



June 1, 2023

City of Camas
Community Development Department
Planning Division
616 NE Fourth Ave
Camas, WA 98607

Re: AT&T's Radio Frequency (RF) Engineering Justification for the Proposed Wireless Communications Facility in the City of Camas: PS25 Camas School Relo at 706 NE 14th Ave, Camas, WA 98607

To Whom It May Concern,

Enclosed please find the RF Justification document prepared for AT&T's proposed new wireless communications facility at the above noted location. This letter serves as my verification, to the best of my knowledge, of the accuracy of the RF information, propagation maps, and analysis provided in the attached RF Justification.

Thank you for your consideration of this information.

Sincerely,

A handwritten signature in black ink, appearing to read "Samsul Bujang", with a long horizontal flourish extending to the right.

Samsul Bujang
RF Engineer
AT&T Mobility

Bujang, Samsul

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Education

Bachelor Degree in Engineering

(B. Eng.), Electrical, Electronics and System Engineering from the National University of Malaysia (2000)

Experience

AT&T Senior RF Engineer 2010 – Present

Celcite Senior RF Consultant 2008 – 2010

Huawei Senior RF Engineer 2008

Motorola RF Optimization Consultant 2007 – 2008

Alcatel RF Team Leader 2006 – 2007

Ericsson RF Consultant 2004 – 2006

Maxis Broadband Sdn Bhd RF Engineer 2001 – 2004



PS25 Camas School Relo RF Justification

SERVICE OBJECTIVES

AT&T is proposing to build a new wireless communication facility (“WCF” or “facility”), PS25 Camas School Relo, at: 706 NE 14th Ave, Camas, WA 98607 (45.589689/ -122.403714) in the City of Camas.

Service Objectives—Generally

AT&T strives for a network design that provides high radio frequency (“RF”) signal strength and signal-to-interference-plus-noise ratio (“SINR”) 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 number of resources to handle voice calls, data connections, and data volume. When these capacity limits are reached, user experience quickly degrades. Capacity issues for LTE networks are identified by using SINR metrics to measure the network’s signal quality when there is a high traffic load condition. High traffic areas in the network experience poor SINR due to the increased amount of signal noise/interference generated by the interfering strength of the simultaneous transmissions (*i.e.* too many users accessing the network in a given area).

Service Objectives & Targeted Service Area—Proposed New Facility

This proposed facility is intended to provide coverage replacement and fill a significant gap in AT&T’s network coverage, capacity and mobility experienced by its customers in the City of Camas area which includes schools, residences and businesses as well as WA HWY 14 (the “Targeted Service Area”). This Facility will also include AT&T’s 850MHz *low-band* 5th Generation (“5G”) technology. AT&T’s 850MHz low-band 5G technology is further explained at the end of this document.

The Targeted Service Area is currently served by AT&T’s existing facility on the Garver Theater rooftop, located at 1612 NE Garfield Street, Camas WA 98607. AT&T’s lease will end on November 1st, 2028, therefore, AT&T must remove their facilities by then. It is important that the new proposed location is near the existing facility at Garver Theater to maintain the same coverage footprint, as it is at a higher elevation. The area is mostly residential, and moving south of the area will provide limited coverage replacement due to the drop in elevation.

As determined by AT&T’s RF Engineers, 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 that the public now demands. This includes emergency 911 calls throughout the area. The service objectives, Targeted Service Area and proposed location were determined by AT&T’s RF engineers through a combined analysis of market demand, service requests, RF engineering design, and input from public safety officials.

SEARCH RING & PREFERRED LOCATION

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, identified in **Figure A—Search Ring**, where a new wireless facility may be located to provide effective service in the Targeted Service Area. A discussion of the general methodology AT&T's RF engineers used to identify the Search Ring is included at the end of this RF Justification document.

PREFERRED LOCATION

Radio frequency broadcasts travel in a straight line and diminish as they travel further away from the antennas; therefore, it is generally best to locate a facility near the center of the identified Search Ring and Targeted Service Area. Furthermore, as the proposed WCF is intended to offload capacity in a specific area, it is even more important for the facility to be strategically located within the identified Search Ring to be able to establish a dominant signal within the Targeted Service Area—*i.e.* so that the new site will provide dominant service to users' handsets and prevent them from communicating with AT&T's other existing sites, thereby relieving some of the burden on AT&T's existing facilities by offloading users' data requirements to the new site. Accordingly, the location of the proposed new WCF is centered geographically within the identified Search Ring to maximize the coverage and signal dominance within the Targeted Service Area.

ANTENNA HEIGHT

Antenna height plays an equally important role in meeting the service objectives within the Targeted Service Area. The proposed antenna tip height of 59ft was determined by considering various factors such as the height of surrounding wireless sites, ground elevation, obstructions to the signal, and the surrounding terrain. Based upon these factors, AT&T's RF engineers determined that the proposed 59ft antenna tip height is the minimum necessary to best meet AT&T's service objectives to provide dominant coverage and enhanced capacity within the Targeted Service Area. 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. As further detailed in this document, a lower antenna tip height at the proposed location would not provide as effective dominant coverage and capacity improvement within the Targeted Service Area and would not meet AT&T's service objectives for the proposed Facility.

PROPOSED NEW AT&T FACILITY

ANTENNAS AND EQUIPMENT

To meet the above coverage objectives, this proposed site will contain up to 9 panel antenna and 9 RRH units (together with all associated accessory equipment).

PROJECTED NEW COVERAGE

Figure B—Existing AT&T Coverage shows existing AT&T wireless services in the general area of the proposed new site, which demonstrates the Targeted Service Area being served by the existing site (PX22) indicated by the black diamond. The red star indicates the location of the proposed new WCF. The blue diamond indicates the location of existing AT&T WCF sites; coverage from AT&T's existing WCF sites is shaded in green. As can be seen, the targeted area is served by the existing AT&T site that will be relocated.

Figure C—Targeted Service Area shows the coverage without the existing Facility (PX22) and BEFORE the addition of the proposed new WCF. As can be seen, the Targeted Service Area will have minimal to no 4G & 5G voice service and does not have adequate 4G & 5G LTE service. User experience will also be degraded due to the limited capacity.

Figure D—Projected New AT&T Coverage identifies the projected coverage from the proposed new WCF with the requested antenna tip height of 59 ft. The proposed antenna tip height is the minimum necessary to help fill the coverage gap relative to nearby complementary wireless facilities and to support the FirstNet Network. This 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 E—Projected New AT&T Coverage identifies the projected coverage from the proposed new WCF with an antenna tip height of 49 ft. As seen from the figure, coverage footprint is reduced. The Proposed Location @ 59' provides 3.49% more coverage than an antenna tip height of 49 ft.

Figure F—Existing AT&T Coverage at Garver Theater Building (PX22) and Proposed Coverage AFTER Addition of Proposed New WCF. This figure shows the current coverage served by the existing facility (PX22) overlaid with the coverage of the new proposed WCF. The blue areas indicate the areas with coverage loss where coverage from the new WCF is limited.

Figure B—Existing AT&T Coverage

Current Site at Garver Theater Building (PX22)

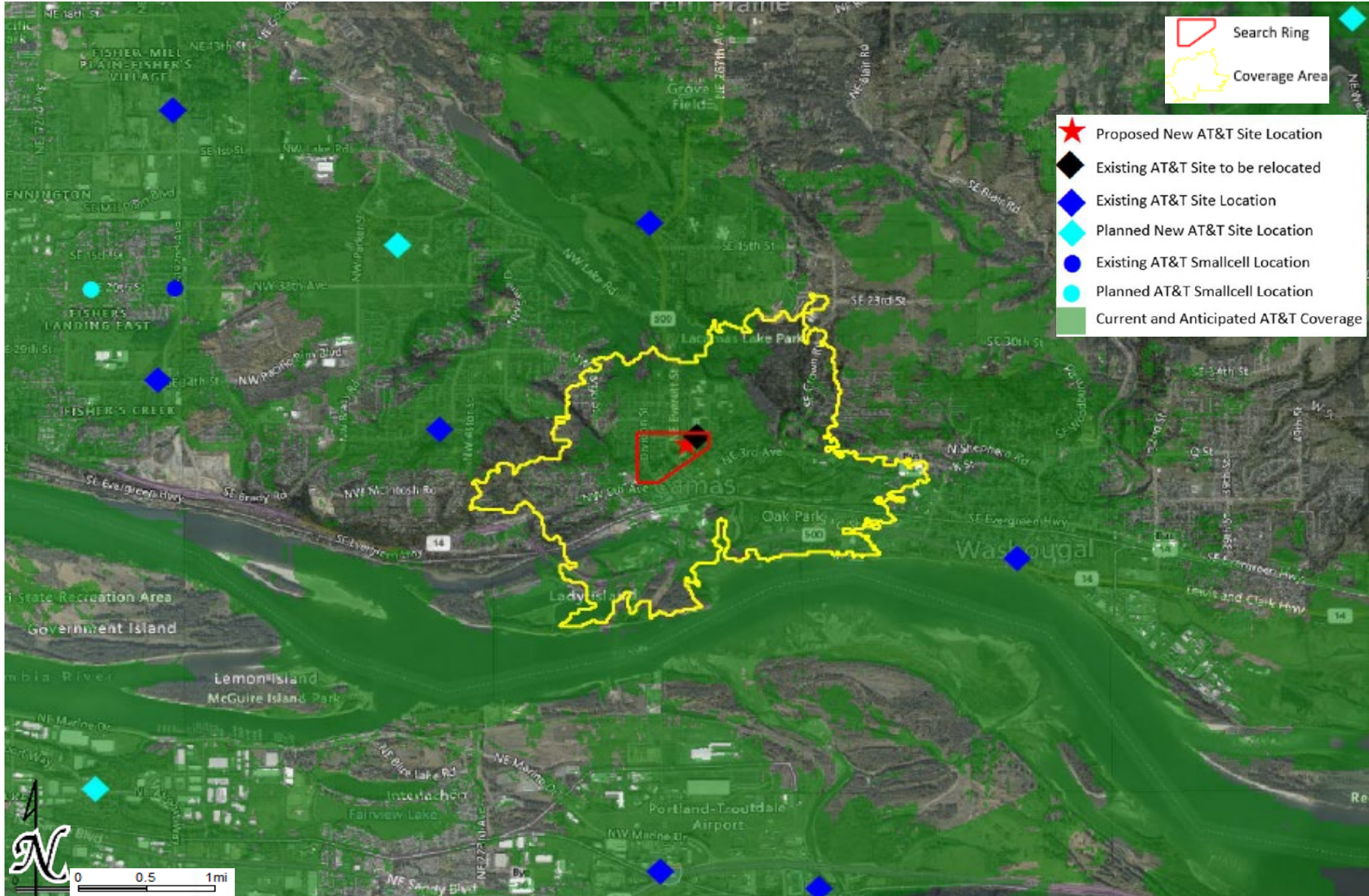


Figure C—Targeted Service Area without the Existing Facility (PX22) and BEFORE Addition of Proposed New WCF

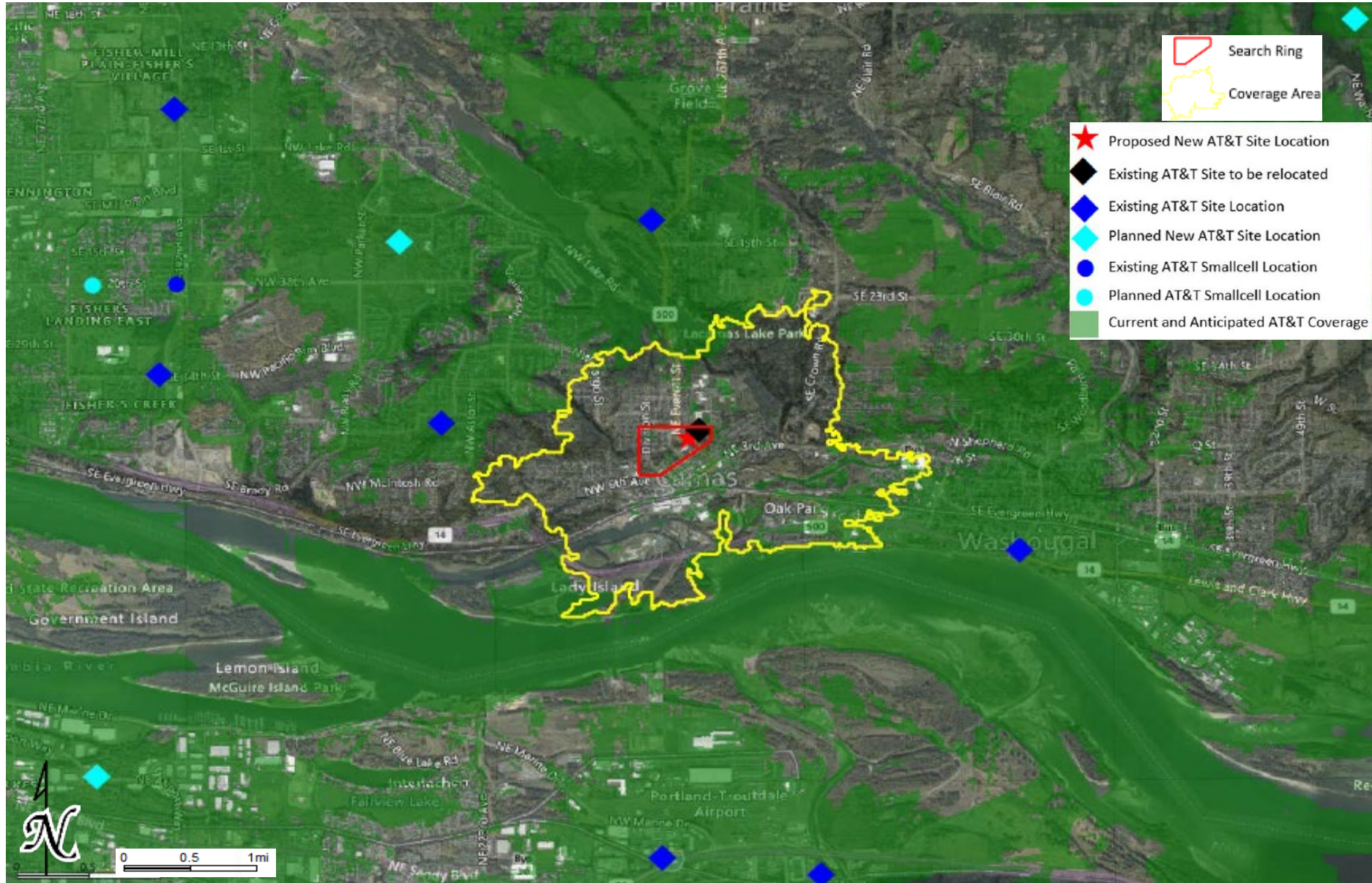


Figure E—New AT&T Coverage

Projected New AT&T Coverage AFTER Proposed New WCF On-Air—49ft Antenna Tip Height

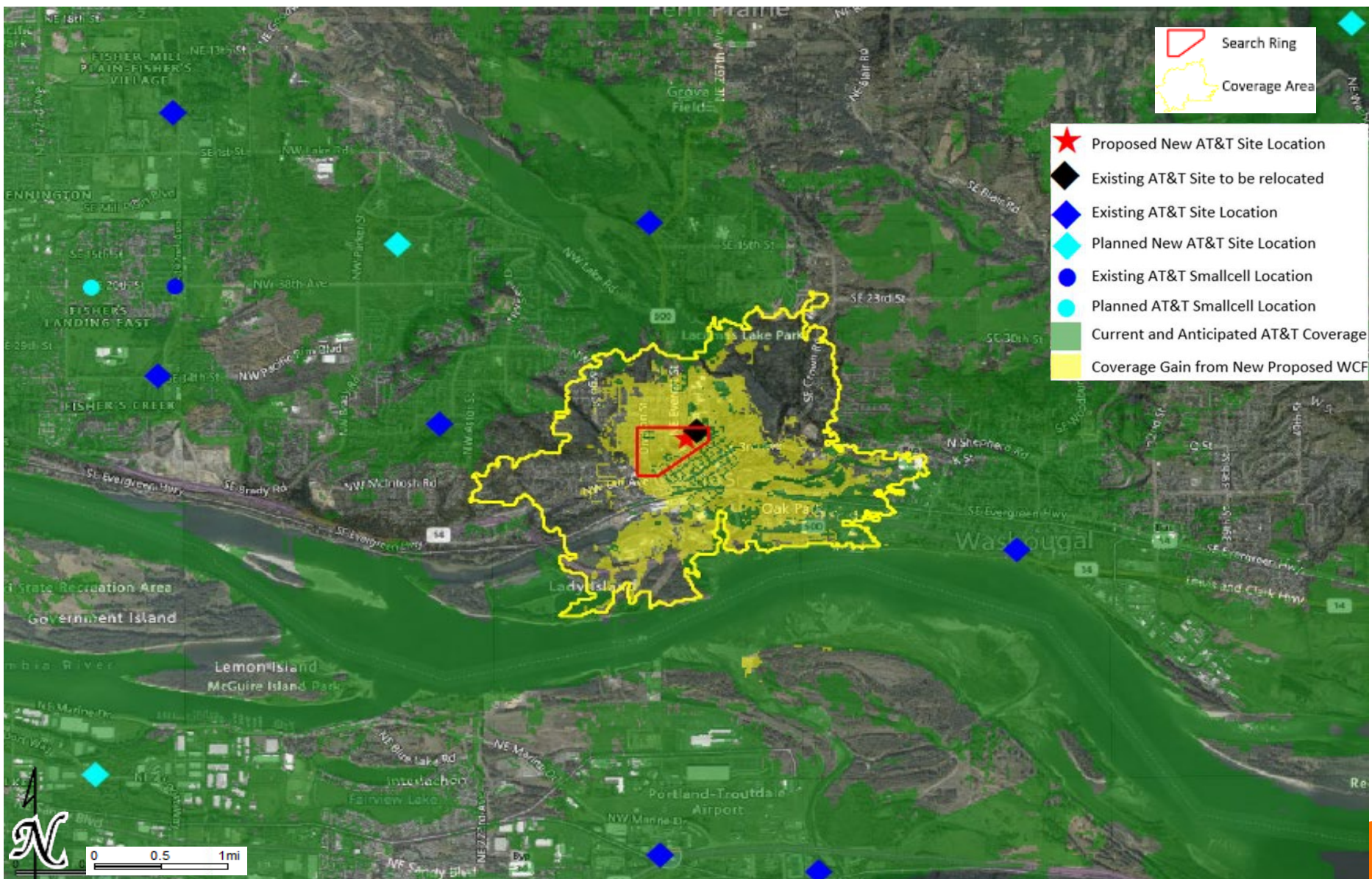
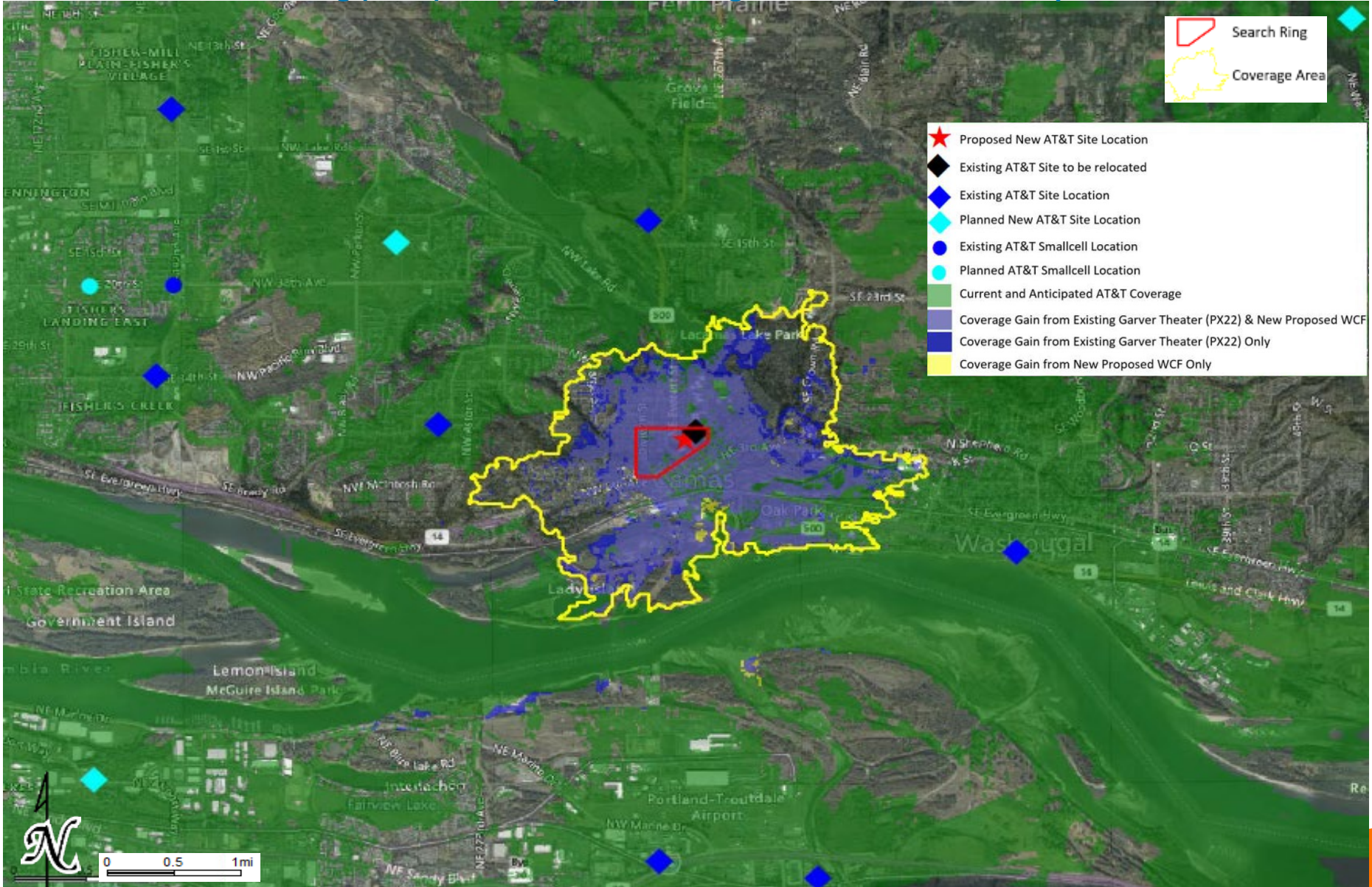


Figure F—Existing AT&T Coverage

at Garver Theater Building (PX22) and Proposed Coverage AFTER Addition of Proposed New WCF



Alternative Site Analysis

AT&T considers all siting possibilities within, and adjacent to, a search ring to determine the best location for a new facility to meet AT&T's service objectives for the Targeted Service Area. AT&T will first attempt to utilize an existing tower or structure for collocation at the desired antenna height. If an existing tower or structure is not available or determined to be infeasible, AT&T will then propose a new tower. For this proposed Facility, AT&T's RF engineers generally evaluated the following alternative locations within the identified search ring as possible locations for the proposed new WCF.

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

Alternative Site #1 (45.584083/ -122.403639) – Colocation: An existing 120 ft BNSF Railway Company Tower located at 211 NE 2nd St., approximately .39 miles southwest of the proposed new WCF. The available tip height of 103 ft which is the estimated highest available antenna tip on that tower based on the current layout of the equipment on it.

- **Figure H—Alternative Site #1—New AT&T Coverage Comparison** demonstrates the projected new coverage from an approximate 103 ft antenna tip height on the existing tower (shaded in blue) versus the projected new coverage from the proposed new WCF with a 59 ft antenna tip height (the *additional* coverage from the proposed new WCF is shaded in yellow). As can be clearly seen by the propagation map, Alternative Site #1 does not provide sufficient coverage within the Targeted Service Area. Alternative Site #1 is located south at a lower elevation and with the estimated available antenna tip height, coverage replacement to the north of the area is limited. If AT&T were to replace the tower, it will need to be at least 250 ft to be able to maintain the current coverage in that direction.

Alternative Site #2 (45.589981/ -122.403741) – Colocation: An approximately 22 ft wooden Utility Pole located approximately .08 miles northwest of the proposed new WCF. The available tip height of 42 ft (replace w/ a 20' taller metal pole) which is the highest available antenna tip on the pole.

- **Figure I—Alternative Site #2—New AT&T Coverage Comparison** demonstrates the projected new coverage from an approximate 42 ft antenna tip height (shaded in blue) versus the projected new coverage from the proposed new WCF with a 59 ft antenna tip height (the *additional* coverage from the proposed new WCF is shaded in yellow). As can be clearly seen by the propagation map, Alternative Site #2 does not provide sufficient coverage within the Targeted Service Area. Alternative Site #2 is short which will shrink the overall coverage and will not provide coverage replacement in most of the areas.

Alternative Site Analysis – cont'd

Alternative Site #3 (45.586864/ -122.407667) – Colocation: An approximately 20 ft wooden Utility Pole located approximately .27 miles southwest of the proposed new WCF. The available tip height of 40 ft (replace w/ a 20' taller metal pole) which is the highest available antenna tip on the pole.

- **Figure J—Alternative Site #3—New AT&T Coverage Comparison** demonstrates the projected new coverage from an approximate 40ft antenna tip height (shaded in blue) versus the projected new coverage from the proposed new WCF with a 59ft antenna tip height (the *additional* coverage from the proposed new WCF is shaded in yellow). As can be clearly seen by the propagation map, Alternative Site #3 does not provide sufficient coverage within the Targeted Service Area. This alternative location is located southwest at a lower elevation and with the antenna tip height, coverage replacement will be limited to the north and east.

Alternative Site #4 (45.591094/ -122.408611) – Crown Park: A raw land parcel located at 120 NE 17th Ave., approximately .27 miles northwest of the proposed new WCF. The structure will need to be at least 150 ft to clear the trees, however, as it is located northwest, an antenna tip height of 180 ft is needed to close the coverage gap and maintain the current coverage to the east.

- **Figure K—Alternative Site #4—New AT&T Coverage Comparison** demonstrates the projected new coverage from an approximate 60 ft antenna tip height (shaded in blue) versus the projected new coverage from the proposed new WCF with a 59 ft antenna tip height (the *additional* coverage from the proposed new WCF is shaded in yellow). As can be clearly seen by the propagation map, Alternative Site #4 does not provide sufficient coverage within the Targeted Service Area. This alternative location is also surrounded by tall trees and coverage replacement is limited due to shadowing or blocking of those trees.

Alternative Site #5 (45.587972/ -122.412892) – Benton Park: A raw land parcel located on Parcel 82932000, approximately .49 miles southwest of the proposed new WCF. The structure will need to be at least 150 ft to clear the trees, however, as it is located far west outside of the search ring, an antenna tip height of 200 ft is needed to close the coverage gap and maintain the current coverage to the north and east areas.

- **Figure L—Alternative Site #5—New AT&T Coverage Comparison** demonstrates the projected new coverage from an approximate 60 ft antenna tip height (shaded in blue) versus the projected new coverage from the proposed new WCF with a 59 ft antenna tip height (the *additional* coverage from the proposed new WCF is shaded in yellow). As can be clearly seen by the propagation map, Alternative Site #5 does not provide sufficient coverage within the Targeted Service Area. This alternative location is also surrounded by tall trees and coverage replacement is limited due to shadowing or blocking of those trees.

Alternative Site Analysis – cont'd

Alternative Site #6 (45.589308/ -122.40285) – Christian Life Church: A raw land parcel located at 701 NE Garfield St., approximately .03 miles south of the proposed new WCF.

- **Figure M—Alternative Site #6—New AT&T Coverage Comparison** demonstrates the projected new coverage from an approximate 60 ft antenna tip height (shaded in blue) versus the projected new coverage from the proposed new WCF with a 59 ft antenna tip height (the *additional* coverage from the proposed new WCF is shaded in yellow). As can be clearly seen by the propagation map, Alternative Site #6 does not provide sufficient coverage within the Targeted Service Area. This alternative location is at a lower elevation compared to the proposed new WCF and due to that, its coverage replacement is less, especially to the northwest where elevation is higher.

Alternative Site #7 (45.587094/ -122.401011) – Riverview Bank: A rooftop collocation located at 700 NE 4th Ave., approximately .22 miles south of the proposed new WCF. The building is approximately 33ft and considering a maximum of 10' above the roofline, the antenna tip height is approximately 43ft.

- **Figure N—Alternative Site #7—New AT&T Coverage Comparison** demonstrates the projected new coverage from an approximate 43 ft antenna tip height (shaded in blue) versus the projected new coverage from the proposed new WCF with a 59 ft antenna tip height (the *additional* coverage from the proposed new WCF is shaded in yellow). As can be clearly seen by the propagation map, Alternative Site #7 does not provide sufficient coverage within the Targeted Service Area. This alternative location is located southeast at a lower elevation and with the antenna tip height, coverage replacement will be limited to the northwest areas.

Alternative Site #8 (45.586075/ -122.400531) – Safeway Parking Lot: A raw land parcel located on Parcel 986061996, approximately .31 miles southeast of the proposed new WCF.

- **Figure O—Alternative Site #8—New AT&T Coverage Comparison** demonstrates the projected new coverage from an approximate 60 ft antenna tip height (shaded in blue) versus the projected new coverage from the proposed new WCF with a 59 ft antenna tip height (the *additional* coverage from the proposed new WCF is shaded in yellow). As can be clearly seen by the propagation map, Alternative Site #8 does not provide sufficient coverage within the Targeted Service Area. This alternative location is located southeast at a lower elevation and with the antenna tip height, coverage replacement will be limited to the northwest areas.

Alternative Site Analysis – cont'd

Alternative Site #9 (45.587411/ -122.399864) – Zion Lutheran Church: A raw land parcel located at 824 NE 4th Ave., approximately .25 miles southeast of the proposed new WCF. NOTE: This would be a stealth bell tower/ church spire.

- **Figure P—Alternative Site #9—New AT&T Coverage Comparison** demonstrates the projected new coverage from an approximate 60 ft antenna tip height (shaded in blue) versus the projected new coverage from the proposed new WCF with a 59 ft antenna tip height (the *additional* coverage from the proposed new WCF is shaded in yellow). As can be clearly seen by the propagation map, Alternative Site #9 does not provide sufficient coverage within the Targeted Service Area. This alternative location is located southeast at a lower elevation and with the antenna tip height, coverage replacement will be limited to the northwest areas.

Table 1

Site location	Coordinates	Tip height (ft)	Coverage surface (sq. mi)	Percentage
Proposed Location	45.589689, -122.403714	59'	2.11	56.24
Proposed Location	45.589689, -122.403714	49'	1.97	52.75
Alternative Location 1	45.584083, -122.403639	103'	2.02	54.12
Alternative Location 2	45.589981, -122.403741	42'	1.84	49.05
Alternative Location 3	45.586864, -122.407667	40'	1.16	31.05
Alternative Location 4	45.591094, -122.408611	60'	1.72	46.01
Alternative Location 5	45.587972, -122.412892	60'	1.74	46.54
Alternative Location 6	45.589308, -122.40285	60'	1.88	50.05
Alternative Location 7	45.587094, -122.401011	43'	1.48	39.55
Alternative Location 8	45.586075, -122.400531	60'	1.78	47.48
Alternative Location 9	45.587411, -122.399864	60'	1.68	44.82

Figure G—Alternative Site Locations

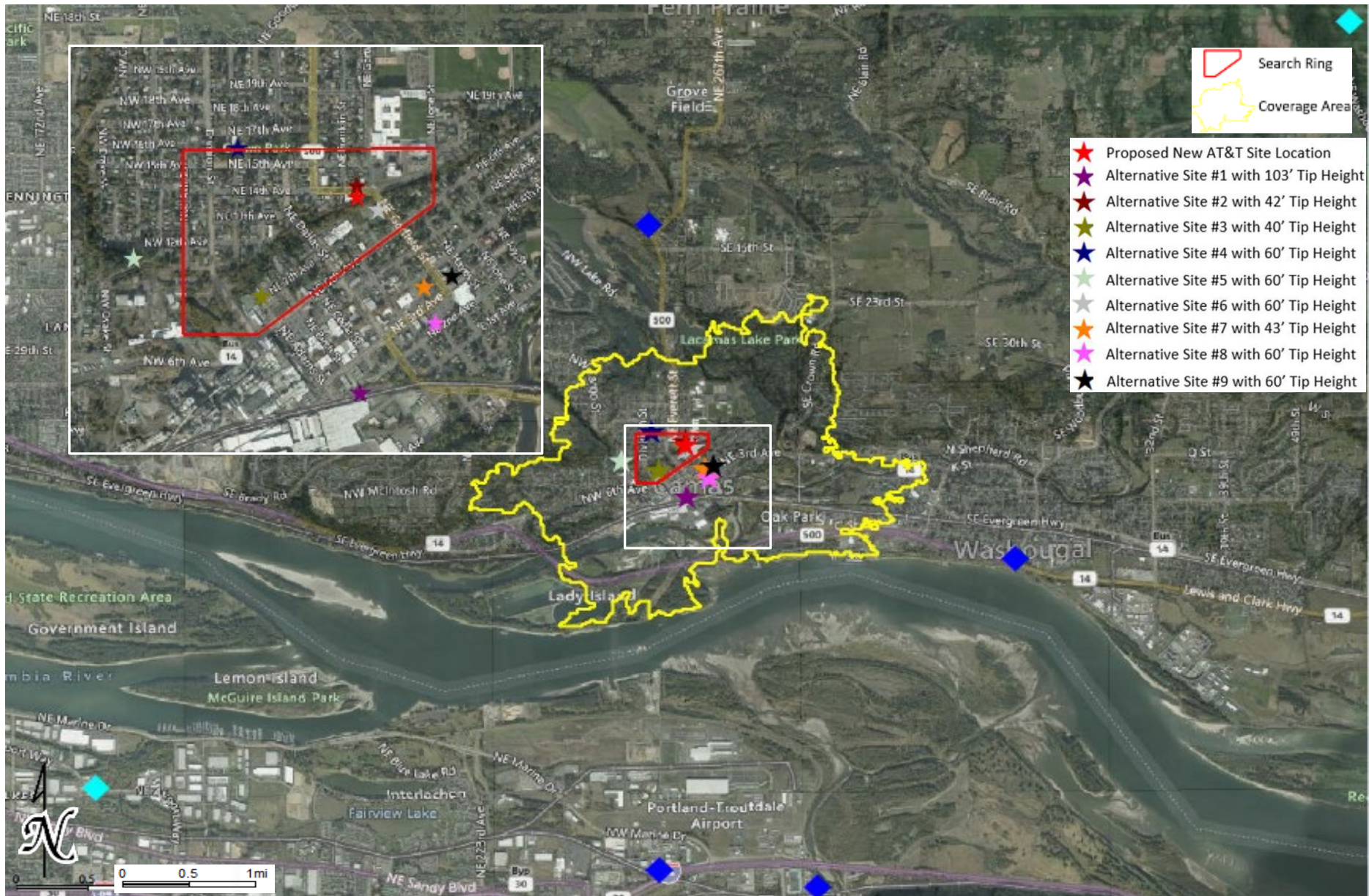


Figure H—Alternative Site #1—New AT&T Coverage Comparison

Projected New AT&T Coverage from Alt. Site #1 @ 103 ft vs. Proposed New WCF @ 59 ft

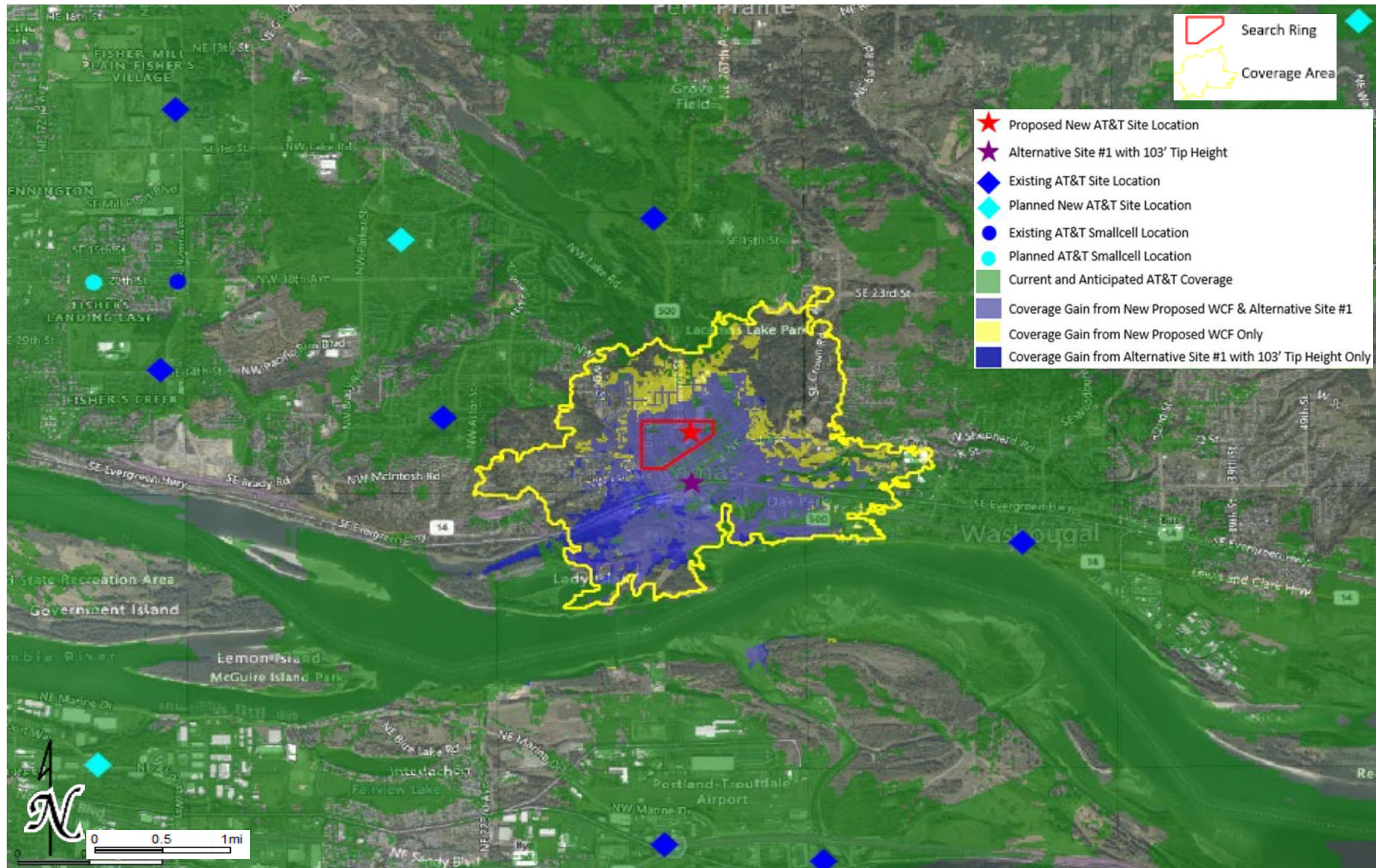


Figure I—Alternative Site #2—New AT&T Coverage Comparison

Projected New AT&T Coverage from Alt. Site #2 @ 42 ft vs. Proposed New WCF @ 59 ft

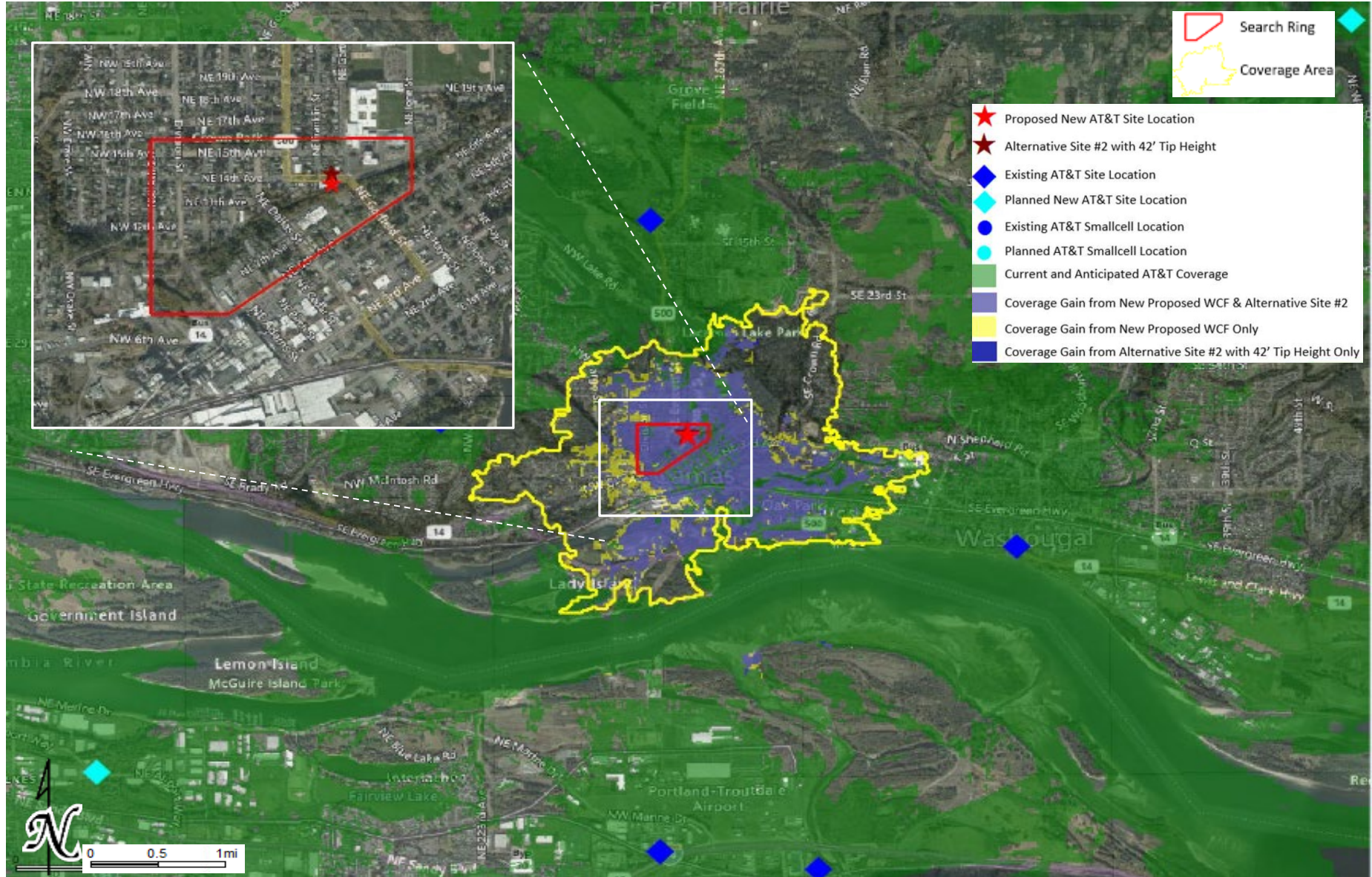


Figure L—Alternative Site #5—New AT&T Coverage Comparison

Projected New AT&T Coverage from Alt. Site #5 @ 60 ft vs. Proposed New WCF @ 59 ft

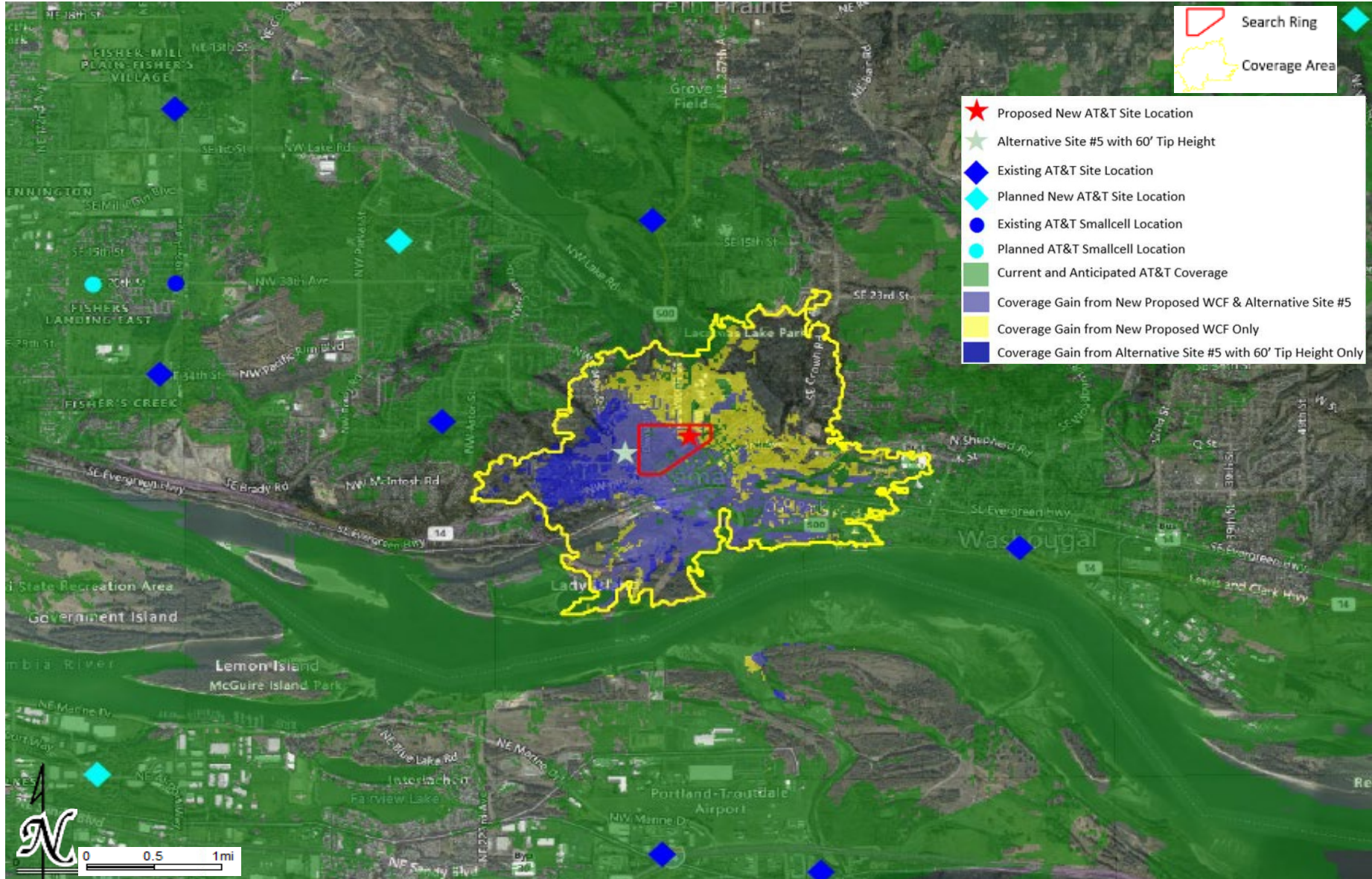


Figure M—Alternative Site #6—New AT&T Coverage Comparison

Projected New AT&T Coverage from Alt. Site #6 @ 60 ft vs. Proposed New WCF @ 59 ft

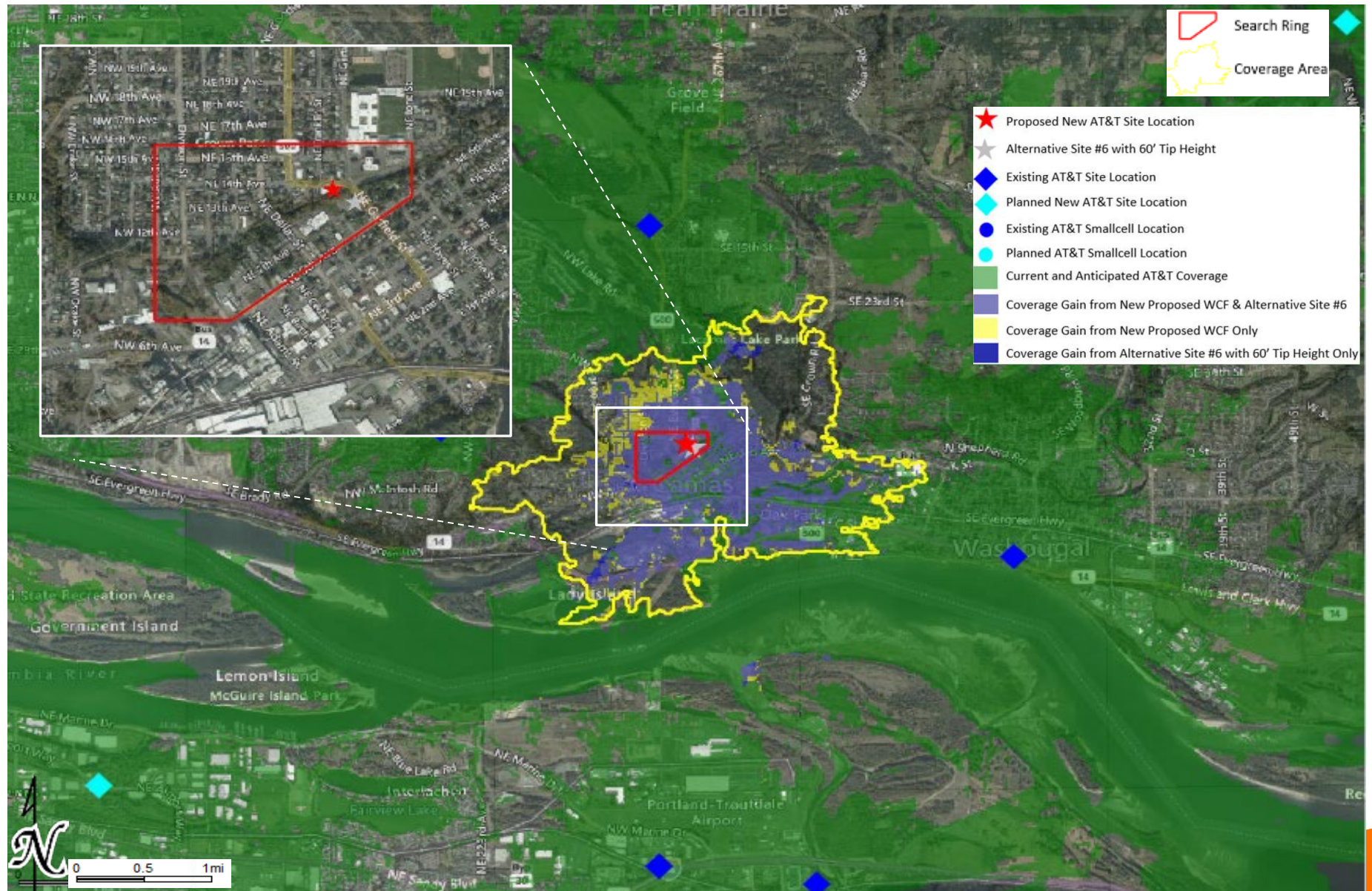


Figure N—Alternative Site #7—New AT&T Coverage Comparison

Projected New AT&T Coverage from Alt. Site #7 @ 43 ft vs. Proposed New WCF @ 59 ft

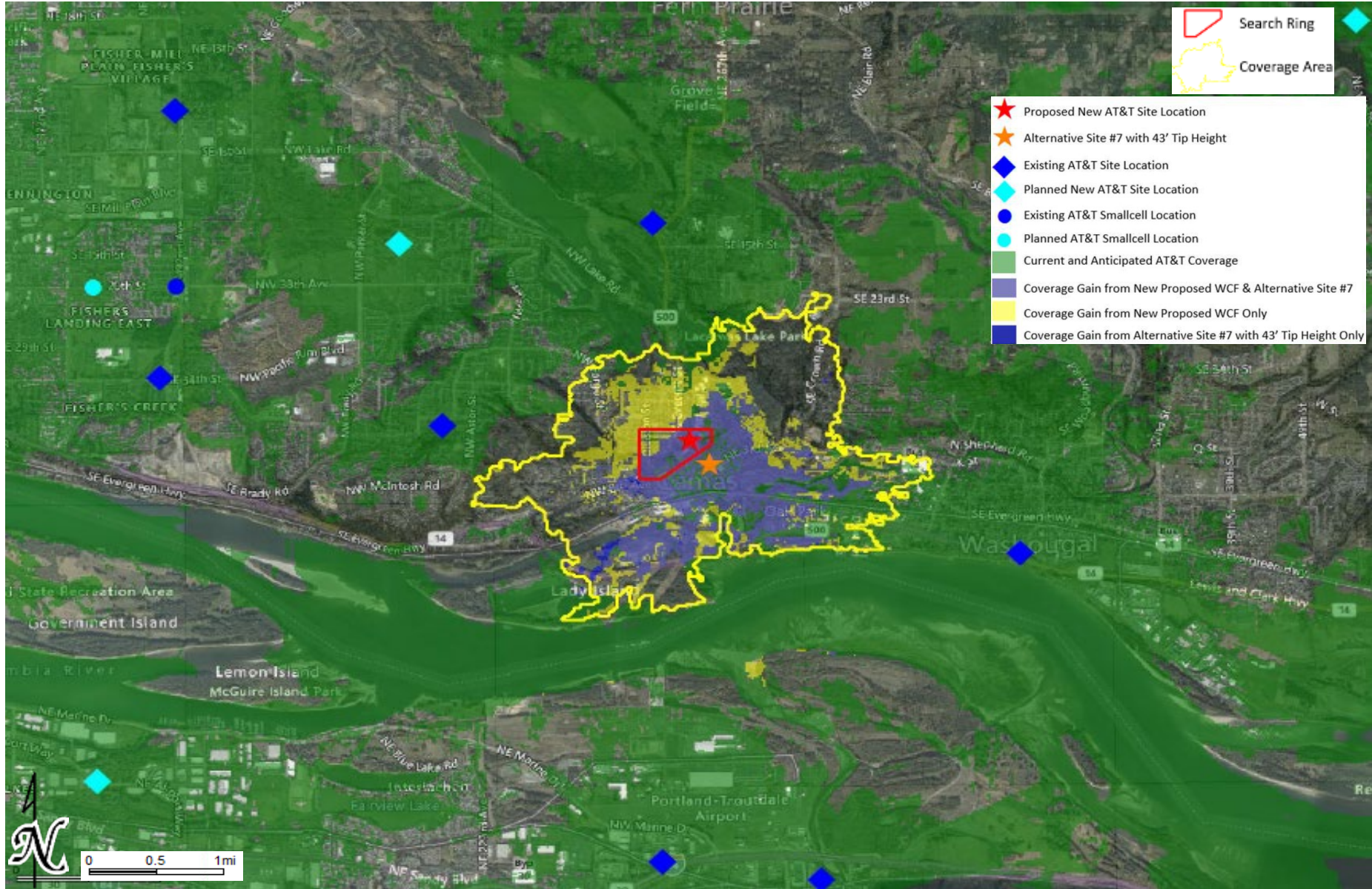
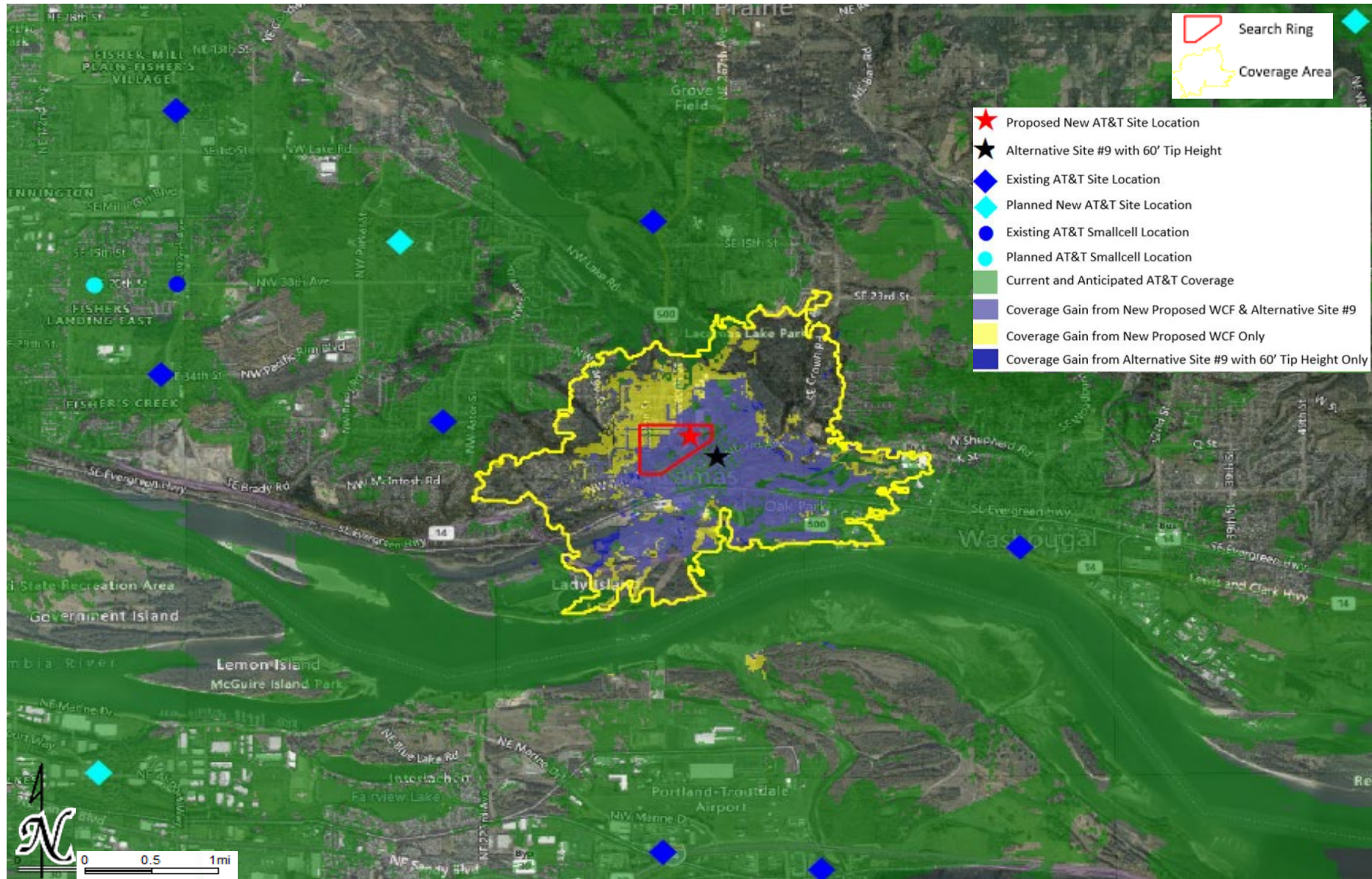


Figure P—Alternative Site #9—New AT&T Coverage Comparison

Projected New AT&T Coverage from Alt. Site #9 @ 60 ft vs. Proposed New WCF @ 59 ft



AT&T's 5G NETWORK

AT&T is upgrading and expanding its wireless communications network to support the latest 5G technology. 5G stands for “5th Generation”. This acronym refers to the ongoing process of improving wireless technology standards, which is now in its 5th generation. With each generation comes improvement in speed and functionality—4G LTE offers speeds up to ten times faster than 3G and 5G offers speeds up to 1-gigabit per second.

This technology is the next step in increasing broadband speeds to meet the demands of uses and the variety of content accessed over mobile networks and is necessary to facilitate capabilities that are being designed into the latest devices (*i.e.* Samsung Galaxy S20, iPhone 12). 5G, specifically, is the next generation of wireless technology expected to deliver latency and capacity enhancements that will help enable revolutionary new capabilities for consumers and businesses.

There are several components of 5G wireless technology and three separate bands of wavelength spectrum used to build a 5G network—low-band (<2 GHz), mid-band (3-10 GHz), and high-band millimeter wave (mmWave) (20-100 GHz):

- **Low-band 5G.** Low-band 5G frequencies (generally below 2GHz) are the oldest cellular (and TV) frequencies and are being used by AT&T to provide widely-available 5G service in residential, suburban, and rural areas. This is the same spectrum used for 3G and 4G cellular services today. The low-band 850MHz 5G frequency is proposed for this Facility.

Low-band 5G frequencies are a tradeoff of download speed versus distance and service area—they are slower than the high-band mmWave and mid-band frequencies, but they travel the farthest and can pass through more obstacles to provide a better, more reliable indoor and outdoor signal for a larger service area (*i.e.*, miles, not feet).

- **Mid-band 5G.** Mid-band 5G frequencies (generally 3-10GHz) cover most current cellular and WiFi frequencies and provide broader coverage than high-band mmWaves (typically a half a mile), but with slower speeds. Use of these frequencies is not as prevalent for building a 5G network as much of the bandwidth in this range is currently unavailable.

AT&T's 5G NETWORK—Cont.

- **High-band 5G+ mmWave.** High-band millimeter wave (mmWave) frequencies (generally 20-100GHz) are the new FCC-approved frequencies most associated with 5G service—"5G+" is AT&T's name for 5G service delivered using high-band mmWave spectrum. AT&T offers an enhanced wireless experience on 5G+ with mmWave service though with more limited coverage. Results continue to be impressive, with peak download speeds up to 1 gigabit per second (Gbps)—fast enough to stream 4K movies.

High-band mmWave frequencies deliver this unprecedented performance by transmitting a large amount of data more efficiently than 4G LTE, but the higher frequencies used means that mmWaves can only travel short distances (~1,000ft). Accordingly, high-band 5G+ mmWave sites need to be in close proximity to one another and are typically used in dense, high trafficked areas such as urban areas, stadiums/arenas, airports, manufacturing and healthcare centers, etc.

5G wireless technology, across all frequencies, also includes enhanced network radio protocols and other improvements in data transmission that allow the network to more efficiently use the same frequencies currently used today for 4G. As noted, AT&T is proposing to deploy low-band 850MHz 5G at this Facility. Upon completion, the Facility will become part of AT&T's statewide and nationwide communications networks.

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—Cont.

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. AT&T's system in Sunnyside uses only frequencies in the 1900 MHz so AT&T's system requires more sites in order to achieve the same coverage that is provided by the carriers which use the 850 MHz to 950 MHz frequency band.

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.