Network Engineering

RF Documentation

Overview:

Verizon Wireless strives to provide excellent wireless service for our customers with a network of cell sites that allows our customers to reliably place and receive 4G mobile calls. Increased customer usage and weak in building coverage is driving the need for additional RF network infrastructure to increase wireless capacity in the area of the proposed BALMER cell site.

The proposal is to install a 80' tall monopole with twelve new VZW panel antennas attached near the top. Supporting base station equipment will be located at the base of the monopole.

Coverage:

In order to provide excellent Cellular service, which Verizon Wireless defines as outdoor RF signal ROPL of 123 dB or less, the antenna height and site location need to provide essentially a line of sight to the roads, offices, and homes where our customers work and reside to allow for additional loss due to buildings, vehicles and vegetation. This site proposes twelve panel style antennas to provide antenna ports (the panels support more than one port each) necessary for utilizing the radio frequencies supporting all Verizon Wireless radio bandwidth providing wireless voice, data and e911 services to our customers.

The terrain, mixed use residential with suburban and rural structures including mature trees in the vicinity make the pole with an overall height of 80 feet above ground the minimum height necessary to provide adequate levels of coverage in the context of this location and the surrounding existing Verizon Wireless sites.

Capacity:

Verizon Wireless is committed to providing our customers excellent wireless experience connectivity for both voice and data sessions. New cells such as the subject BALMER site are added to the network due to needs with respect to wireless call capacity and/or coverage. As noted for this new cell the driving need is wireless data service capacity and better indoor coverage in the area. The goal of BALMER is to offload calls from the existing nearby Verizon Wireless sites which are 3.5 miles W, and 3 miles E, with other cells further, and improve in-building service in the area by adding the new cell. When a mobile user attempts to make a call on a wireless network where capacity is impacted by heavey usage and/or by poor signal strength the resulting delay and slow data throughput (data call) or busy signal (voice call) is very frustrating. The capacity of wireless networks is limited primarily by the spectrum availability and usage efficiency but also by coverage like this case due to users heavy usage inside large buildings. To remedy capacity issues additional sites in the vicinity of the users are added to provide more infrastructure which when properly placed increases the efficiency of the existing cells and introduces new capacity in the area thus providing all users in the vicinity with much higher 4G wireless data transfer speeds and a better overall wireless experience. The subject site is being proposed so that calls going to surrounding sites can be "off-loaded" to it. In order for this capacity off-loading to be successful, precise placement with respect to both location and height of the new antennas is required. If the site is too far from the cell that it is designed to remedy, the signal will not have adequate strength to capture calls from the impacted cell (or cells). Similarly, sites that are too close to one another can provide some additional capacity, but will waste large amounts of potential capacity (low efficiency) by not maximizing the full potential of a new cell location. Thus for new cell solutions to work, cell placement and height with respect to the surrounding network are the most critical factors.

Site Location:

The location of the subject site has been carefully selected based on its relationship with the several surrounding Verizon Wireless sites (to offload), the local terrain and type of environment (coverage), and consideration to where a cell site can realistically be constructed. The location of a new cell is easily the most important criteria for a network plan. Building a cell in the wrong location will cause it to not meet the objectives (capacity offloads and indoor coverage in this case) and a poor location cannot be fixed. A wrong location will cause more cells than otherwise required to be built and will waste band width (efficiency) for the new and existing cells. Please consider this while reviewing this project.

Propagation Maps:

There are several methods for determining levels of coverage within a given network of wireless sites. One of these is through the use of RF (radio frequency) propagation estimate maps showing the levels of service described here using a measure of "ROPL". This is an expression of the loss of radio signal in a given area from cell site to reaching the customer. For this project there are no significant coverage gaps being addressed but it is known that indoor service levels are not up to Verizon standards and this is also a network RF capacity project driven by the rapid growth of wireless 4G services. For modern 4G systems it is important to present a strong RF signal to the user device in as much area as possible as this allows higher data transfer speeds which in turn gives the network more capacity through greater bandwidth efficiency.

The propagation maps that follow show four levels of RF signal service, designated as the following colors:

Red>= -103 dB ROPL, very strong level of service adequate for providing extremely reliable and fast data rate service in all locations

Yellow>= -113 dB ROPL, level of service adequate for providing high level of service and data rate inside majority types of buildings and excellent for cars and outdoors

Green >= -123 dB ROPL, a level of service capable of providing good service and data rates inside most buildings, cars and outdoors

Blue >= -133 dB ROPL, a level of service providing marginal service in buildings and cars but reliable outdoors

White – no reliable service

Exhibit 1A is the current 4G RF signal in this area. As you can see the new BALMER cell will address coverage in the terms of "weak" RF. As noted this cell is to also provide increase wireless capacity by offloading calls to it from surrounding (far away) cells.

Exhibit 1B is a propagation map showing the same criteria of RF signal strength. Please note the strong new RF signal provided in the area around the new cell BALMER. This stronger RF signal will provide much improved in building services and faster 4G data to a significant area thus increasing the bandwidth efficiency and coverage for the network as a whole.

Cell Server Maps:

Exhibit 2A is the same RF propagation prediction map (based of RF ROPL) but this time shows which cell is the strongest server for the area and thus the one providing primary coverage in that area. 2A is the current server plot and shows the cells FAIRCHILD, AIRPORT, and others as the servers in the BALMER area. The goal of the new cell is to accomplish call traffic relief by offloading the wireless traffic from these existing cells to the new BALMER cell.

Exhibit 2B is the new server plot and shows the area serving is predicted to shift to the new cell thus providing the offload required. It is important that the new cell signal strength is both dominant (a measure stronger than all other RF signals) and evenly divided between new cell sectors for efficiency (calls are able to utilize the full capacity of both the new and existing cells/sectors). These server plots show the BALMER new cell meeting both of these goals (dominant and efficient) due primarily to its carefully chosen location and height.

As a note: The antennas, as proposed and designed for the above noted site, are in compliance with all applicable FCC requirements. In addition, the proposed site meets all applicable ANSI/IEEE C95.1-1992 exposure levels, as adopted by the FCC requirements and the equipment we use meets the following safety/regulatory standards: FCC Part 15 & Part 24, UL 1950, 3rd Edition, CSA C22.2 #234, UL 50-Type 3R, Transmit Spurious Emissions: IS-95B, FCC Part 15 & Part 24.

Summary:

In summary, the proposed wireless communication facility at this location with a height of 80 feet above ground level is needed to meet the wireless 4G network coverage and capacity for current and especially future use in this area. I respectfully request approval for this new cell project.

Sincerely,
Scott Cashmore
RF Engineer
Verizon Wireless

EXHIBIT 1A - RF signal strength BEFORE BALMER is added, please note the green areas where service indoor some buildings may be and issue

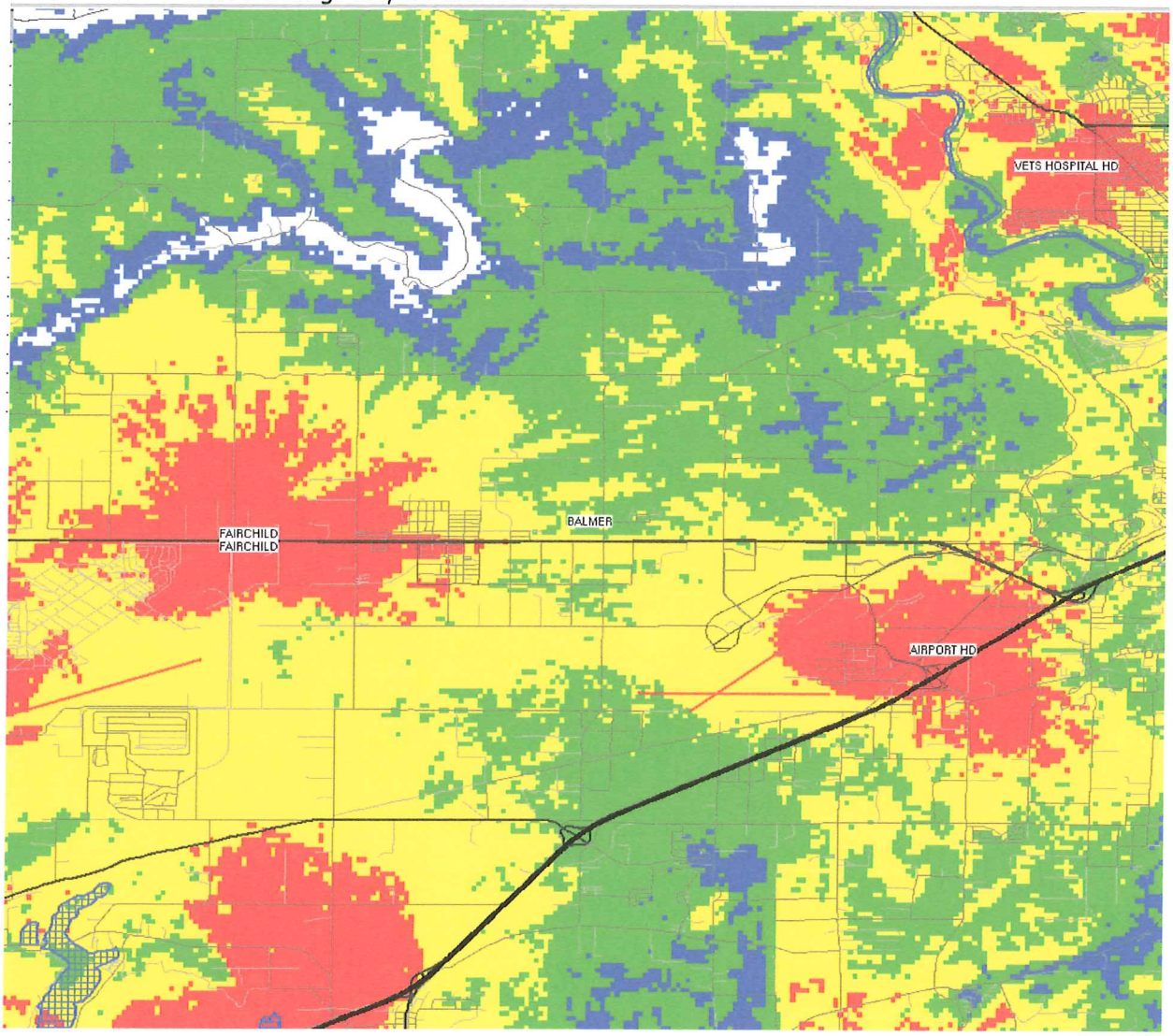

EXHIBIT 1B - RF signal strength AFTER BALMER is added, note improved coverage.

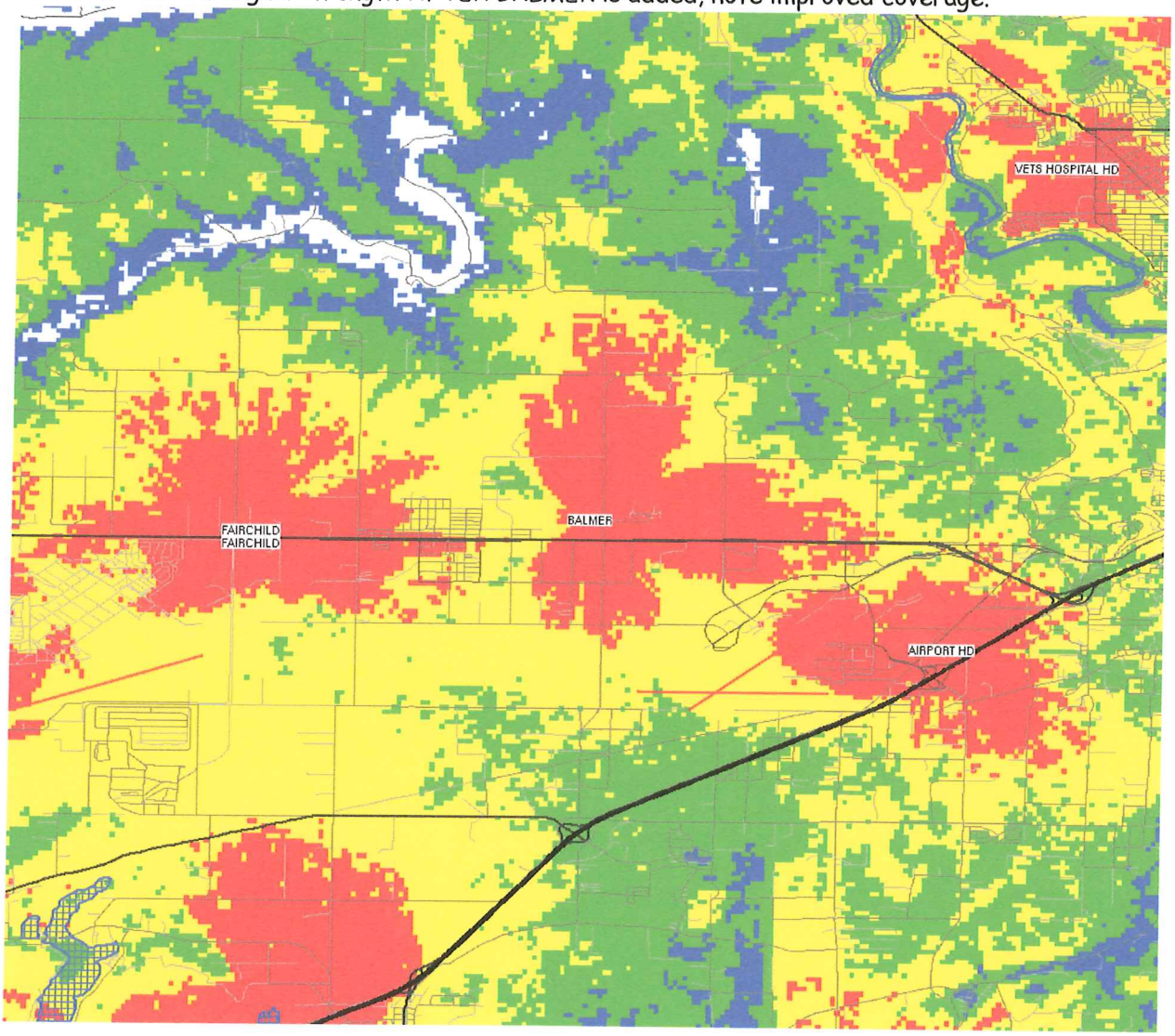

EXHIBIT 2A - RF signal SERVING cell BEFORE BALMER is added

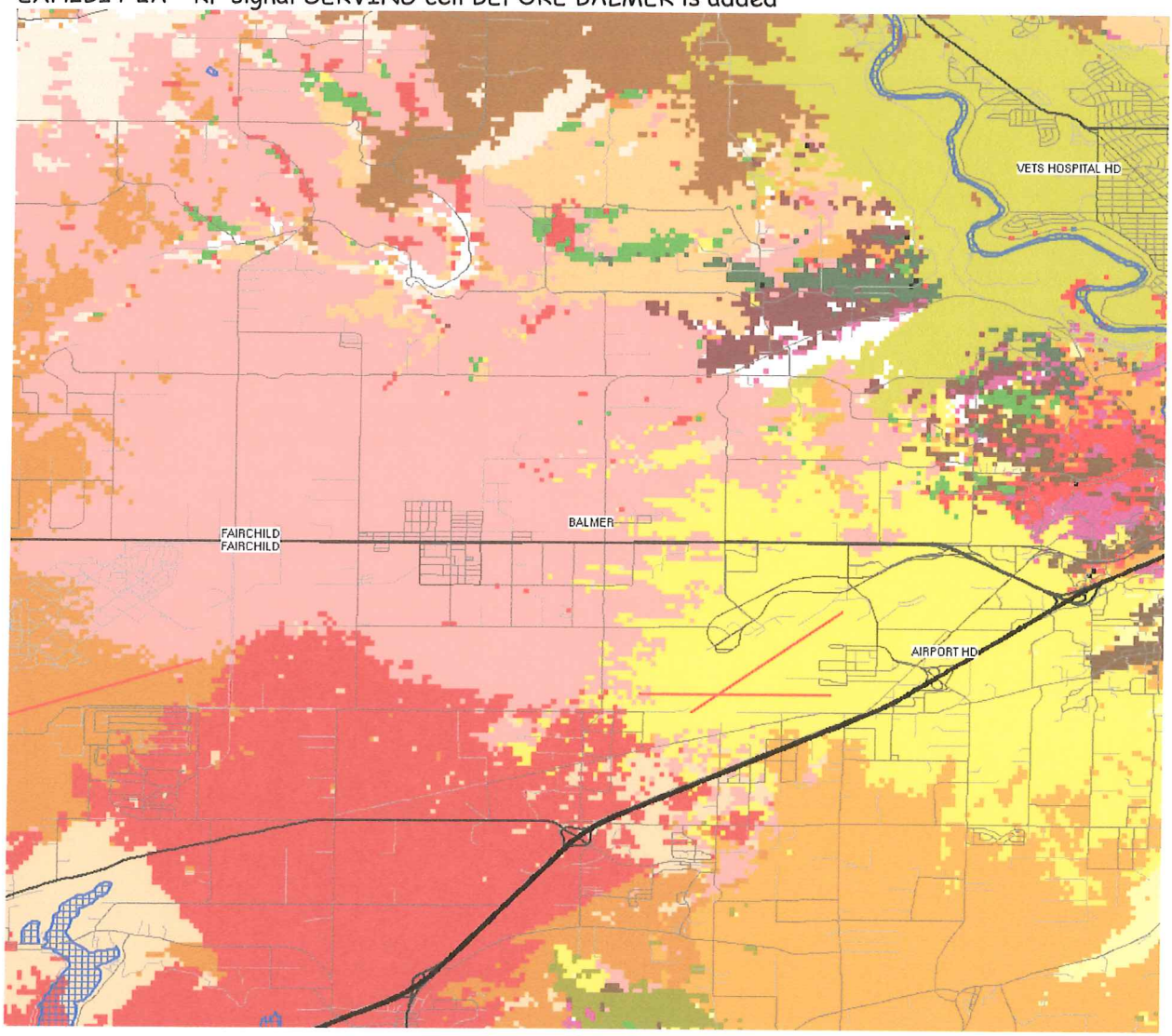

EXHIBIT 2A – RF signal SERVING cell AFTER BALMER is added, note offload of cells which provide much better service for all customers in area.