



# IDK Communications

July 24, 2018

Mr. Michael Donovan  
Town of Rye  
10 Central Road  
Rye, NH 03870

RE: Verizon Wireless Application – 120 Brackett Road

Dear Mr. Donovan,

IDK Communications (“IDK”) has been tasked with the following scope pertaining to the above referenced subject.

- 1.) Review the technical information for existing and proposed sites provided by the applicant along with Verizon’s RF Report and coverage maps dated December 4, 2017 and July 16, 2018
- 2.) Review the application provided by the applicant
- 3.) Perform an independent coverage analysis with alternatives
- 4.) Provide a written summary report with outputs

#### Radio Frequency (RF) Coverage Analysis:

When analyzing a site for radio frequency propagation several factors contribute to the overall performance. Of great importance are factors such as height above average terrain, tree density, building density and construction, frequency and equipment performance specifications.

The following paragraphs identify characteristics of each item used in determining overall performance.

#### Equipment specifications:

It is important to first determine whether a candidate site is limited by the radio path from the handset in a vehicle or building to the radio base station at the tower or by the radio path from the base station at the tower to the handset in a vehicle. In most cases because of the limited output power of the handset the path from the vehicle or inside a building to the radio base station at the tower is your limiting factor. Once this is known input parameters for both the base station and the handset are used to calculate the overall receive parameter used in the propagation modeling.

#### Height above average terrain:

Another important factor in determining a site's viability is how high the antennas will be in relation to the surrounding terrain. In the cellular/PCS world being at a maximum height above the average terrain is not necessarily a good thing since the systems are designed to provide handoffs to adjacent sites. Cellular/PCS carriers will re-use frequencies at different sites so it is important not to create interference with themselves. This philosophy differs from that of older wireless paging systems for example where sites were picked for their greater heights above average terrain. Cellular/PCS sites are picked by how they relate to the area that requires coverage. These areas are where the general population lives and commutes. A site that provides for coverage within a geographical area does not need to be on the highest point for that area but rather an area that provides enough clearance above the average terrain.

#### Tree Density:

Going along with height above average terrain is tree density. This factor is important because where the height of the antennas just clears the overall tree canopy in the surrounding area there may be additional losses associated with foliage. This loss can vary depending on types of trees and the density of the area. These losses are taken into account when determining propagation. It is also important to note that tree losses at the PCS frequencies of 2100 MHz are greater than the cellular frequencies of 700/800 MHz. Verizon's application is for operating in the 700 MHz frequency range.

#### Building Density and Construction:

Another factor in the determination of propagation is the building density and construction. Buildings can exhibit different types of losses depending on the construction material. Appropriate RF parameters for building density can be used when modeling coverage for areas such as Rye.

Input parameter values are chosen and then used in statistical calculations to determine if a viable signal is available for a particular area. In some cases coverage deficient areas are caused by shadows from particularly high terrain. Elimination of the deficient area may sometimes only be accomplished by increasing antenna height or by selecting an alternative site if the heights become too great.

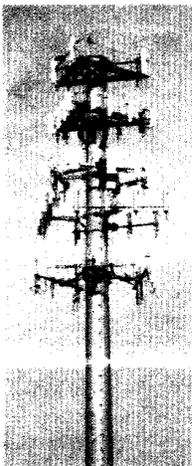
## **Site Configuration Options**

### Antenna Support Structures

When designing an antenna site there are several options with respect to the structure that supports the antennas. Two of the most basic structures are lattice and monopole towers.

The lattice tower consists of three or four legs with interconnecting braces and is capable of heights in excess of 300 feet. The lattice towers can be either guyed with wires or self-supporting. With structural capacity being equal the self-supporting structures are wider than the guyed counterpart version.

The monopole structures are possible to heights of 190 feet. As their heights increase so does the complexity of the foundations used to support the structure. Antennas can be either mounted on the exterior of the pole with the transmission lines inside the pole or they can be mounted inside the pole with the transmission lines. Mounting the antennas inside the pole creates a more stealth design and they can also be disguised as flagpoles or trees. Mounting antennas within a pole however will cause the carriers to take up more vertical space and thus the amount of co-location will decrease. If antennas are mounted outside the pole they can be flush mounted to the exterior of the pole to reduce the visual impact. Doing this would also have the same result as mounting the antennas inside with respect to the co-location opportunities. The pictures below offer three types of antenna installations outside of a monopole.



Non-Flush Mount  
Install



Flush Mount Install



Monopine Stealth

## Equipment Powering

Typically a cell/PCS carrier constructs a site with an electrical feed and a backup option in the event of an AC failure. The electrical feed to a site is either supported overhead by utility poles or is trenched underground through conduits.

The backup power option can consist of various options such as a propane or diesel generator, or batteries. Out of all these options the generator would be the loudest when activated. Typically for maintenance purposes the generators are run once a week for a short duration.

## **Coverage Analysis:**

IDK was tasked to validate the radio frequency performance of the Verizon data that was supplied to the Planning Board. Verizon provided proposed and existing system information for its radio sites along with proposed signal level thresholds for providing LTE coverage. The site data together with GIS information for the Town were used in IDK's RF analysis. The output of these analyses is a map or plot that depicts the radio frequency propagation prediction for each site. IDK has presented an analysis using the 700 MHz frequency band currently used by Verizon.

The sites used by IDK in the analysis are as follows:

- 1.) Existing and planned Verizon radio sites in Rye and adjoining municipalities
- 2.) Proposed site at 120 Brackett Road
- 3.) Alternative site at Elementary School
- 4.) Alternative Site at Ordione State Park
- 5.) Alternative Site at Lot 66
- 6.) Alternative Site at 505 Ocean Blvd
- 7.) Alternative Site at Wallis Sands

## Results:

Propagation analysis was performed using the existing and proposed Verizon radio sites. Maps are included at the end of this report that depict the results with the coverage areas for each site in blue. Areas with blue represent reliable LTE coverage. IDK confirms the signal level thresholds used by the applicant in the analysis as typical for the region. Areas with less than reliable coverage are depicted in white. The following paragraphs identify each scenario with the associated results:

### **FIGURE 1**

IDK ran LTE coverage for all existing and planned Verizon sites to determine if a coverage gap existed in the Town of Rye, specifically in the targeted area of Route 1A, Sagamore Road, Brackett Road, Route 1B, Parsons Road, Clark Road, Ordione State Park and the adjoining roads. The results show that indeed there exist gaps in coverage in those areas of the Town.

### **FIGURE 2**

Figure 2 shows the Verizon existing coverage with the proposed site at 125 feet. The site provides coverage to the targeted areas of Route 1A, Sagamore Road, Brackett Road, Route 1B, Parsons Road, Clark Road, Ordione State Park and the adjoining roads. The site provides interconnection to the existing site in Portsmouth.

### **FIGURE 3**

Figure 3 shows the Verizon existing coverage with an alternative at the Elementary School site at 125 feet. The site provides coverage to the targeted areas of Route 1A, Sagamore Road, Clark Road and Brackett Road but not to Route 1B, Parsons Road or Ordione State Park. The site provides interconnection to the existing site in Portsmouth.

### **FIGURE 4**

Figure 4 shows the Verizon existing coverage with an alternative at the Ordione State Park site at 125 feet. The site provides coverage to the targeted areas of Route 1A, Sagamore Road, Brackett Road, Route 1B, Parsons Road, Clark Road, Ordione State Park and the adjoining roads. There are some gaps along Sagamore, Clark and Parsons Road that do not exist with the proposed site. The site provides interconnection to the existing site in Portsmouth.

### **FIGURE 5**

Figure 5 shows the Verizon existing coverage with an alternative at Lot 66 at 125 feet. The site provides similar coverage to the proposed location to the targeted areas. The site provides interconnection to the existing site in Portsmouth.

### **FIGURE 6**

Figure 6 shows the Verizon existing coverage with an alternative at 505 Ocean Blvd at 125 feet. The site provides coverage to the targeted areas of Route 1A, Sagamore Road, Brackett Road, Route 1B, Parsons Road, Clark Road, Ordione State Park and the adjoining roads. The coverage along Sagamore and Parsons Road is not as good as the proposed site. The site provides interconnection to the existing site in Portsmouth.

## **FIGURE 7**

Figure 7 shows the Verizon existing coverage with an alternative at Wallis Sands at 125 feet. The site provides coverage to the targeted areas of Route 1A, Sagamore Road, Brackett Road, Route 1B, Parsons Road, Clark Road, Ordione State Park and the adjoining roads. The coverage along Sagamore and Route 1B as well as the Ordione State Park is not as good as the proposed location. The site provides interconnection to the existing site in Portsmouth.

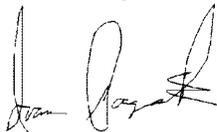
## **Coverage Summary**

The following summarizes the findings of the coverage scenarios:

- Today there exists LTE coverage gaps in the Town of Rye in the targeted areas of Route 1A, Sagamore Road, Brackett Road, Route 1B, Parsons Road, Clark Road, Ordione State Park and the adjoining roads for Verizon.
- The proposed site at 120 Brackett Road at 125 feet provides coverage to those areas identified to have gaps.
- The alternative location at the Elementary School does not provide the same amount of coverage to the targeted areas as the proposed location.
- The alternative location at Ordionne State Park provides similar coverage to the proposed site except along Sagamore, Clark and Parsons Road.
- The alternative location on Lot 66 provides similar coverage to the proposed location.
- The alternative location at 505 Ocean Blvd provides similar coverage to the proposed site except along Sagamore and Parsons Road.
- The alternative location at Wallis Sands provides similar coverage to the proposed location except along Sagamore, Route 1B and Ordione State Park.

IDK has no other additional comments regarding the referenced application and find that standard engineering practice was used in their coverage analysis. If you have any questions please feel free to contact me at (978) 375-7914.

Yours truly,



Ivan Pagacik

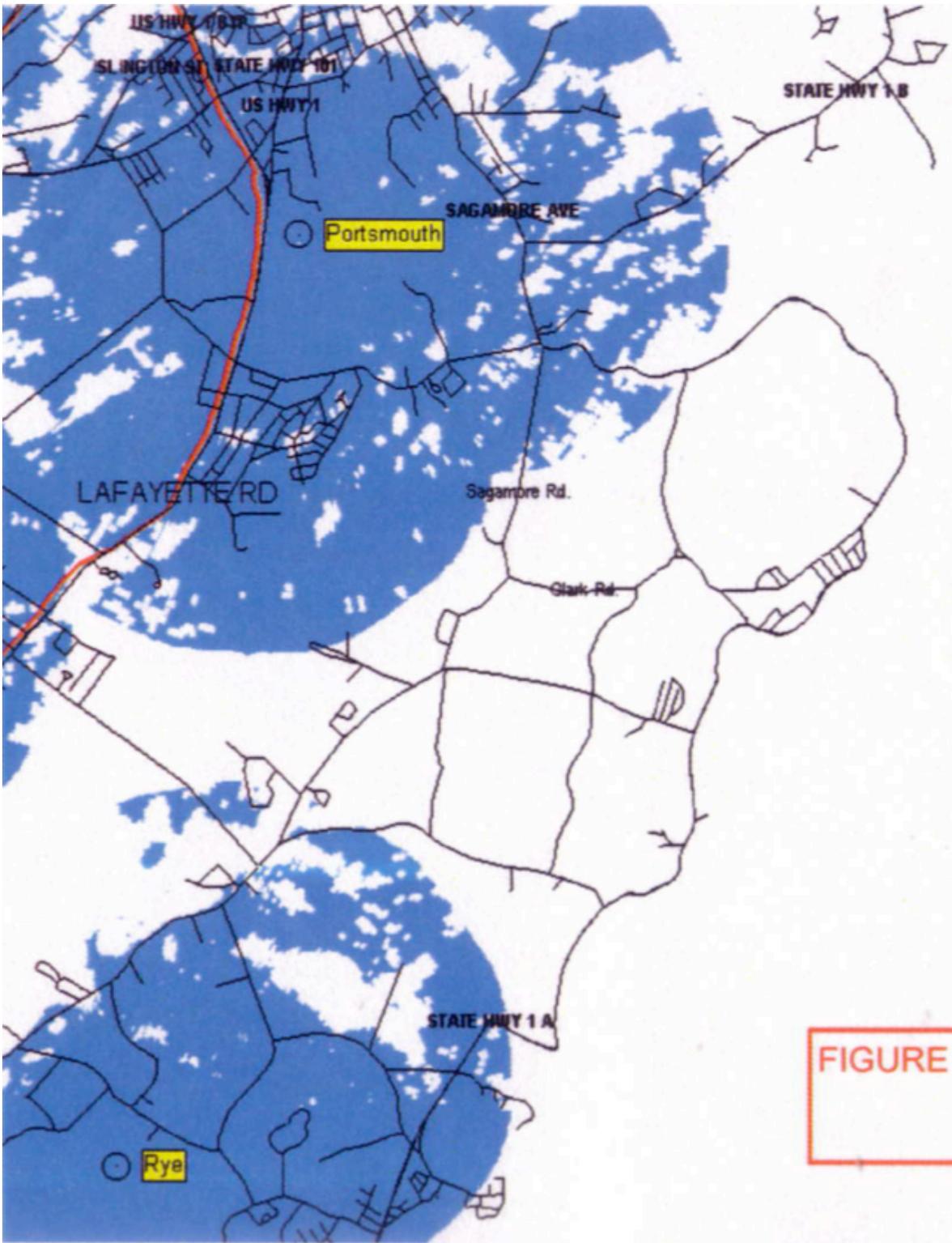


FIGURE 1 - Existing Verizon Coverage

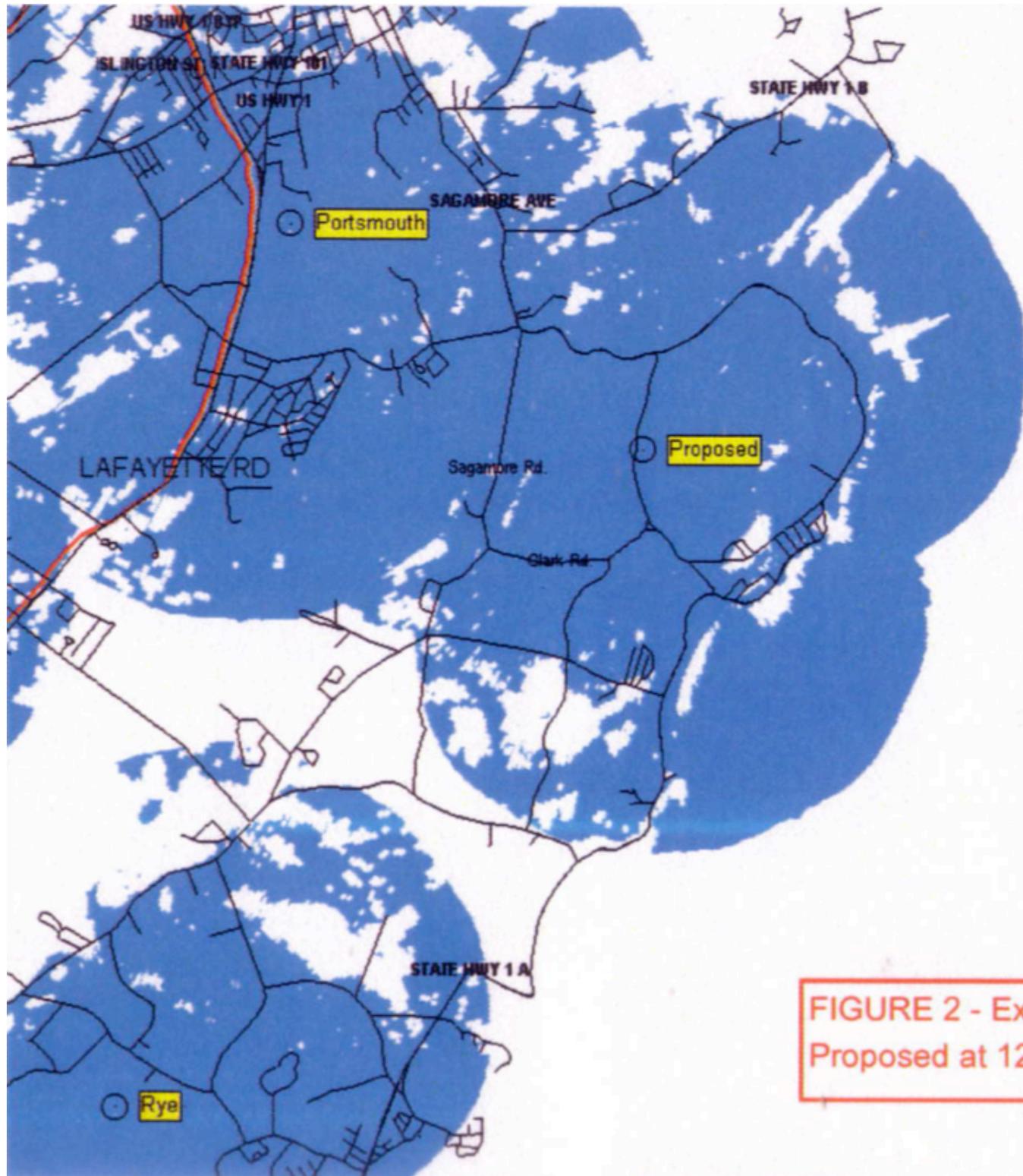


FIGURE 2 - Existing Verizon Coverage with Proposed at 125 Feet

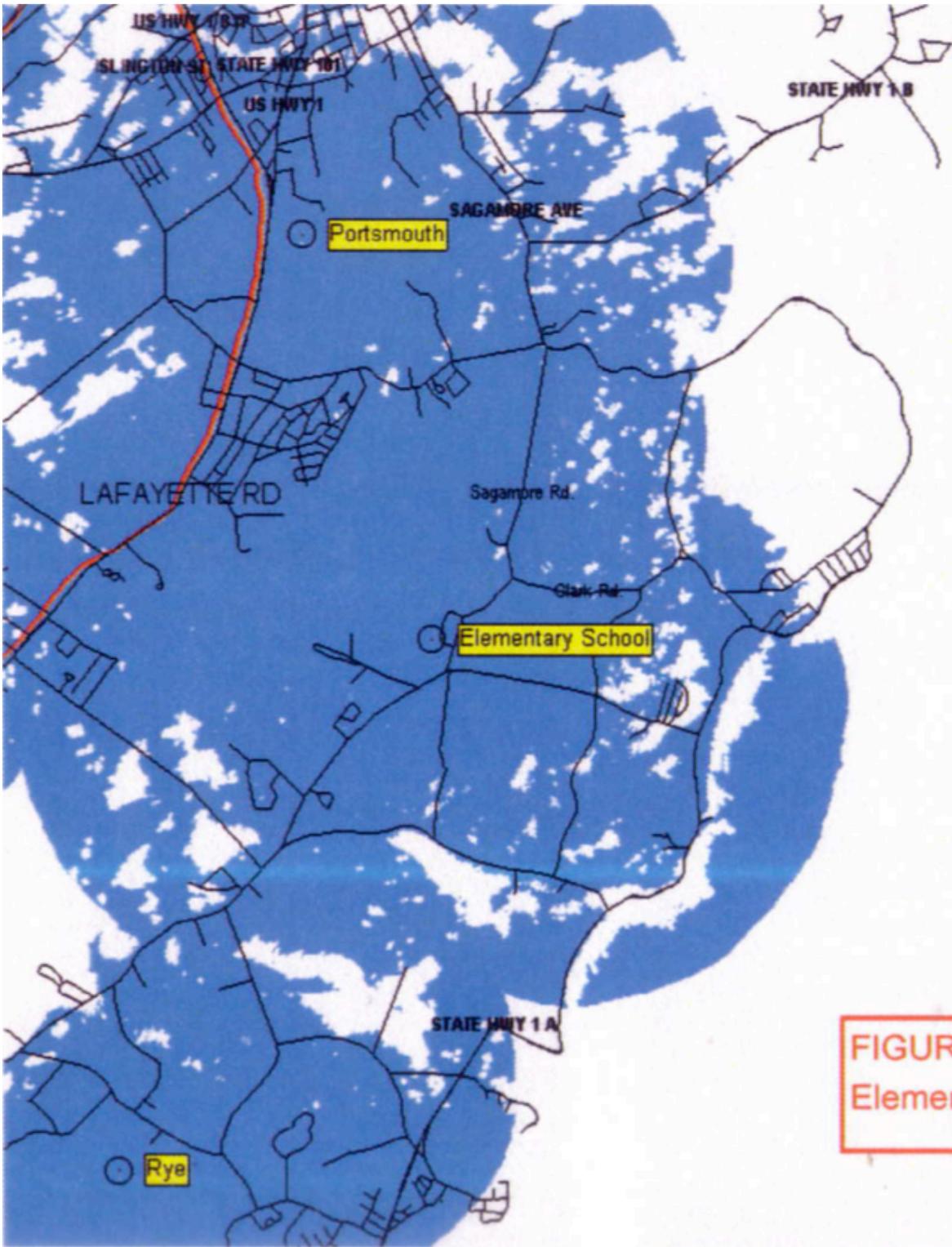


FIGURE 3 - Existing Verizon Coverage with Elementary School at 125 Feet

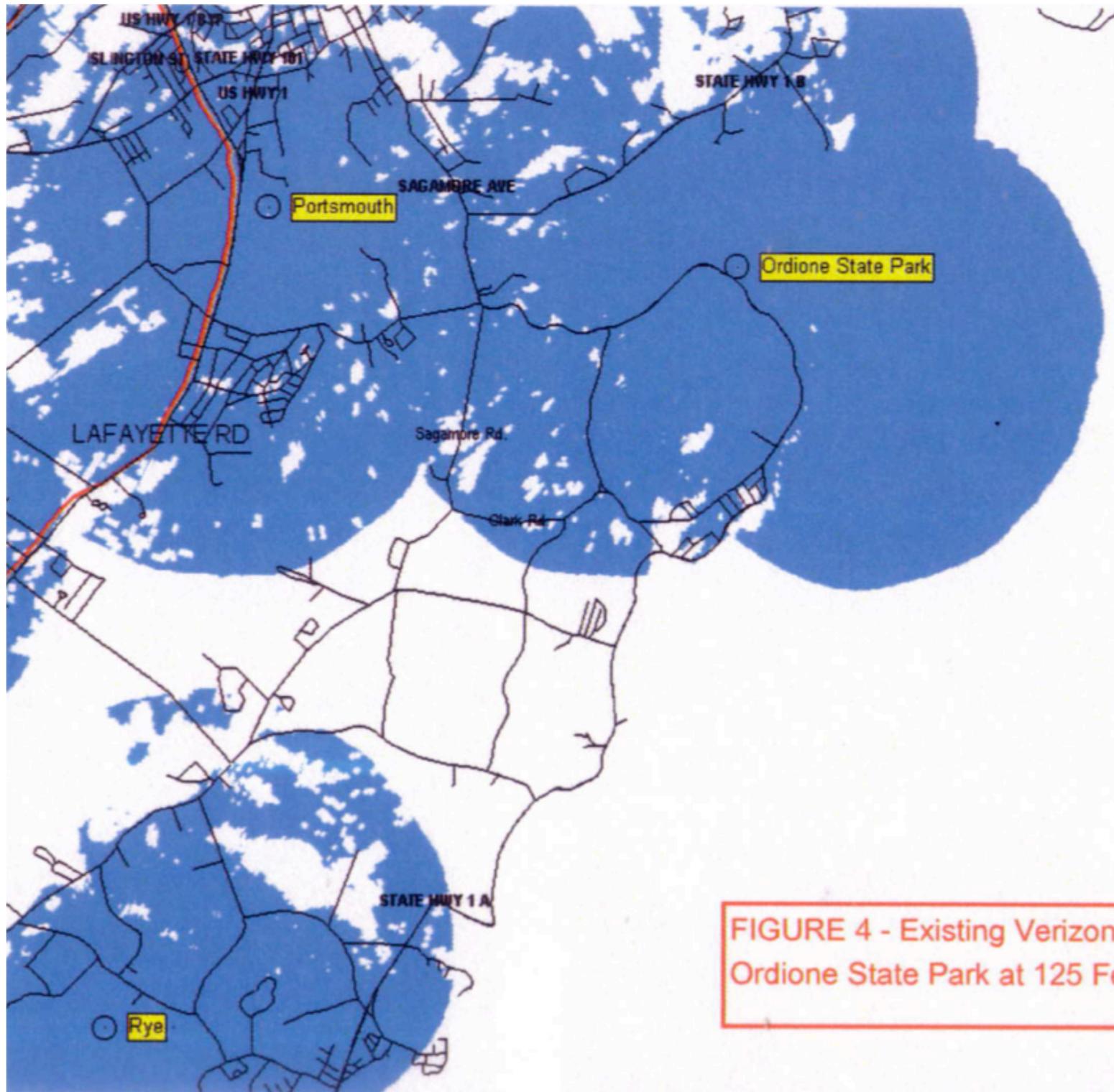


FIGURE 4 - Existing Verizon Coverage with Ordione State Park at 125 Feet

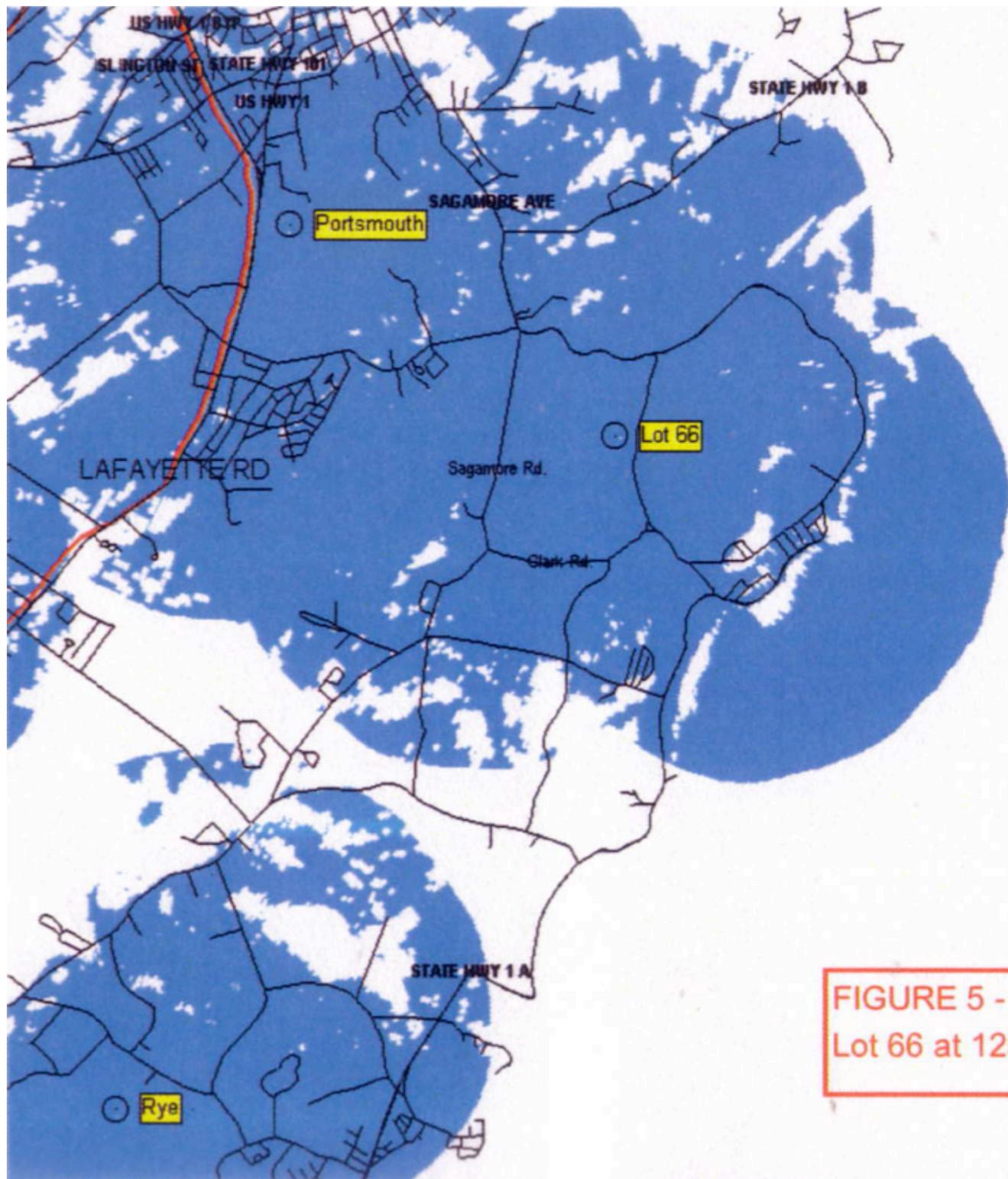


FIGURE 5 - Existing Verizon Coverage with Lot 66 at 125 Feet

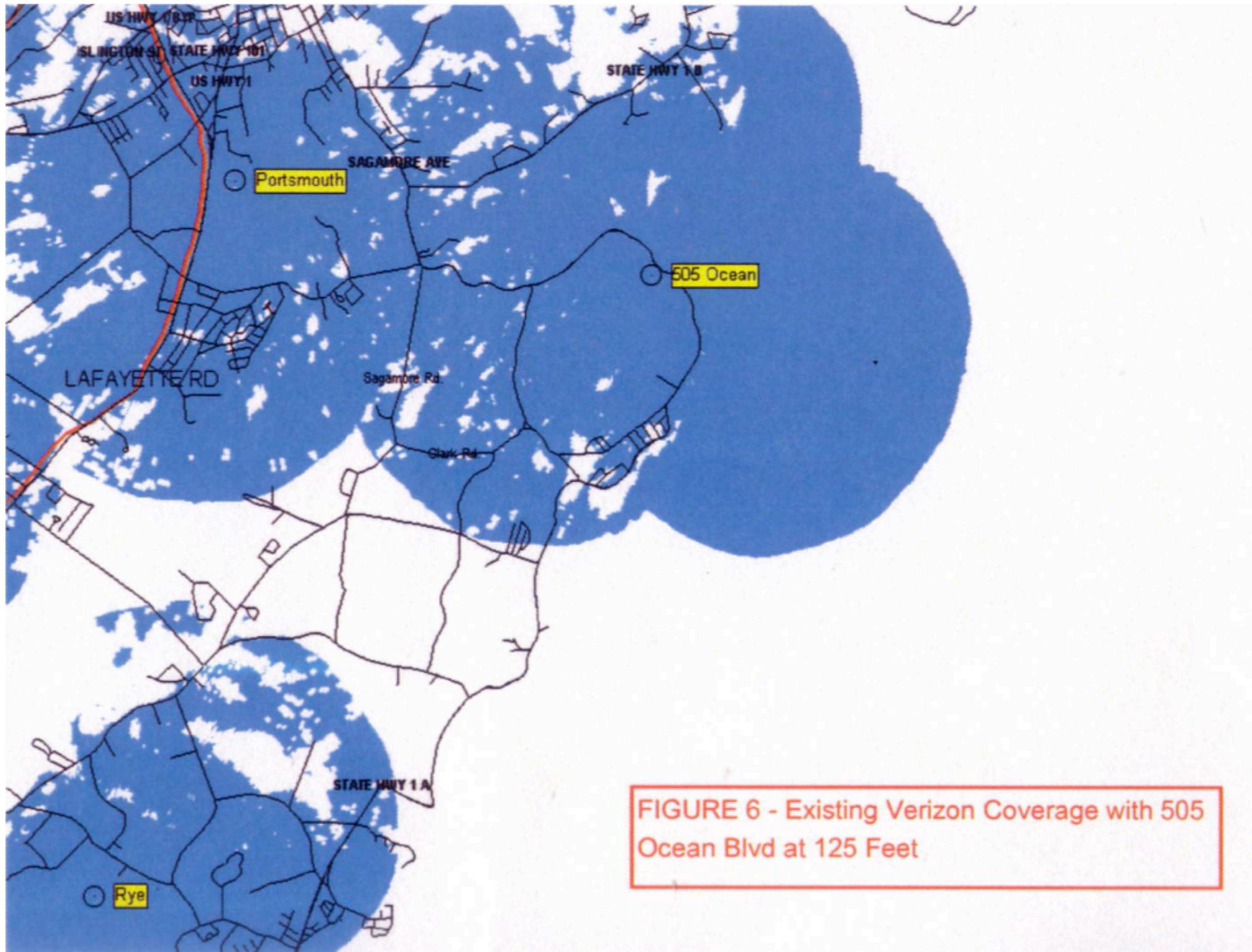


FIGURE 6 - Existing Verizon Coverage with 505 Ocean Blvd at 125 Feet

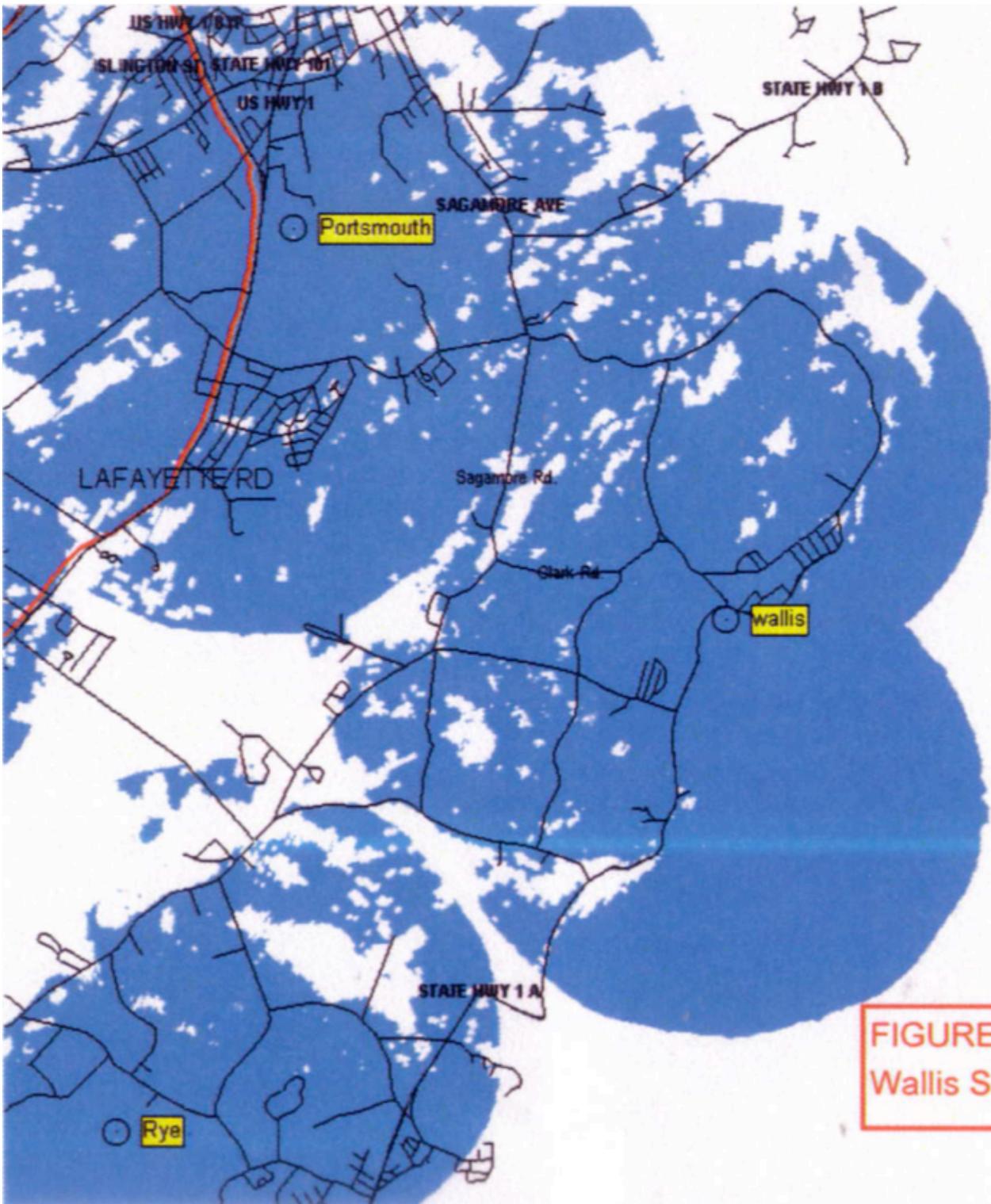


FIGURE 7 - Existing Verizon Coverage with Wallis Sands at 125 Feet