

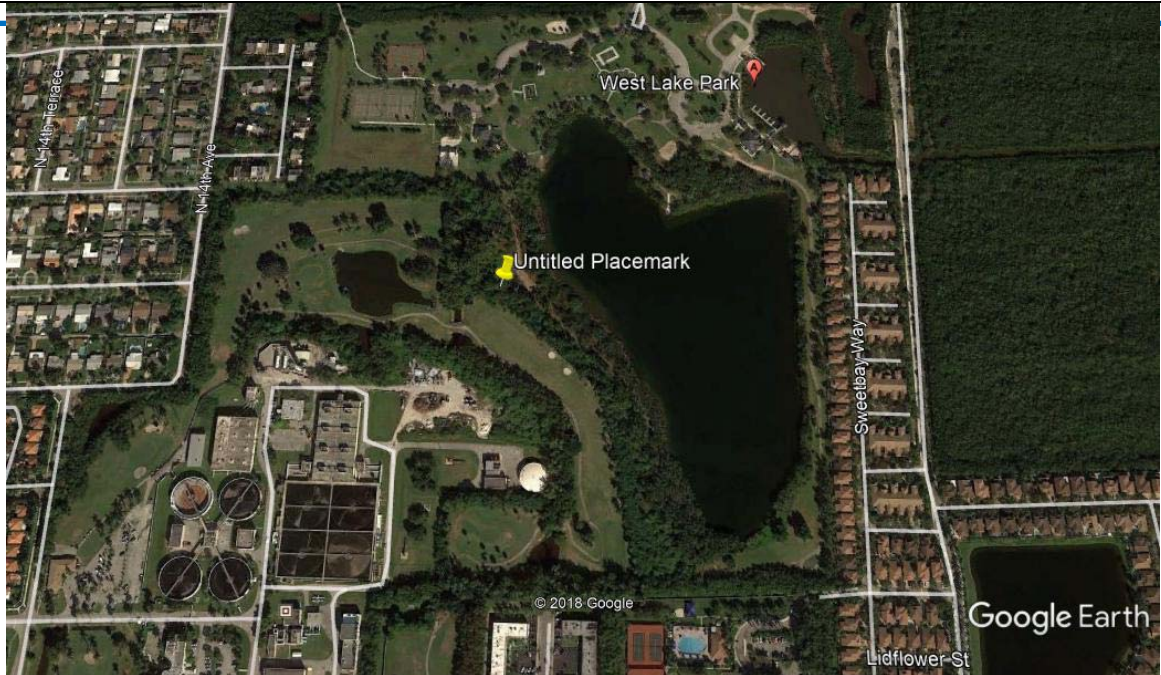


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COVERAGE AND SHADOWING	<p>G.M. Selby performed an RF analysis to determine coverage and shadowing. The RF coverage (utilizing the Okumura-Hata model) provides comparable coverage to the West Lake Park Tower, and the findings were that shadowing were very minimal. Any shadowing or coverage issues that are encountered can be mitigated utilizing repeaters, in building DAS, etc. in the affected areas.</p> <p>It is important to note that shadowing does not mean there is no coverage. It simply means that the RF power will have a degradation and the signal will not be as strong (e.g. 4 bars rather than 5 bars). In addition, shadowing occurs regardless of where you place the P25 BTS because there will always be items blocking the signal between the tower and the user.</p>
TIMING	<p>Based on experience deploying antennas, coax, BTS, DC power plants, generators, etc., it is G.M. Selby's belief that the P25 installation can still be completed prior to the end of the year utilizing the CIRC location rather than West Lake. The antennas on the roof should not take more than two weeks (not including any modifications that may be required to the roof) and four to eight weeks to complete the installation of the power plant, battery strings, generator and conduit for pulling cables up to the boiler room on the roof.</p> <p>The P25 equipment can be installed in outdoor enclosures in the boiler room on a raised platform, and that installation should take no more than two to four weeks to complete.</p> <p>Upon completion of the installation, the only item remaining is integration, drive testing and RF optimization which may vary.</p>
COST	<p>The estimates supplied by KCI, MCP and Motorola for the installation on the CIRC tower we believe are exaggerated. The CIRC tower can be installed for the same value as what was estimated for the West Lake Park site or less. A helicopter is not needed and not everything needs to be placed on the roof.</p> <ul style="list-style-type: none">• The BTS equipment and installation materials can be taken up in the freight elevator.• The microwave antennas and 25' antennas can be raised via winch or if necessary a crane.• The batteries, DC plant and generator should be installed down on the 3rd or 4th floor in a private room constructed down in the parking garage, and those materials can be taken directly to the installation location via vehicle.
LOCATION	<p>The West Lake Park Site has a single entrance, and the location where the tower is to be constructed is bordered by a retention pond on two sides with close proximity to the Intracoastal. Given the site (as demonstrated in the drawings) is only 2'1" above sea level, it will regularly be under water limiting access to the site. Especially after a storm where a 4 to 6' storm surge will likely remain for 48 to 72 hours before receding.</p> <p>The CIRC location is 1.7 miles away from the ocean and has multiple access locations on all sides. Regardless of damage in the area, the technicians will be able to reach the CIRC site and bring materials to the site to perform recovery of the equipment, because the likelihood they will encounter storm surge is incredibly remote.</p>



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REDUNDANCY, RECOVERY AND RESILIENCY

After a storm, the West Lake Park site will likely require replacement of all the microwave antennas, P25 RF antennas and coax on the tower. A crane will not be able to access the site due to the weight of the crane. That results in the only viable solution being to raise the materials via winch (cathead). A winch must be secured to a heavy vehicle (not a boat) in order to accommodate the weight and physics of raising the materials up to the top of the tower. In addition, those items all weigh a great deal. In particular, the 1 5/8" coax (e.g. depending on amount of 1 5/8" on a reel the weight is 250lbs or more per reel and if all the coax is to be replaced that is 6 325' runs of coax) and the microwave antennas. Those items cannot be brought to site in a boat. They must be trucked in so as to accommodate the weight and have what is required to raise the materials in to place.

Lastly, the site cannot be recovered with a cell site on wheels (COW) as originally stated. Broward

County will not be able to pull a COW to the site to recover until after the storm surge has receded and there is no way to know how long that will transpire. As specified in the Motorola contract and documentation supplied by KCI and MCP, the COW will be installed on a trailer that can be pulled to the site. Those trailers are typically 18" to 24" above the ground and that does not provide sufficient clearance above the storm surge.

Here is an example of how a cell site on wheels is constructed.





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Lastly, with respect to the West Lake Park site, it will require a 4 man tower team to recover the site. That site cannot be recovered with BTS technicians. After a storm, the recovery team will be competing with the wireless carriers (e.g. ATT, Verizon, TMO, Sprint, etc.) for tower crews to recover the site.

From a Disaster Recovery and Resiliency perspective, the CIRC location does not have the same issues. The equipment will be protected inside the building with the exception of the microwave and RF antennas. Storm surge is not an issue as the building is 1.7 miles from the ocean, and it is not bordered by any bodies of water. In addition, it has multiple avenues of access and a tower crew is not required to climb. Tower technicians can be trained to perform the recovery up on the roof, and spare materials for the recovery can be stored up on the roof in order to eliminate the need to raise the replacement antennas up to the roof. Even if the power is out, the technicians can simply climb the stairs up to the roof.

If a COW is in fact required to recover the CIRC site, a COW can be brought to the site, placed inside the parking garage (affording it protection against weather, vandalism and theft) and placed nearby to the power supply.

Lastly, given the CIRC Hotels location, refueling of the generator will continue to be viable as the fuel truck will have access and visiting the site in order to refuel the CIRC Hotel generators as well. West Lake Park will only have a 500 gallon tank (thus requiring frequent refueling), and it is unrealistic to assume that the Disaster Recovery team (if the area is under a storm surge) will be able to refuel the tank utilizing a boat.



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EVALUATION OF THE

RF Analysis CIRC HOTEL

**1740 POLK STREET, HOLLYWOOD
BROWARD COUNTY, FLORIDA**

Prepared for:
BROWARD COUNTY COMMISSIONERS
March 29, 2019



Prepared By
Gerald Zadikoff, PE

April 2019

Introduction

G. M. Selby entered into an agreement with the City of Hollywood (Florida) to evaluate the CIRC Hotel building as a candidate site for the installation of communications equipment consisting of a P25 site and two microwave dishes.

The purpose of this document is the evaluation of the site proposed at the CIRC Hotel for the installation an Emergency Responders Communications site.

CIRC Site Evaluation

Site Details

- Latitude: 26° 00' 46.47" (From the 2C Certification dated 03/04/19)
- Longitude: 80° 08' 32.92" (From the 2C Certification dated 03/04/19)
- Antenna Elevation: 297' (base of the antennas)
- 3x SC412-HD2LDF Receive Antennas
- 3x CC807-11 Transmit Antennas
- Base Station Power Output: 100 W
- Cable Length: 300'

Assumptions

Due to the long cable run we assumed the following coaxial cable AVA7 (1-5/8"). This assumption is not an endorsement or recommendation of such product. It simply provides an approximation on the losses introduced by the cables.

In this case the cable assumed has an attenuation of 0.631 dB/100' for a total cable loss of 1.9 dB. We then rounded up the loses to 2.5 dBs to account for connector losses.

RF Analysis

Our analysis was performed using the Okumura-Hata model. This is one of the most extensively used propagation models in the wireless industry. This model is well suited for urban areas with low buildings. This topography matches very well the conditions found in Southern Florida.

The propagation analysis resulted in the following prediction. See the figure below:

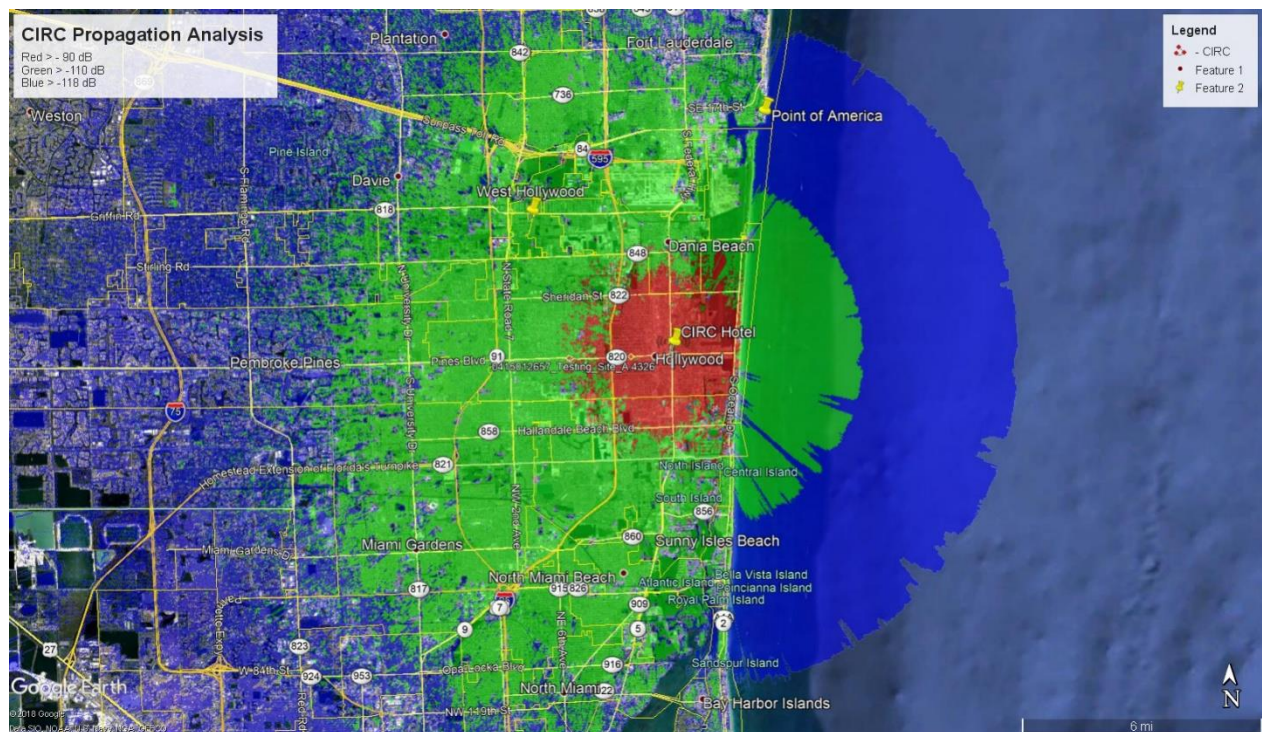


Figure 1.- Propagation Analysis

Red means very good coverage, green fair, and blue is marginal coverage.

Based on this analysis GM Selby believes that the coverage provided by a site located at the CIRC hotel would satisfy the communication needs of the First Responders and system users.

GM Selby lacks any information regarding neighboring sites belonging to the same or other systems, therefore, interference or the relation with other sites was not considered in this analysis.

Furthermore, RF analyses are performed based on empirical models, thus no model predicts the behavior of the radio waves with 100% certainty.

It is recommended that the antennas be placed as close as possible to the edge of the rooftop. However, in our opinion, the proposed location will not greatly affect the performance of the site.

Due to the RF equipment location in the parking garage, we recommend using 1-5/8" coaxial cable, as the cable run will be approximately 300'. This will introduce a power loss of 3 dBs (i.e. 50% of the power out of the antennas).

Microwave Links

No information was provided regarding the microwave links (e.g.: frequency, power, end-points exact coordinates and heights). This section is not an in-depth analysis and/or design of the microwave links. GM Selby is providing an assessment on antenna installation conditions that may affect the links performance.

However, based on the visual inspection of the site and information extracted from other reports indicating that the two end-point are located at Point of Americas and West Hollywood we can state that there is low risk that the new location of the microwave antennas will affect the performance of their respective links. However, we recommend that a line-of-sight verification be performed once the site is ready for development.

In this analysis, outside of the rooftop itself, we did not detect any potential obstructions in the microwave path.

The microwave antennas shall be installed in a way that allows repair personnel, unrelated to the telecommunications system, to perform its tasks without affecting the links, or more important being exposed to radiation outside OSHA limits. For this reason, we suggest the installation of the West Hollywood link microwave antenna at a sufficient height from the roof level to comply with OSHA regulations.

Below is a Line-of-Sight view of the two links:

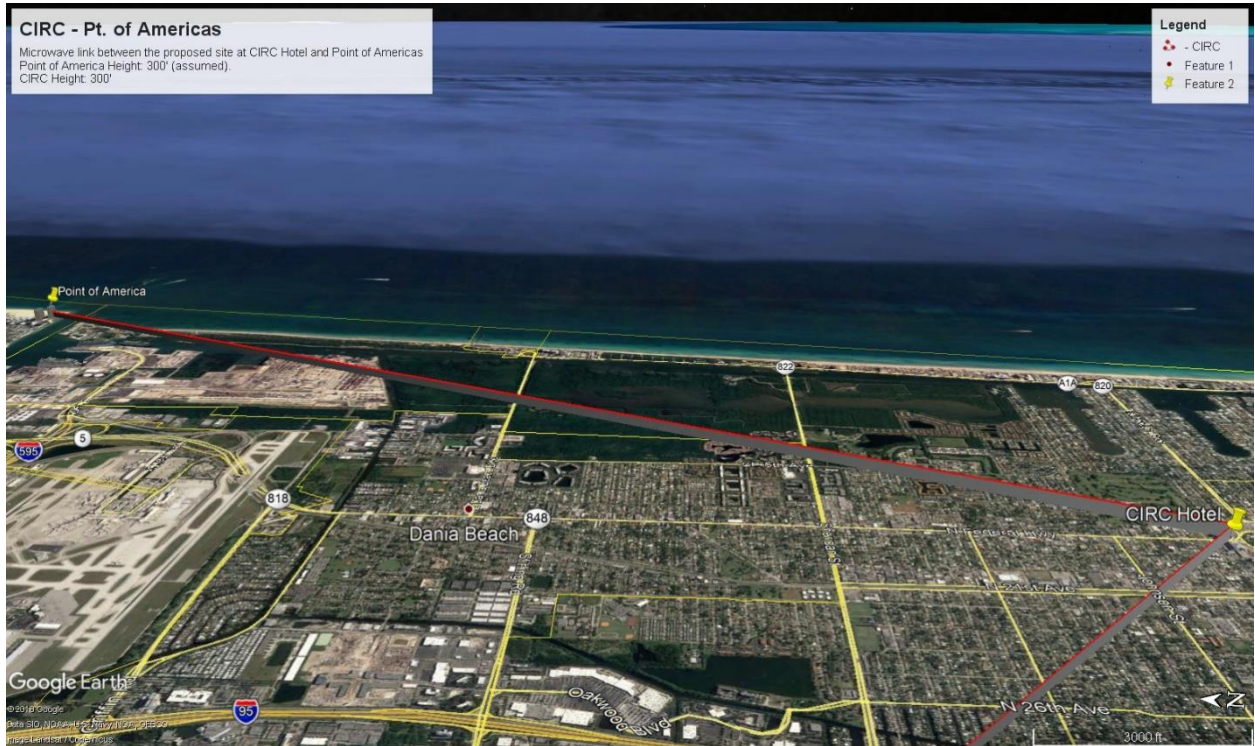


Figure 2.- CIRC - Point of Americas Microwave Link

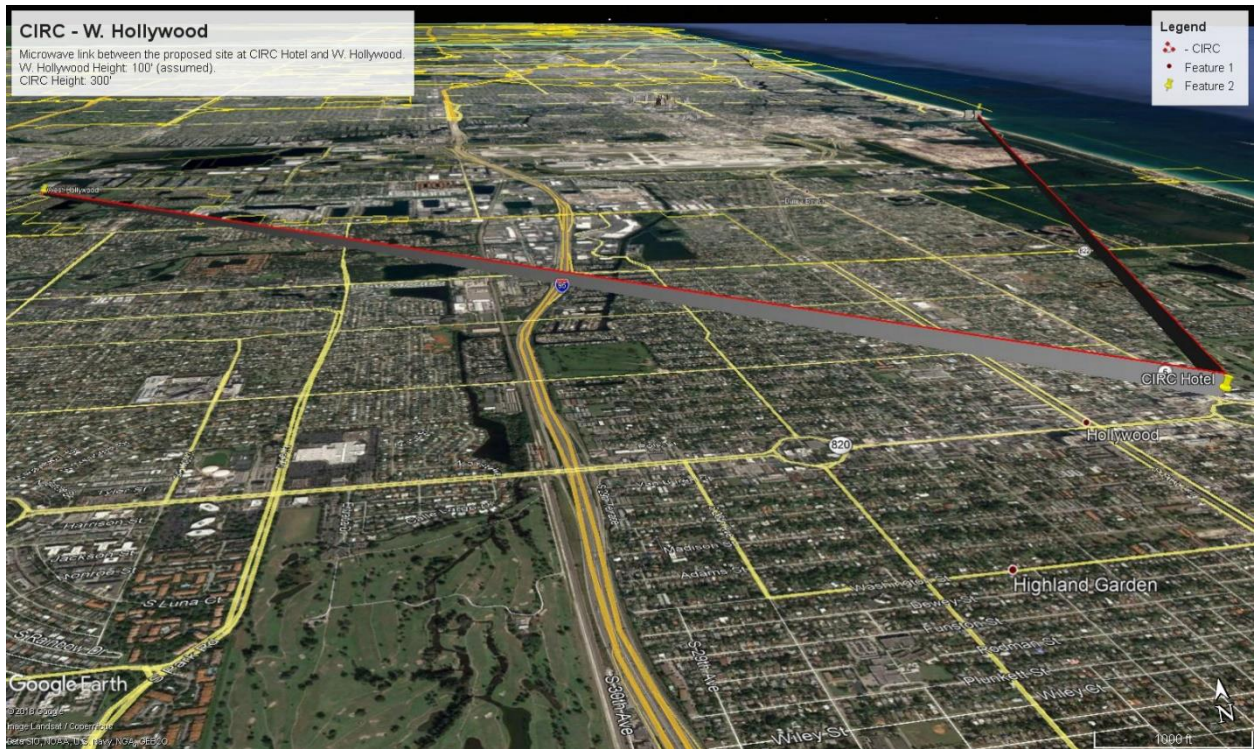


Figure 3.- CIRC - West Hollywood Microwave Link

Conclusions

GM Selby believes that the CIRC hotel site is an acceptable candidate to host P25 and microwave links communications equipment.

GM Selby recommends that once the details of the antenna and equipment room locations are finalized, a more detailed study and site visit be performed to ensure that the final equipment location does not negatively affect the performance.