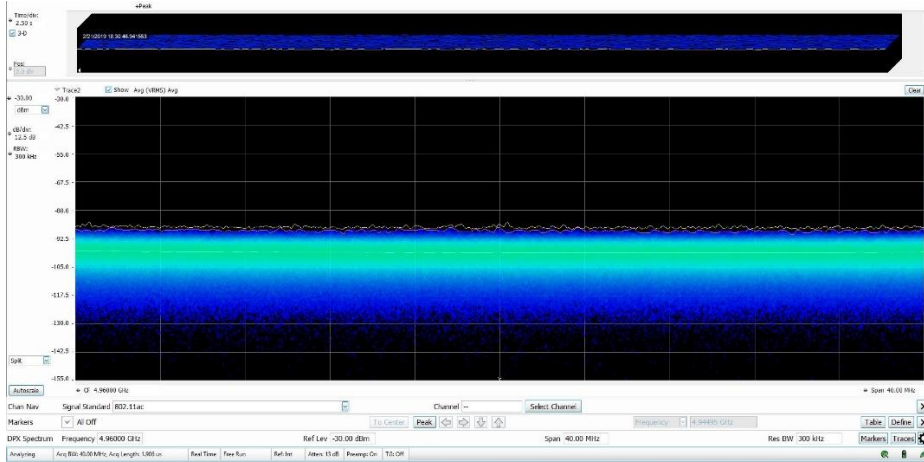
4.99GHz

Highland Park Lift Station

|	
Available Power	Power is available.
Mounting Option	Mounting is available on current tower. Extension is recommended.
Security	This site is behind a locked fence.
LAN Access	There is not a direct connection to the city network.
Spectrum Analysis	2.4GHz is saturated. 5GHz is not being used. 4.9GHz is not being used.

# Highland Park Lift Station 2.4GHz Spectrum Analysis
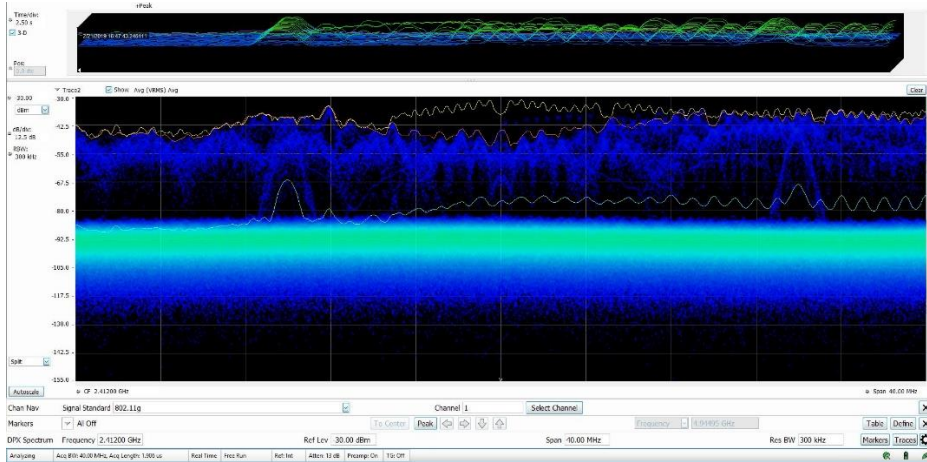
Channel 1

Channel 6
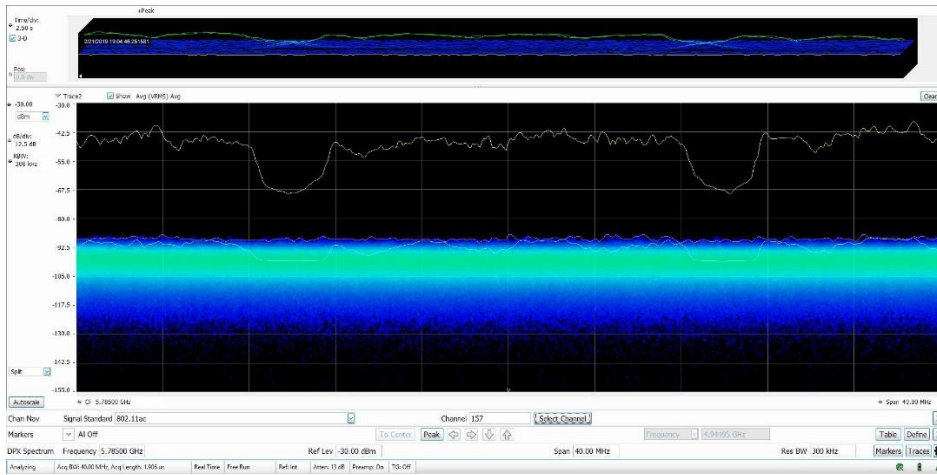

Channel 11

Highland Park Lift Station 5.8GHz Spectrum Analysis
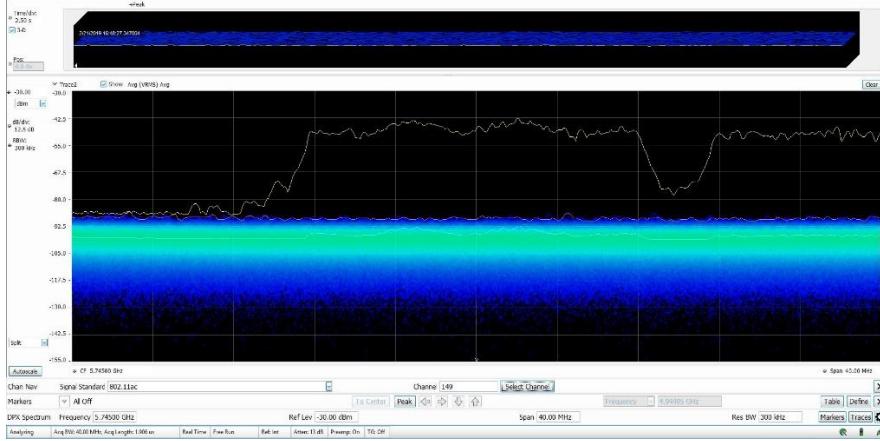
Channel 149

Channel 157

Channel 165
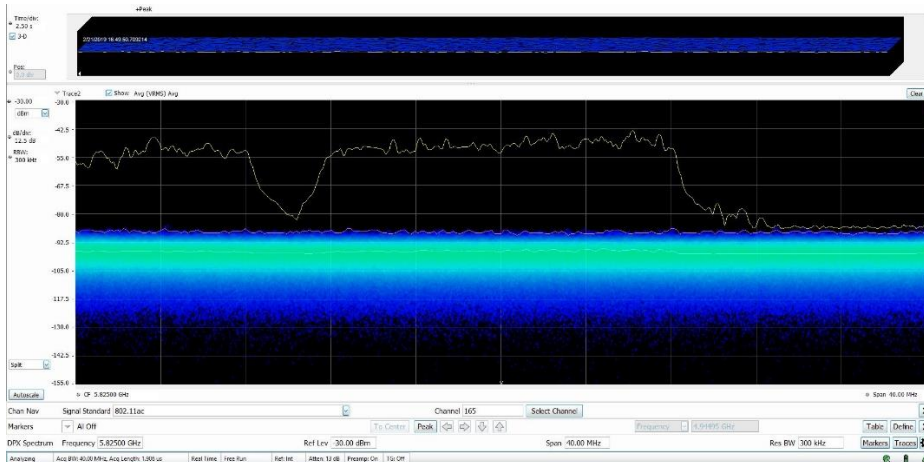
Highland Park Lift Station 4.9GHz Spectrum Analysis

4.94GHz
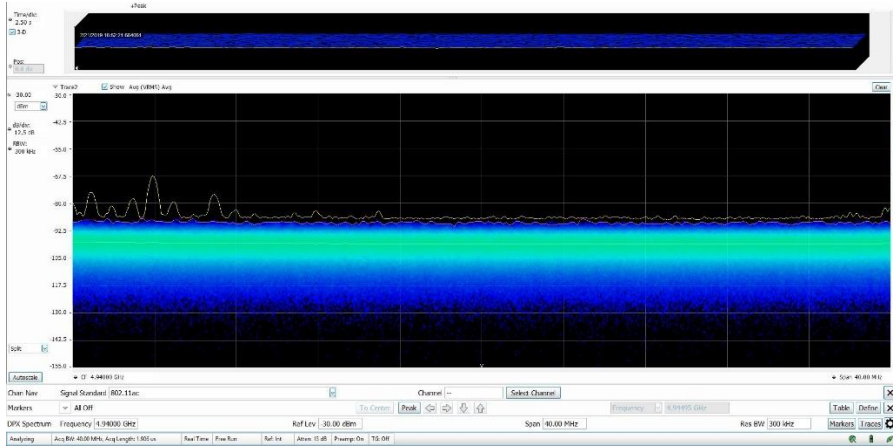
4.96GHz
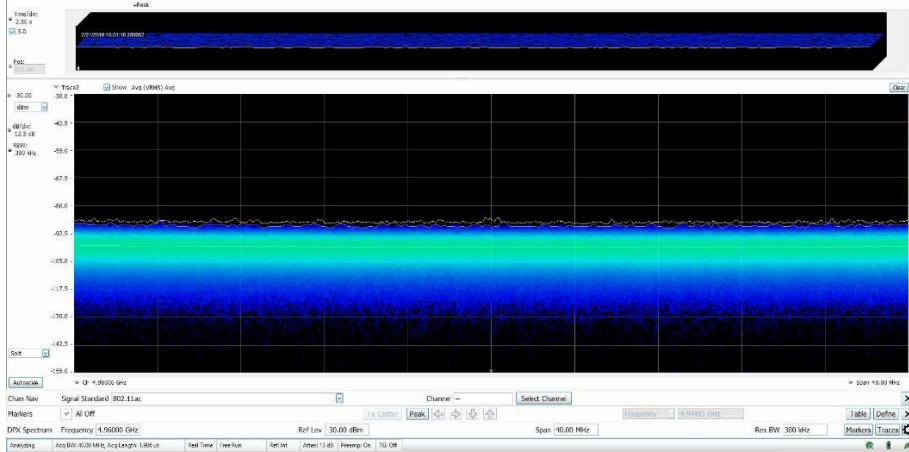
4.99GHz

Kelly Lane Lift Station

|	
Available Power	Power is available.
Mounting Option	Mounting is available on current tower. Extension is recommended.
Security	This site is behind a locked fence.
LAN Access	There is not a direct connection to the city network.
Spectrum Analysis	2.4GHz is saturated. 5GHz is not being used. 4.9GHz is not being used.

# Kelly Lane Lift Station 2.4GHz Spectrum Analysis
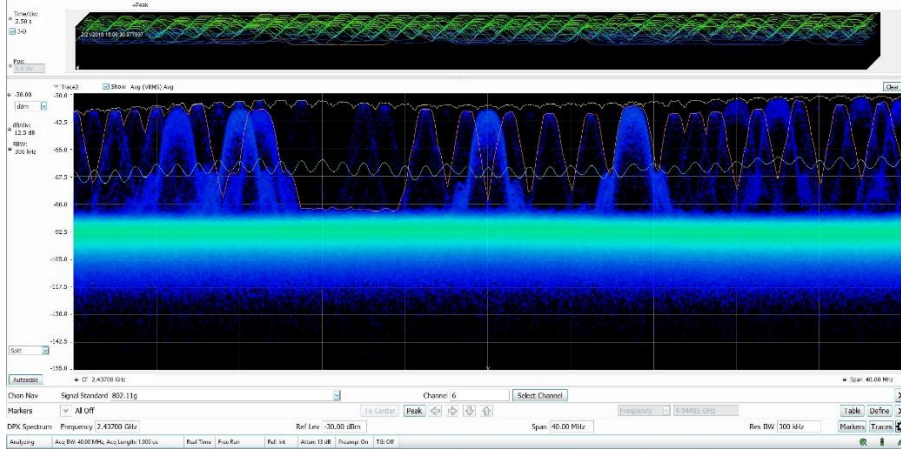
Channel 1

Channel 6
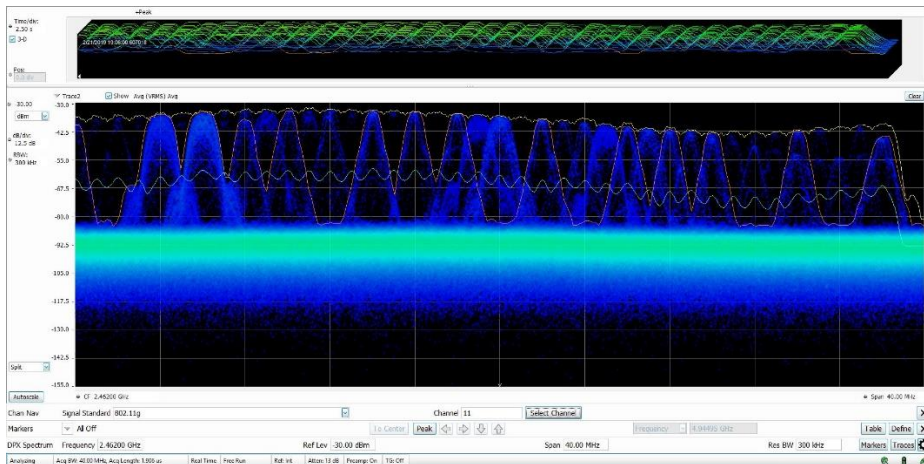
Channel 11

Kelly Lane Life Station 5.8GHz Spectrum Analysis
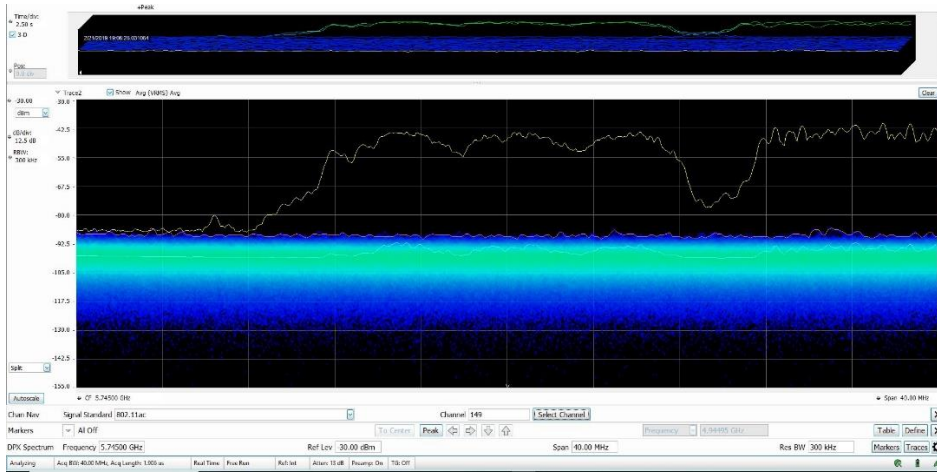
Channel 149

Channel 157

Channel 165
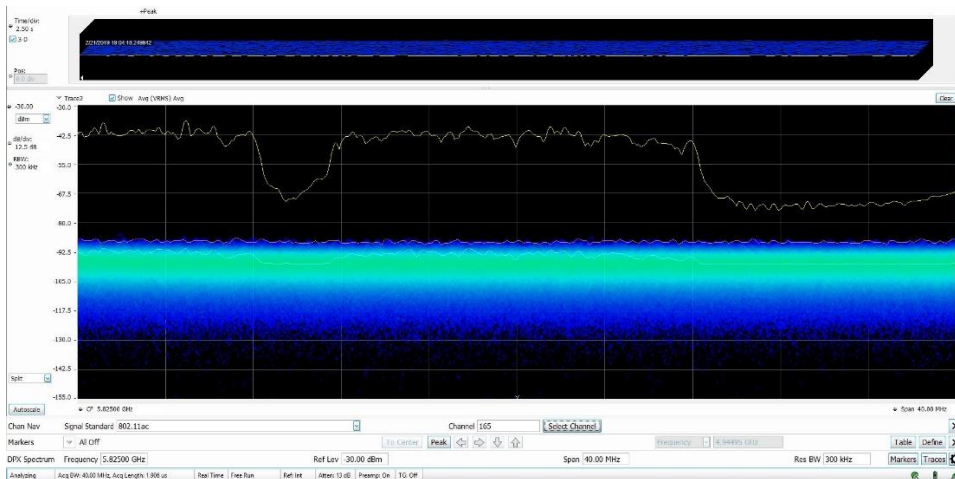
Kelly Lane Lift Station 4.9GHz Spectrum Analysis

4.94GHz
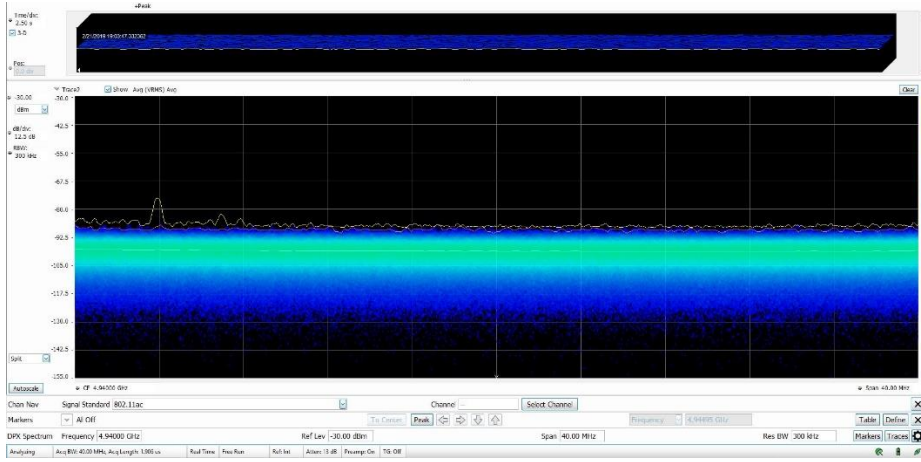
4.96GHz
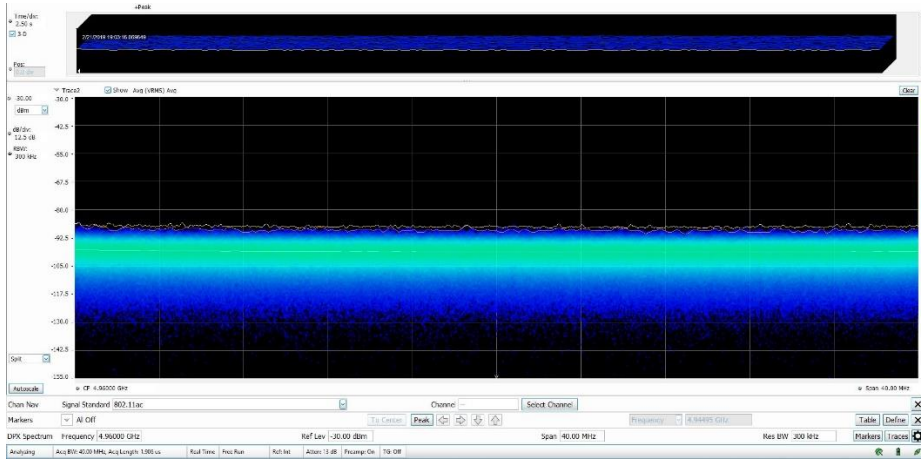
4.99GHz
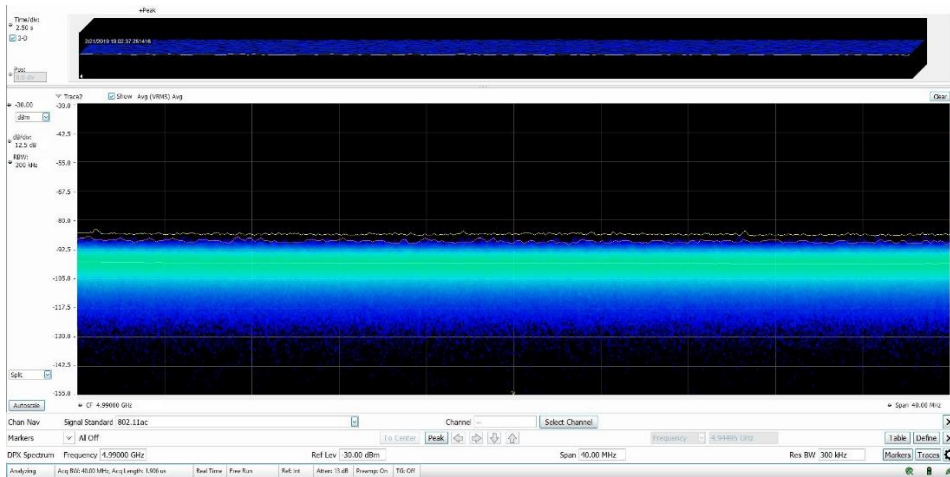
Lake Pump

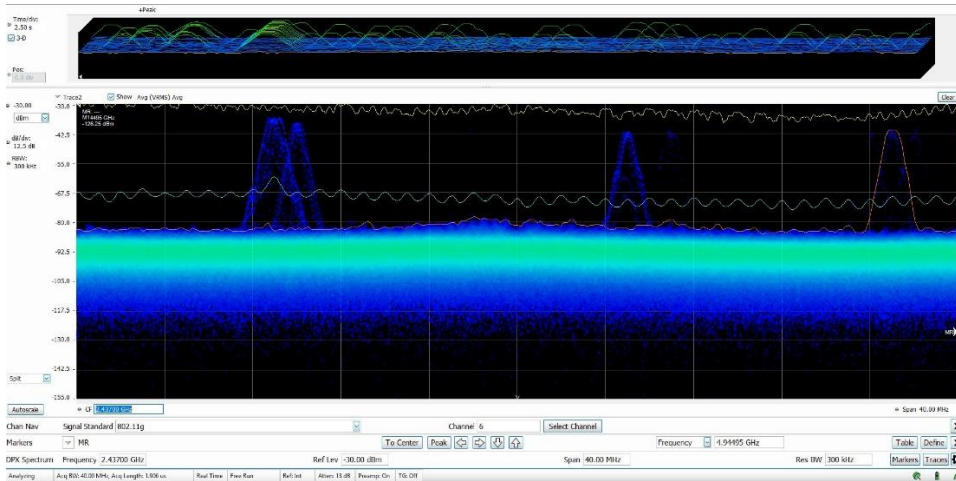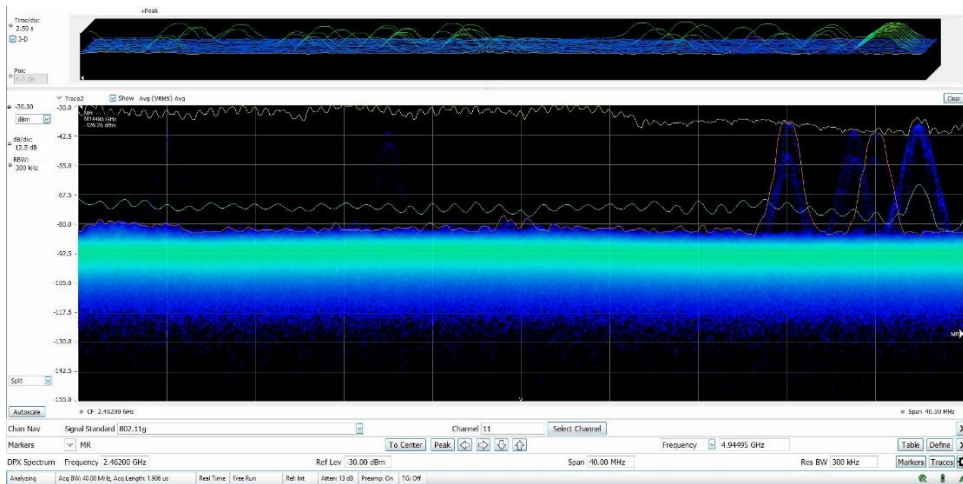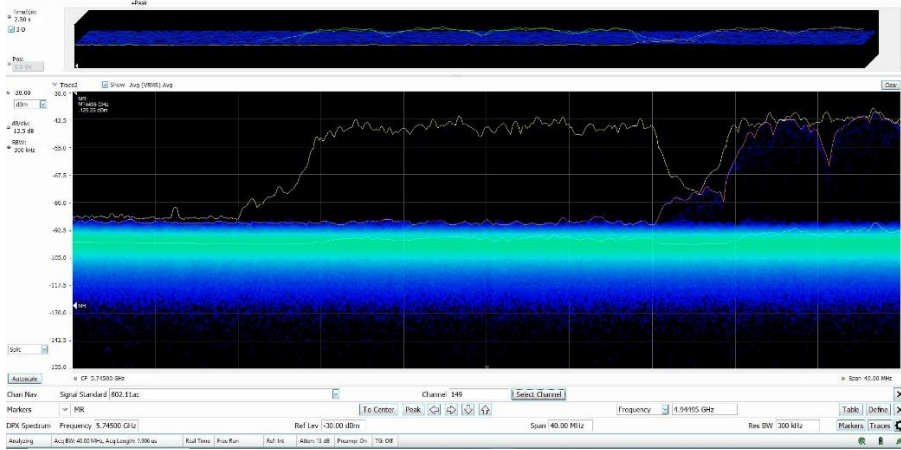| Available Power	Power is available.
Mounting Option	Mounting is not currently available.
Security	This site is a building that is locked.
LAN Access	There is not a direct connection to the city network.
Spectrum Analysis	2.4GHz is saturated. 5GHz is not being used. 4.9GHz is not being used.

Lake Pump 2.4GHz Spectrum Analysis
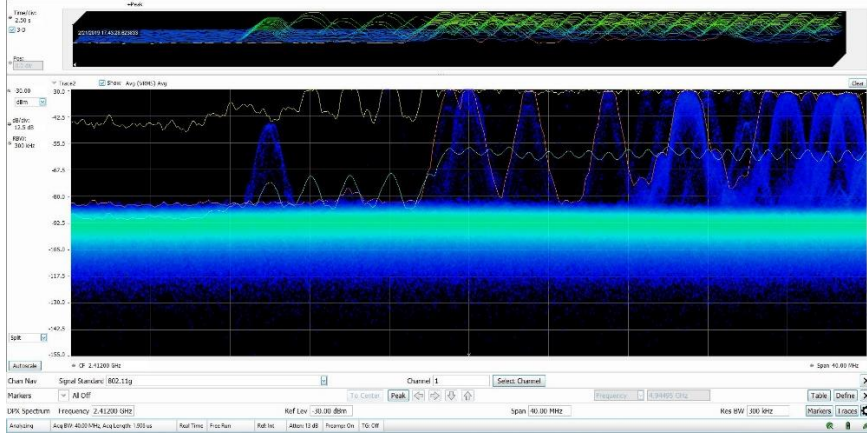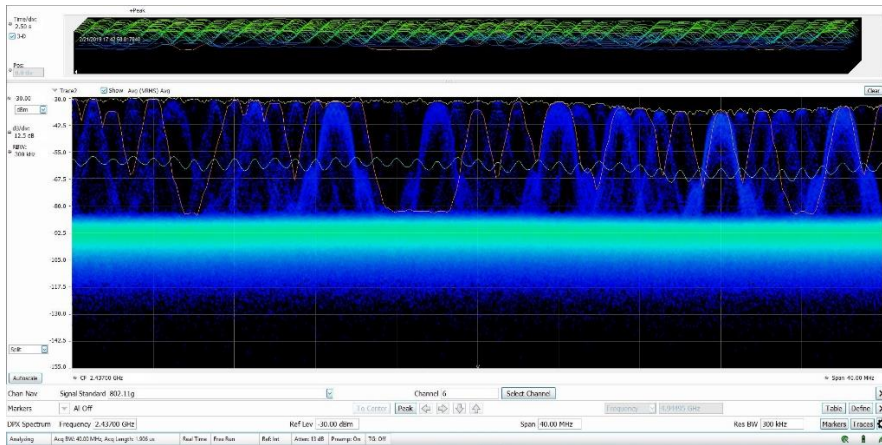
Channel 1

Channel 6
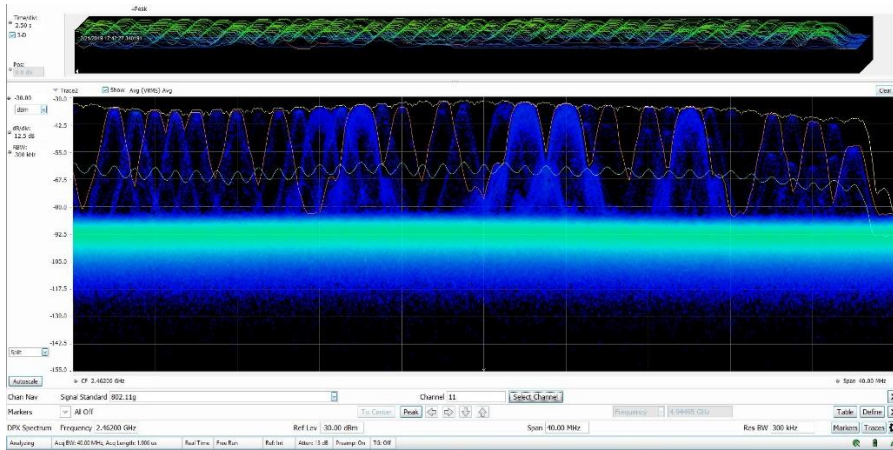
Channel 11

Lake Pump 5.8GHz Spectrum Analysis
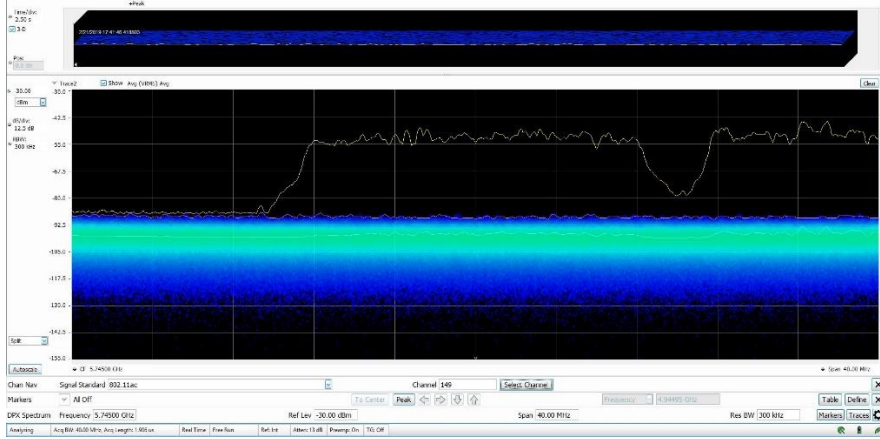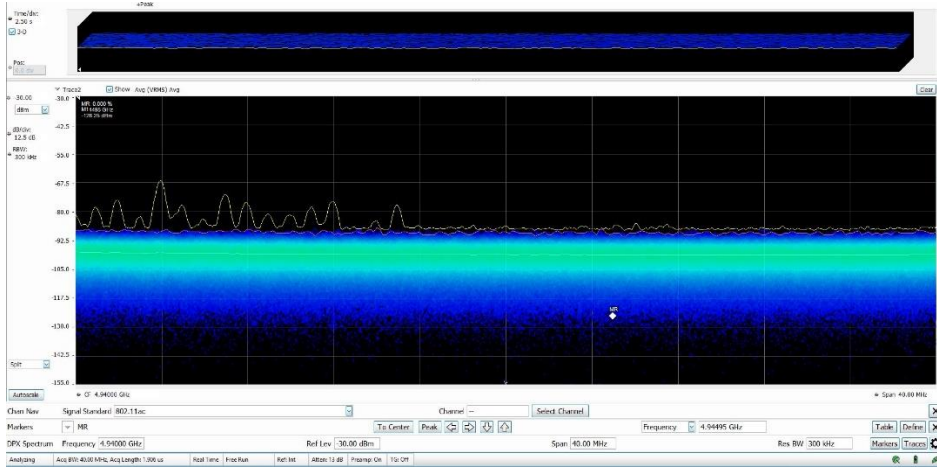
Channel 149
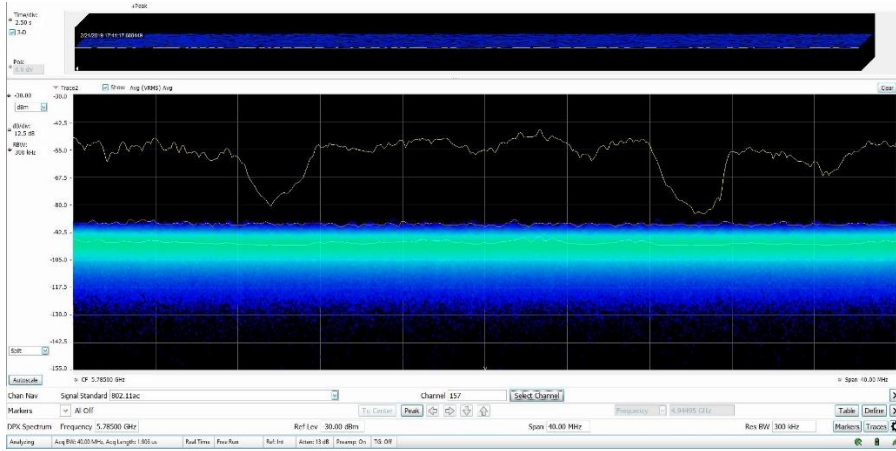
Channel 157

Channel 165
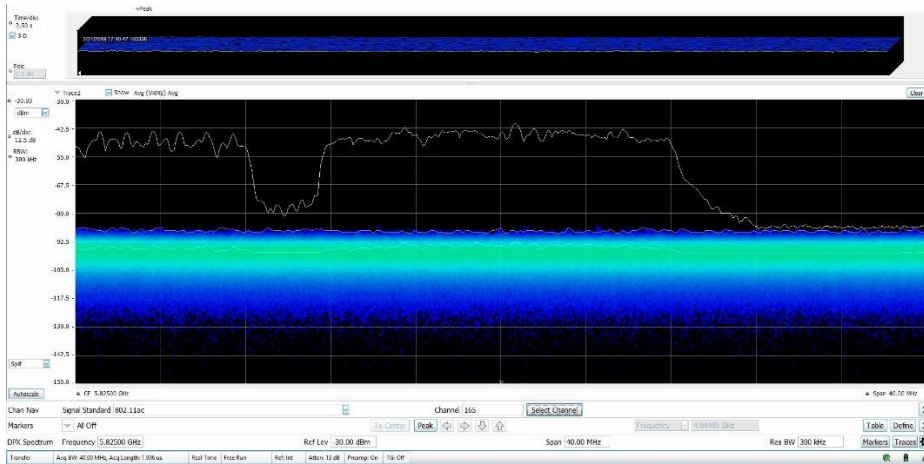
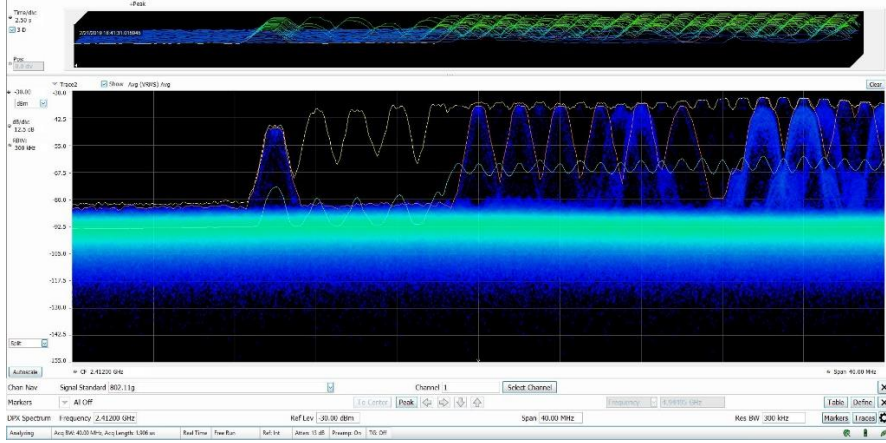# Lake Pump 4.9GHz Spectrum Analysis

4.94GHz
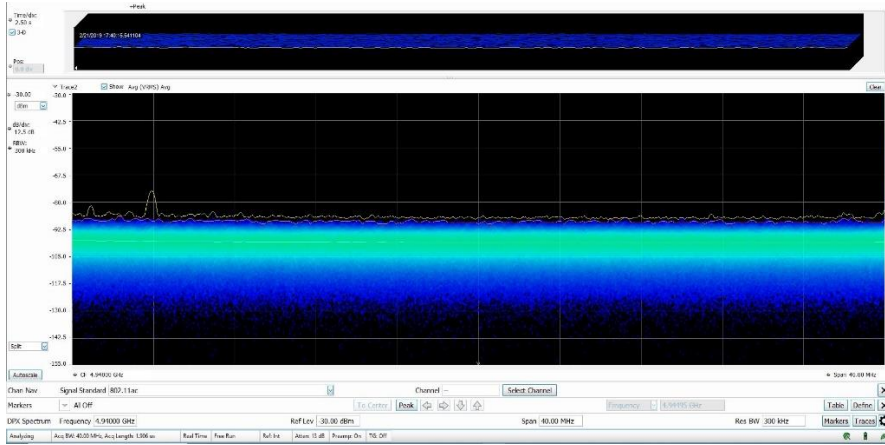
4.96GHz
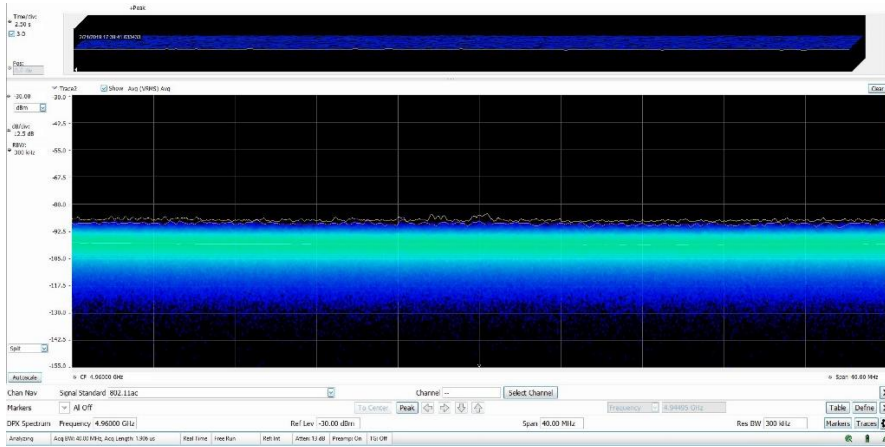
4.99GHz
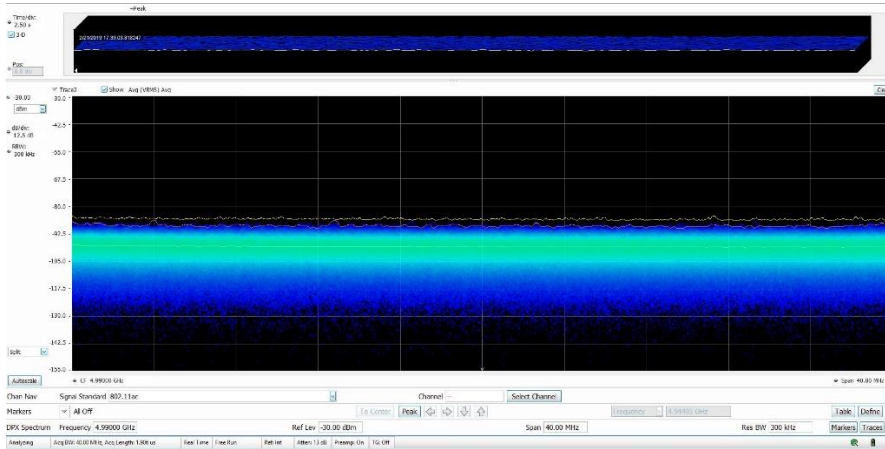
Library

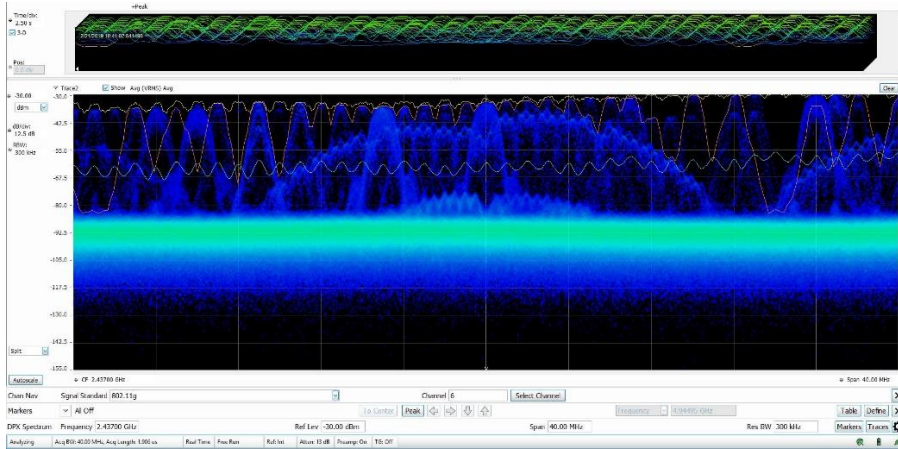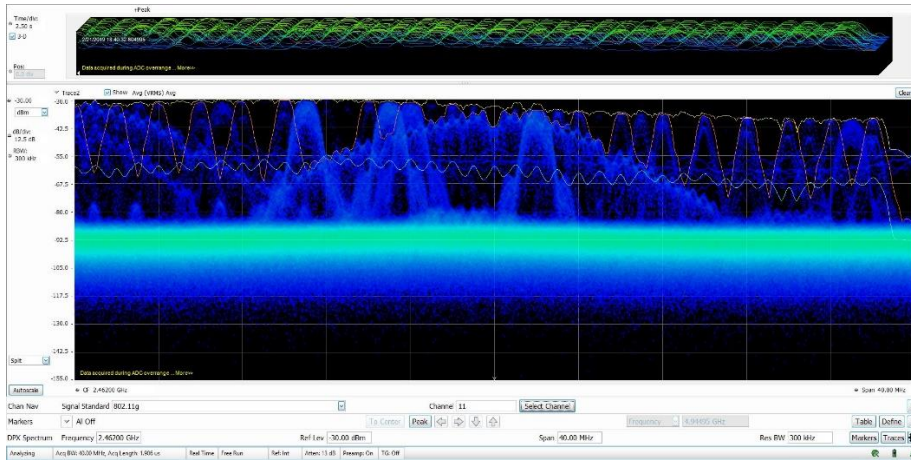|	
Available Power	Power is available.
Mounting Option	Mounting is not currently available.
Security	This site is a building that is locked.
LAN Access	There is not a direct connection to the city network.
Spectrum Analysis	2.4GHz is saturated. 5GHz is not being used. 4.9GHz is not being used.

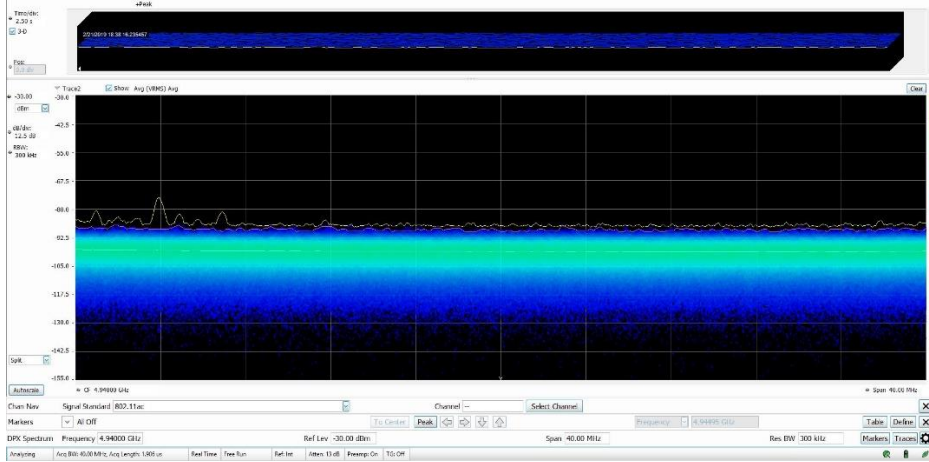# Library 2.4GHz Spectrum Analysis
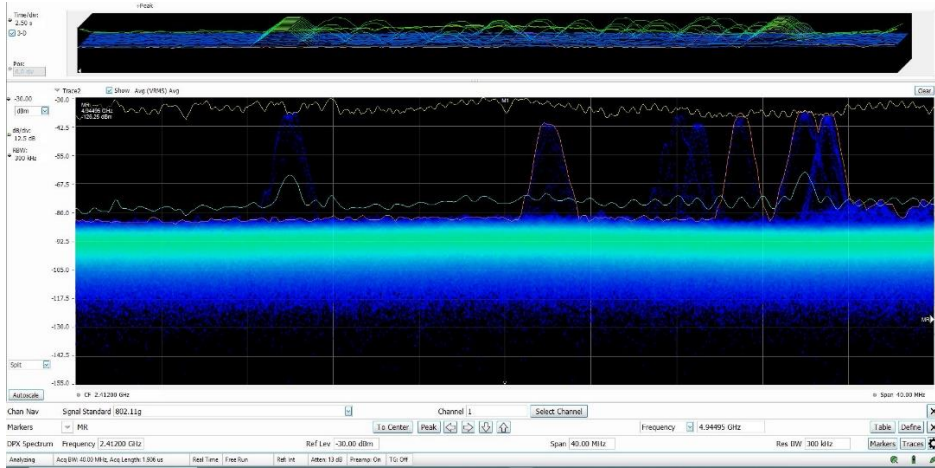
Channel 1

Channel 6

Channel 11

Library 5.8GHz Spectrum Analysis

Channel 149
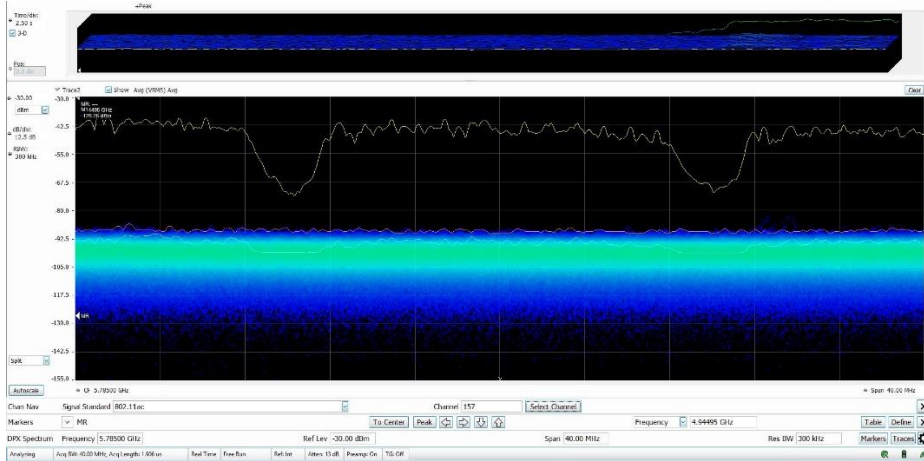
Channel 157

Channel 165
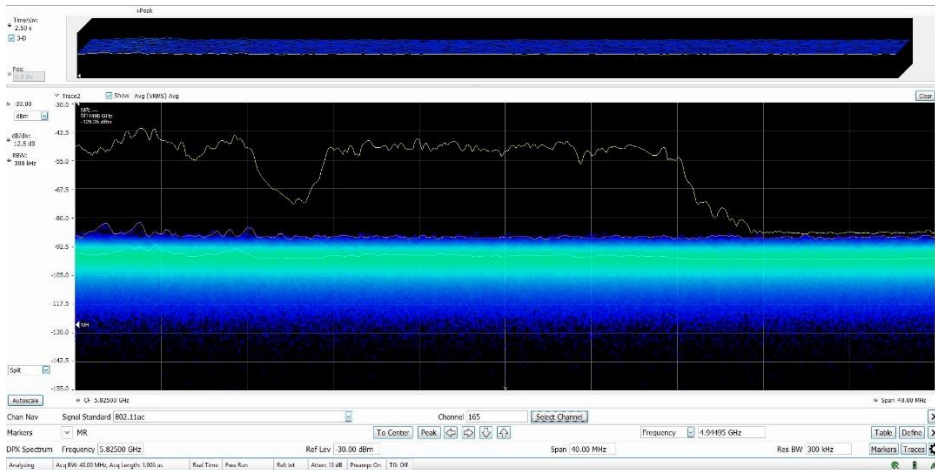
Library 4.9GHz Spectrum Analysis

4.94GHz

4.96GHz
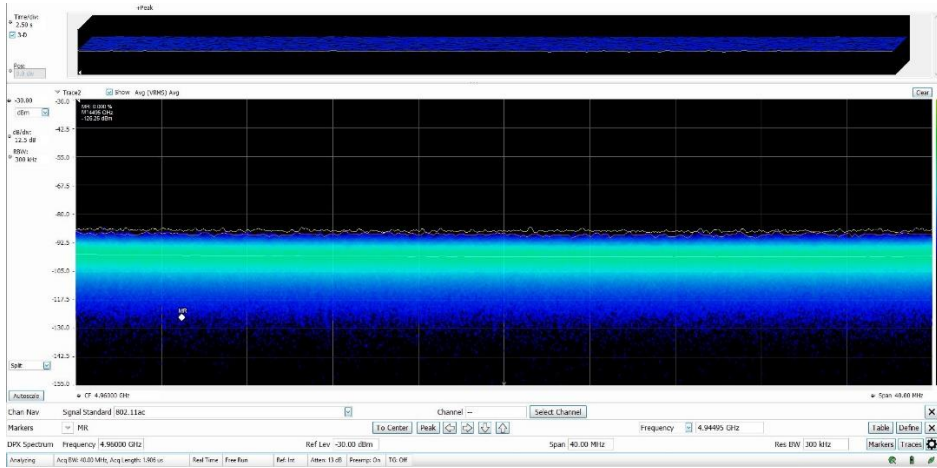
4.99GHz

Littleblackhawk Lift Station

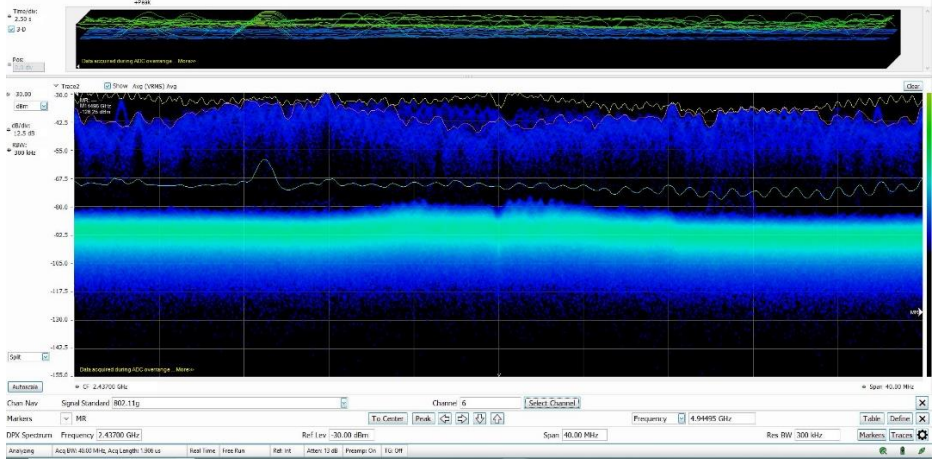|	
Available Power	Power is available.
Mounting Option	Mounting is not currently available.
Security	This site has a locked fence.
LAN Access	There is not a direct connection to the city network.
Spectrum Analysis	2.4GHz is saturated. 5GHz is not being used. 4.9GHz is not being used.

Littleblackhawk Lift Station 2.4GHz Spectrum Analysis

Channel 1

Channel 6

Channel 11

Littleblackhawk Lift Station 5.8GHz Spectrum Analysis

Channel 149

Channel 157

Channel 165

Littleblackhawk Lift Station 4.9GHz Spectrum Analysis

4.94GHz

4.96GHz
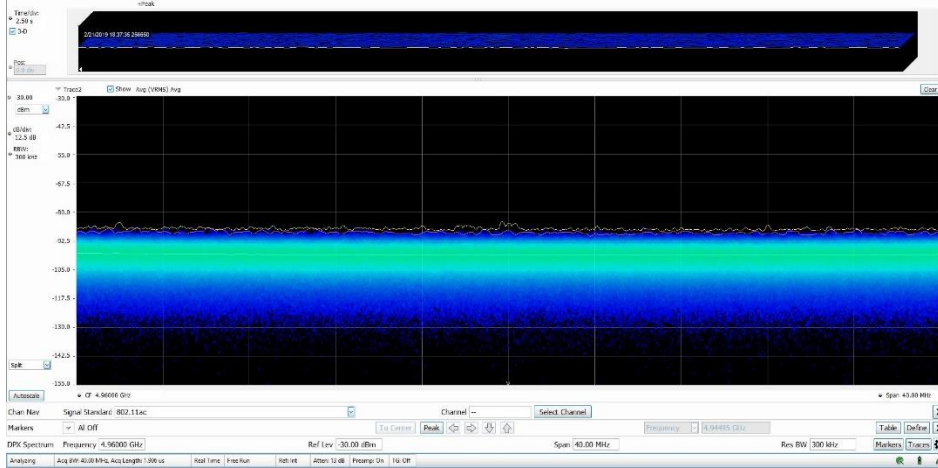
4.99GHz
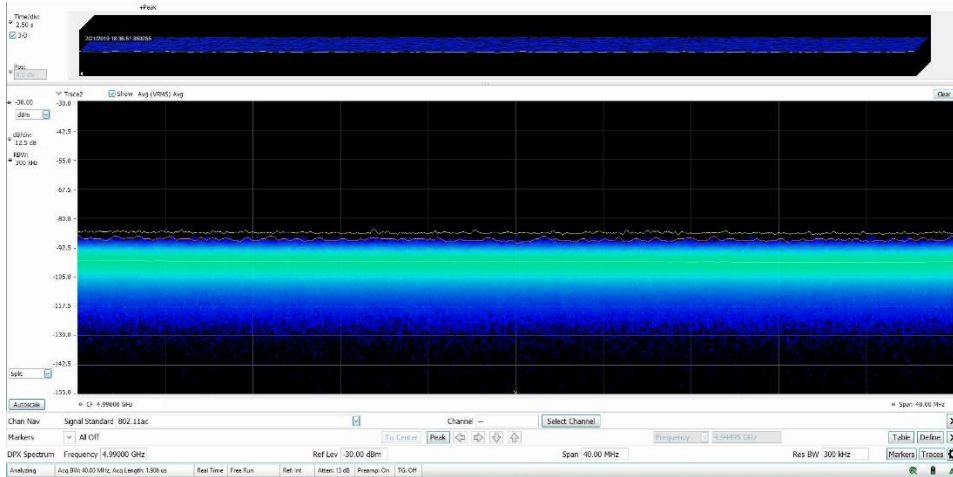
Mud Valve 5

Available Power	Power is not available.
Mounting Option	Mounting is not currently available.
Security	This site is not secure.
LAN Access	There is not a direct connection to the city network.
Spectrum Analysis	2.4GHz is saturated. 5GHz is not being used. 4.9GHz is not being used.

(No picture was taken. Valve is next to a parking lot.)

Mud Valve 5 2.4GHz Spectrum Analysis
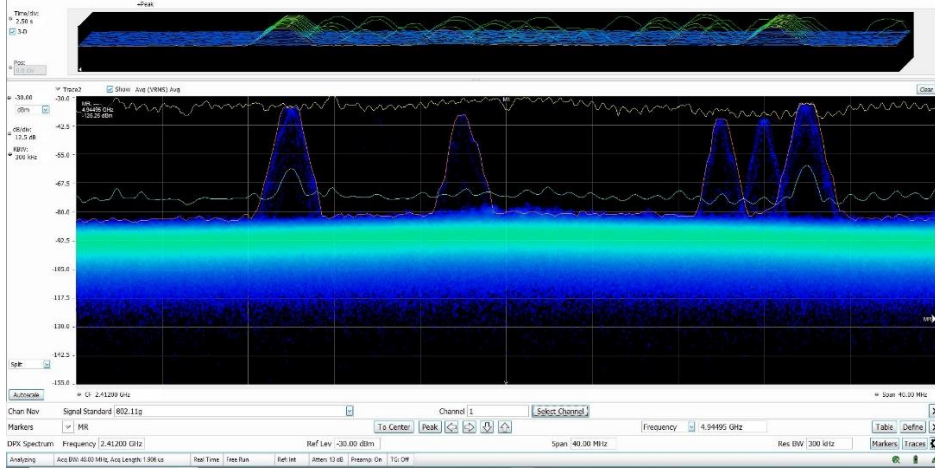
Channel 1

Channel 6
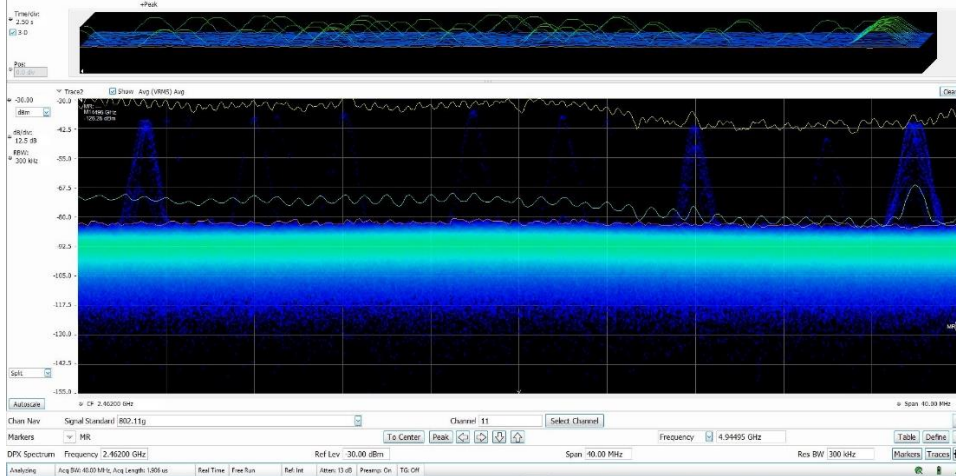
Channel 11

Mud Valve 5 5.8GHz Spectrum Analysis
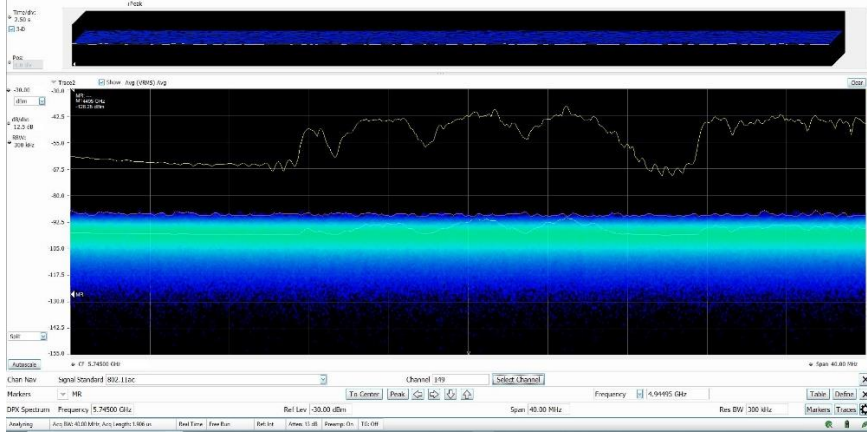
Channel 149
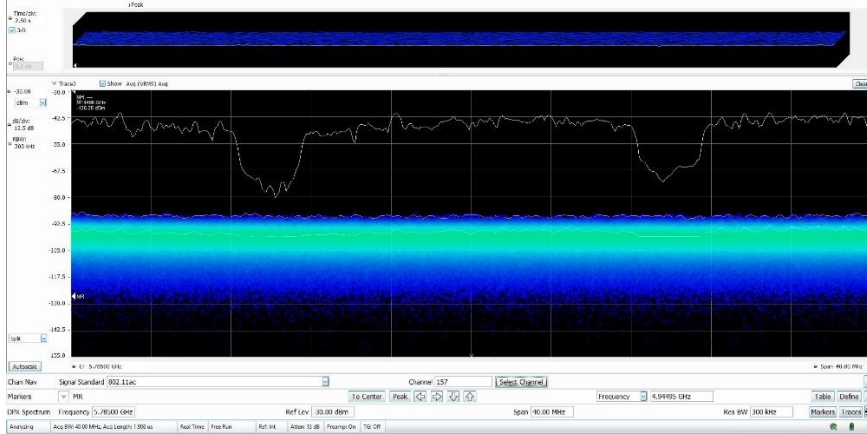
Channel 157

Channel 165
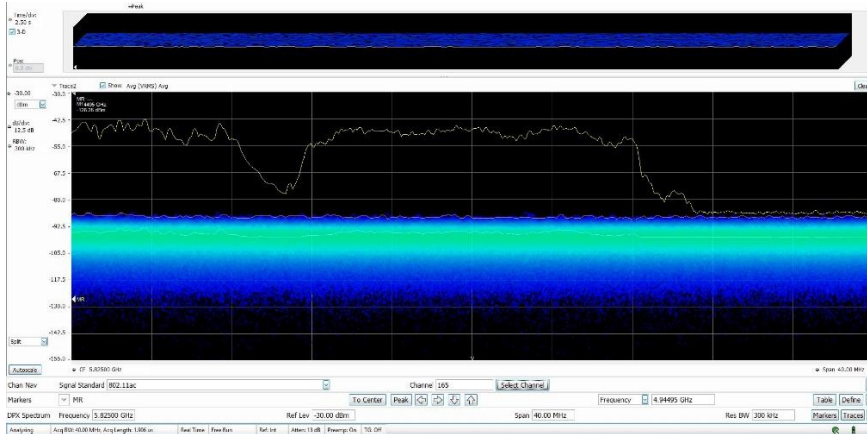
Mud Valve 5 4.9GHz Spectrum Analysis

4.94GHz
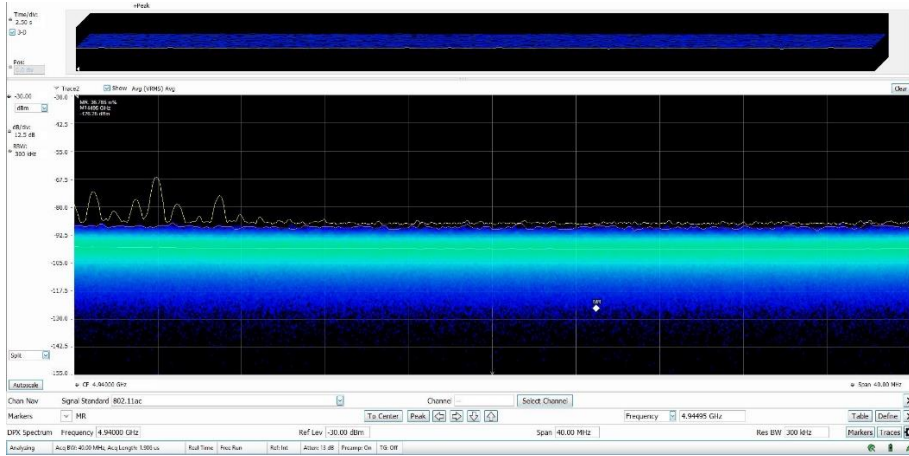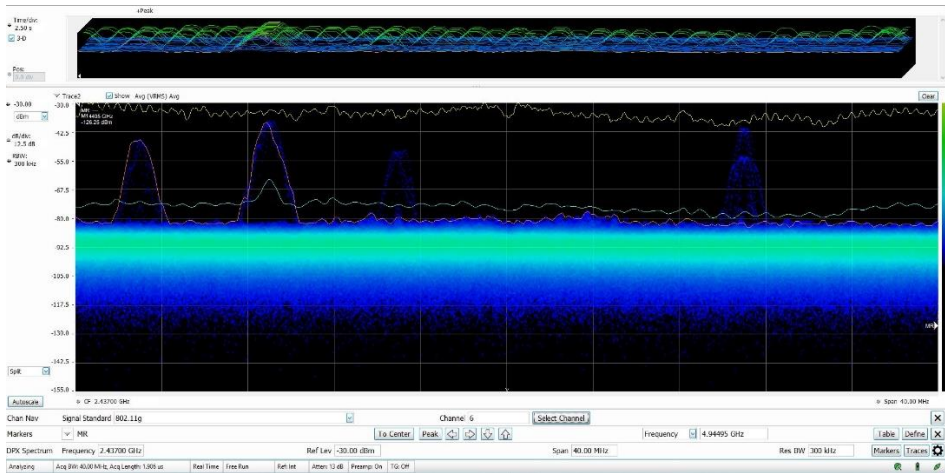

4.96GHz
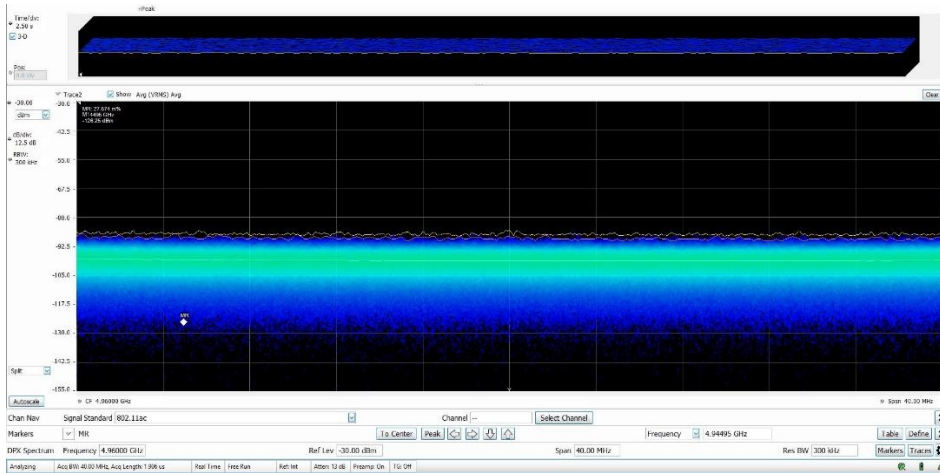
4.99GHz
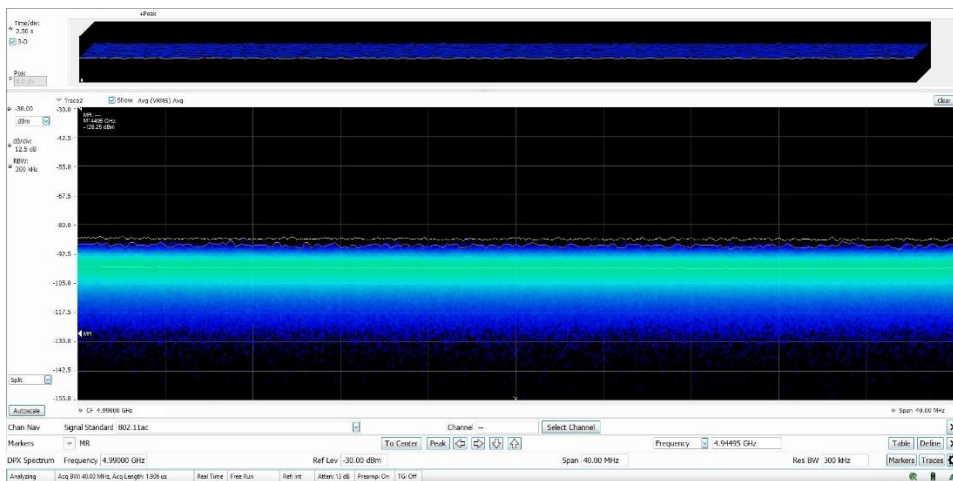
Parks Department Administration

Available Power	Power is available.
Mounting Option	Mounting is not currently available.
Security	This site is a building that is locked.
LAN Access	There is not a direct connection to the city network.
Spectrum Analysis	2.4GHz is saturated. 5GHz is not being used. 4.9GHz is not being used.

Parks Department Administration 2.4GHz Spectrum Analysis
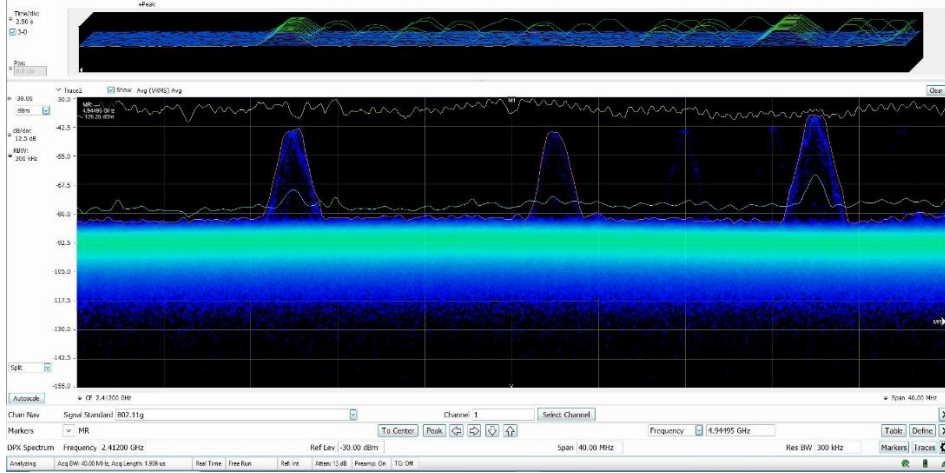
Channel 1

Channel 6
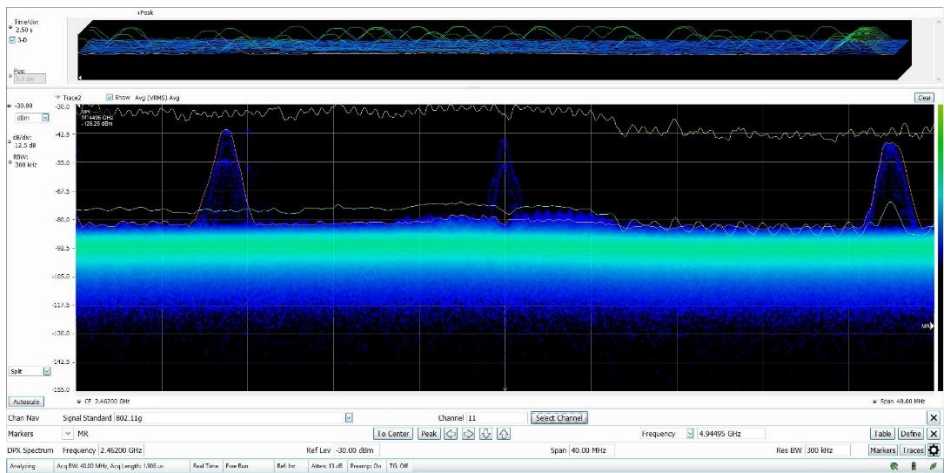
Channel 11

Parks Department Administration 5.8GHz Spectrum Analysis
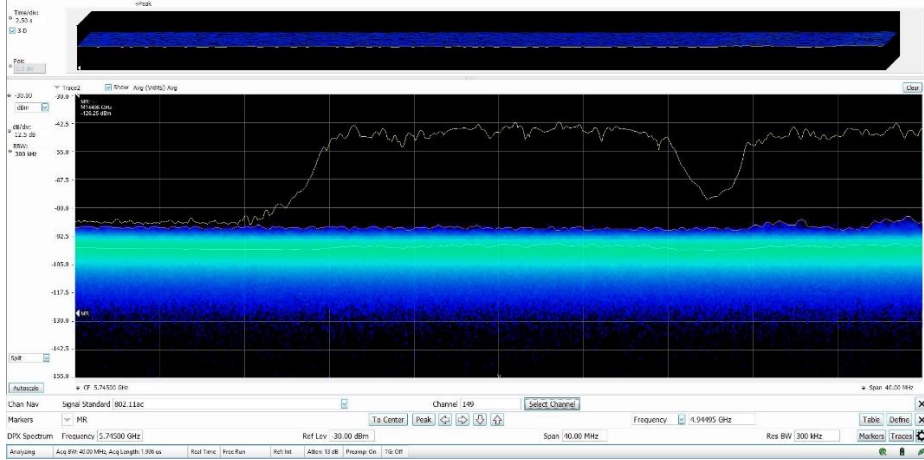
Channel 149
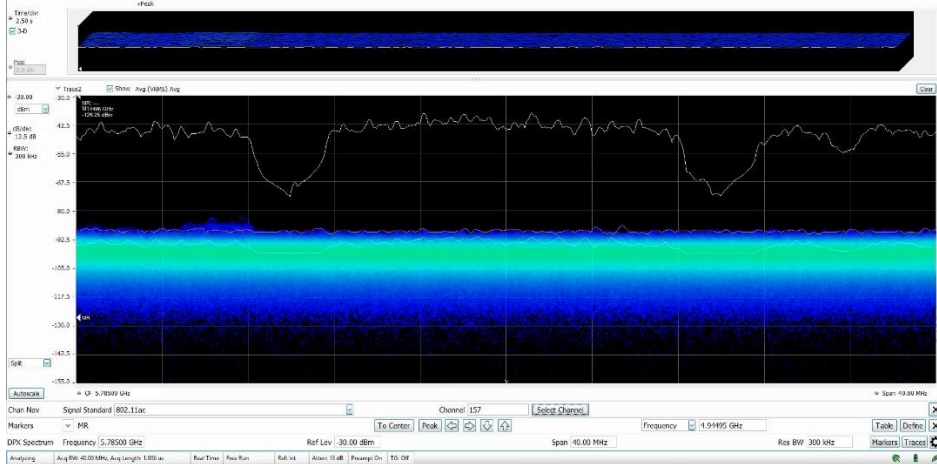
Channel 157

Channel 165
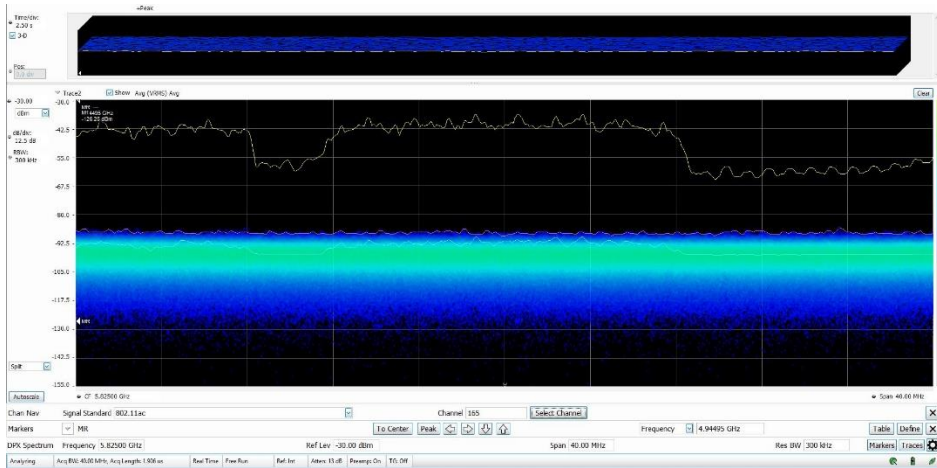
Parks Department Administration 4.9GHz Spectrum Analysis
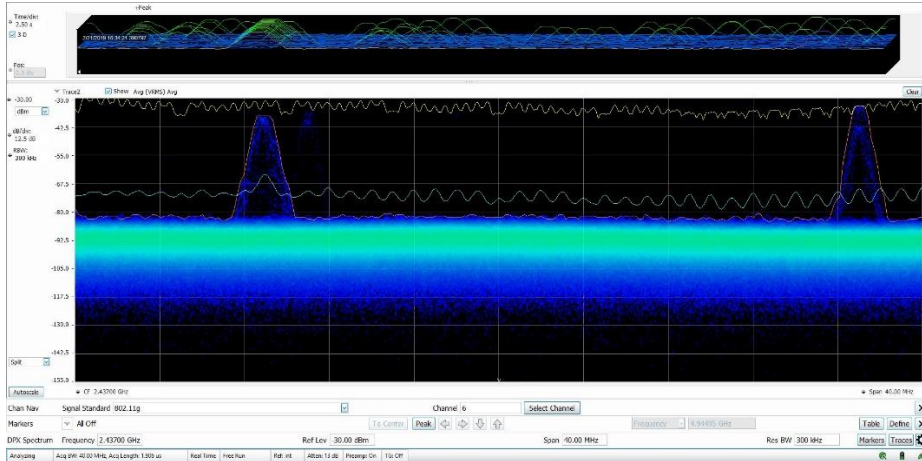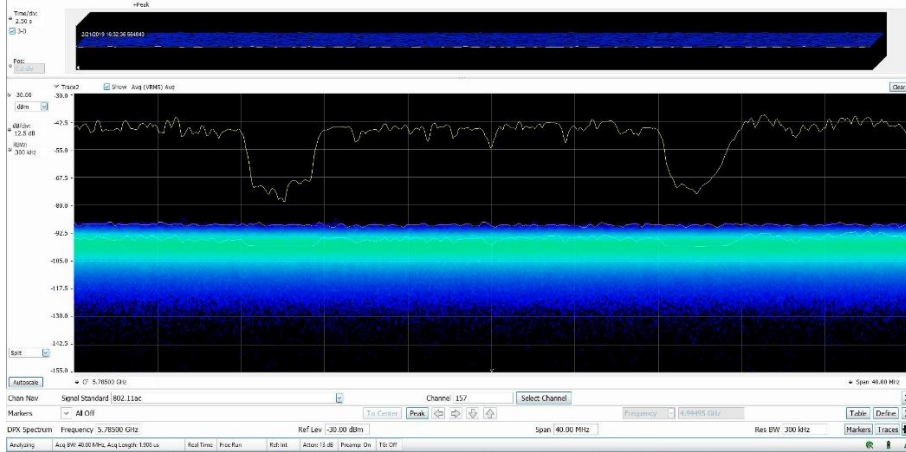
4.94GHz
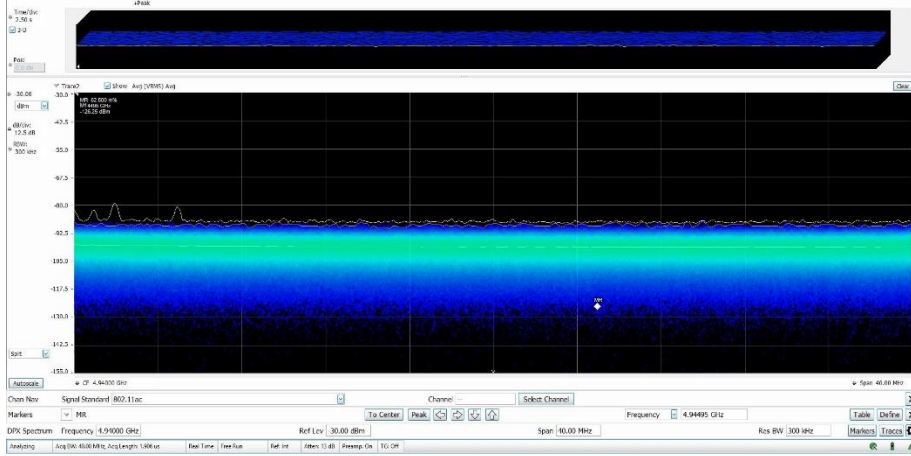
4.96GHz
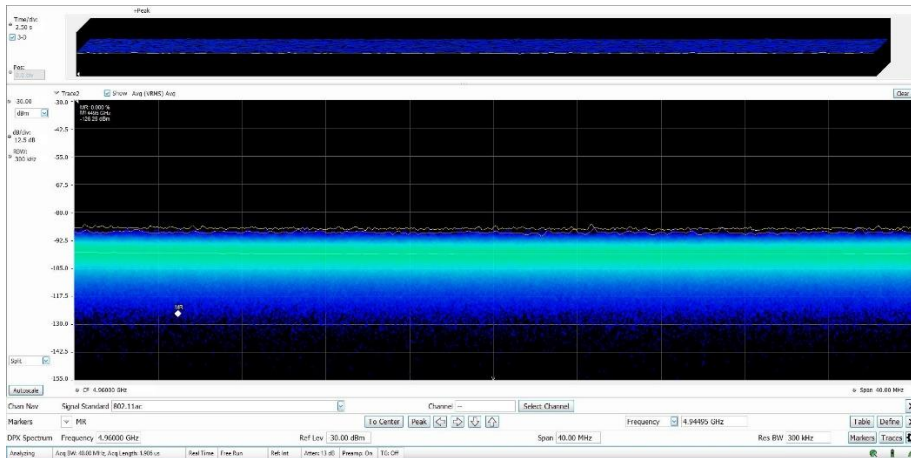
4.99GHz
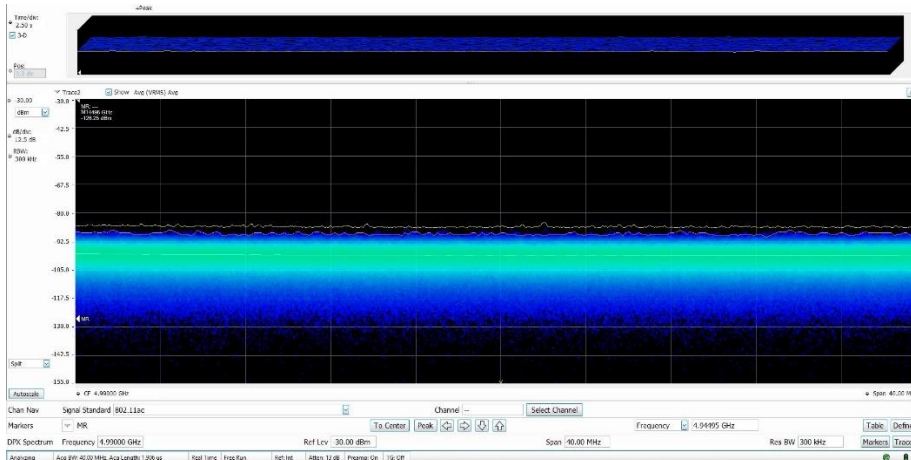
Pfenning Pump Station

Available Power	Power is available.
Mounting Option	Mounting is available on the current tower.
Security	This site is behind a locked fence and has a locked building.
LAN Access	There is not a direct connection to the city network.
Spectrum Analysis	2.4GHz is saturated. 5GHz is not being used. 4.9GHz is not being used.

Pfenning Pump Station 2.4GHz Spectrum Analysis
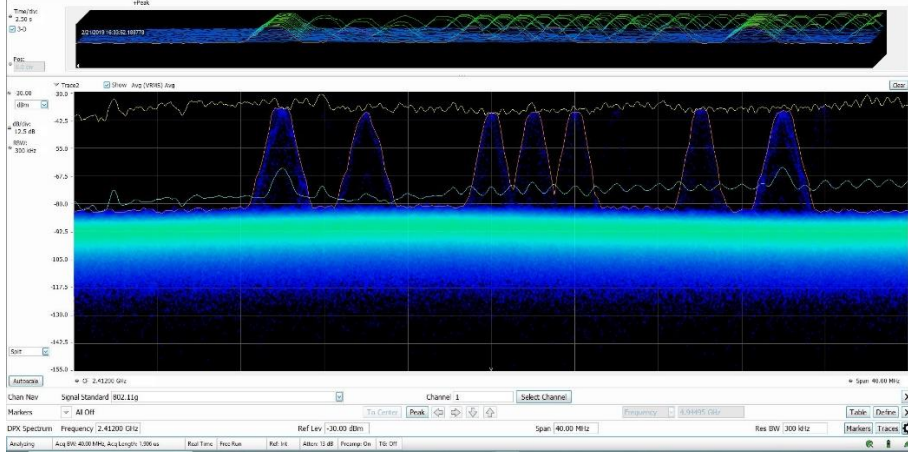
Channel 1

Channel 6
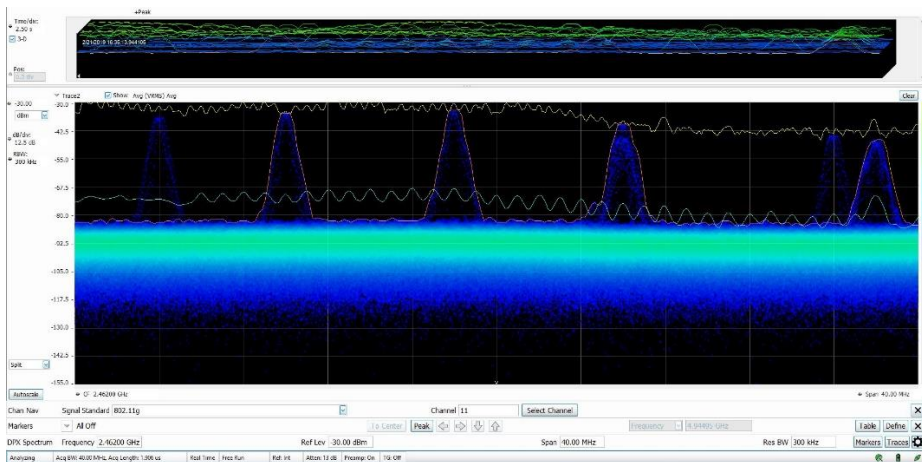
Channel 11

Pfenning Pump Station 5.8GHz Spectrum Analysis
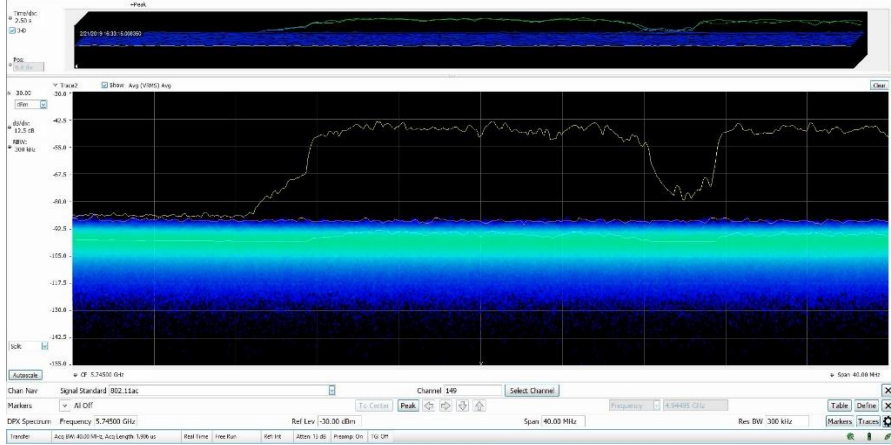
Channel 149

Channel 157

Channel 165
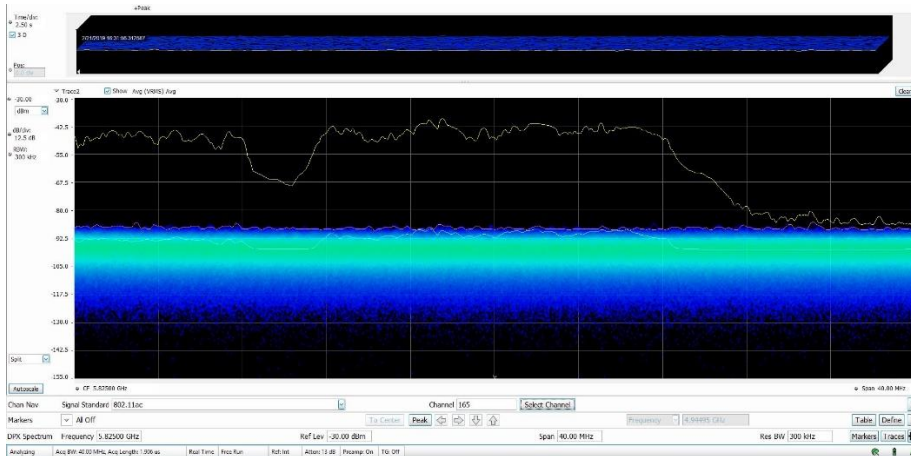
Pfenning Pump Station 4.9GHz Spectrum Analysis
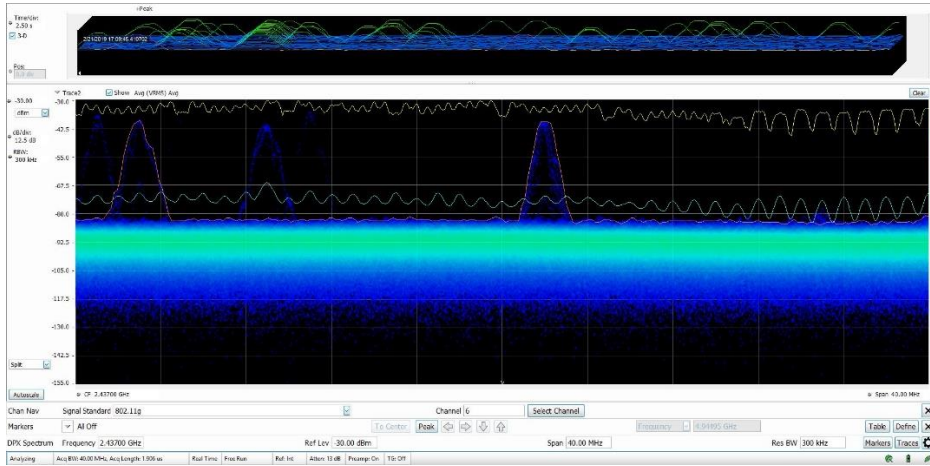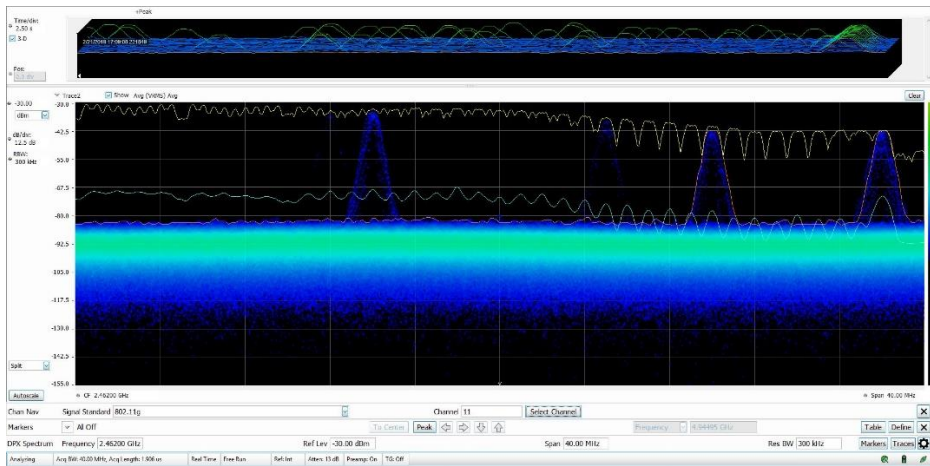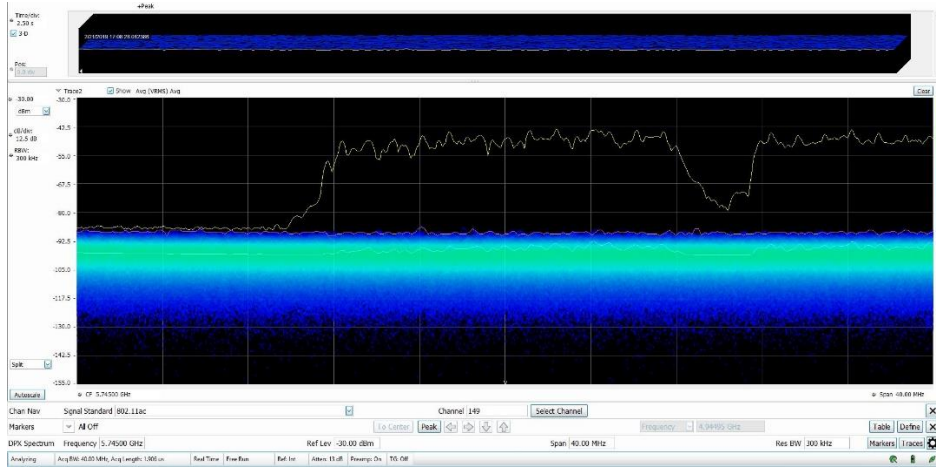
4.94GHz
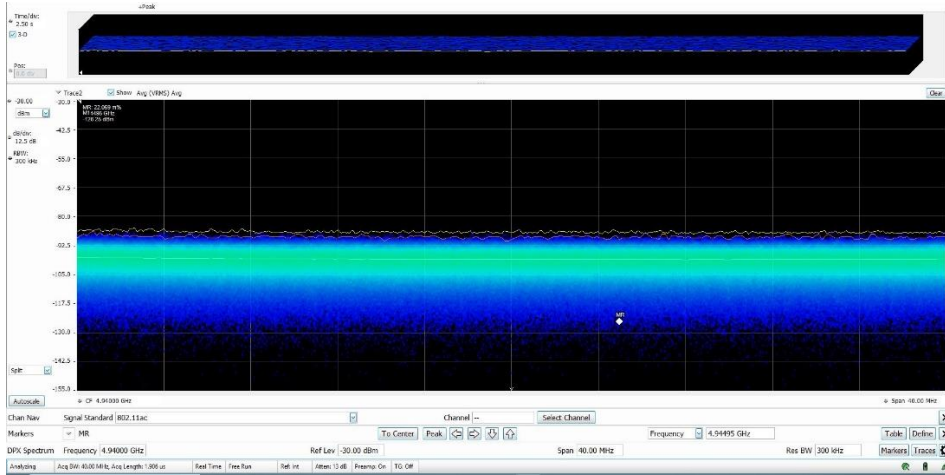
4.96GHz
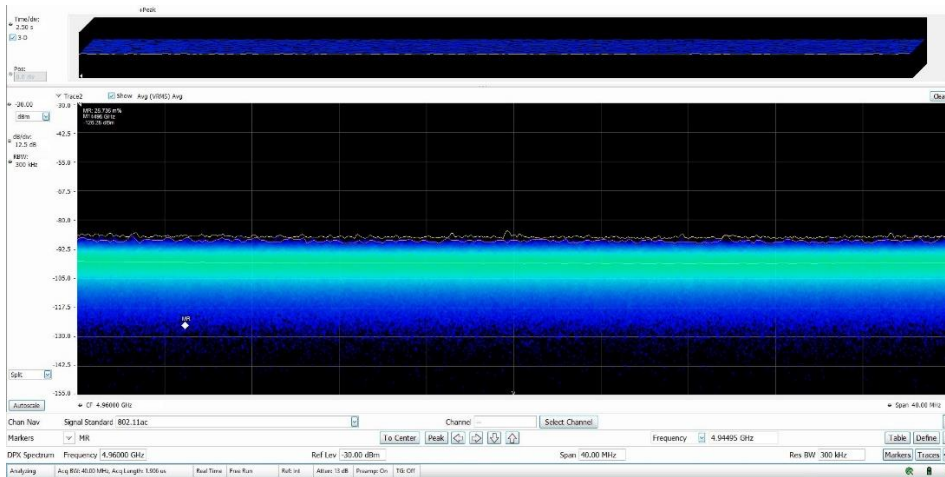
4.99GHz

Pfluger Crossing Lift Station

Available Power	Power is available.
Mounting Option	Mounting is not currently available.
Security	This site has a locked fence.
LAN Access	There is not a direct connection to the city network.
Spectrum Analysis	2.4GHz is saturated. 5GHz is not being used. 4.9GHz is not being used.

Pfluger Crossing Lift Station 2.4GHz Spectrum Analysis
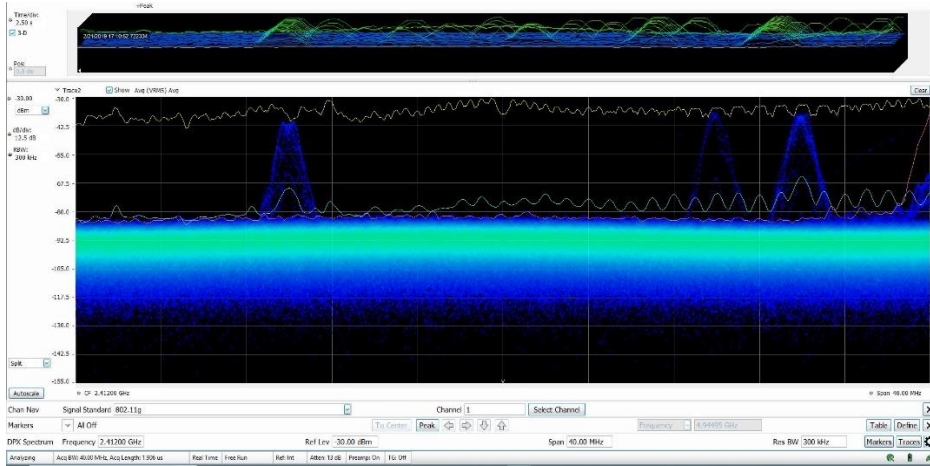
Channel 1

Channel 6

Channel 11

Pfluger Crossing Lift Station 5.8GHz Spectrum Analysis
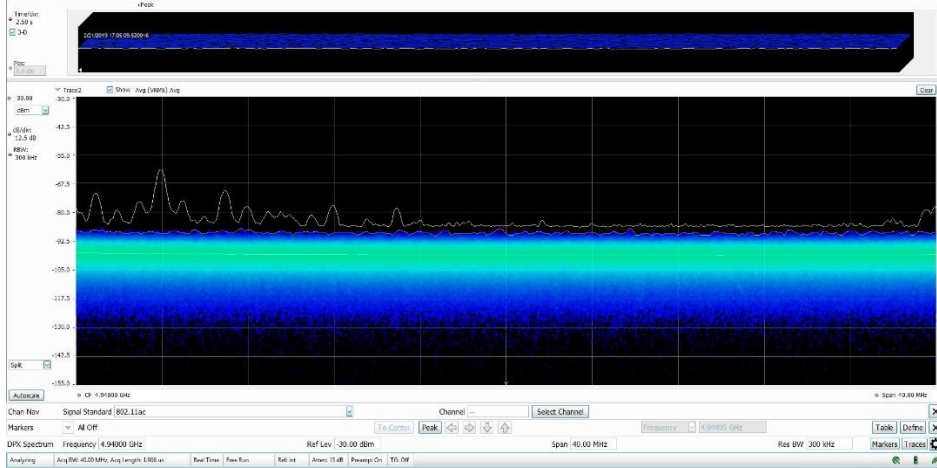
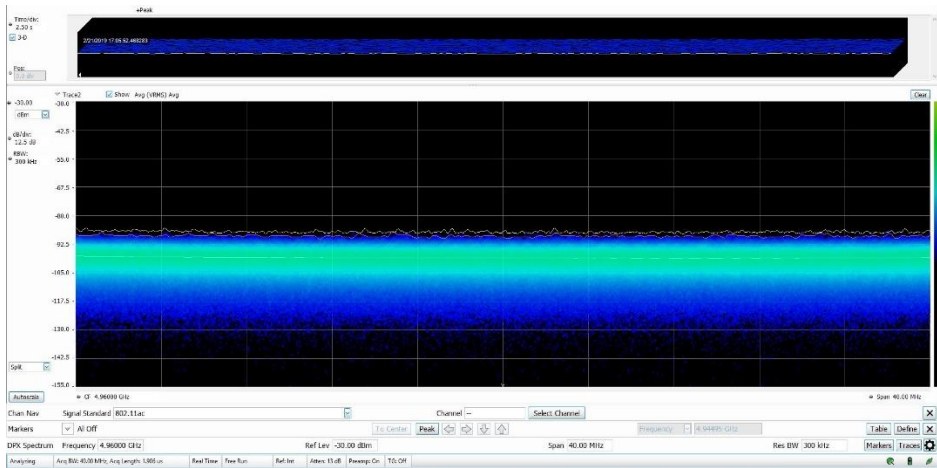## Channel 149
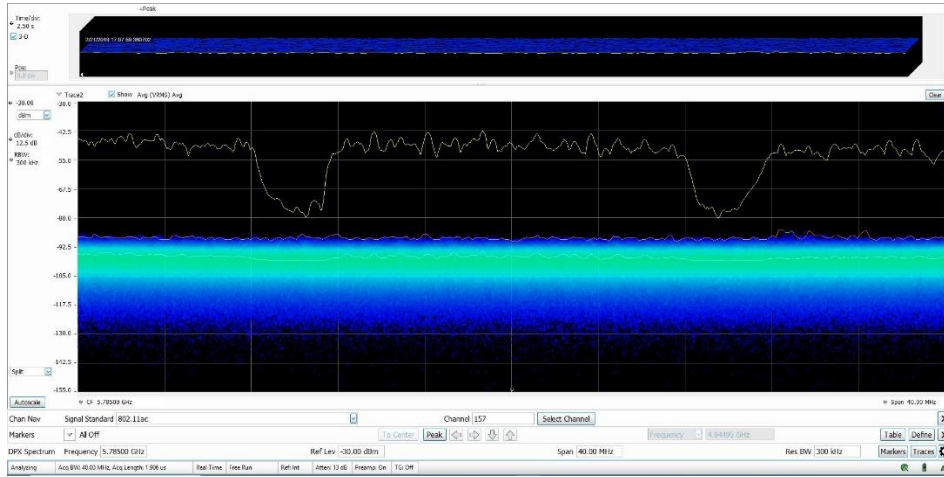
Channel 157

Channel 165
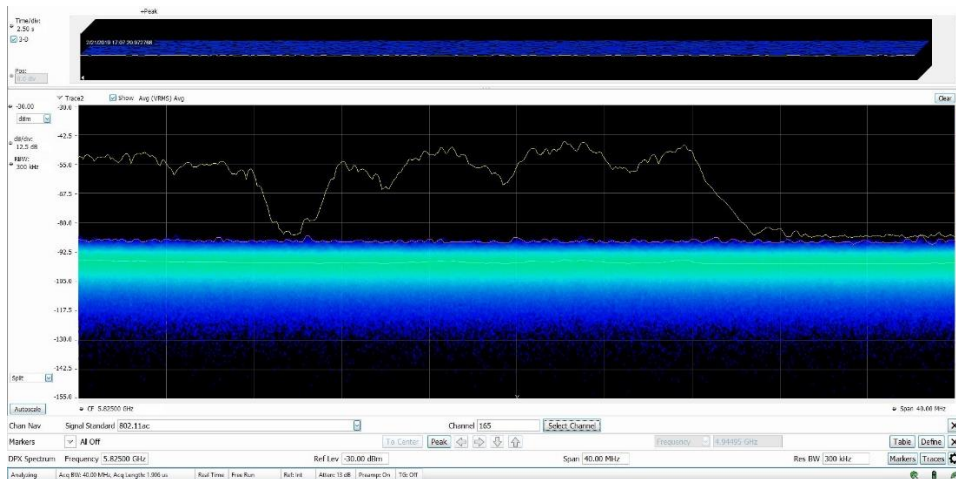
Pfluger Crossing Lift Station 4.9GHz Spectrum Analysis
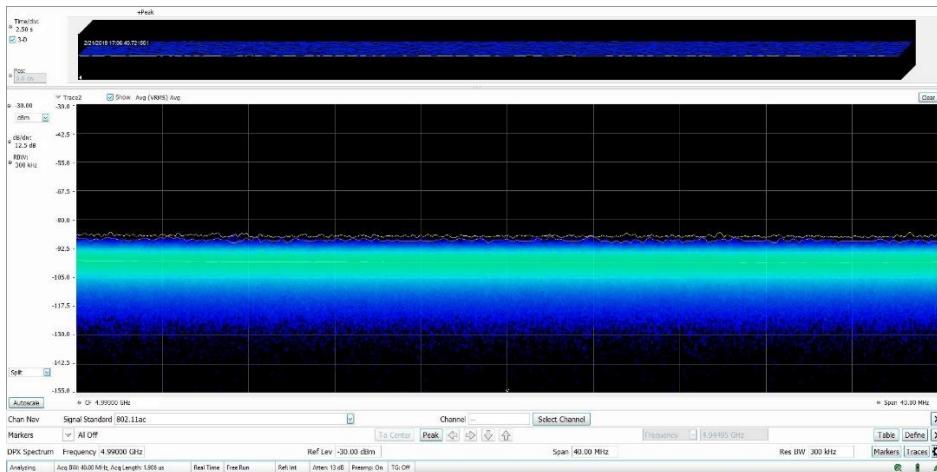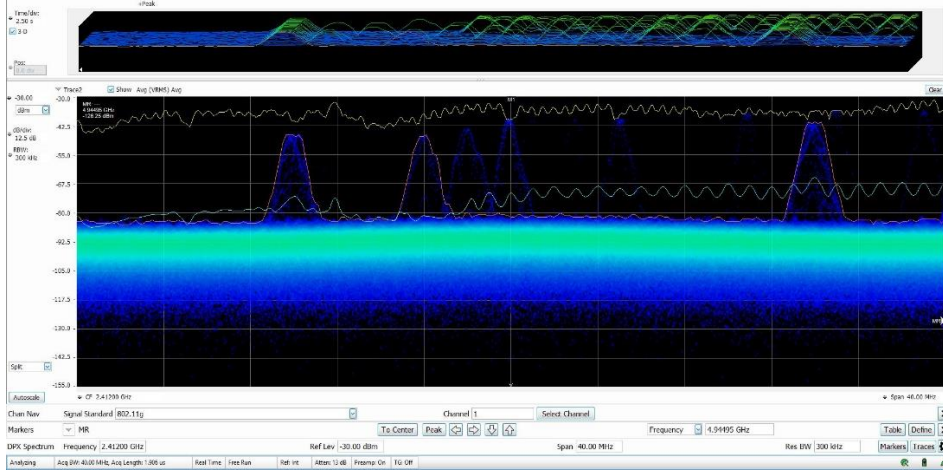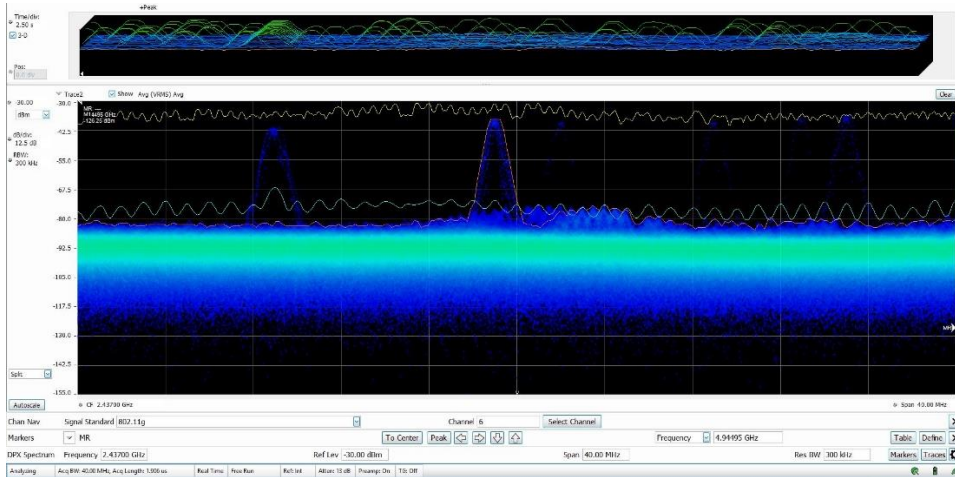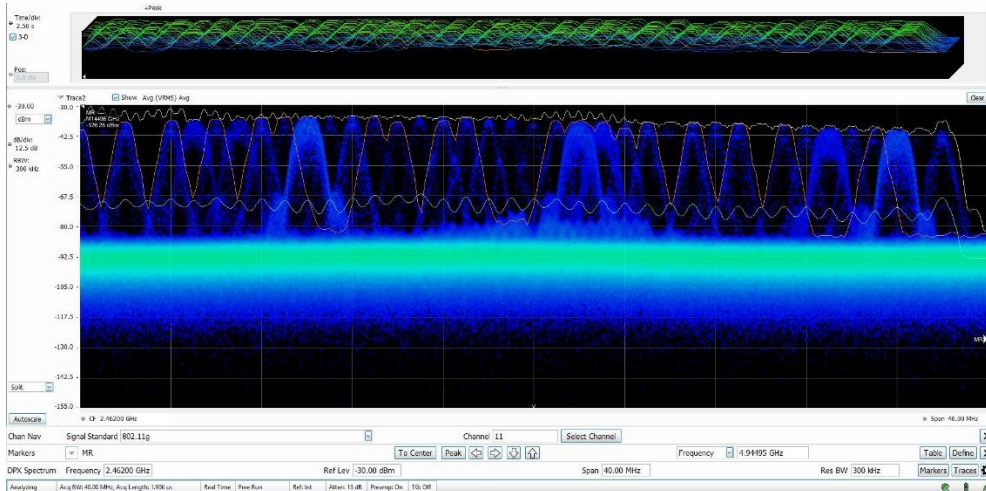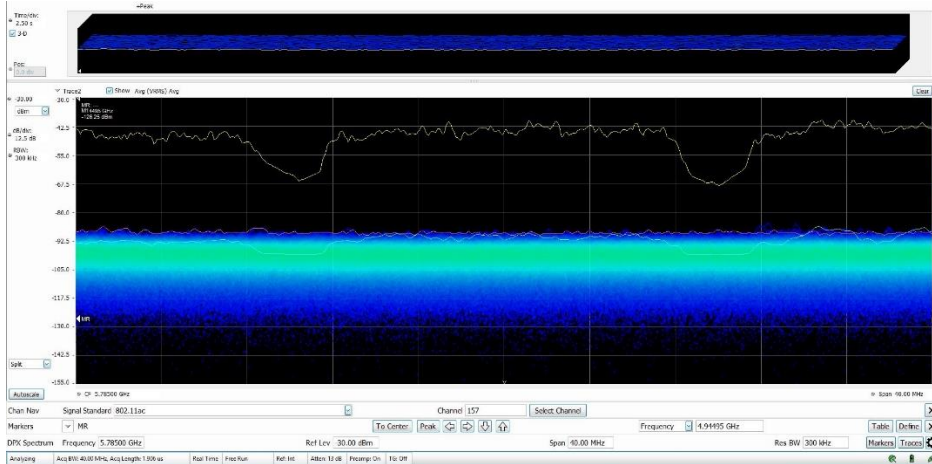
4.94Ghz

4.96GHz

4.99GHz

Well Site 5

Available Power	Power is available.
Mounting Option	Mounting is available on the current tower. Extension is recommended.
Security	This site is behind a locked fence.
LAN Access	There is not a direct connection to the city network.
Spectrum Analysis	2.4GHz is saturated. 5GHz is not being used. 4.9GHz is not being used.

Well Site 5 2.4GHz Spectrum Analysis

Channel 1

Channel 6

Channel 11

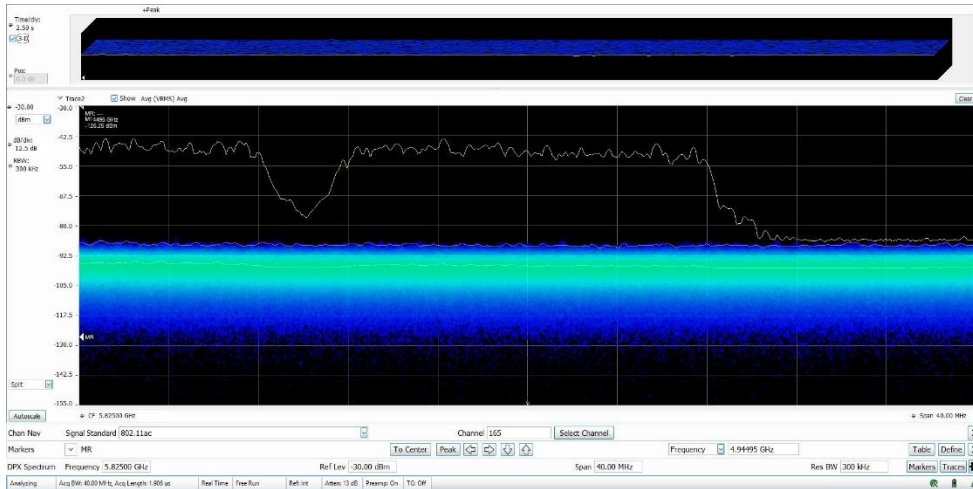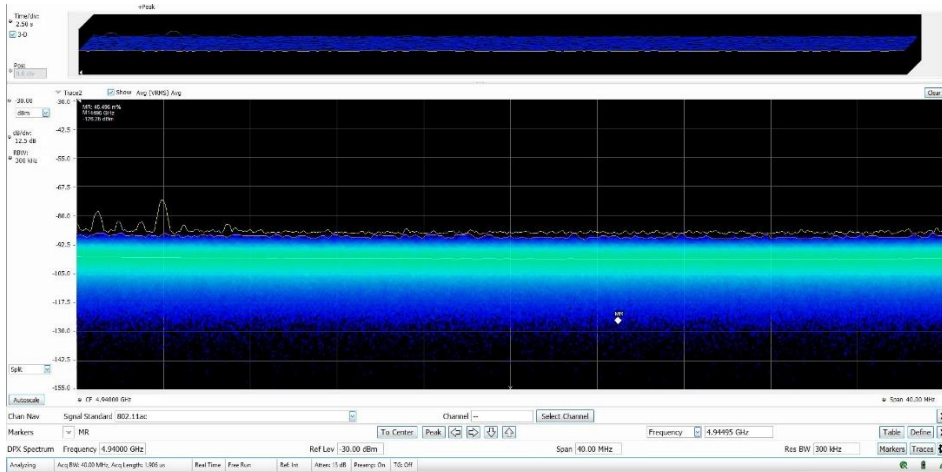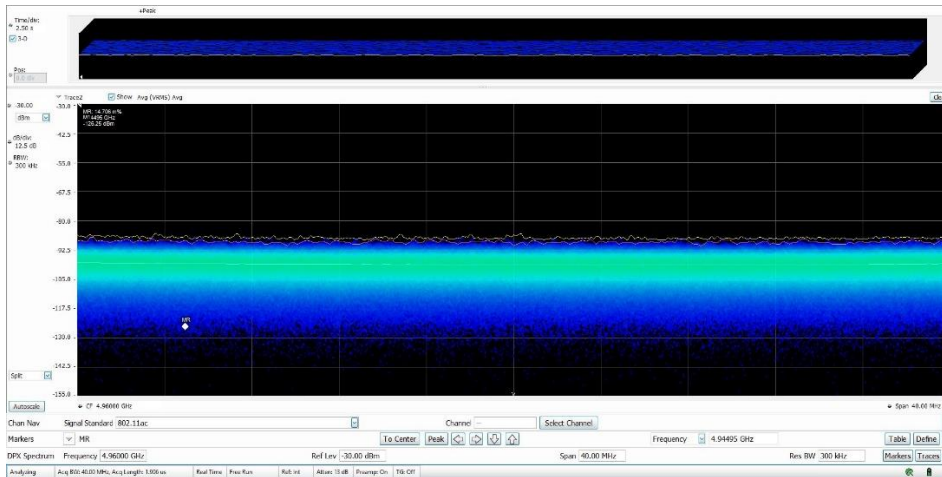# Well Site 5 5.8GHz Spectrum Analysis
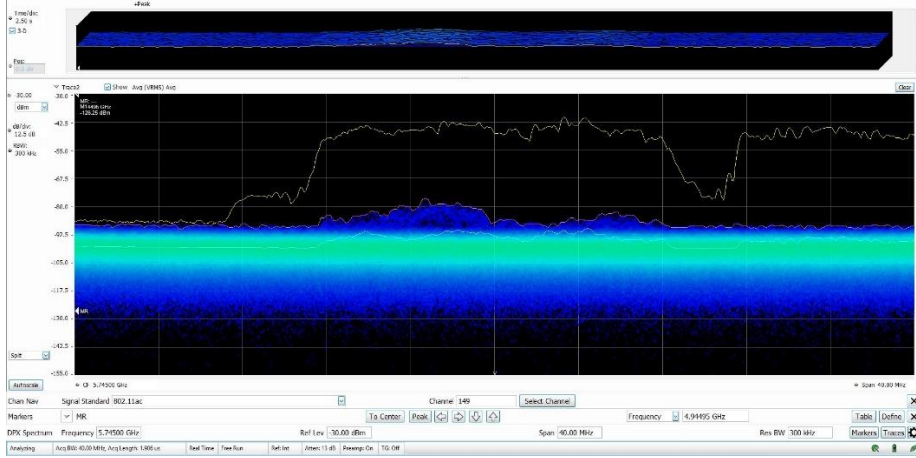
Channel 149

Channel 157

Channel 165
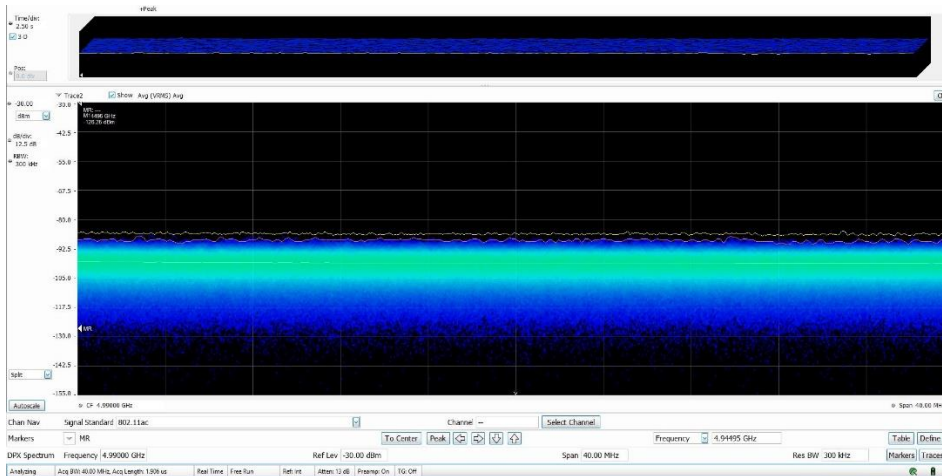
Well Site 5 4.9GHz Spectrum Analysis

4.94GHz

4.96GHz

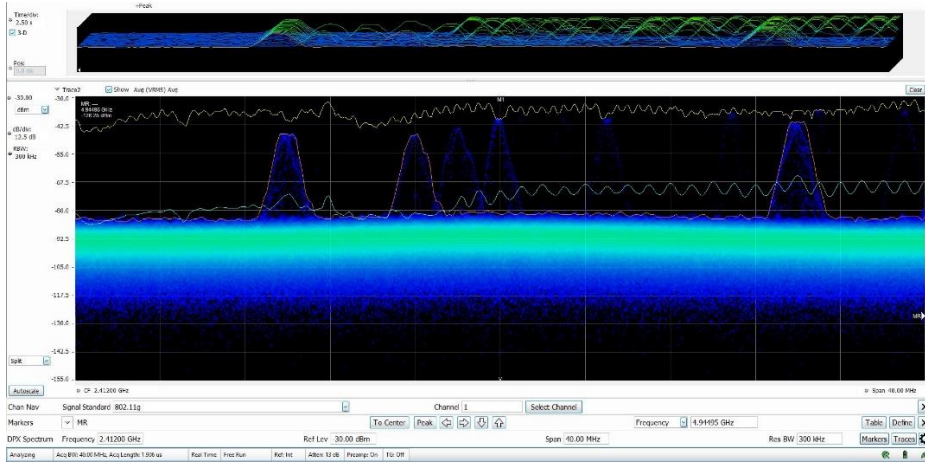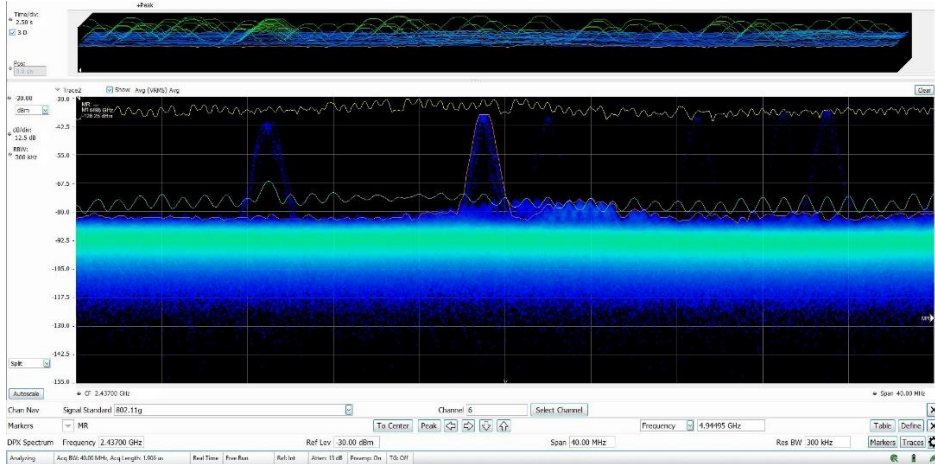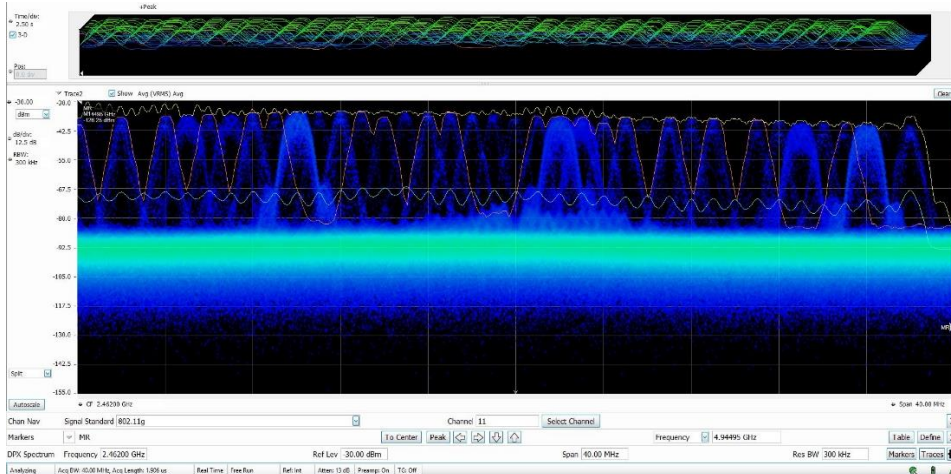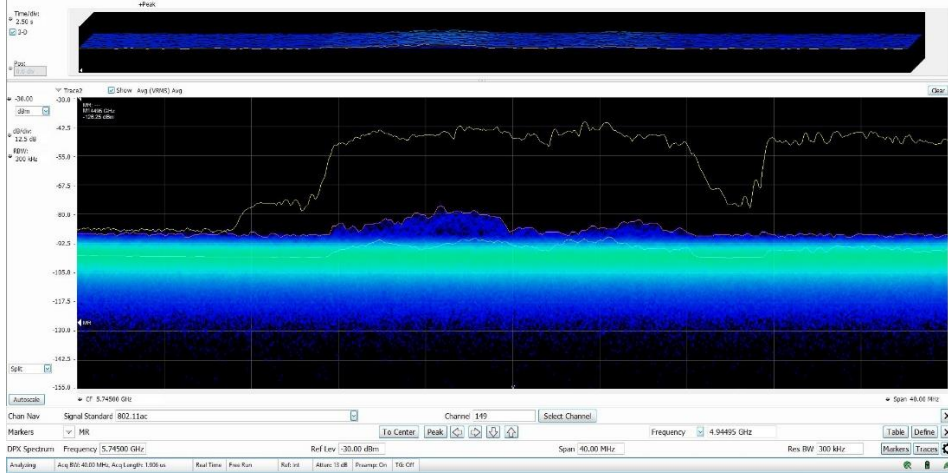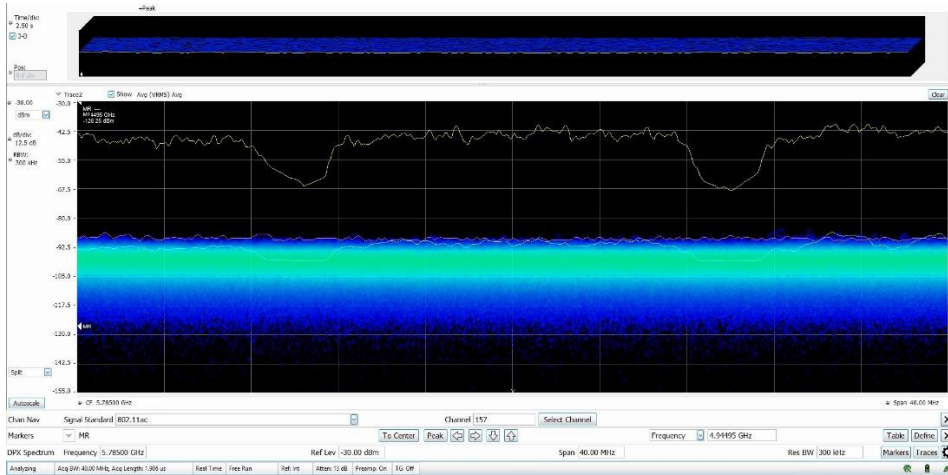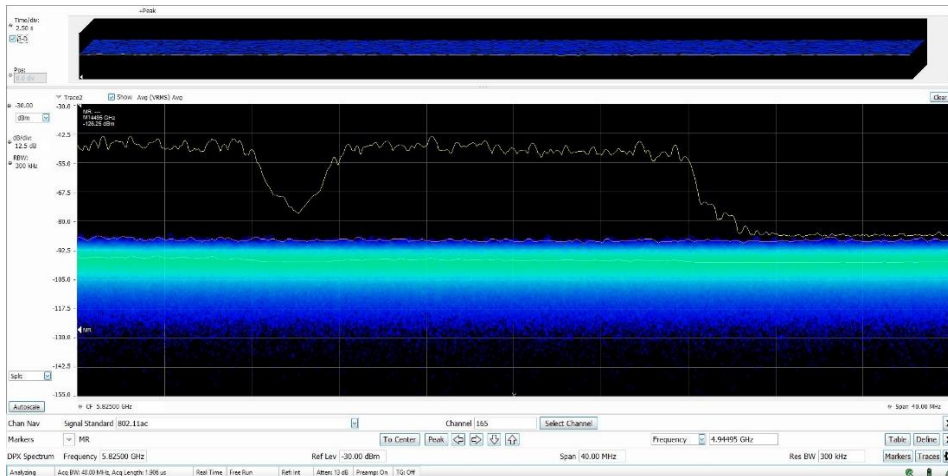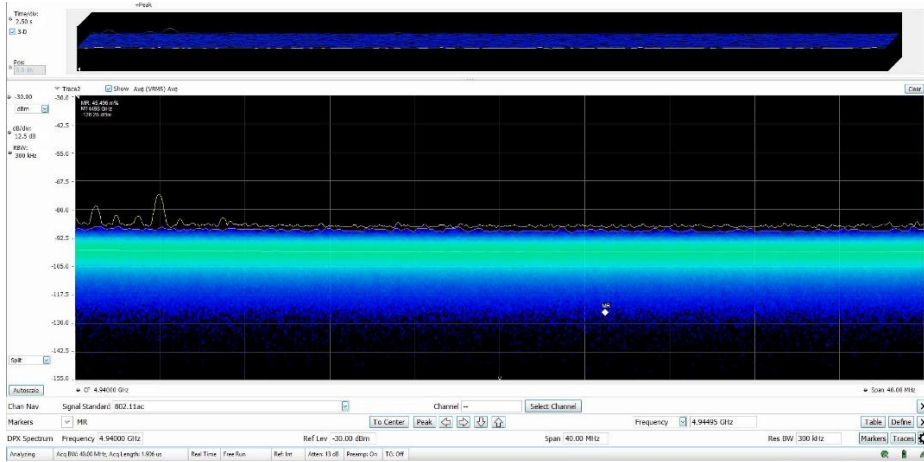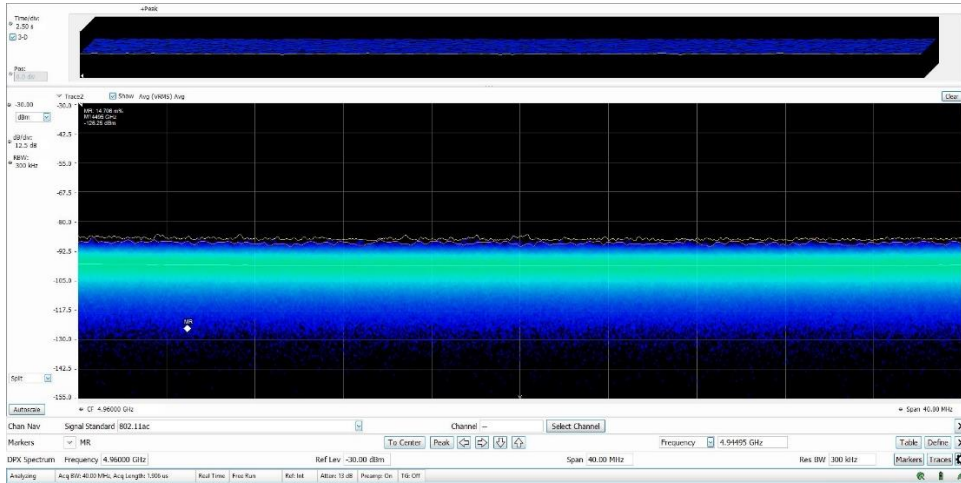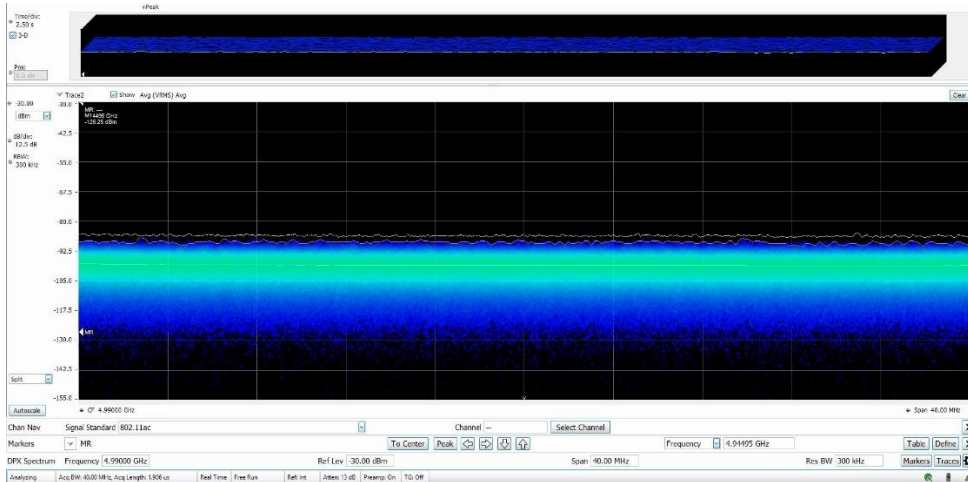## 4.99GHz

Well Site 7

Available Power	Power is available.
Mounting Option	Mounting is available on the current tower. Extension is recommended.
Security	This site is behind a locked fence.
LAN Access	There is not a direct connection to the city network.
Spectrum Analysis	2.4GHz is saturated. 5GHz is not being used. 4.9GHz is not being used.

Well Site 7 2.4GHz Spectrum Analysis

Channel 1

Channel 6

Channel 11

Well Site 7 5.8GHz Spectrum Analysis

Channel 149

Channel 157

Channel 165

Well Site 7 4.9GHz Spectrum Analysis

4.94GHz

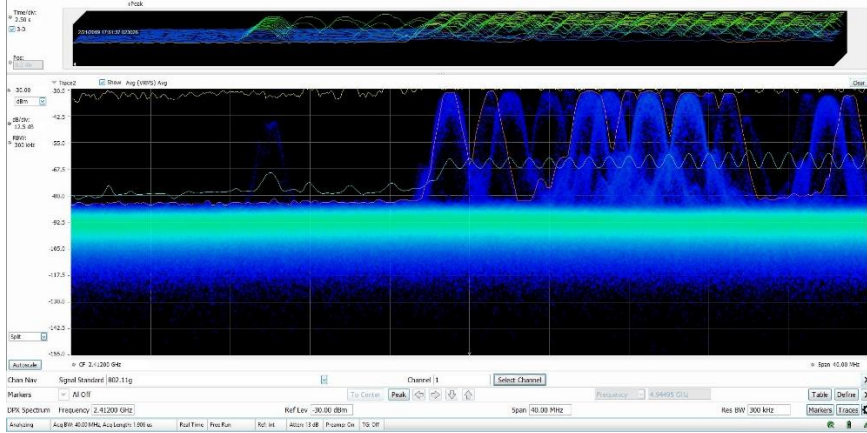### 4.96GHz

4.99GHz

Weiss Lane Lift Station

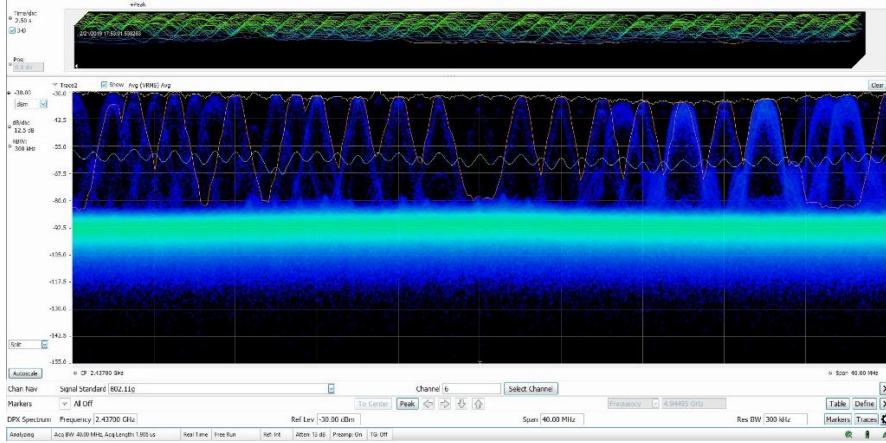|	
Available Power	Power is available.
Mounting Option	Mounting is available on current tower.
Security	This site is behind a locked fence.
LAN Access	There is not a direct connection to the city network.
Spectrum Analysis	2.4GHz is saturated. 5GHz is not being used. 4.9GHz is not being used.

(No picture was taken due to fence.)
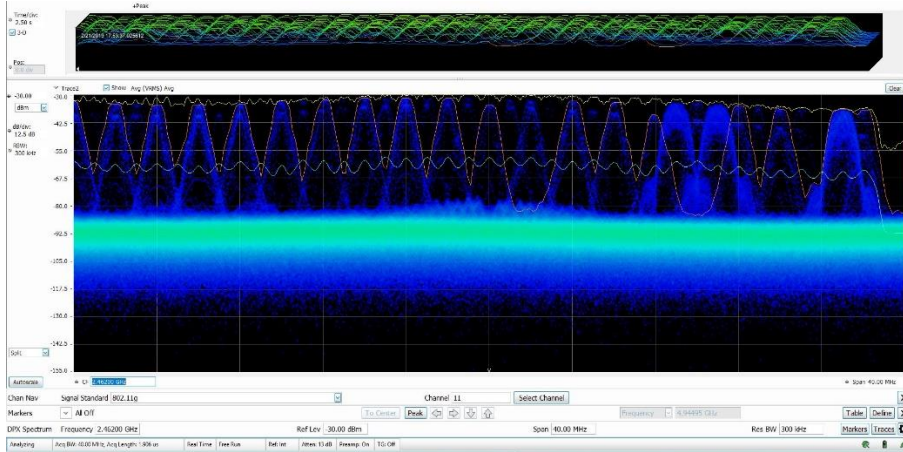
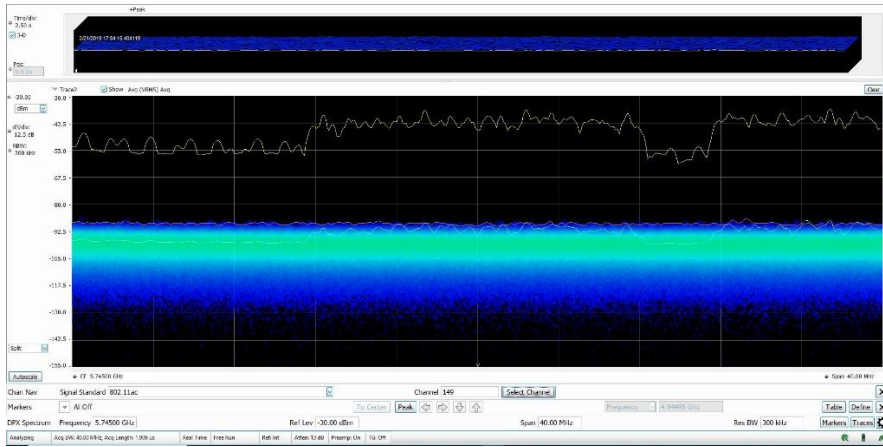# Weiss Lane Lift Station 2.4GHz Spectrum Analysis
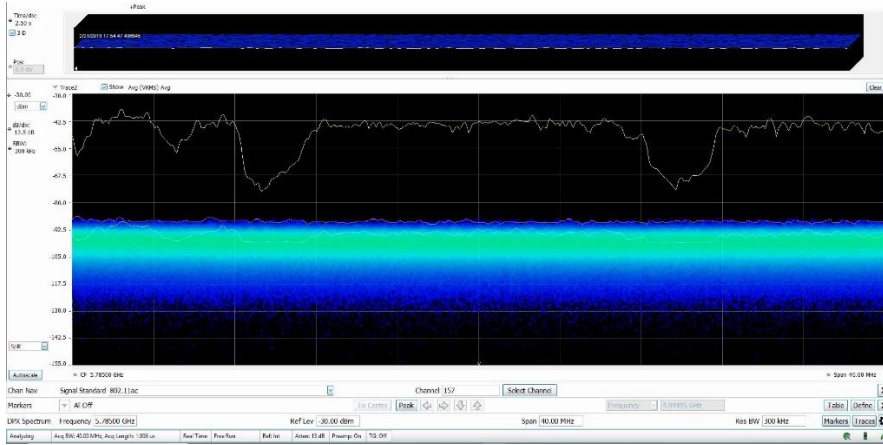
Channel 1

Channel 6

Channel 11

Weiss Lane Lift Station 5.8GHz Spectrum Analysis
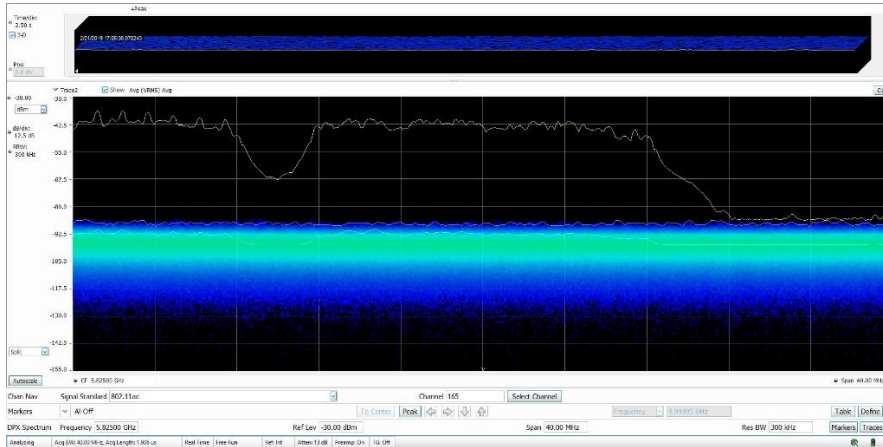
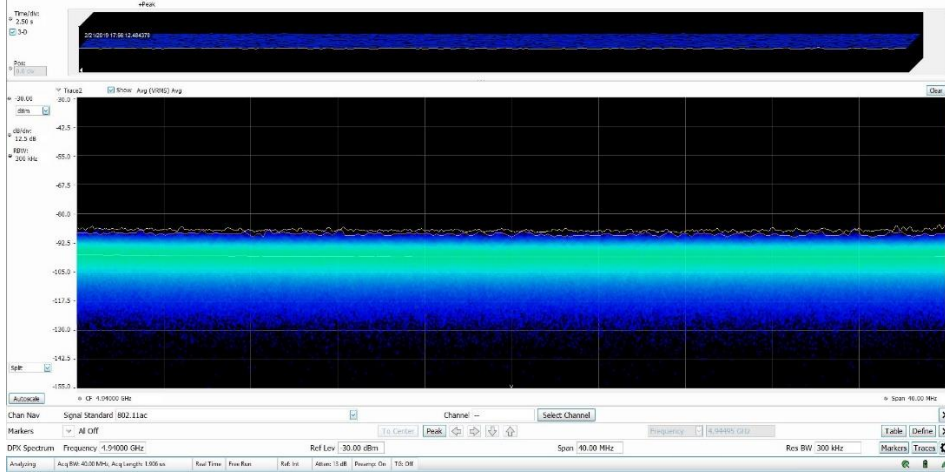## Channel 149

Channel 157

Channel 165

Weiss Lane Lift Station 4.9GHz Spectrum Analysis

4.94GHz

4.96GHz
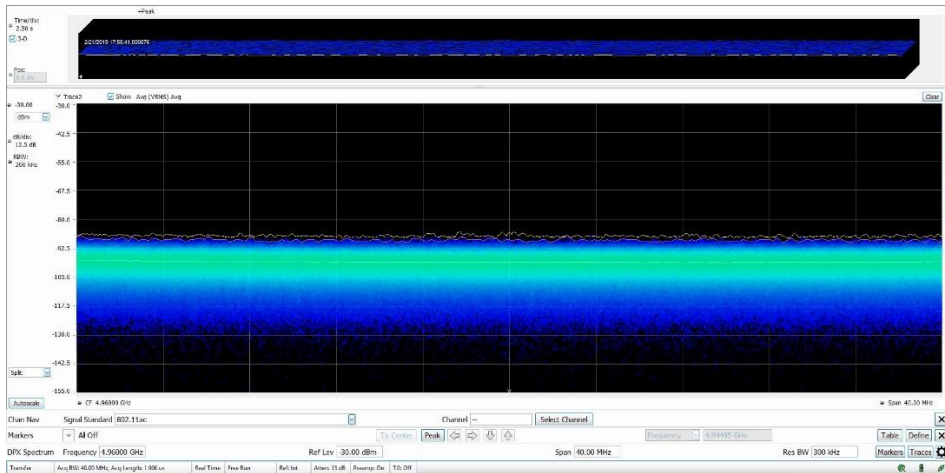
4.99GHz
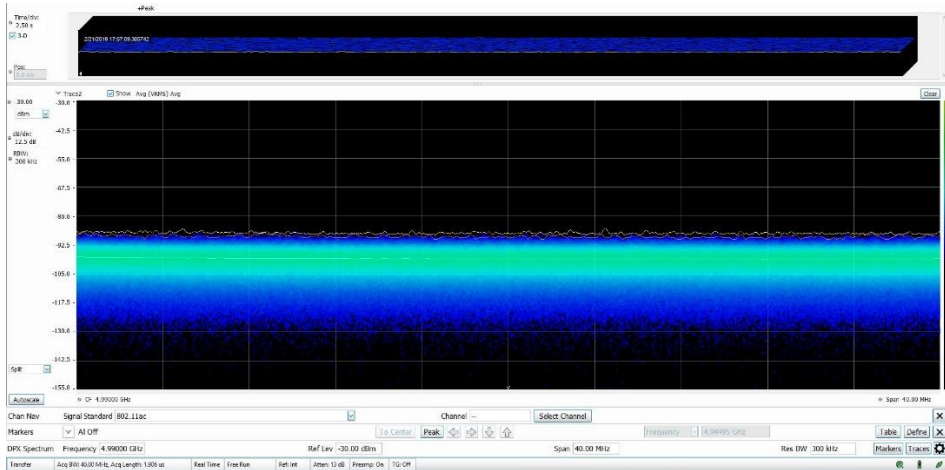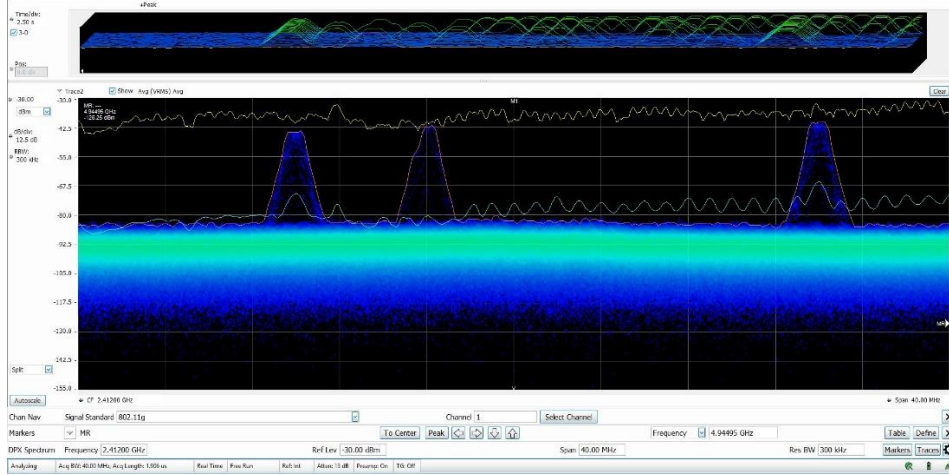
Well Site 4

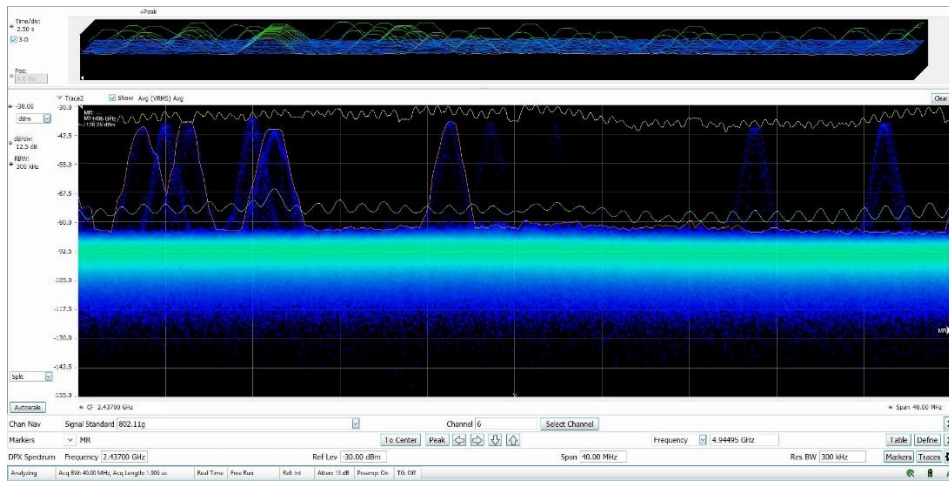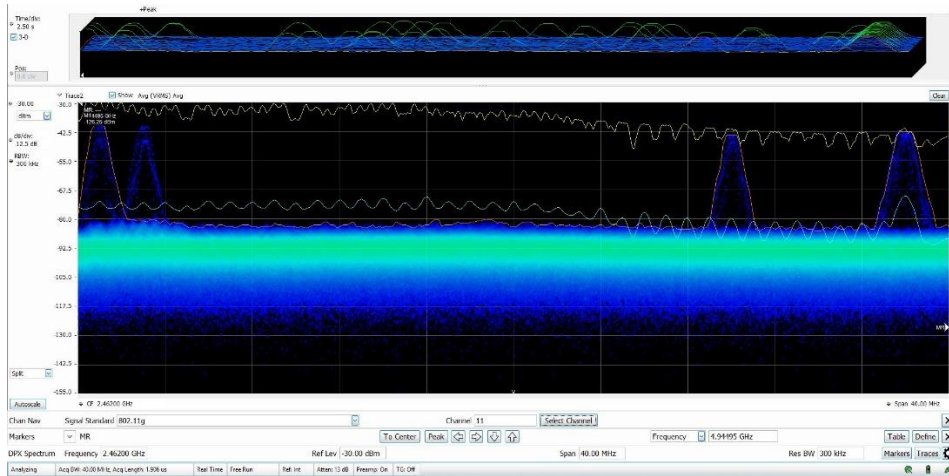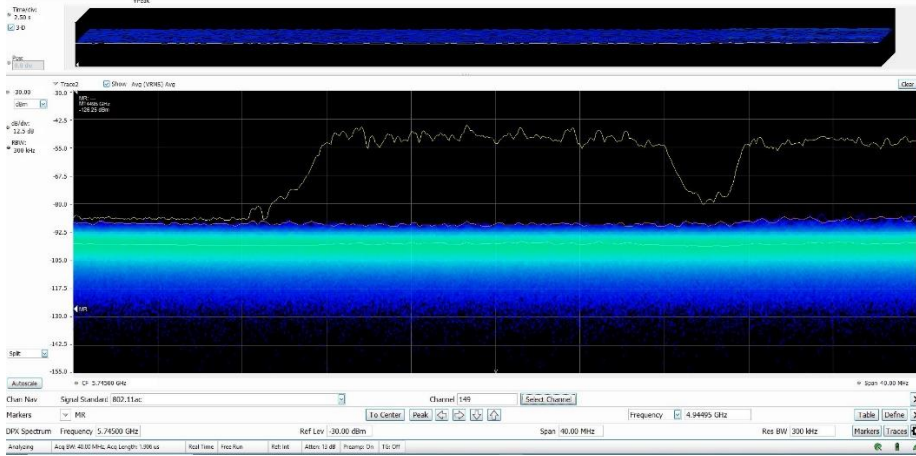|	
Available Power	Power is available.
Mounting Option	Mounting is not currently available.
Security	This site is behind a locked fence.
LAN Access	There is not a direct connection to the city network.
Spectrum Analysis	2.4GHz is saturated. 5GHz is not being used. 4.9GHz is not being used.

Well Site 4 2.4GHz Spectrum Analysis

Channel 1

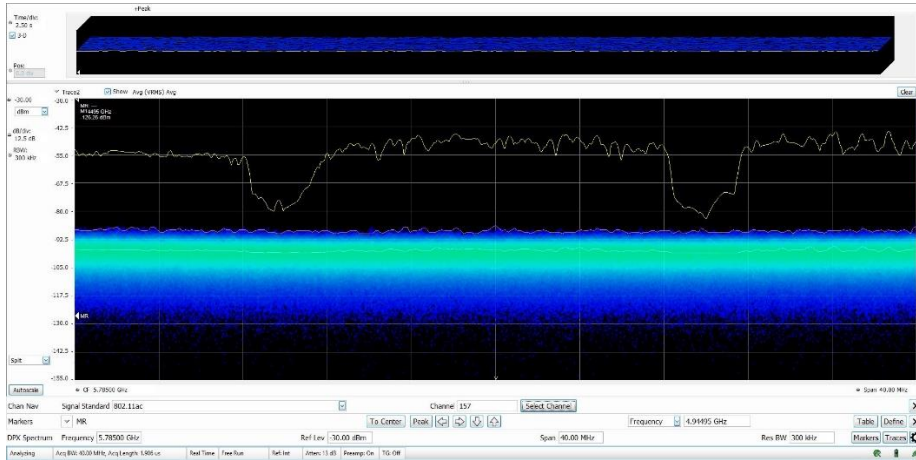## Channel 6

Channel 11

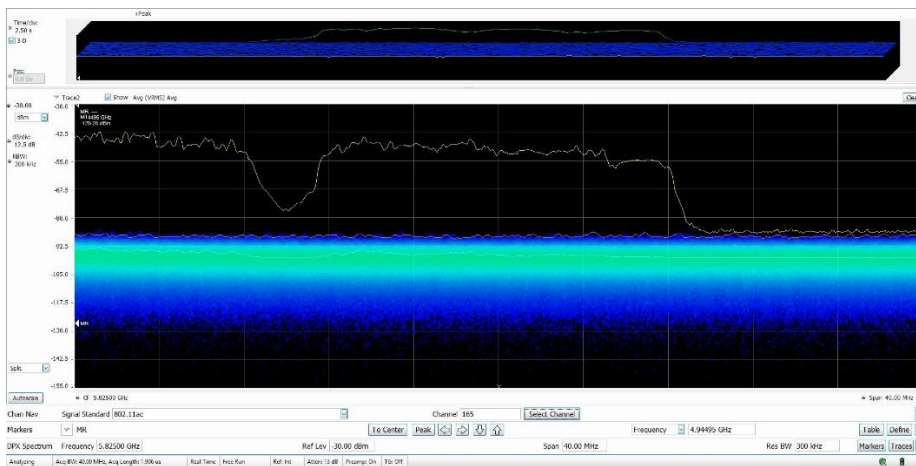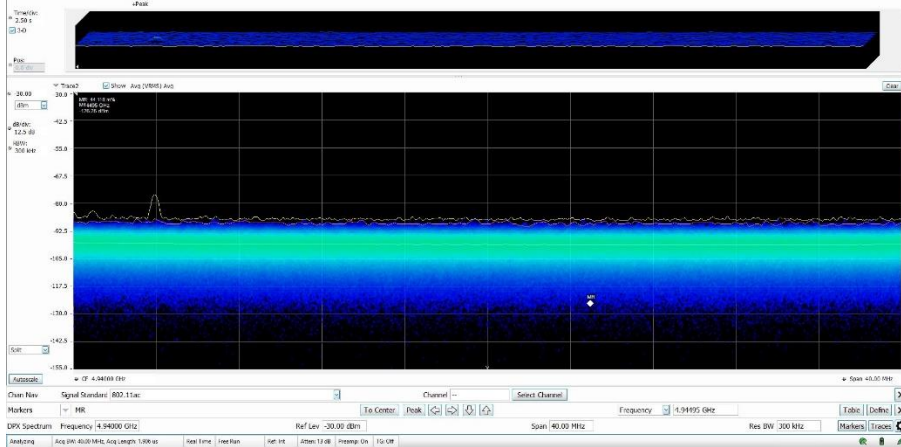# Well Site 4 5.8GHz Spectrum Analysis

Channel 149
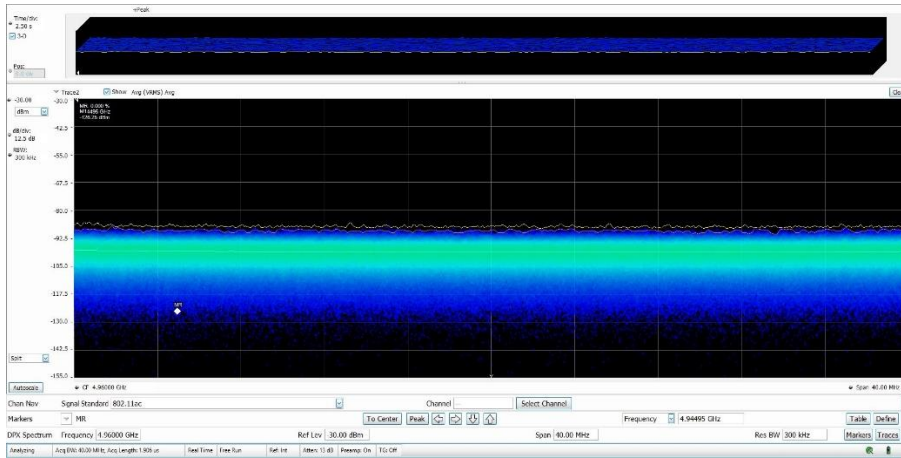

Channel 157
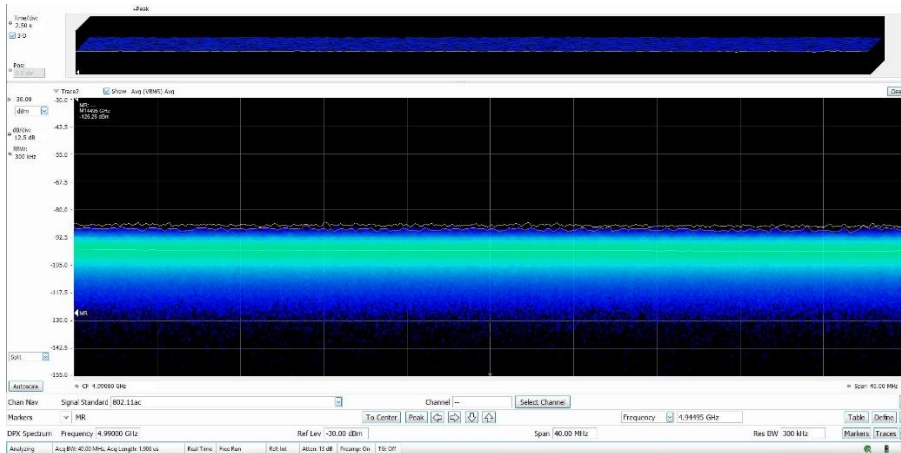

Channel 165

Well Site 4 4.9GHz Spectrum Analysis

4.94GHz

4.96GHz

4.99GHz
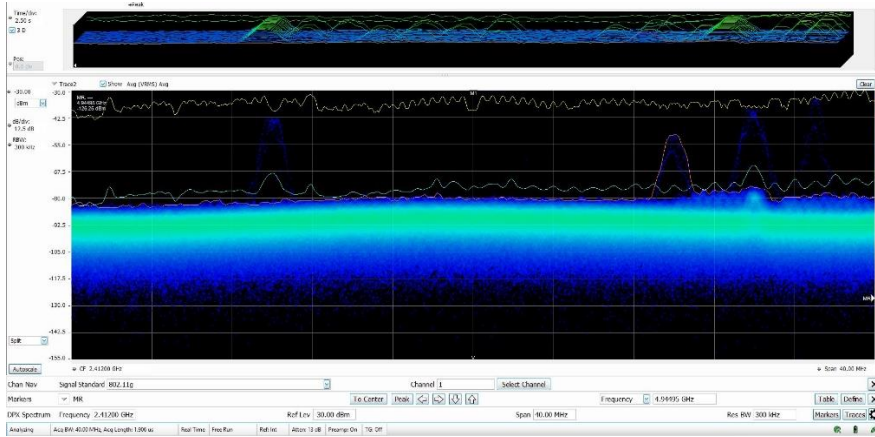
Well Site 6

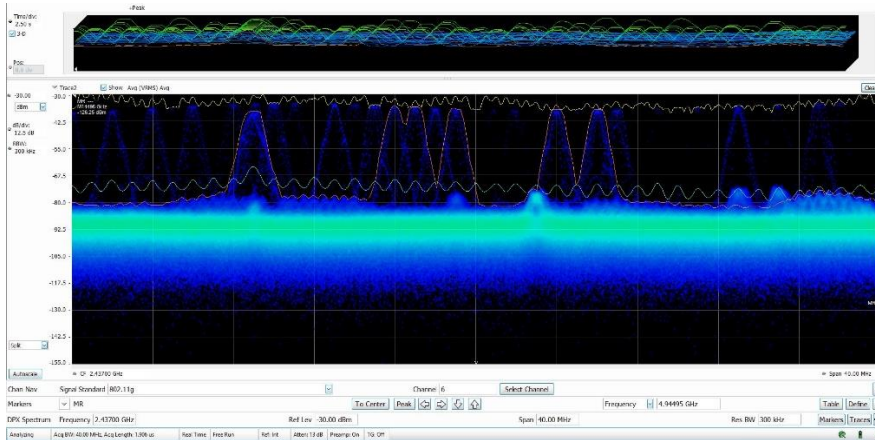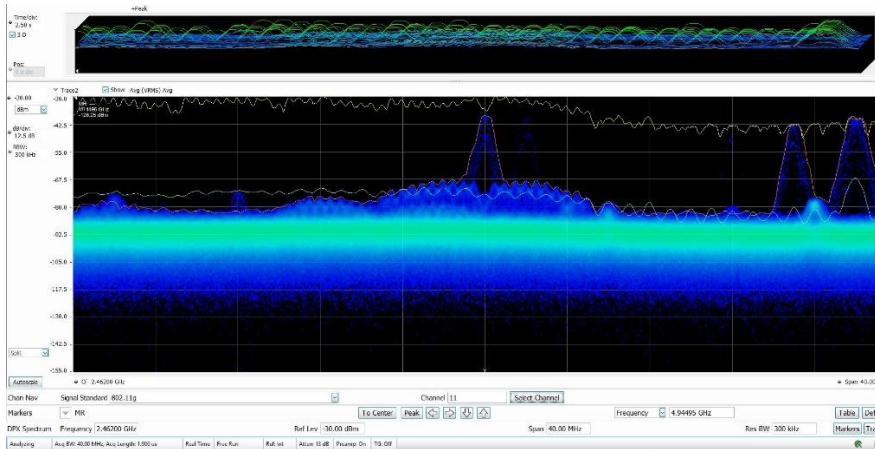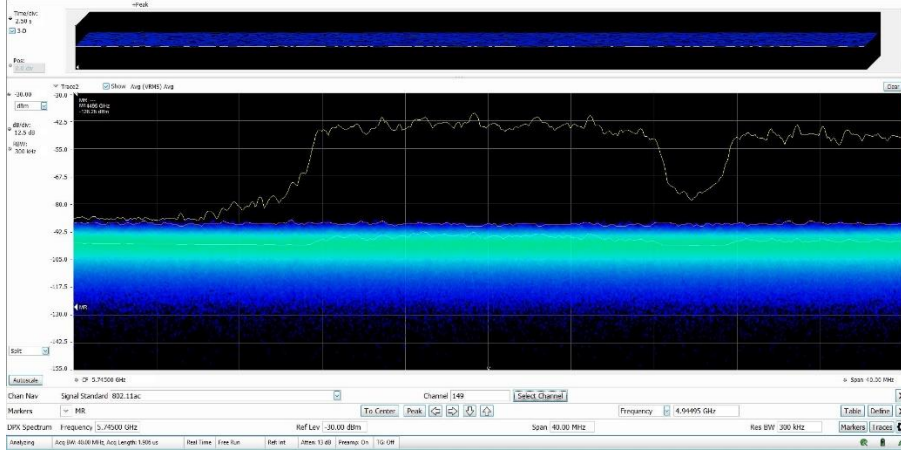|	
Available Power	Power is available.
Mounting Option	Mounting is available on current tower.
Security	This site is behind a locked fence.
LAN Access	There is not a direct connection to the city network.
Spectrum Analysis	2.4GHz is saturated. 5GHz is not being used. 4.9GHz is not being used.

Well Site 6 2.4GHz Spectrum Analysis

Channel 1

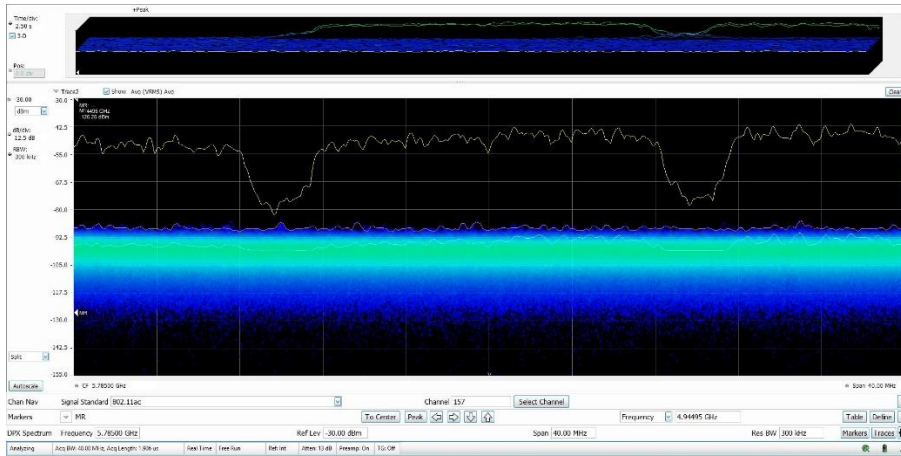## Channel 6

Channel 11

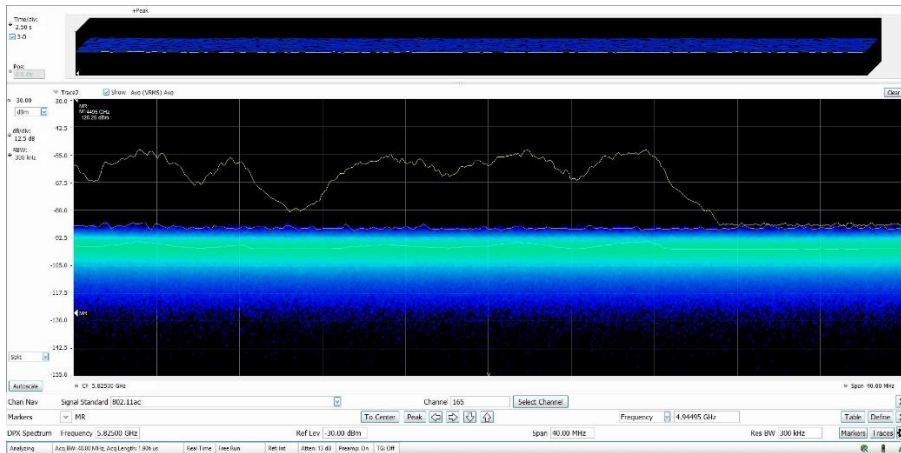# Well Site 6 5.8GHz Spectrum Analysis
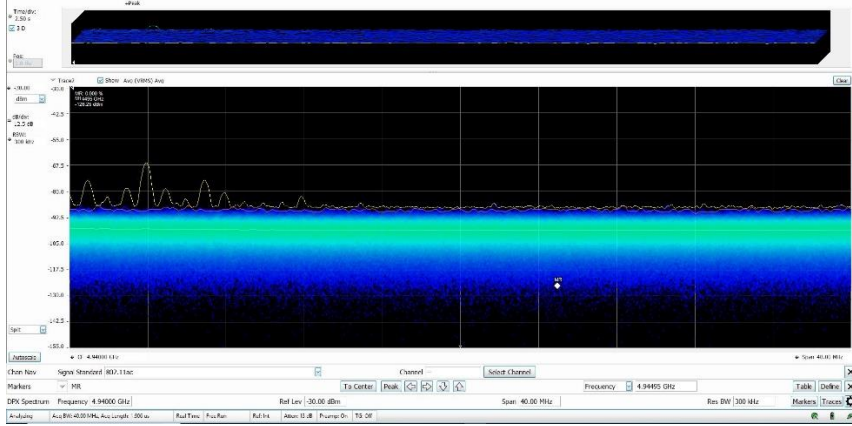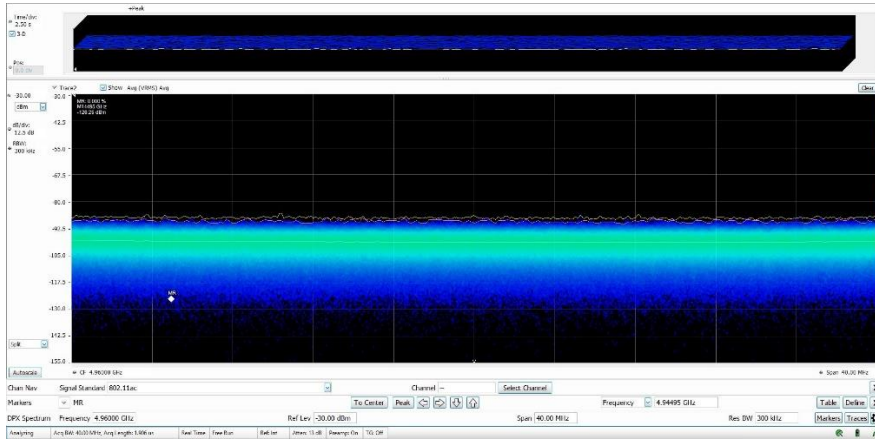
Channel 149

Channel 157
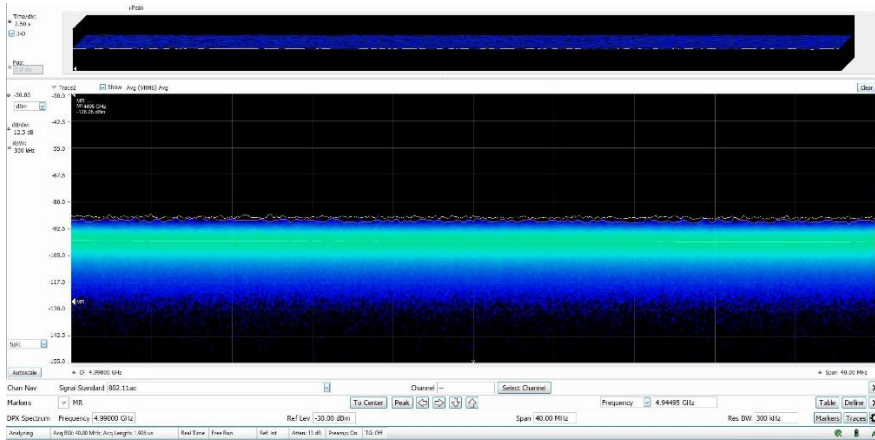

Channel 165

Well Site 6 4.9GHz Spectrum Analysis

4.94GHz

4.96GHz

4.99GHz

Well Site 8

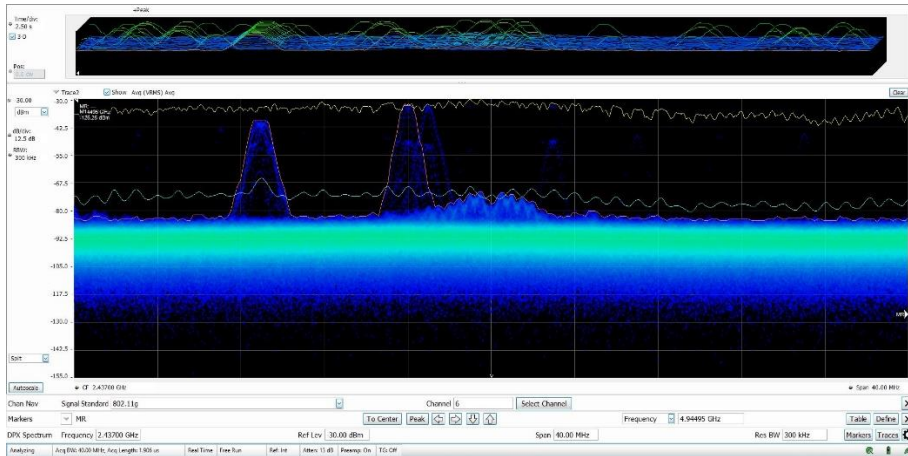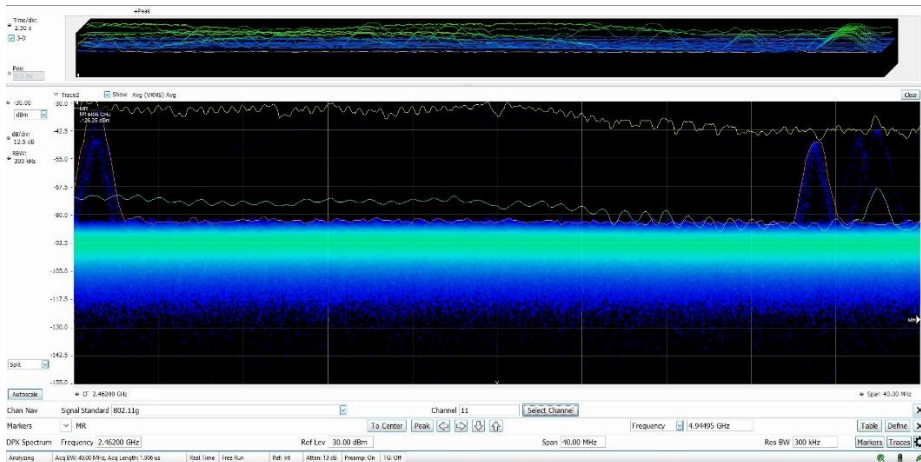| Available Power	Power is available.
Mounting Option	Mounting is not currently available.
Security	This site is behind a locked fence.
LAN Access	There is not a direct connection to the city network.
Spectrum Analysis	2.4GHz is saturated. 5GHz is not being used. 4.9GHz is not being used.

Well Site 8 2.4GHz Spectrum Analysis
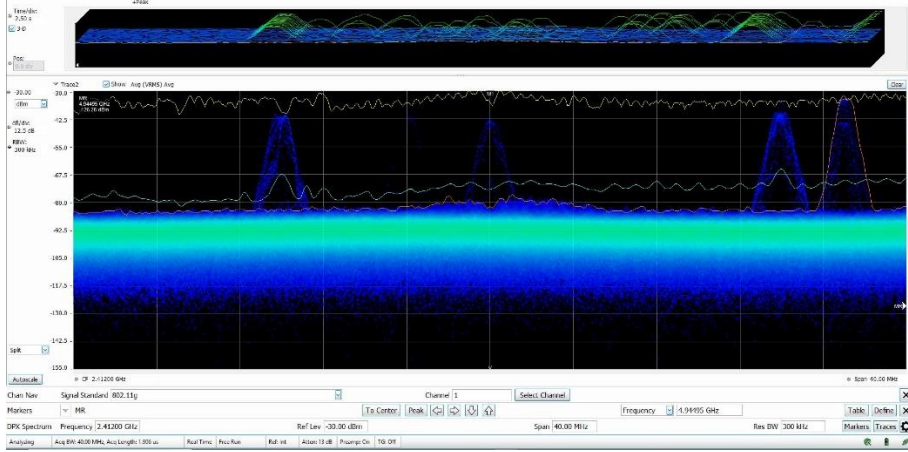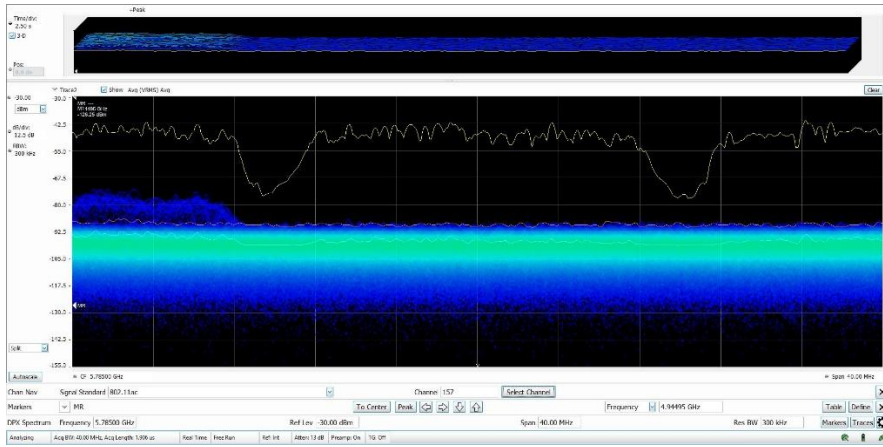
Channel 1

Channel 6
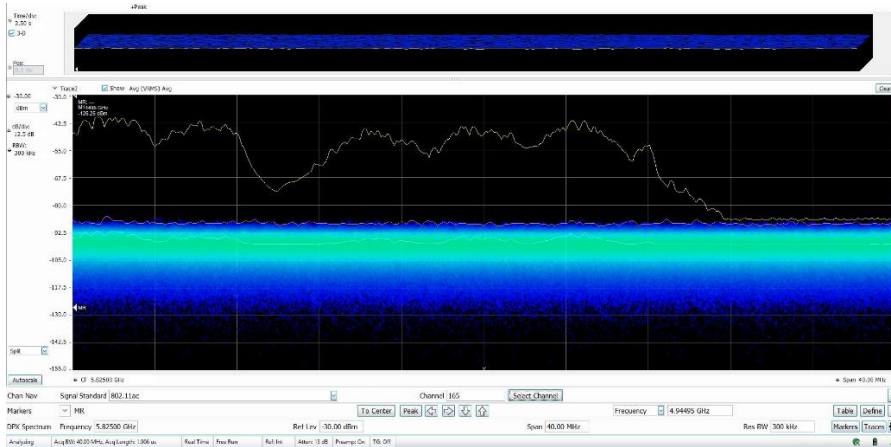

Channel 11

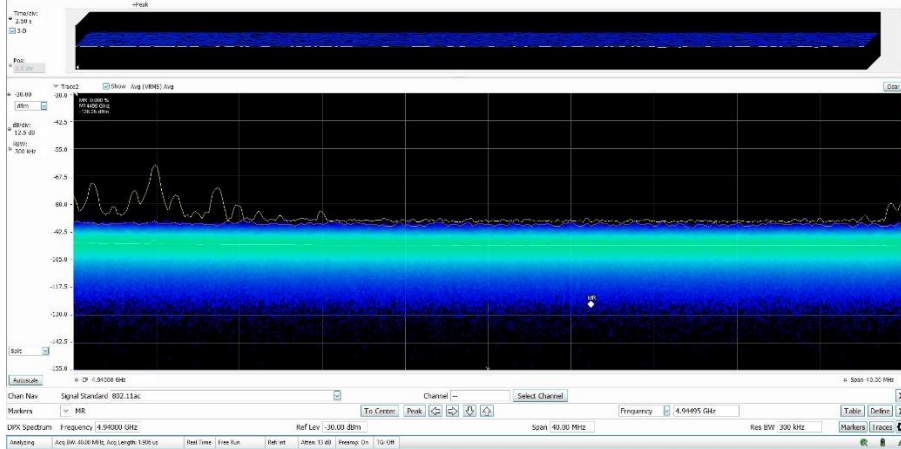# Well Site 8 5.8GHz Spectrum Analysis
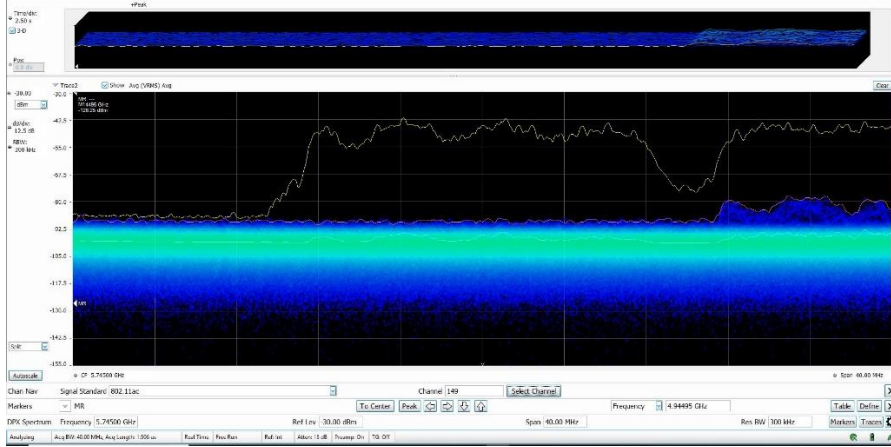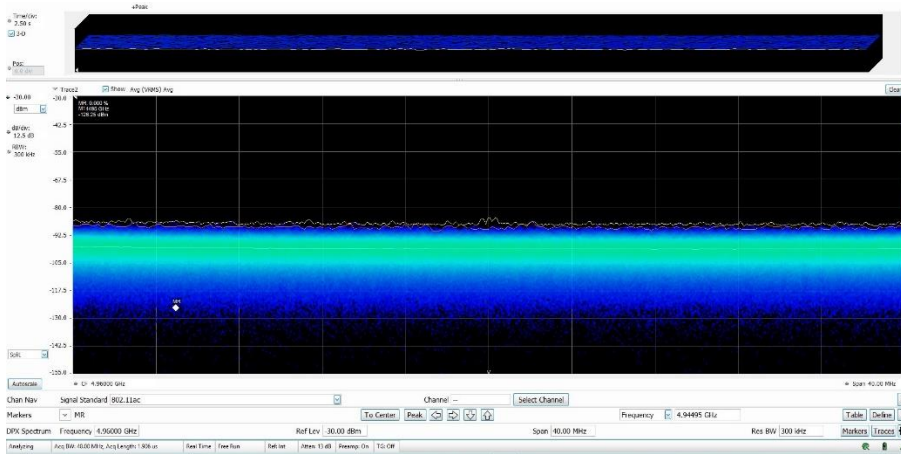
Channel 149

Channel 157

Channel 165

Well Site 8 4.9GHz Spectrum Analysis

4.94GHz

4.96GHz

4.99GHz