



at&t

# BR0306 Bainbridge Lynwood Center RF Justification

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## SERVICE OBJECTIVES & TARGETED SERVICE AREA

AT&T is proposing to build a new wireless communication facility (“WCF” and/or “Facility”) BR0306 Bainbridge Lynwood Center (to be collocated on an existing Kitsap Public Utilities District (“KPUD”) water tower at No situs address, Baker Rd, Bainbridge Island, WA 98110 (47.606325, -122.544258).

### Service Objectives—Generally

AT&T strives for a network design that provides high radio frequency (“RF”) signal strength and provide good DL Dominance resulting in quality service inside buildings and vehicles. To support this network design there are two main drivers that prompt the need for a new cell site—coverage and capacity.

“Coverage” is the need to expand wireless service into an area that either has no service or bad service. “Capacity” is the need for more wireless resources. Cell sites have a limited amount of resources to handle voice calls, data connections, and data volume. When these capacity limits are reached, user experience quickly degrades.

### Service Objectives—Proposed New Facility

The proposed new Facility is a service coverage site. Currently, there is a significant gap in 4G LTE service in the SW tip of Bainbridge Island with minimal to no 4G LTE service.

This WCF aims to provide adequate and dominant coverage in and around Lynwood Center and the surrounding residential areas, especially those to the west (the “Targeted Service Area”). This Facility will also provide improved coverage for ferries on the Seattle-Bremerton Ferry. This service objective and Targeted Service Area was determined by AT&T’s RF engineers through a combined analysis of market demand, customer complaints, service requests, and RF engineering design.

The proposed new Facility meets AT&T’s service objectives to provide sufficient continuous and uninterrupted outdoor, in-vehicle, and in-building wireless service within the Targeted Service Area, resulting in fewer dropped calls, improved call quality, and improved access to additional wireless services the public now demands (this includes emergency 911 calls).



## SEARCH RING

AT&T's RF engineers performed an RF engineering study—considering multiple objectives—to determine the approximate site location and antenna height required to best fulfill the noted service objectives within the Targeted Service Area. From this study, AT&T's RF engineers identified a “search ring” area where a new wireless facility may be located to provide effective service in the Targeted Service Area. As this is a service coverage site intended to provide seamless coverage in the specific area, the proposed new Facility must be located within the identified search ring to be able to establish a dominant signal within the Targeted Service Area.

**Figure A—Search Ring**, indicates the search ring AT&T's RF engineers established for this proposed site. A discussion of the methodology AT&T's RF engineers used to identify the search ring is included at the end of this RF Justification document.

**Figure A—Search Ring**



## PROPOSED NEW AT&T FACILITY

### Antennas and Equipment

To meet AT&T's service objectives within the Targeted Service Area, AT&T is proposing to install up to twelve (12) eight-foot (8ft) panel antennas and eighteen (18) remote radio head (RRH) units, together with all associated equipment.

### Projected New Coverage

Based upon the above proposed equipment and antenna tip height, AT&T's RF engineers project that the proposed Facility will provide the following new AT&T 4G LTE coverage.

**Figure B—Existing AT&T 4G LTE Coverage** shows existing AT&T 4G LTE services in the general area of the proposed new Facility, which demonstrates the current gap in coverage in the Targeted Service Area. As can be seen, there is a coverage gap in all areas not shaded in green. Currently, the Targeted Service Area has minimal to no 4G voice service and does not have adequate 4G LTE service. **Figure C—New AT&T 4G LTE Coverage** shows the projected new AT&T 4G LTE coverage from the proposed new WCF with the requested antenna tip height of 55'7".

### Antenna Tip Height

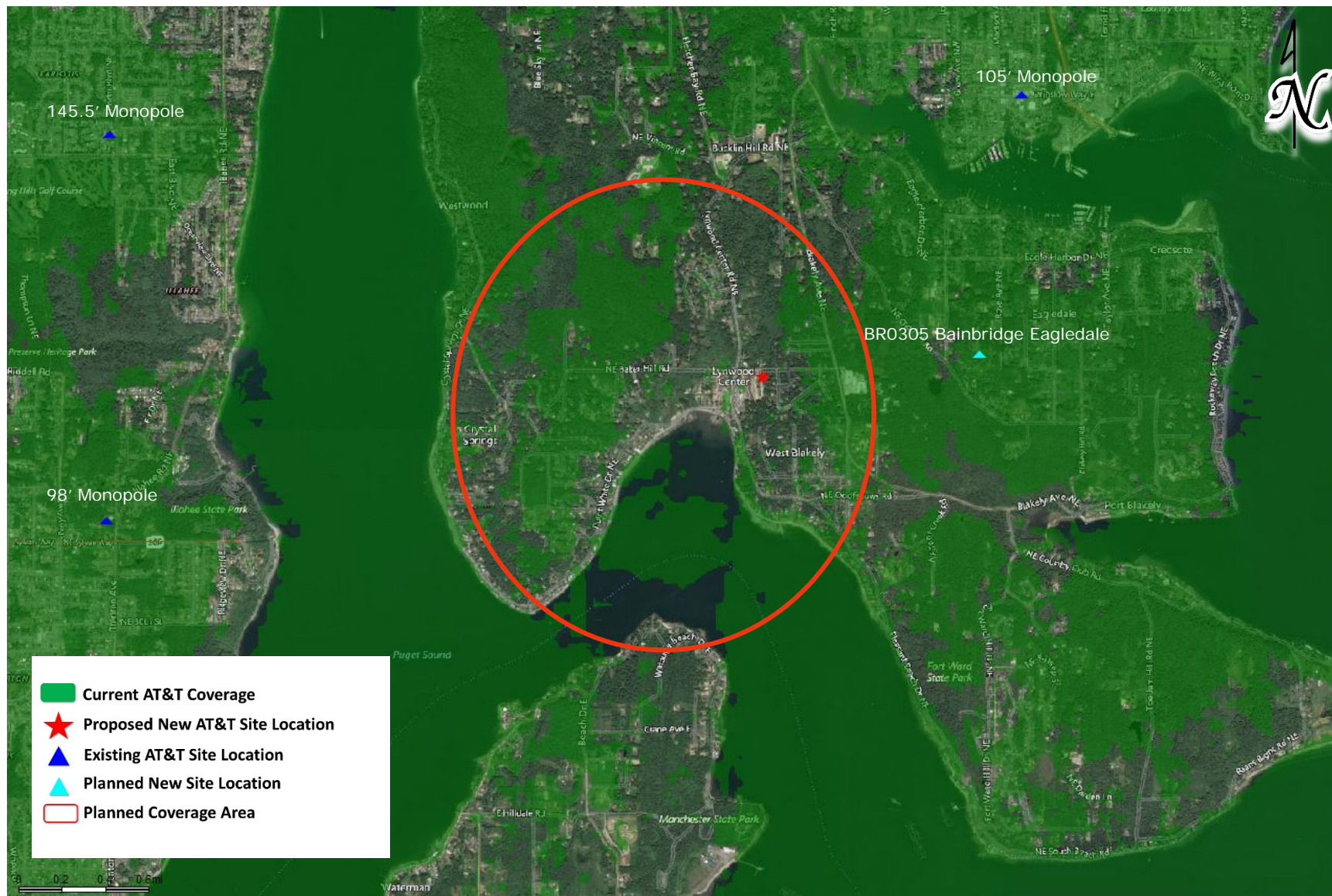
As the proposed new Facility is intended to provide new coverage, height and location play an important role. The proposed antenna tip height of 55'7" was determined by considering various factors such as the height of surrounding wireless sites, ground elevation, obstructions to the signal, and the surrounding terrain. Accordingly, the proposed 55'7" antenna tip height is the minimum necessary to best meet AT&T's service objectives within the Targeted Service Area.

As shown in **Figures D.1 & D.2—Height Comparison—New AT&T 4G LTE Coverage**, the projected new coverage provided by antennas on the water tank with a 45'7" and 35'7" antenna tip height, respectively, would not provide sufficient coverage to meet AT&T's service objectives within the Targeted Service Area. Specifically, coverage decreases by 39% if there's a 10' reduction in height to 45'7" and 58% coverage decrease if there's a 20' reduction in height to 35'7". Most notably, large portions of Lynwood Center Rd and Blakeley Ave NE, and the surrounding residences, would not receive coverage under the lower 35'7" and 45'7" antenna tip heights as compared with the proposed 55'7" tip height. The proposed antenna tip height is also the height where an AT&T wireless device can be reliably used to make and receive telephone calls and use data service in the presence of varying signals.



## Figure B—Existing AT&T 4G LTE Coverage

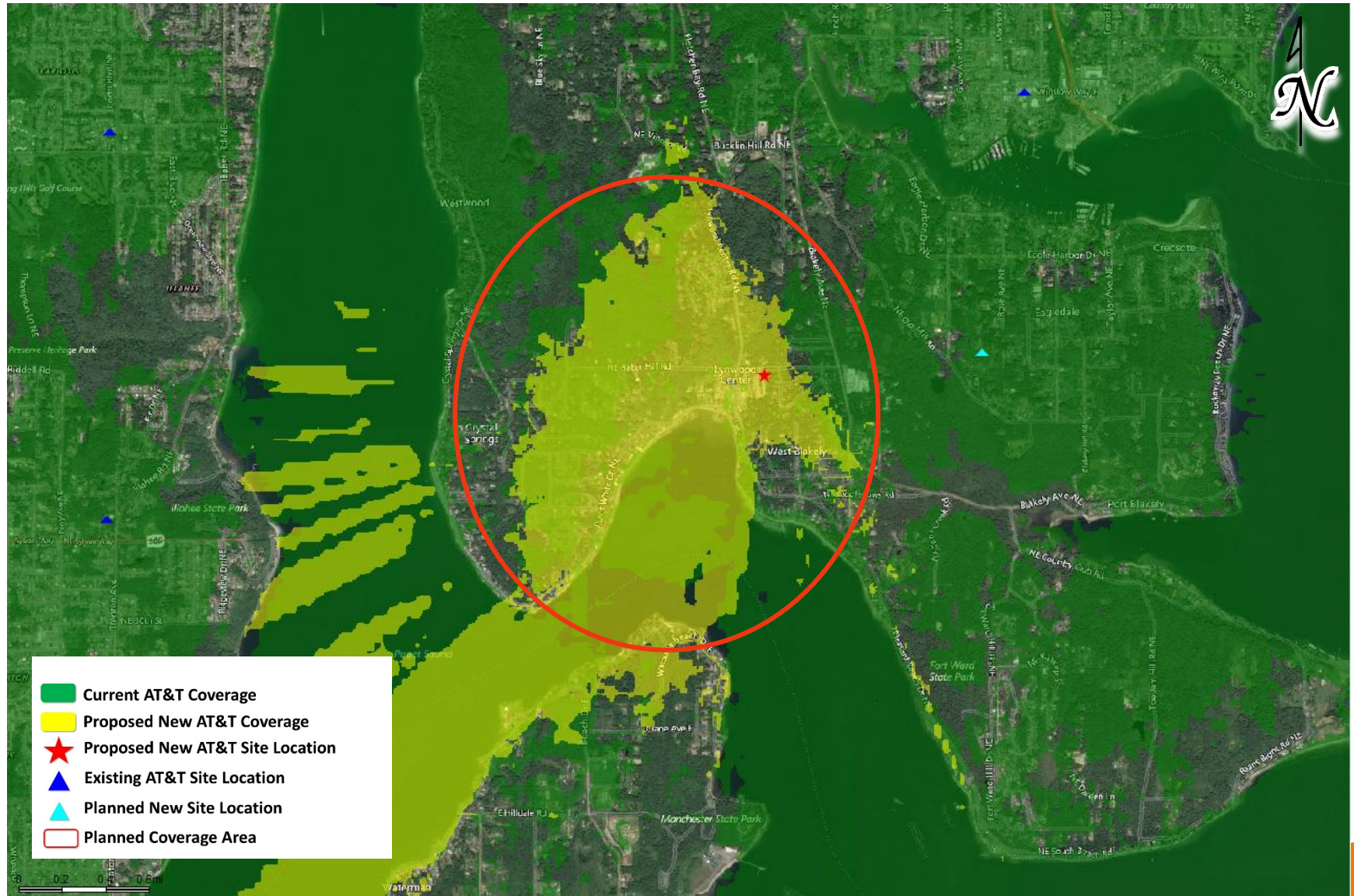
Existing AT&T Coverage in Targeted Service Area BEFORE Addition of Proposed New Wireless Facility





## Figure C—New AT&T 4G LTE Coverage

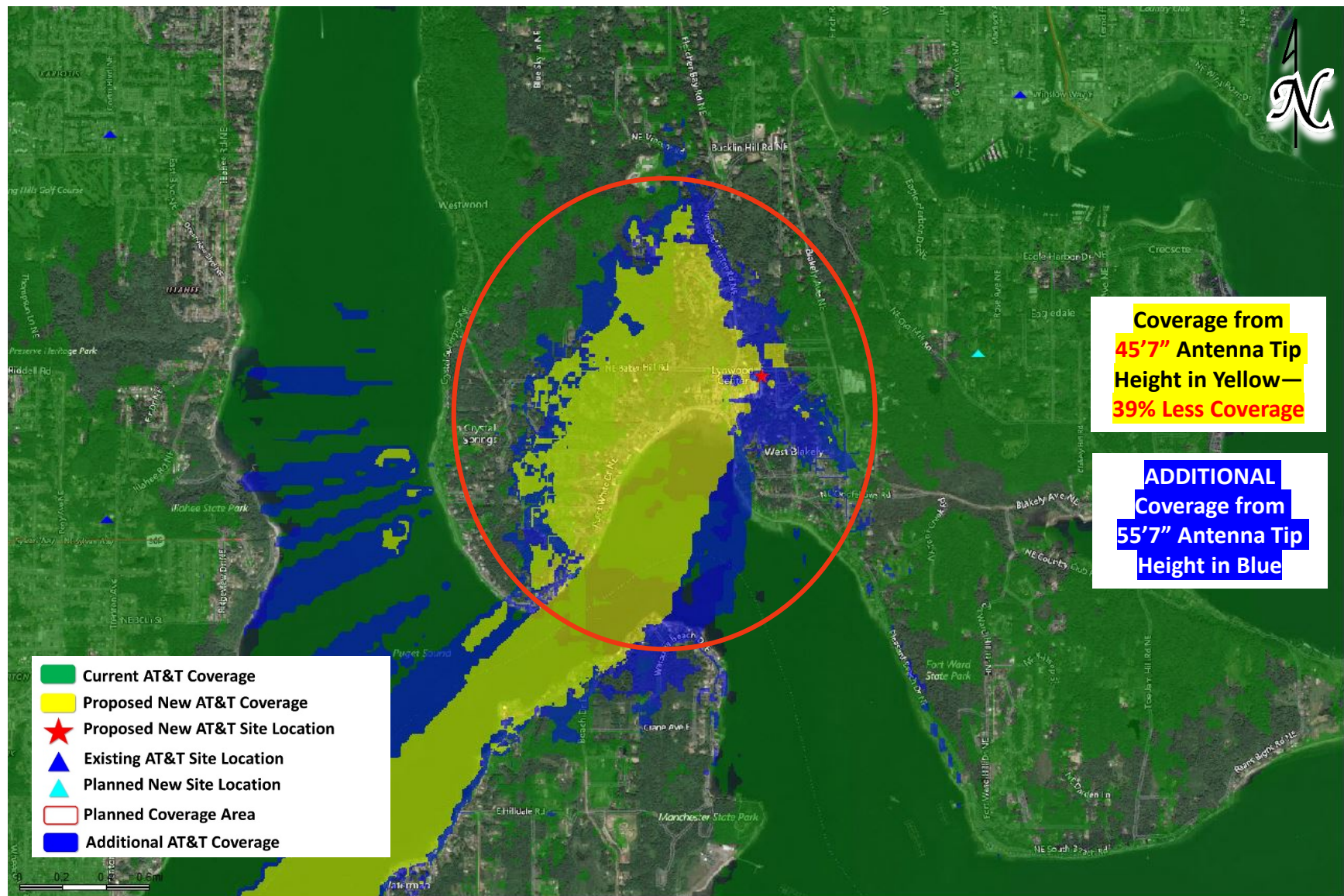
Projected New AT&T Coverage AFTER Proposed AT&T WCF On-Air—**55'7"** Antenna Tip Height





## Figure D.1—Height Comparison—New AT&T 4G LTE Coverage—45'7"

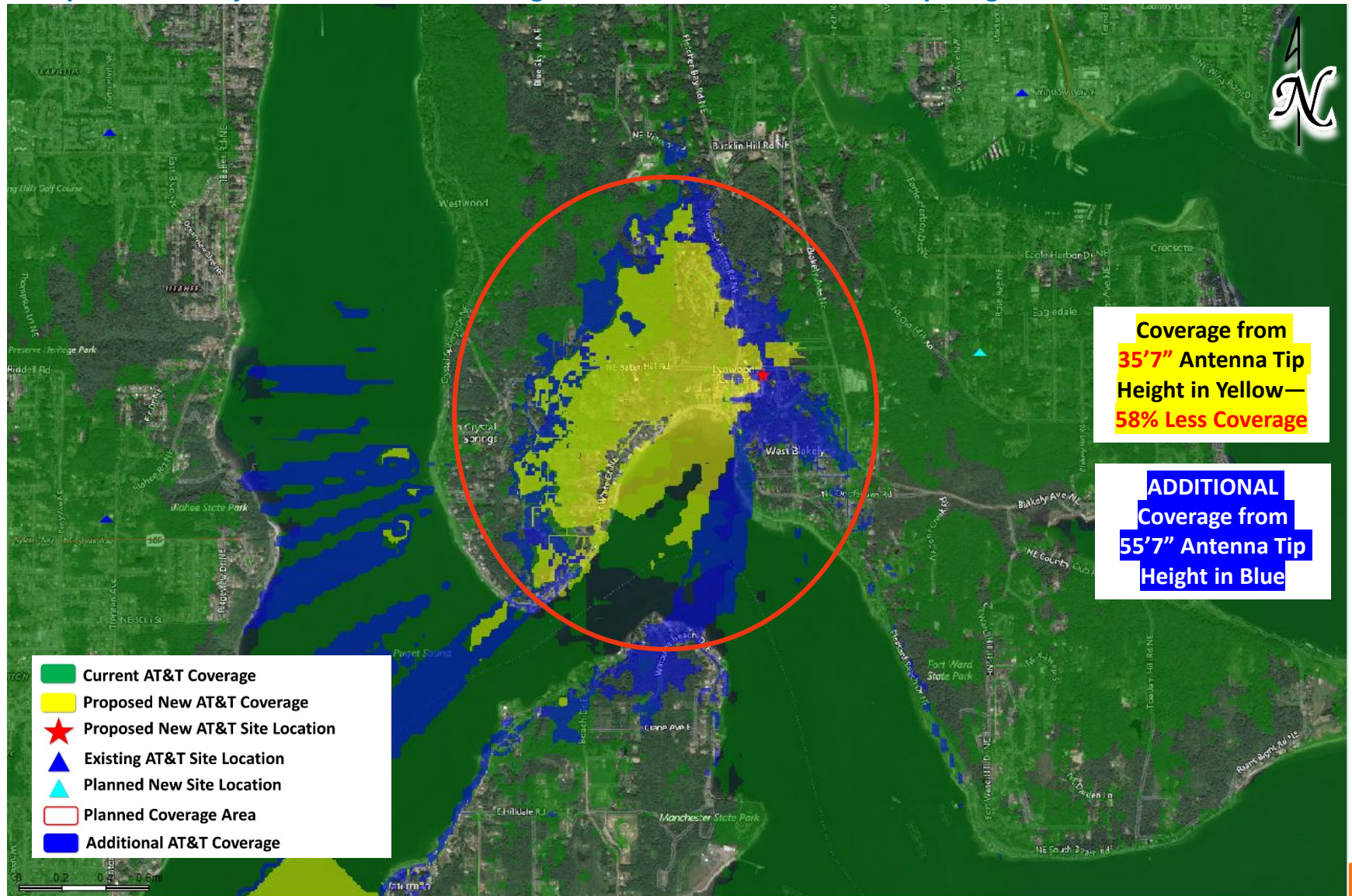
Comparison of Projected New AT&T Coverage with 45'7" v. 55'7" Antenna Tip Height





## Figure D.2—Height Comparison—New AT&T 4G LTE Coverage—35'7"

Comparison of Projected New AT&T Coverage with 35'7" v. 55'7" Antenna Tip Height





## ALTERNATIVE SITE ANALYSIS

AT&T's RF engineers evaluated two alternative site locations within the Search Ring as possible locations for the proposed new WCF.

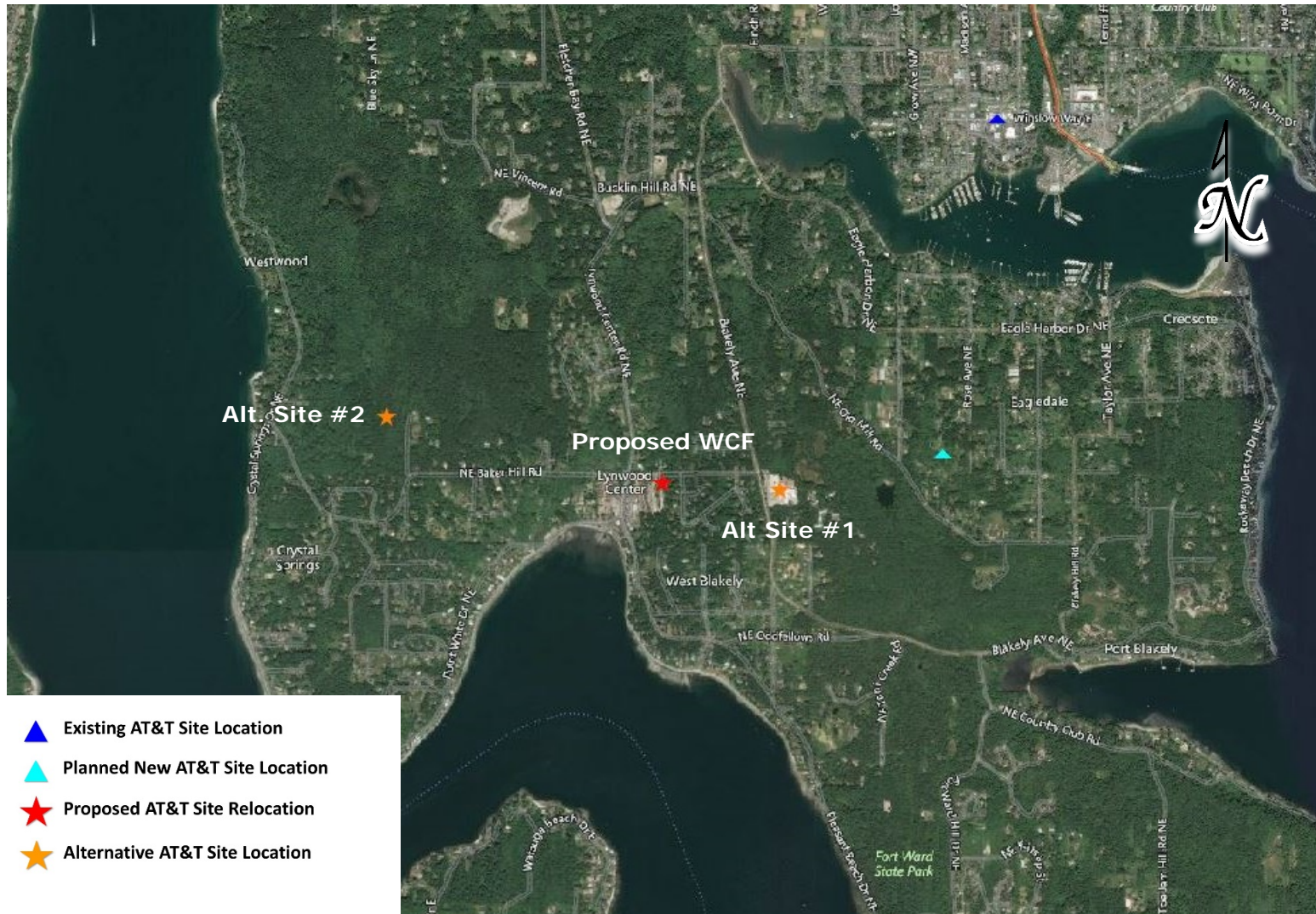
**Figure E—Alternative Site Locations** shows the location of each alternative site in relation to the proposed new site location.

- **Alternative Site #1 (47.605953 / -122.535308)** : An elementary school rooftop located approximately 0.42 miles east from the proposed new WCF.
- **Alternative Site #2 (47.609814, -122.56525)** : A raw land site located approximately 1.01 miles northwest of the proposed new WCF

**Figure F—Alt Site #1—New AT&T 4G LTE Coverage** demonstrates the projected coverage from Alternative Site #1—a 40ft antenna tip height on the roof of an elementary school, which is the highest available antenna tip per the BIMC. As can be seen by the propagation map, the coverage from this site will not be able to provide Lynwood Center with dominant seamless coverage. This is due to the low antenna tip height and blockage of the wireless signal by the surrounding terrain. This Alt. Site #1 location and low available height will not meet AT&T's coverage objectives for the Targeted Service Area.

**Figure G—Alt Site #2—New AT&T 4G LTE Coverage** demonstrates the projected coverage from Alternative Site #2—a new 110' monopole on Bainbridge Island Parks Department conservation land. As can be seen by the propagation map, the coverage from this site will also not be able to provide Lynwood Center with dominant seamless coverage. Despite the higher antenna tip height, the distance of this site from the Targeted Service Area and blockage of the wireless signal by the surrounding terrain impairs coverage. Additionally, a significant amount of the projected coverage from this site is concentrated to the north in less populated areas. Accordingly, this Alternative Site #2 will not meet AT&T's coverage objectives for the Targeted Service Area.

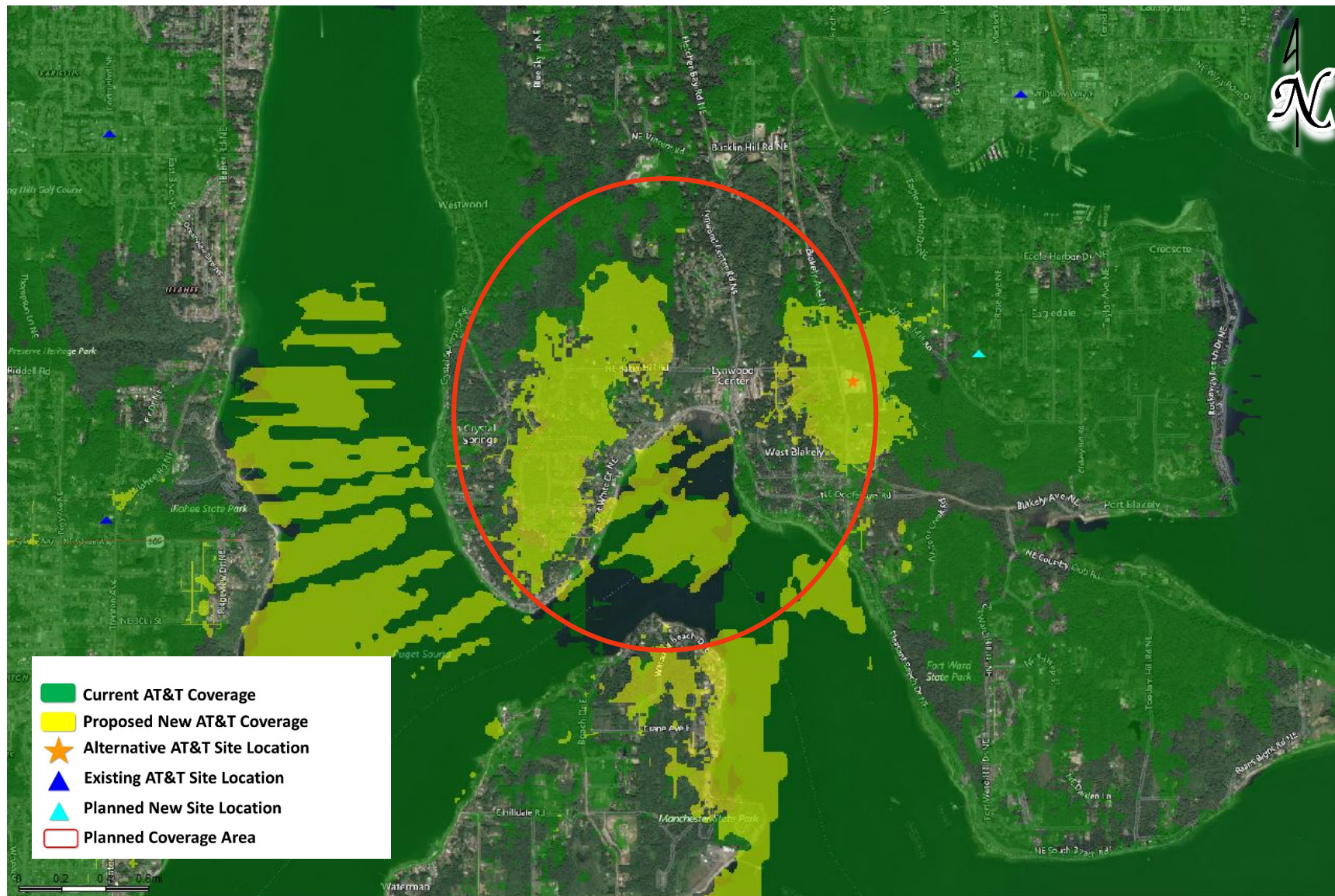
Figure E—Alternative Site Locations





## Figure F—Alt Site #1—New AT&T 4G LTE Coverage

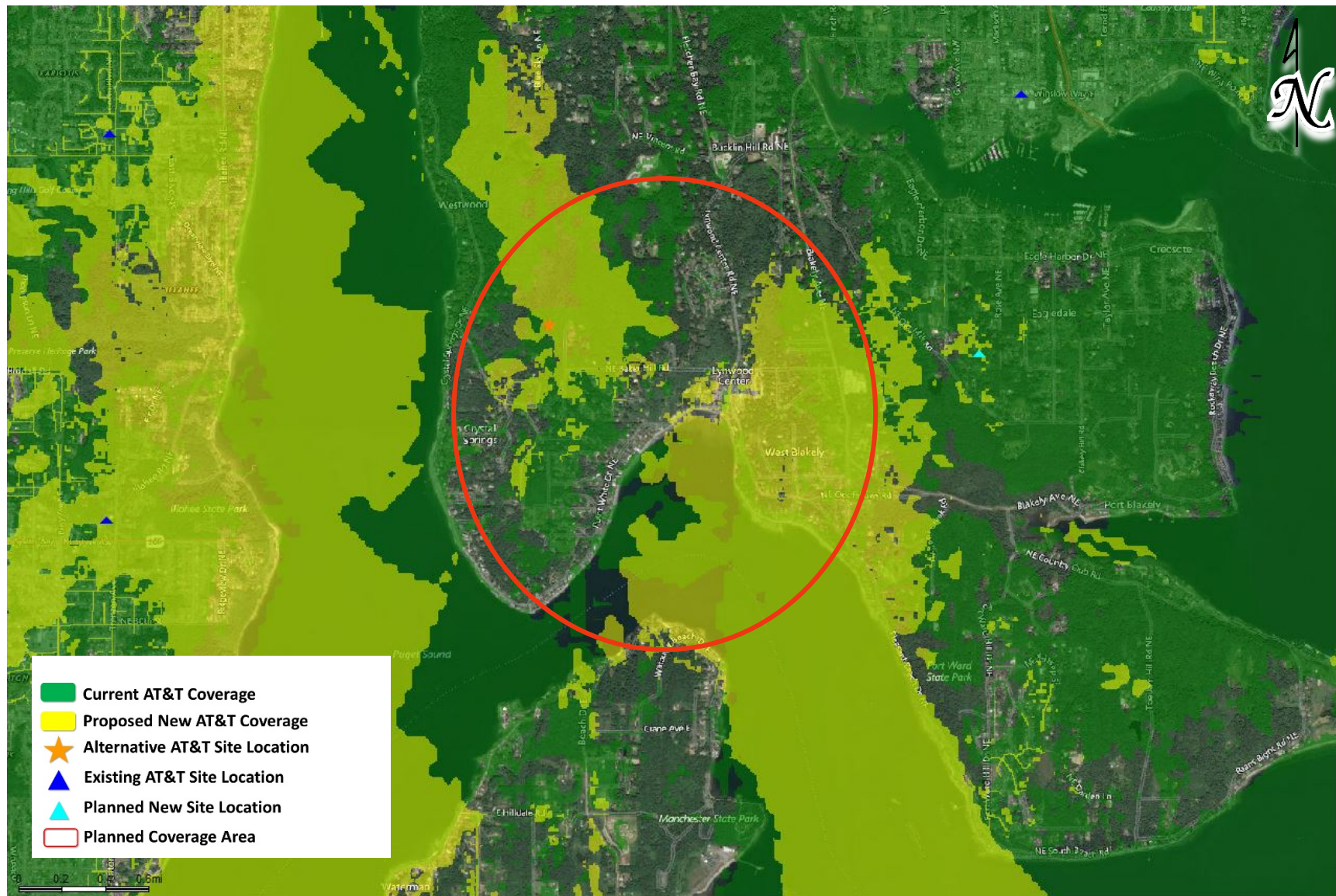
Projected New AT&T Coverage AFTER Alternative Site #1 On-Air—**40ft** Antenna Tip Height





## Figure G—Alt Site #2—New AT&T 4G LTE Coverage

Projected New AT&T Coverage AFTER Alternative Site #2 On-Air—**110ft** Antenna Tip Height





## SEARCH RING METHODOLOGY

AT&T's RF engineers used coverage propagation software systems to predict the coverage provided by the proposed new WCF. The software and AT&T's RF engineers considered the general factors outlined below, as well as more project-specific factors such as the type of antenna, antenna tilt, etc.

**Coverage.** The antenna site must be located in an area where the radio frequency broadcasts will provide adequate coverage within the targeted service area. The RF engineer must take into consideration the coverage objectives for the site as well as the terrain in and around the area to be covered. Because radio frequency broadcasts travel in a straight line and diminish as they travel further away from the antennas, it is generally best to place an antenna site near the center of the desired coverage area. However, in certain cases, the search ring may be located away from the center of the desired coverage area due to the existing coverage, the surrounding terrain, or other features which might affect the radio frequency broadcasts, *e.g.* buildings or sources of electrical interference.

**Clutter.** AT&T's WCFs must "clear the clutter"—the WCF site must be installed above or close to RF obstructions (the "clutter") to enable the RF to extend beyond and clear the clutter. AT&T's radio frequencies do not penetrate mountains, hills, rocks, or metal, and are diminished by trees, brick and wood walls, and other structures. Accordingly, AT&T's antennas must be installed above or close to the "clutter" to provide high quality communications services in the desired coverage areas. Additionally, if the local code requires us to accommodate additional carriers on the support structure, the structure must be even taller to also allow the other carriers' antennas to clear the clutter.

**Call Handoff.** The WCF site must be in an area where the radio broadcasts from the site will allow seamless "call handoff" with adjacent WCF sites. Call handoff is a feature of a wireless communications system that allows an ongoing telephone conversation to continue uninterrupted as the user travels from the coverage area of one antenna site into the coverage area of an adjacent antenna site. This requires coverage overlap for a sufficient distance and/or period of time to support the mechanism of the call handoff.

**Quality of Service.** Users of wireless communications services want to use their services where they live, work, commute and play, including when they are indoors. AT&T's coverage objectives include the ability to provide indoor coverage in areas where there are residences, businesses and indoor recreational facilities.

## SEARCH RING METHODOLOGY—Con't

**Radio Frequencies used by System.** The designs of wireless communications systems vary greatly based upon the radio frequencies that are used by the carrier. If the carrier uses radio frequencies in the 850 MHz to 950 MHz range, the radio signals will travel further and will penetrate buildings better than the radio frequencies in the 1900 MHz band. As a result, wireless communications systems that use lower radio frequencies will need fewer sites than wireless communications systems that use higher radio frequencies.

**Land Use Classifications.** A&T's ability to construct a WCF site on any particular property is affected by state and local regulations, including zoning and comprehensive plan classifications, goals, and policies. AT&T's search rings take these laws and regulations into consideration.