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MOTOROLA
SOLUTIONS

CIRC Feasibility Study Summary for BCBOCC

APRIL 9, 2019

Study Contributors

- Motorola Solutions Inc. (MSI) – Prime radio vendor
 - Jeff Erhardt: Project Manager
- KCI Technologies (KCI) – Motorola infrastructure design subcontractor
 - Eric Kohl: Senior Associate
- Mission Critical Partners, LLC (MCP) – County’s technical consultant
 - Nick Falgiatore: Senior Technology Specialist



Tasks Conducted

- Physical inspection
- Floor loading analysis
- Antenna mounting analysis
- X-ray of floors in riser closets
- Federal filings (FAA, NEPA, SHPO)
- Microwave path studies
- Design drawings



Design Considerations

- Buildout of an equipment room inside the existing boiler room on the rooftop
- Mount of antennas along an inner parapet wall on the rooftop and at the corners of the building
- Installation of a generator and concrete enclosure on the fourth floor of the garage
- Route of power from the ground floor of the garage to the generator and to the rooftop



Study Summary

- Construction at the CIRC will require significant building structural modifications
- Coverage will be reduced in the immediate vicinity due to shadowing from the building and may be further impacted by future construction
- Construction at the CIRC will be significantly more expensive in both capital and sustainment costs compared to a free-standing tower
- Construction at the CIRC will take longer than a free-standing tower, pushing project completion into Q3 2020 (Calendar Year)
- Restoration of service following equipment outages at the CIRC will take longer compared to a free-standing tower



Design Challenges

- Ability to drain water underneath the location where the equipment room will be constructed
 - The floor will not support equipment room with associated equipment with raised concrete pad
- Routing of cables from the ground floor to the rooftop
 - Core drilling required through existing telecommunication closets
- Transportation of building materials and equipment to the rooftop
 - High-rise crane and/or helicopter required







Flood Mitigation

- The floor will not support raising the equipment room to allow sufficient drainage without building structural modifications
 - Drain located under proposed equipment location
 - Rust stains identified on the floor
 - Draining required for HVAC
- The location of the equipment room is not in an environmentally controlled area with the potential for flooding or water entry
 - Leak from the boilers
 - Water entry through vents
- Any options for raising the equipment room will require significant structural enhancements to the building, greatly increasing costs and schedule delays
 - Subject to approval by the building owner
- Construction without drainage solutions presents risks of equipment room being flooded

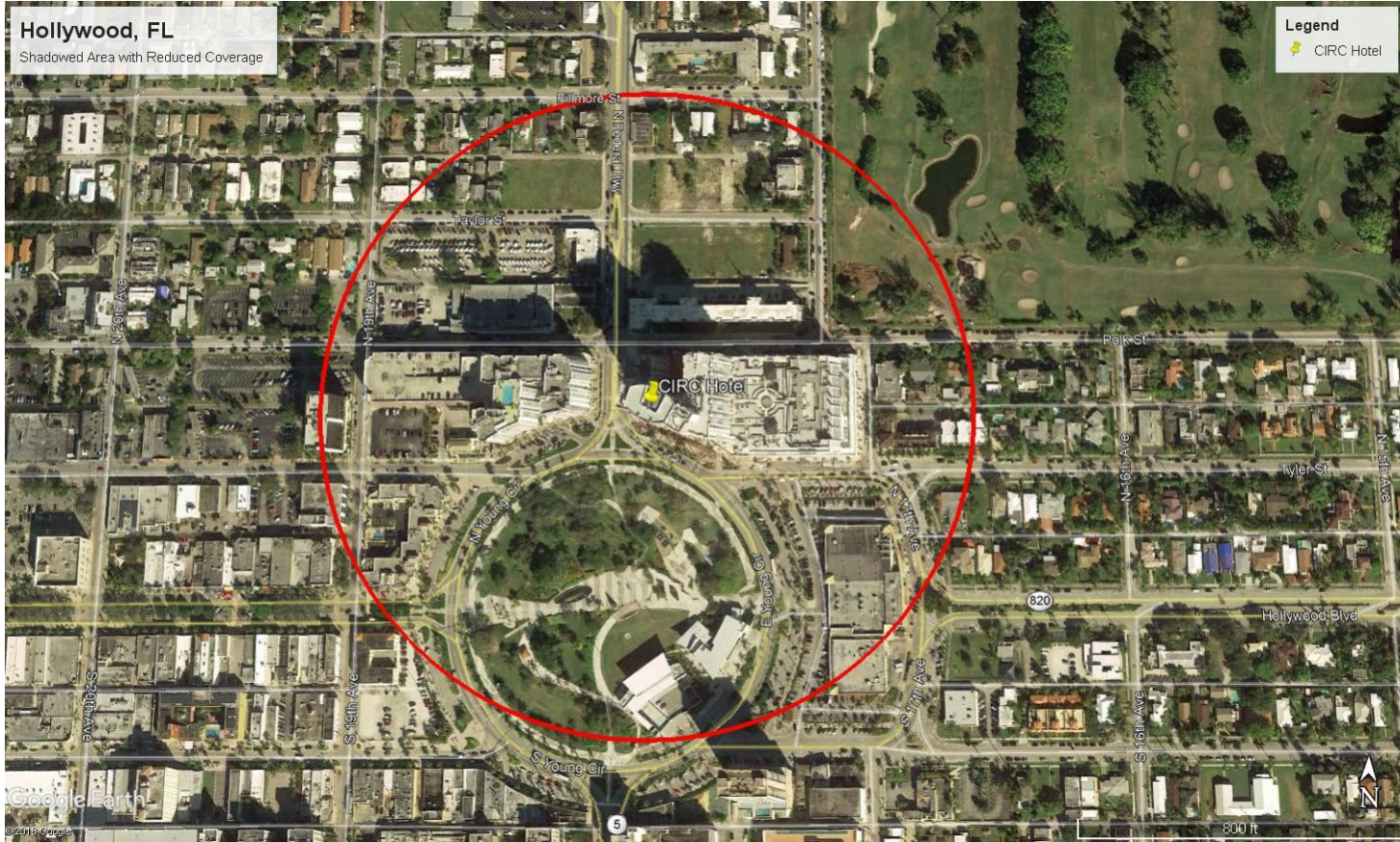




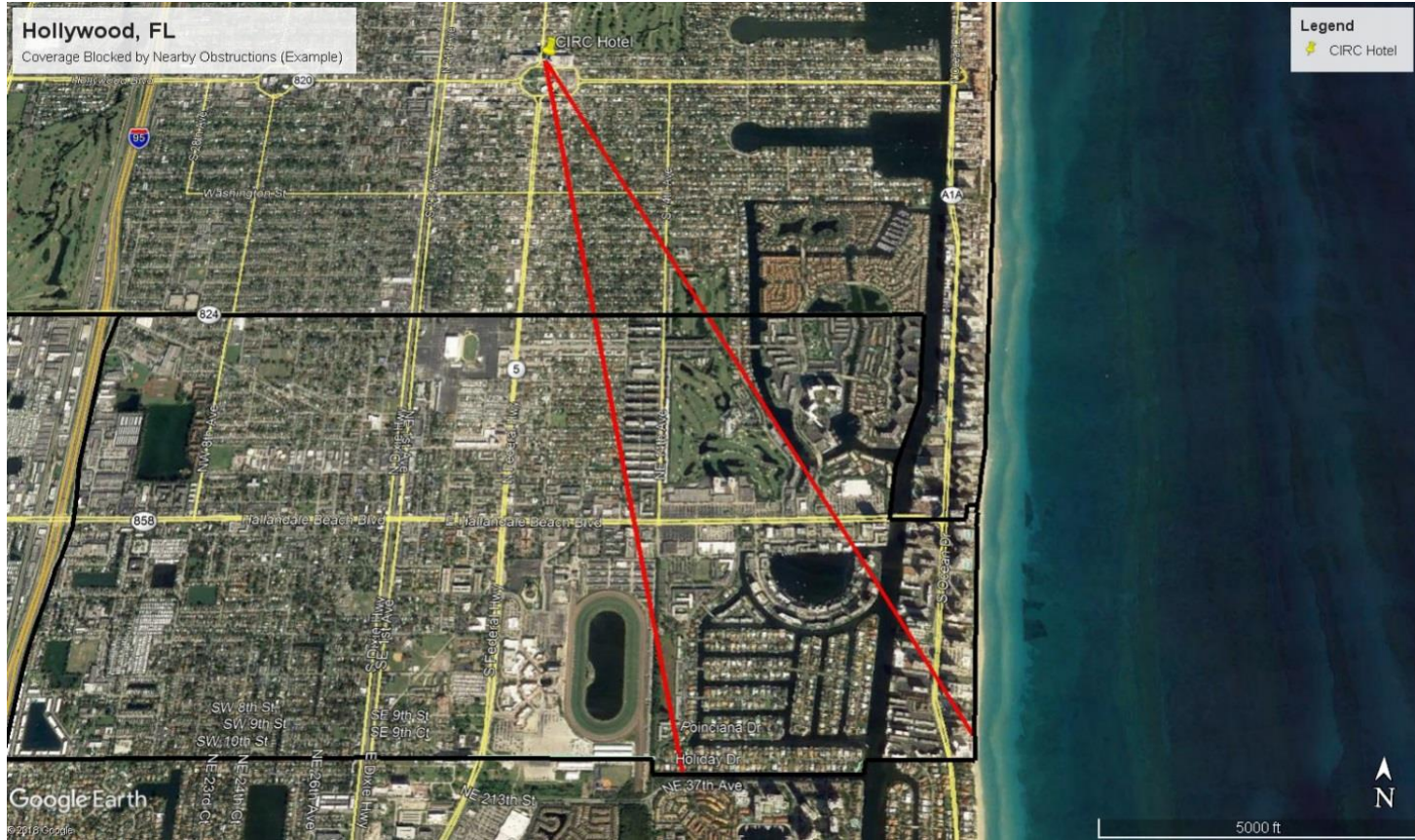
Coverage Impacts

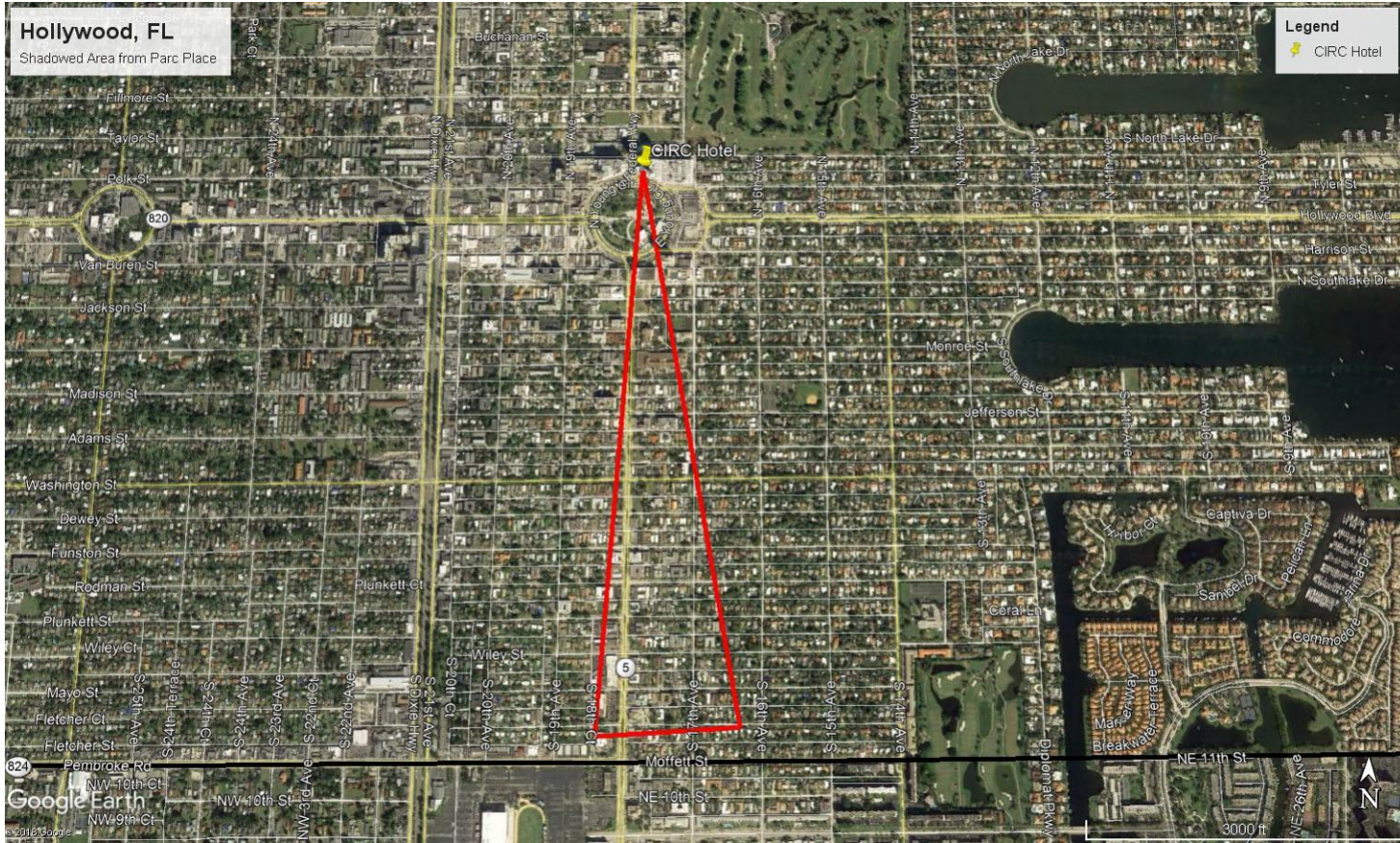
- Systemwide coverage initially evaluated to be comparable to a tower in West Lake Park
- Coverage in the immediate vicinity of the CIRC will be reduced due to shadowing from the building
- Shadowing may be worsened if the FAA does not approve antenna heights above the top of the building, requiring lower placement of antennas
- Construction of tall buildings in the immediate vicinity of the CIRC will impair coverage
- Computer modeling does not consider building shadowing or structural obstructions











Cost Analysis

- Construction costs at the CIRC estimated between \$2.1 million (installation via crane) and \$2.8 million (installation via helicopter)
 - Construction costs only
 - Does not include building structural enhancements
 - Does not include schedule delay costs
- Lease costs at the CIRC have not yet been negotiated, but are estimated to fall between \$5,200 per month and \$6,200 per month based on lease payments at existing condo locations
 - Costs estimated with a 3% CPI increase
- Cost of a free-standing tower is \$750,000, with \$5,000 in annual maintenance costs
 - Construction costs only
- Approximate lifespan of a radio tower is 50 years



Cost of Ownership Comparison

Cumulative Cost of Ownership	CIRC (\$5,200 / month)	CIRC (\$6,200 / month)	Free-standing Tower
Capital Costs (initial installation)	\$2,450,000 (average)	\$2,450,000 (average)	\$750,000
Year 5	\$2,781,290	\$2,846,210	\$776,546
Year 10	\$3,165,346	\$3,305,526	\$807,319
Year 15	\$3,610,572	\$3,838,000	\$842,995
Year 20	\$4,126,711	\$4,455,282	\$884,352
Year 25	\$4,725,058	\$5,170,882	\$932,296
Year 30	\$5,418,706	\$6,000,458	\$987,877
Year 35	\$6,222,834	\$6,962,164	\$1,052,310
Year 40	\$7,155,039	\$8,077,045	\$1,127,006
Year 45	\$8,235,719	\$9,369,498	\$1,213,599
Year 50	\$9,488,525	\$10,867,805	\$1,313,984

CIRC Implementation Schedule

Milestone	Completion Date
Feasibility Study with Proposed Design Delivered	March 29, 2019
Lease Executed	June 1, 2019
Construction Permits Received	August 1, 2019
Construction Begins	August 1, 2019
*Construction Complete	March 1, 2020
Radio Equipment Installation Complete	May 1, 2020
System Testing Complete	September 1, 2020
System Ready for Cutover	September 1, 2020

*Does not include building structural modifications

Maintenance Impact

- It will take technicians longer to access radio equipment on the rooftop when compared to a free-standing tower
 - Key access, elevator, stairwell, long route on the rooftop
- In the event replacement equipment is needed, heavy equipment will need to be carried by hand
- Equipment that cannot be carried by hand or antenna replacements will require crane or helicopter



Comparison to Other County Rooftop Locations

- Floor loading at other rooftop sites support the proposed equipment
- All three buildings have existing equipment rooms that will adequately support the County's equipment
- Antenna mounting locations at the existing structures are on top of rooftop equipment rooms that elevate antenna and reduce the impact of shadowing
- Other buildings include flat faces with roadway access where equipment can be hoisted to the rooftop without the use of a crane
- The buildings are the tallest buildings in their respective areas, with no planned construction in the surrounding areas that could obstruct coverage
- These rooftops are located along the coast where there are no viable alternative locations for free-standing towers

Summary

- Significant structural modifications required, which will further increase costs and delay the schedule beyond projections
- Coverage in the immediate vicinity of the CIRC will be reduced due to shadowing and may be reduced over a larger area due to tall structures in the vicinity or reduced antenna height due to FAA restrictions
- The CIRC will cost between \$8.2 million and \$9.5 million more than a free-standing tower over the life of the tower
- Implementation at the CIRC will push the project schedule into Q3 of 2020 (Calendar Year) or beyond
- Restoration periods at the CIRC will be longer compared to a free-standing tower

Next Steps

- Decide whether or not to proceed with negotiations with the CIRC
- If negotiations proceed with the CIRC:
 - Review feasibility study with CIRC and work toward agreed design (structural modifications, antenna placements, core drilling, etc.)
 - Determine if AT&T service will be provided to the building, or if the existing provider will be utilized
 - Agree on lease terms, including payments

Questions?



Mission**Critical**Partners

Nick Falgiatore

nickfalgiatore@missioncriticalpartners.com

MissionCriticalPartners.com

