Attachment 1
Northrop Grumman Systems Corporation
Application for Special Temporary Authority

Background. Northrop Grumman Systems Corporation ("Northrop Grumman") is grateful to the Commission and the First Responder Network Authority ("FirstNet") for the special temporary authority ("STA") that was consented to effective November 2, 2013 (Call Sign WG9XHQ) to build a trial Long Term Evolution ("LTE") network to test hypothetical first responder communications in and between the New York City metro area and the Northern Virginia metro area outside of Washington, DC (the "Demo Network"). The Demo Network uses FirstNet's 700 MHz band spectrum for local first responder test communications in New York and Northern Virginia. The purpose of the Demo Network is to develop, implement, test and demonstrate how a primary state public safety network operations center ("NOC"), with local content and local control, will interface with a regional network core as part of the FirstNet Nationwide Network. The network core in the Demo Network houses and is testing three critical first responder features to ensure the integrity of the first responder network: (1) identity management; (2) cyber security; and (3) applications delivery. Northrop Grumman's investment to date in the Demo Network is approximately $3 million.

Important Visits by Stakeholders Are Still Occurring. The Demo Network entered the operational phase at the end of December 2013. Thereafter, Northrop prepared the New York and Northern Virginia sites for visits by important public safety stakeholders, and commenced visits. The STA requested by this application, which is technically identical to the network authorized under WG9XHQ, is needed: (a) to complete visits by important stakeholders, including FirstNet; (b) to complete testing; and (c) to share with FirstNet and the Commission important lessons learned from deployment and operation of the Demo Network. To date, the following stakeholders have visited the Demo Network:

- The Head of the Public Safety Advisory Council – Harlin McEwen
- Association of Public-Safety Communications Officials (APCO) – Jeff Cohen, Roger Wespe
- The Department of Homeland Security (via WidePoint, which was awarded a large BPA contract with the Department of Homeland Security)
- National Institute of Standards and Technology ("NIST") / Public Safety Communications Research (PSCR) – Dereck Orr and his technical team
- Commonwealth of Virginia Spectrum Manager – David Warner
- Commonwealth of Virginia FirstNet Statewide Interoperability Coordinator – Brandon Smith
- The State of Maryland – Ray Lehr and Lori Stone
- The State of Michigan – Brad Stoddard
- LAPD Chief Information Officer
- Deputy CIO from the FBI – Dean Hall
- The CTO of Customs and Border Patrol – Wolf Tombe
- U.S. Army – Combat Training Centers Program Representatives

- The Social Security Administration
- London Metropolitan Police

Northrop Grumman is working to schedule visits to the Demo Network by the following:

- FirstNet Board Members
- The General Manager of FirstNet – Bill D'Agostino
- The Deputy General Manager of FirstNet – TJ Kennedy
- The Acting Deputy Chief Technology Officer of FirstNet – Jeff Bratcher
- NYPD – Chief Chuck Dowd and members of NYPD
- The Mayor's Office of Citywide Emergency Communications in New York City
- The Department of Information Technology and Telecommunications in New York City
- FirstNet Statewide Interoperability Coordinators from all 50 states, territories, and 556 tribal nations
- FCC and NTIA Leaders
- Members of Congress or members of their staff, including: Rep. Greg Walden (R-OR); Rep. Anna Eshoo (D-CA); Rep. John Shimkus (R-IL); Rep. Bob Latta (R-OH); Rep. Leonard Lance (R-NJ); Rep. Jim Matheson (D-UT); Rep. Mike Pompeo (R-KS); and Rep. Renee Ellmers (R-NC)
- FEMA
- The Department of Justice
- U.S. Secret Service
- Bureau of Alcohol, Tobacco, Firearms and Explosives
- The Virginia State Police
- The FirstNet Technical Team

The Demo Network. As the Commission and FirstNet are aware, Northrop Grumman aimed to take every step possible to ensure that configuration of the Demo Network closely resembles the real-world, anticipated architecture of the FirstNet core network. In the Demo Network, the Solutions Center in Brooklyn represents how a primary state NOC, with local content and local control, will interface with a regional network core in the FirstNet network. The Northrop Grumman Innovation Center in McLean models the regional network core. The slides attached hereto at Exhibit 1 depict: (1) a nationwide distributed network for FirstNet, including local hubs, regional hubs and the nationwide network core; and (2) how FirstNet can leverage existing commercial and municipal infrastructure for first responders communications through the core network.

Features in the core network were developed to test how FirstNet can manage the network and utilize critical identity management features and cyber security technology to protect the integrity of the communications and protect the operation of the network. An applications delivery platform also has been implemented, and is being tested, providing an "apps store" for fire, police and EMS. One of the applications that is under evaluation is the Law Enforcement Information

Exchange ("LInX"), which provides Department of Defense-level security capabilities and features that are capable of addressing sensitive and mission critical homeland security and law enforcement intelligence needs across jurisdictions. LInX helps find hidden associations and connections within existing law enforcement records sources.

Northrop Grumman has made significant progress in developing and testing an identity management solution on the applications delivery platform, using public safety applications from the APCO website. Northrop Grumman also is working on and testing its "tiered" cyber security solution, which may be one of the most sophisticated cyber security solutions ever used for a public safety network in America. Because FirstNet will be a national mission-critical asset, Northrop Grumman takes seriously developing solutions that will ensure network integrity and protect the network.

In addition, Northrop has chosen and deployed equipment in the Demo Network from diverse vendors in order to replicate a real-world test case for FirstNet. The Demo Network demonstrates the LTE interoperability of using fixed Alcatel-Lucent eNodeB transmitting equipment in McLean, and mobile Nokia Solutions and Networks transmitting equipment in New York City, all connected to a Cisco core through fiber optic backhaul that connects the three locations.

Since three of the seven Broadband Technology Opportunities Program ("BTOP") grants for public safety networks are not moving forward,[1] and other BTOP public safety grants are only in the initial stages of development (*e.g.*, LA-RICS), this Demo Network presents an excellent opportunity to operationally emulate the functioning of the FirstNet core network before FirstNet breaks ground, allowing for testing and evaluation of local wireless operations, public safety applications, and interface of a primary state NOC with a regional network core. Moreover, the BTOP projects that are progressing will focus on state and local deployments rather than on providing a core network solution with integrated identity management, cyber security, and an applications delivery platform.

Northrop Grumman Certifications. Consistent with information Northrop Grumman previously provided the FCC and FirstNet, Northrop Grumman confirms the following as part of this application:

1) The STA will enable Northrop to continue operating a trial 700 MHz LTE network in and between New York City and Northern Virginia. The objective is to use the 700 MHz LTE network with end-user devices and a backhaul system to test and develop enhanced first responder applications and solutions that will reside in the core network. The trial

[1] FirstNet announced that agreements could not be reached with the City of Charlotte, North Carolina; the Executive Office of the State of Mississippi; and the Bay Area Regional Interoperable Communications Systems Authority (BayRICS)/Motorola Solutions, Inc. *See* "FirstNet Approves Spectrum Lease Agreements with Adams County, Colo. and New Jersey," FirstNet Press Release (Dec. 17, 2013), *available at*: http://www.ntia.doc.gov/press-release/2013/firstnet-board-approves-spectrum-lease-agreements-adams-county-colo-and-new-jerse.

network will serve as an expository vehicle upon which advanced concepts of hypothetical first responder communications will be demonstrated.

2) With FirstNet's consent, the trial network utilizes FirstNet's spectrum: 758-768 MHz is used as the downlink band and 788-798 MHz is used as the uplink band.

3) One base station is deployed in Northern Virginia (in McLean), and two base stations are deployed in New York City (one in Brooklyn and one in Manhattan). The FCC already has this information, but for convenience we have attached hereto at Exhibit 2 the "perspectives" from the two New York City sites, together with RF site antenna configuration information for each site.

4) A fully redundant backhaul link was deployed to couple the operations in these locations to a common LTE-evolved packet core.

5) Twenty experimental end-user devices are provisioned for testing and demonstration by Northrop employees. In the New York locations, the end user devices are operated within a radius of three miles or less of the base stations. In Northern Virginia, the end-user devices are operated indoors.

6) Northrop's temporary operations will not be used in actual mission-critical operations or in the delivery of live transmissions to protect life, property, or safety.

7) Northrop has implemented internal procedures to monitor and maintain control of the handsets and will promptly respond to any reports of harmful interference. Each unit will be registered to its recipient, and Northrop will maintain a record of each device so that each can be easily recalled at any time during testing and when testing is complete.

8) Northrop analyzed information from the FCC's license databases, and commissioned Comsearch to undertake an engineering study. That study, filed with the FCC, determined that the proposed operation will not interfere with, or create significant potential interference with, public safety operations in the 700 MHz band, including the operations of the Commonwealth of Virginia pursuant to WPTZ775.

9) Northrop is working with the Commonwealth of Virginia on its consent for the above-referenced STA application with the following conditions, which are identical to the conditions imposed by the Commonwealth when it consented to the STA authorized under WG9XHQ: STA operations must be strictly limited to the in-building parameters proposed in the application. Northrop must assume all causalities, risks, damages, and liabilities that may result from operations associated with the STA. If Northrop deviates from the terms of the STA, the Commonwealth can revoke its approval of the STA. Northrop filed the Comsearch engineering study with the FCC on October 18, 2013. Northrop also agreed to notify the Interoperability Coordinator, the Commonwealth Spectrum manager and the Virginia State Police if any upcoming test associated with the STA deviates from the STA as granted. Northrop also will notify the STARS NOC prior to commencing any test and will

only conduct such tests with the concurrence of the Virginia State Police. These coordinating activities have been undertaken by Northrop and the Commonwealth with success relative to the current STA, WG9XHQ.

10) Northrop understands that FirstNet has the right to monitor its operations. Northrop also understands that if additional time for its trial is needed beyond November 2, 2014 that it will be required to file an application with the FCC and, once again, seek FirstNet's consent.

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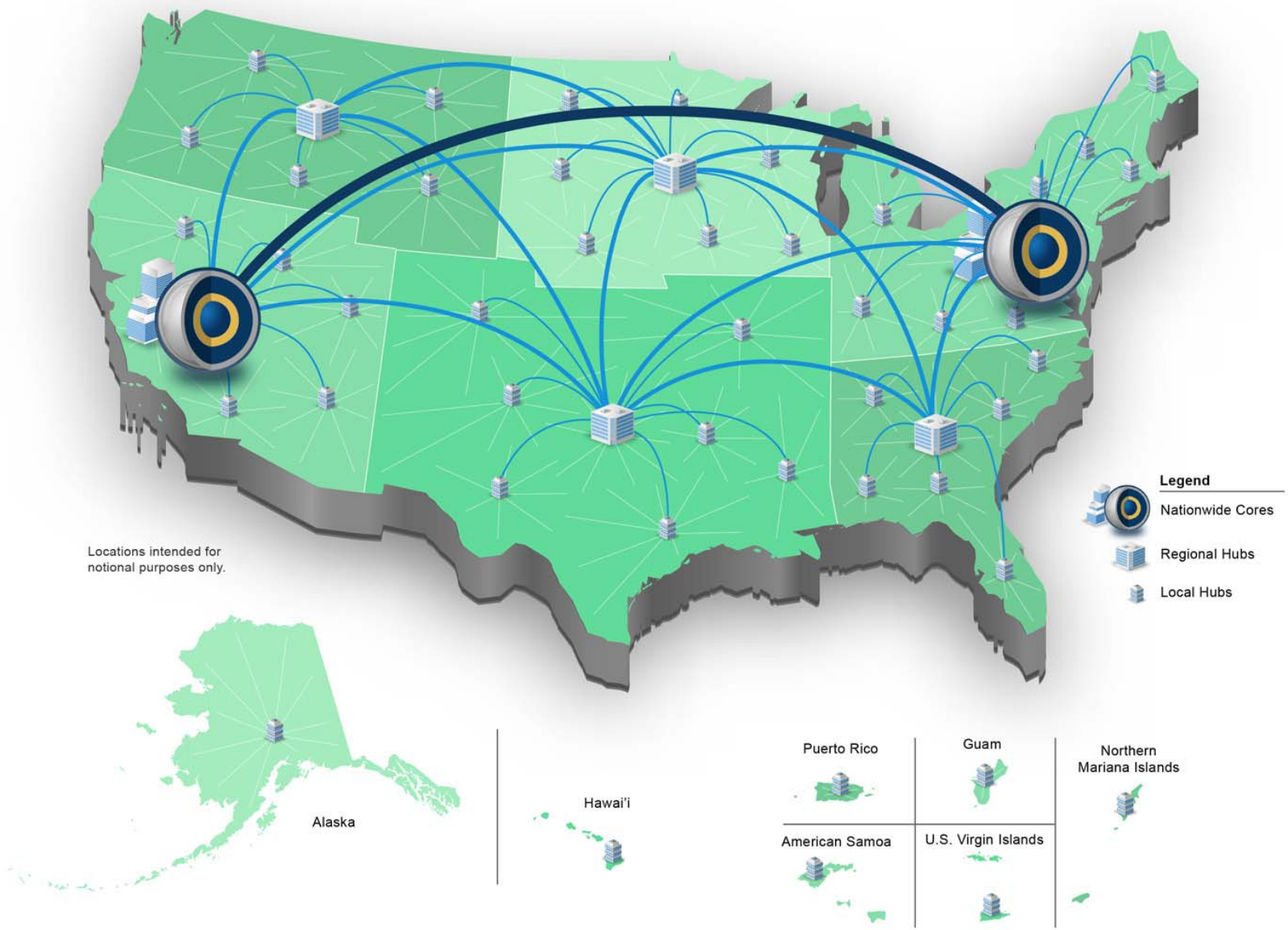
Exhibit 1
Northrop Grumman Systems Corporation
Application for Special Temporary Authority

Nationwide Distributed Network



Leveraging Existing Infrastructure

NORTHROP GRUMMAN

Proposed FNN Architecture

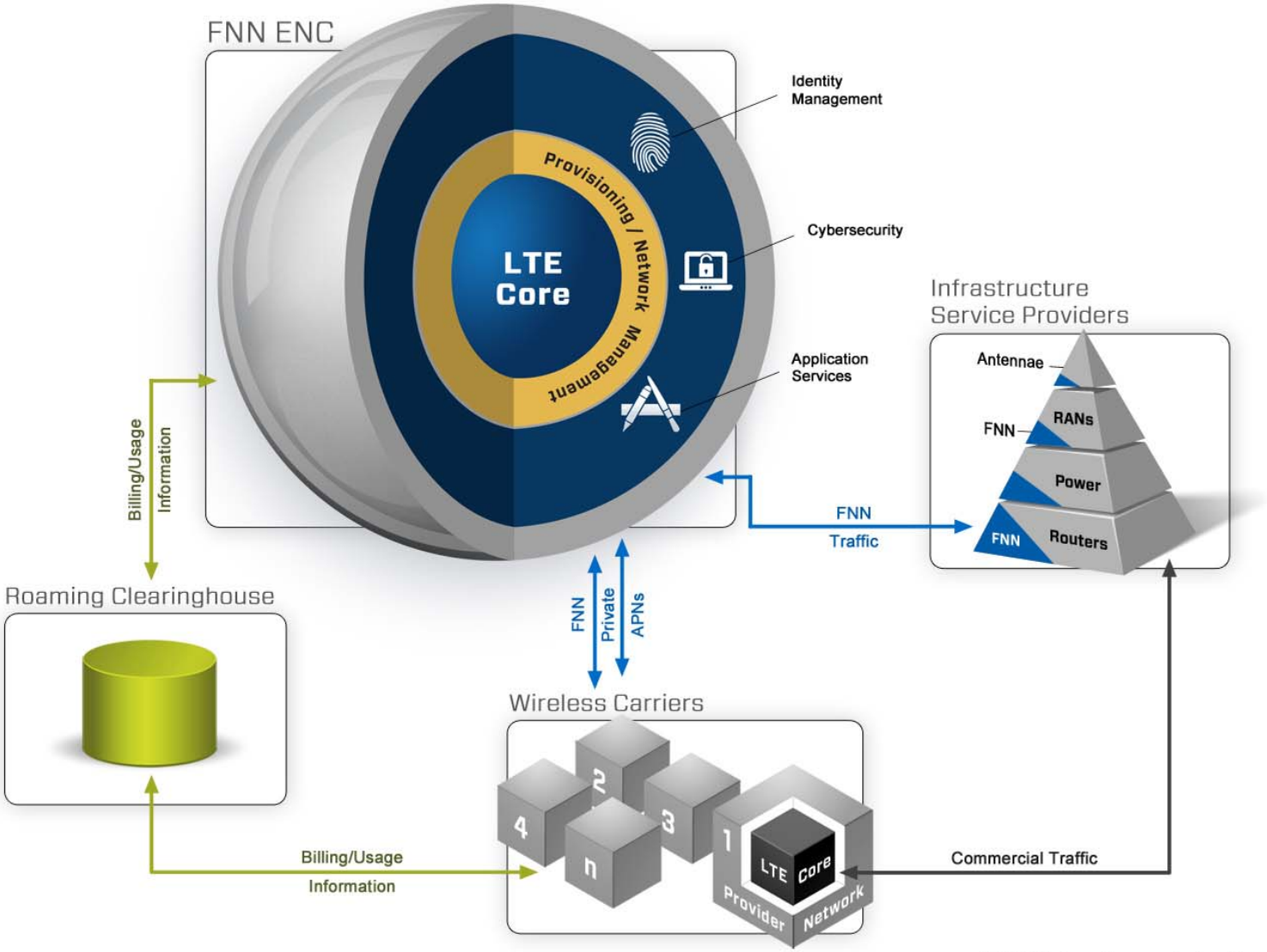


Exhibit 2
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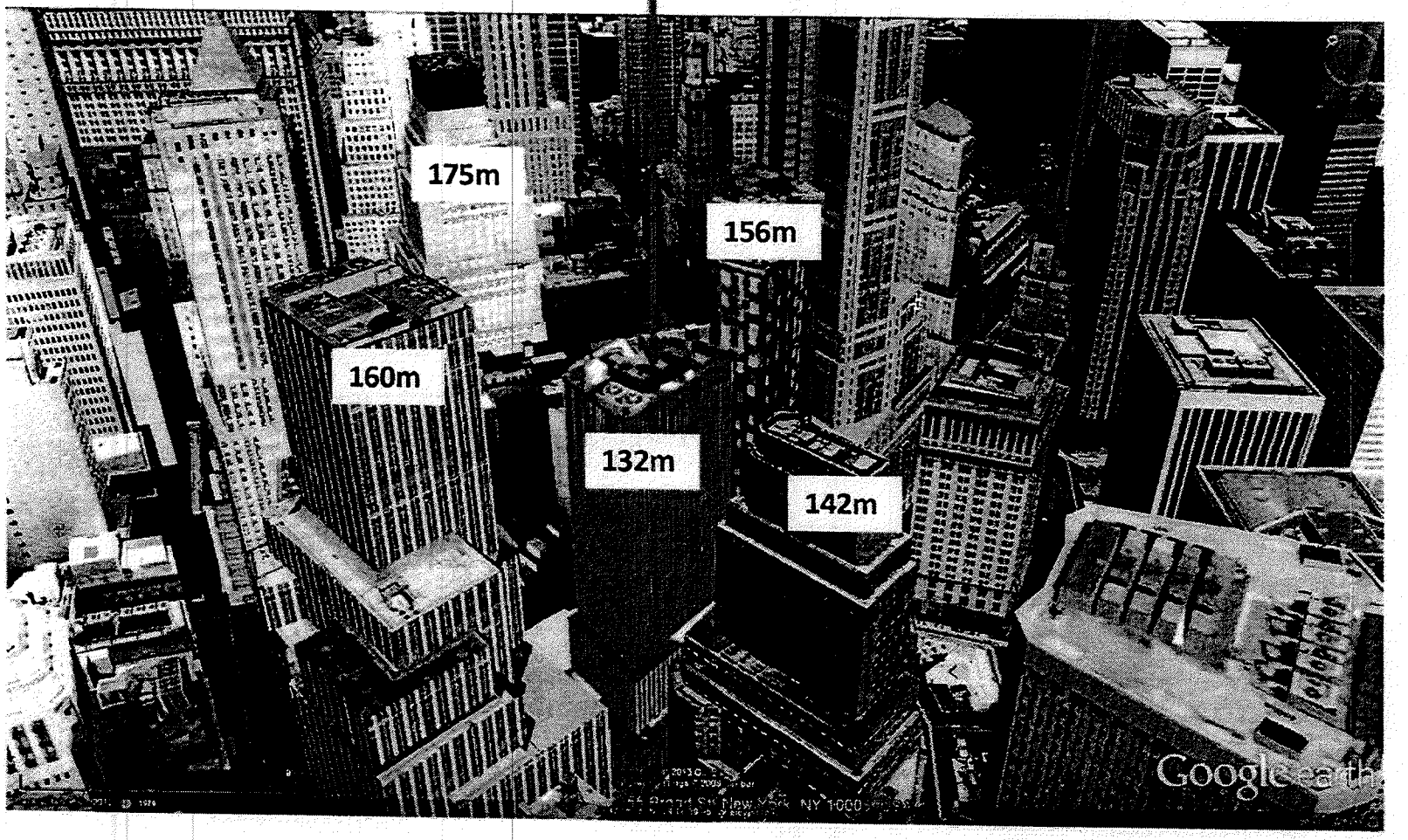
NY City Sites

Perspectives

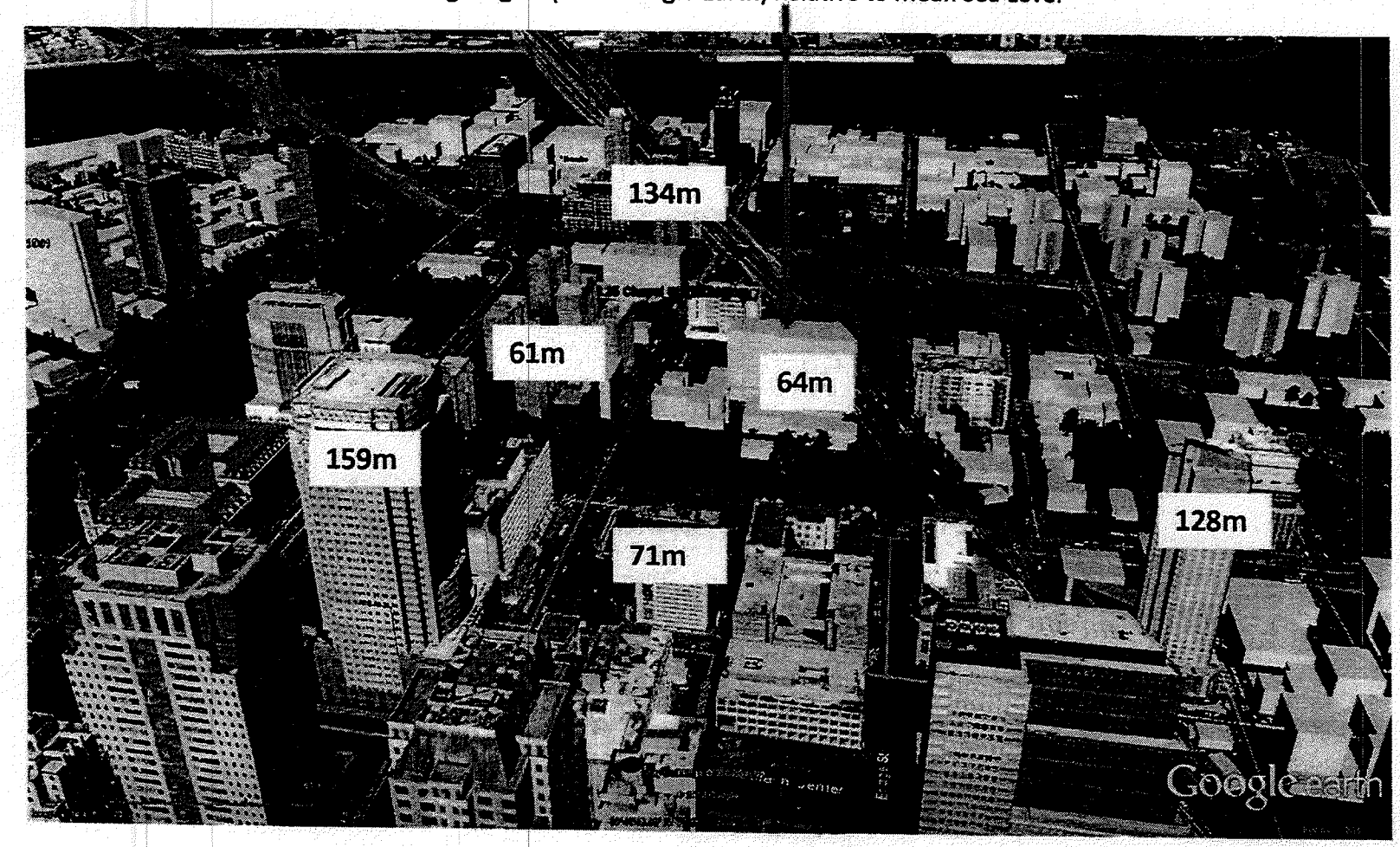
55 Broad St. Manhattan NY

Building Heights (from Google Earth) Relative to Mean Sea Level



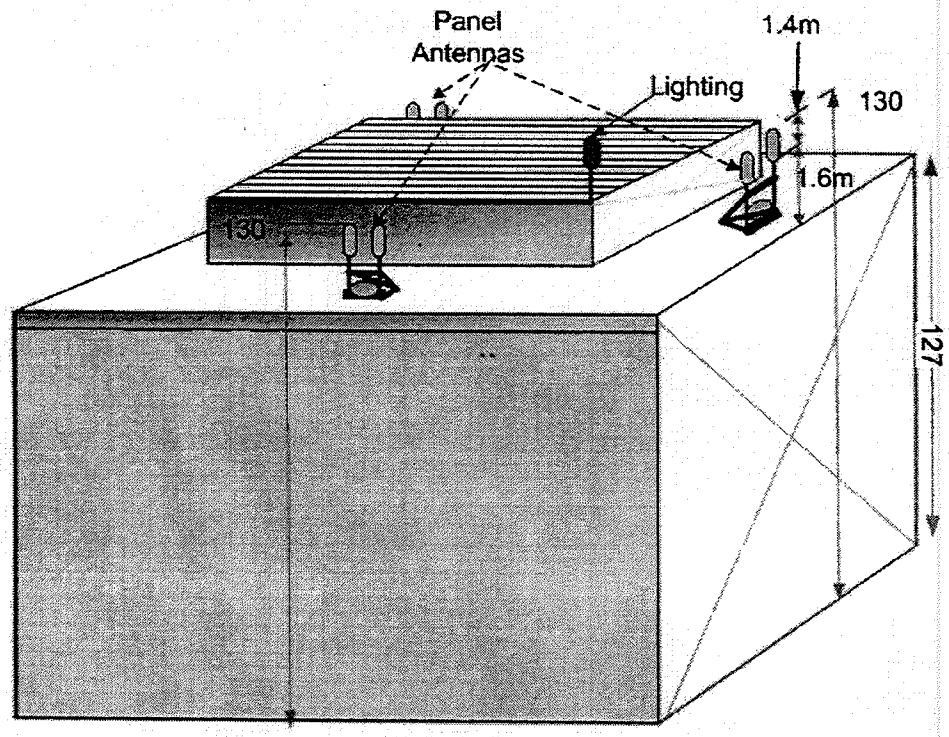
25 Chapel St. Brooklyn, NY

Building Heights (from Google Earth) Relative to Mean Sea Level



RF Site Antenna Configuration/Installation
55 Broad St. Manhattan, NY

- A general sketch of building rooftop panel antenna installation is shown in diagram
  - The panel antenna configuration model is shown in diagram with dimensions applicable to 55 Broad St. Manhattan, NY location) for three sector positions
  - Ground Elevation (Above Mean Sea Level) is 5m
  - Building Height Above Ground is 127m
  - Total Height (Ground to Tip of Antenna) is 130m
  - Lighting installation is as shown (in Red) assumed to be at least 1m higher than tip of panel antenna



RF Site Antenna Configuration/Installation
25 Chapel St. Brooklyn, NY

- A general sketch of building rooftop panel antenna installation is shown in diagram
  - The panel antenna configuration model is shown in diagram with dimensions applicable to 25 Chapel St. Brooklyn, NY location) for three sector positions
  - Ground Elevation (Above Mean Sea Level) is 17m
  - Building Height Above Ground is 47m
  - Total Height (Ground to Tip of Antenna) is 50m
  - Lighting installation is as shown (in Red) assumed to be at least 1m higher than tip of panel antenna