



## **Augusta County, Virginia**

# **Wireless Facilities Telecommunications Analysis For Wireless Voice and Broadband Services**

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## Executive Summary

Over the past two decades, local governments and municipalities across the nation have been inundated with requests to construct new facilities, primarily in the form of tall towers, to support a growing market for wireless telecommunication applications. The wireless services being provided is termed Personal Communication Services (PCS) and commonly include voice, texting, and wireless internet. These services play an important and vital role in many personal and business applications.

The Telecommunications Act of 1996 mandates that localities cannot prohibit development of towers and other equipment but provides a great deal of latitude in formulating plans and policies which address issues associated with their development. The challenge facing most localities is to develop a plan which complies with the requirements of the Telecommunications Act of 1996, while at the same time adequately addressing the issues and concerns of the citizenry.

In the fall of 2011, The Atlantic Group was contracted to assist the county in developing a Wireless Facilities Analysis with respect to the siting of towers for areas of poor or no service. This analysis represents a comprehensive review and analysis of: the existing infrastructure, gaps in coverage, carrier needs, propagation, interference, topography, and air navigation facilities.

The existing trend of subscribers abandoning their land line phones for wireless technology will continue. Personal Digital Devices (PDAs), laptops, and tablets have become the new devices of choice for high speed broad band for internet access, full motion video, voice, picture, and applications that interface with homes, buildings, automobiles and other devices. Wireless has become the expanded medium for the future.

In this study, the consultant, The Atlantic Group has identified current gaps in 3-G services and has evaluated the geographic areas of the County. The determination is: for Augusta County to be able to service current poorly served areas and anticipate future 4-G services, the county should help facilitate these needs through a plan that will address this issue.

This analysis addresses the potential tower sites that will service the new 4-G networks.

Based upon this review, it is determined that the existing infrastructure is not capable of meeting most of the future needs of voice and texting services. In addition, wireless broadband must be supplemented with additional tower structures. Through utilization of existing structures and upgrades to equipment, voice and texting services may grow, however in order to provide wireless Broadband, the existing infrastructure must be supplemented by additional tower structures. In areas where structures don't currently exist, Potential Commercial Tower Development Areas or PCTDAs have been identified as areas where tower development is needed.

The consultant has identified twenty-one (21) rural villages and areas where the existing tower structures would not provide high speed service to the areas for Broadband internet usage for 4<sup>th</sup> Generation wireless services.

As a result of expanding 4G data and voice services, incoming wireless 9-1-1 calls for emergency services will be enhanced significantly.

The consultant recommends that twenty-one (21) new Potential Commercial Tower Development Areas be established due to the lack of wireless service.

It should be noted however that any new development in these areas would have to conform to the applicable ordinances governing tower siting.



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## Glossary of Terms

**AGL** – Above Ground Level – the height above ground as measured from the ground to the top of the structure.

**AMSL** – Average Mean Above Sea Level – equal to the sum of the AGL and GE.

**Broadband-** The ability to transmit and receive voice and data services greater than 5 Mbit per second of transmission service speed.

Examples: Voice, internet access, full motion video, messaging, functional applications.

**BTA** – Basic Trading Area.

**CDMA** – Code Division Multiple Access

**Co-location** – The sharing of space on a structure to support multiple carriers.

**Dial-up Service-** The speed related to a standard telephony speed of 14.7 kb/s using a standard modem of transmission and reception.

**FAA** – Federal Aviation Administration.

**FCC** – Federal Communication Commission.

**GE** – Ground Elevation.

**GSM** – Global System Mobile Communication (see review of Wireless Technology).

**Guyed Lattice Tower** – Lattice tower that is supported by wire cables.

**LEC** – Loop Exchange Carrier – a communications company licensed to provide local exchange service for telephony service providers.

**LTE** – Long Term Evolution of Equipment

**Mini/Micro Cell** – Small structure, typically less than 80' AGL, used to fill "gaps" in coverage.

**Monopole** – Cylindrical structure, erected vertically, used to mount antennae.

**MSA** – Mobile Service Area.

**MTA** – Metropolitan Trading Area.

**MW** – Microwave – digital service licensed by the FCC for the transmit and receive of compressed voice data. Microwave systems are used to transmit large amounts of data, from point to point, over greater distances than traditional broadcast systems.

**Propagation** – The physical principle of the energy emitted through broadcasting a frequency as it relates to transmission, power, ASML, antenna gain and transport loss.

Typically shown via color pallet with corresponding signal strength.

**PCTDA** – Potential Commercial Tower Development Area.

**PDA** – Personal Digital Device

**RSA** – Regional Service Area.

**Rx** – Receiver – a wireless radio device that receives a broadcast from a transmission device allowing the broadcast circuit to be completed.

**Self – Supporting Structure** – Either a monopole or lattice design tower that is free-standing and requires no additional support.

**SMR** – Specialized Mobile Radio – two-way paging system used to transmit and receive. SMR systems designate a specific narrow band channel to broadcast and receive, thus creating a “secure” communication channel.

**TDMA** – Time Division Multiple Access (see review of Wireless Technology).

**Topographic Study** – How the terrain and other land forms and natural features impact the transmission and receipt of radio waves.

**Tx** – Transmitter - a wireless radio device that broadcasts a signal to be received by a specific receiver device.

**Wireless Internet** – The provision of internet services through specialized devices over a wireless network.

## Wireless Technology Definitions

**3G – 3<sup>rd</sup> Generation of Technology**-is a generation of standards for mobile phones and mobile telecommunication services fulfilling the **International Mobile Telecommunications-2000 (IMT-2000)** specifications by the International Telecommunication Union. Application services include wide-area wireless voice telephone, mobile Internet access, video calls and mobile TV, all in a mobile environment. Several telecommunications companies market wireless mobile Internet services as 3G, indicating that the advertised service is provided over a 3G wireless network. Services advertised as 3G are required to meet IMT-2000 technical standards, including standards for reliability and speed (data transfer rates). To meet the IMT-2000 standards, a system is required to provide peak data rates of at least 200 kbit/s (about 0.2 Mbit/s). However, many services advertised as 3G provide higher speed than the minimum technical requirements for a 3G service. Recent 3G releases, often denoted 3.5G and 3.75G, also provide mobile broadband access of several Mbit/s to smartphones and mobile modems in laptop computers.

**4G – 4<sup>th</sup> Generation of Technology**- is the fourth generation of cellular wireless standards. It is a successor to the 3G and 2G families of standards. In 2009, the ITU-R organization specified the IMT-Advanced (International Mobile Telecommunications Advanced) requirements for 4G standards, setting peak speed requirements for 4G service at 100 Mbit/s for high mobility communication (such as from trains and cars) and 1 Gbit/s for low mobility communication (such as pedestrians and stationary users).

The world's first publicly available LTE service was opened in the two Scandinavian cities of Stockholm (Ericsson and Nokia Siemens Networks systems) and Oslo (a Huawei system) on 14 December 2009. One of the key technologies for 4G and beyond is called Open Wireless Architecture (OWA), supporting multiple wireless air interfaces in an open architecture platform.

A 4G system is expected to provide a comprehensive and secure all-IP based mobile broadband solution to laptop computer wireless modems, smartphones, and other mobile devices. Facilities such as ultra-broadband Internet access, IP telephony, gaming services, and streamed multimedia may be provided to users.

**Cellular**- Refers to communications systems, especially the Advanced Mobile Phone Service (AMPS), that divide a geographic region into sections, called cells. The purpose of this division is to make the most out of a limited number of transmission frequencies. Each connection, or conversation, requires its own dedicated frequency, and the total number of available frequencies is about 1,000. To support more than 1,000 simultaneous conversations, cellular systems allocate a set number of frequencies for each cell. Two cells can use the same frequency for different conversations so long as the cells are not adjacent to each other. The second analog system in operation in the United States is Extended Advanced Mobile Phone System (EAMPS) that has currently replaced AMPS as the US standard. Narrowband AMPS is the third and existing cellular system in operation in the US. It has three times as many voice channels as EAMPS with no loss of signal quality.

All three systems have forty-two (42) control channels that are for setting up calls; the remaining channels are for voice conversations. All three systems are also analog systems. The systems are listed in chronological order and are backward compatible; that is, the infrastructure is designed so that older phones work on the newer systems.

**PCS-** Short for Personal Communications Service, the U.S. Federal Communications Commission (FCC) term used to describe a set of digital cellular technologies being deployed in the United States. Personal Communications System (PCS) includes Code Division Multiple Access (CDMA), Global System Mobile Communication (GSM), and North American Time Division Multiple Access (TDMA), also called IS-136). Two of the most distinguishing features of PCS systems are that they operate at the 1900 MHz frequency range and that they are completely digital.

**CDMA-** Short for Code Division Multiple Access, a digital cellular technology that uses spread-spectrum techniques. Unlike competing systems, such as GSM, that use time-division multiplexing (TDM), CDMA does not assign a specific frequency to each user. Instead, every channel uses the full available spectrum. Individual conversations are encoded with pseudo-random digital sequence. CDMA is a military technology first used during World War II by the English allies to foil attempts at jamming transmissions. The allies decided to transmit over several frequencies, instead of one, making it difficult for the Germans to pick up the complete signal. Because Qualcomm Inc. created communications chips for CDMA technology, it was privy to the classified information. Once the information became public, Qualcomm claimed patents on the technology and became the first to commercialize it.

**TDMA-** Short for Time Division Multiple Access, a technology for delivering digital wireless service using time-division multiplexing (TDM). TDMA works by dividing a radio frequency into time slots and then allocating slots to multiple calls. In a way, a single frequency can support multiple, simultaneous data channels. TDMA is used by the GSM digital cellular system.

**GSM-** Short for Global System Mobile Communications, one of the leading digital cellular systems. GSM uses narrowband TDMA, which allows eight simultaneous calls on the same radio frequency. GSM was first introduced in 1991 and is available in over 100 countries and has become the de facto standard in Europe and Asia.

**SMR-** Short for Specialized Mobile Radio-Two-Way, and thus used to transmit and receive. This technology takes basic two-way radio and designates a specific Narrowband channel to broadcast and receive, thus creating a "secure" channel for communication.

**MW-** Short for Microwave, this is a medium of communication licensed by the Federal Communications Commission as services used for the transmit and receive of compressed voice and data. These systems typically are direct point-to-point

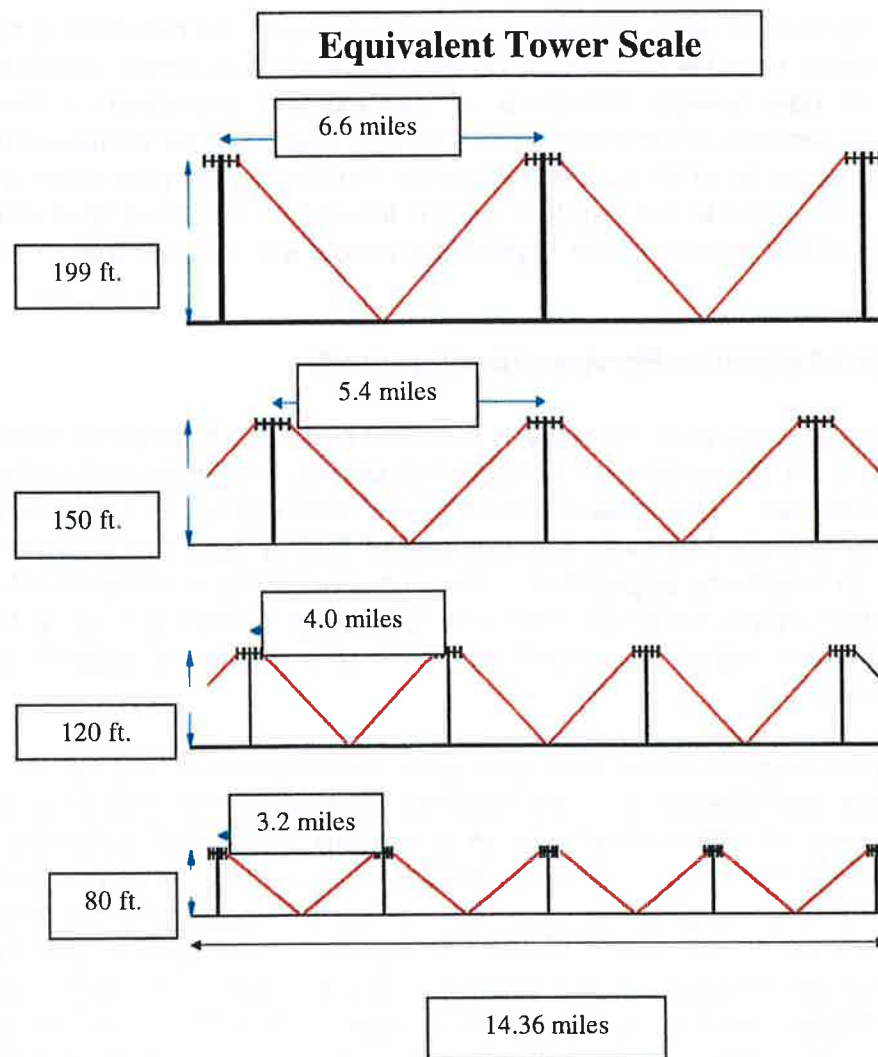


transmissions that large amounts of information may be sent over longer distance verses a short broadcast. This technology typically is in digital form.

**LTE – Long Term Evolution** Derived as a strategy of digital communications equipment that evolve as technology evolves in the wireless network. Phrase is coined by Verizon and other major wireless carriers as to the ability to upgrade from 3G- to 4G equipment.

**Internet-** The electronic medium by which information may be uploaded or downloaded to a degree in which it may be reviewed, manipulated and used for recreational and commercial applications. This technology is typically sent via a wire Local Exchange Carrier (LEC) network. However, the technology is available for the deployment of a wireless network.

**Equivalent Tower Scale-** The modeling of tower heights in relationship to coverage areas. These models are for estimating demand for towers.



# WIRELESS FACILITIES TELECOMMUNICATIONS ANALYSIS AUGUSTA COUNTY

## INTRODUCTION

The objective of the Wireless Facilities Telecommunications Analysis is to identify areas currently not served or underserved by wireless carriers and to provide a framework of potential tower sites under the County's development review process as set forth in the Augusta County Zoning Ordinance. The Goals of The Wireless Facilities Telecommunications Analysis are to address citizen and industry needs as it relates to telecommunication infrastructure. Wireless 4-G broadband communications provide a valuable service to the public as well as to the enhancement of Public Safety.

While there are six (6) Land Mobile Radio or LMR service providers in the County, (See Exhibit 4.0), there are several other technologies such as Wi-Fi and "Hot Spot" services that are offered at a limited basis, but could expand if tower facilities would become available.

In order to provide service within a region, a company needs to establish a network of antenna sites. New antennas may be co-located on existing towers or other structures or may require the placement of new towers. Because of the existing providers in the area, there are possibilities for co-location on these towers. Space that may be available on existing towers often is not considered by other carriers interested in adding service to an area. The County's consultant and staff provide information on all towers in the area that may host additional antennas as part of the tower review application process to ensure that all existing towers are utilized.

### **The Technology of Wireless Services (Background)**

Most personal wireless services operate in a similar fashion. A portable communication device receives from, and, in the case of a portable telephone, transmits radio signals to an elected antenna or antenna set. The area covered by an antenna set is commonly referred to as a "cell." The signal is routed to switching equipment that selects the channel and monitors the signal strength. In telephone applications, the signal normally is connected to the conventional or "land line" public telephone system or Loop Exchange Carrier (LEC). If the communication device is moving, the signal is passed on to an antenna in an adjoining cell and the call continues uninterrupted.

For services which require more than one antenna to serve a large area, such as wireless telephone service, an effective system requires an engineered grid or network of antennas mounted on towers or other structures in a pattern somewhat resembling a honeycomb. Depending on the technology used, the height of the tower, the position of the antenna, topography, vegetation and other factors, the cell size can vary from less than a mile to several miles across. The wireless provider seeks to locate antennas spaced just far enough apart to provide the coverage needed. If the antennas are too close, the signal overlap can cause interference problems and the capacity of the system suffers. If the antennas are too far apart, gaps or holes are created in the coverage pattern which can result in signals being "dropped" as a user moving beyond the range of the antenna transmitting and receiving the signal.

Also, each cell can handle only a finite number of data at one time. As the signal traffic becomes too congested, additional cells are required to provide additional system capacity. The grid of cells just described constitutes the signal coverage pattern for a single PCS provider. Multiple providers are already operating or preparing to operate in the Augusta County area with more expected in the next year. See list on Exhibit 4.0.

The evolution of simple first generation or 1-G voice service has grown into 2-G digital voice to 3-G mobile voice and data. With the advent of 4<sup>th</sup> generation or 4-G, the wireless carriers are providing mobile broadband services. Broadband services are both expanded data and enhanced voice service. Broadband is understood that it is expanded voice and data services.

Broadband service can be delivered via a “wire” service delivery such as from the cable franchised company or from the local telephony company if this service is offered in a specific geographic area. While wire based networks are bound to cable facilities, wireless broadband is not. Because wireless uses radio technology as its service delivery medium, companies such as Verizon, Sprint, NTelos, AT&T, etc. have wireless subsidiaries to provide service to the subscribers in a mobile format.

### **Cell Site Opportunity**

The Telecommunications Act established a role for three parties in the future development of wireless communications services: the communications industry, the FCC, and local government. Within the confines of FCC licensing, administration and local government regulation of land use and zoning, each provider is free to design its own network or system. Wireless communication services providers are not treated as public utilities or franchises but rather are competitors in an open market. Although the free market approach is intended to result in the best communications services for the least cost, it will also result in an increase in the number of wireless communications antennas and towers. However, the free market approach also permits the service providers to choose to locate in the more populated areas that often leaves the sparsely population areas of a locality with little or no coverage.

The following is a general category of sites that could be used for tower locations and/or co-locations of antennas provided the location, siting and design standards of the Augusta County Zoning Ordinance are met.

### **Existing Communication Towers**

Presently, over seventy-eight (78) structures capable of supporting antenna are in place throughout the county. Co-location opportunities exist on many of these sites.

The summary on Table #1 on the following pages lists existing and several approved (but not yet constructed) antenna sites throughout Augusta County and several miles across the county border into adjoining counties. Sites in neighboring counties are identified because of their potential to provide coverage along the borders and into Augusta. Sites are identified by an ATC Case Number, Structure Owner, Location, Tower Height, Latitude/Longitude Coordinates, and the amount of serviceable co-location positions (Slots) available. Sites identified by an asterisk are under either existing or under construction are scheduled to be constructed within the year. Each site can be found on the map presented in Exhibits 4.1/4.2/4.3/4.4. (pg. 40).

## INVENTORY OF ANTENNA SUPPORT STRUCTURES

The map in Exhibit 4.1. identifies the location of antenna support structures in Augusta County either supporting or capable of supporting commercial antennas. Proposals that have received County zoning approval but have not yet been constructed are plotted. Additionally, antenna support structures located near the border in adjacent counties were also included. Structures are identified by site ID (e.g., Augusta = A: A- 001).

A variety of support structures are being utilized in the County to mount antennas. This includes traditional self-support lattice towers, steel monopoles, and guyed towers. Additionally, antennas are mounted on power transmission towers, grain silos and wood poles. The following identification system was used to identify the structure type:

### Inventory Logic Table

Site ID	Structure Type
A-0XX	Self-Support Lattice Tower, Water Tank, Steel Monopole or Guyed Tower
A-2XX	Power Transmission Tower/Pole
A-3XX	Grain Silo
A-4XX	Wood Pole

Table #1.

Augusta County - Inventory of Towers, Silos, Power Mounts, Land, and Water Tanks

Site #	Owner	Site Name	Location	Type	HCC #	Latitude	Longitude	AGL	G.E.	Spots
A-001	Crown	Mint Spring	CR 694 MINT SPRING, VA	MP	N	38°3' 40.22"	79°7' 4.73"	195'	1828	4
A-002	Crown	Stuart's Draft	1557 WHITE HILL ROAD	MP	N	38°2' 25.3"	79°3' 24.4"	195'	1698	4
A-003	Crown	Kiser Hill	2761 HERMITAGE ROAD	GLAT	1016890	38-06-55.6N	78-54-55.5W	240'	1519	4
A-004	VEPCO	Bear Den Mt.	SKYLINE DRIVE	Lattice	1016962	38-03-59.0N	78-47-55.0W	78'	2756	4
A-005	VEPCO	Buketown	SUB. RT. 686	Lattice	1016969	38-18-51.0N	78-58-14.0W	195'	1227	4
R-006	Crown	Fairfield	BTWIN RT. 81 & RT. 64 SE	MP	1017049	37-59-48.0N	79-15-59.0W	185'	1888	4
A-007	SHENNAECOP	Churchville/Haag	INT. RT 612 & RT 742	Lattice	1017072	38-12-8.0N	79-04-39.0W	375'	1588	4
S-008	Tower Assets Newco	Craigsville	1911 CRAIGMONT DRIVE	MP	1017557	38-10-50.4N	79-05-22.1W	160'	1625	4
A-008	WVC,LLC	Kingsbury/Lockeridge	2160 JEFFERSON HWY.	Lattice	1017558	38-05-37.7N	78-57-05.9W	230'	1385	4
A-010	Crown	Greenville	4256 OLD GREENVILLE RD.	MP	N	38°1' 33.97"	79°8' 58.8"	195'	1715	4
A-011	Crown	Overnite	1450 SOUTH DELPINE AVE.	MP	N	38°2' 56.0"	78°54' 26.9"	190'	1375	4
A-012	Crown	Doomis/Swan	982 ROCKFISH RD.	MP	N	38°7' 11.7"	78°52' 5.7"	195'	1322	4
A-013	Crown	Thinking Spring	57 CONSTRUCTION LANE	MP	N	38°5' 3.78"	78°59' 55.94"	195'	1392	4
A-014	Easy Radio, Inc.	Buffalo Gap	SR 793 & RT. 42	GLAT	1017916	38-10-55.0N	79-13-39.0W	460'	1661	4
A-015	Crown	Middle River	2724 CHURCHVILLE AVE.	MP	N	38°12' 25.0"	79°7' 31.0"	195'	1610	4
A-016	Clear Channel	WKCI	SR 795 & SR 1007	GLAT	1018285	38-05-13.6N	78-54-45.4W	280'	1292	N
A-017	Clear Channel	WKCI	SR 795 & SR 1007	GLAT	1018286	38-05-13.6N	78-54-43.1W	280'	1292	N
A-018	Clear Channel	WKCI	SR 795 & SR 1007	GLAT	1018287	38-05-12.1N	78-54-40.7W	280'	1292	N
A-019	Clear Channel	WKCI	SR 795 & SR 1007	GLAT	1018288	38-05-10.4N	78-54-39.0W	280'	1292	N
A-020	Clark Broad. CO: WKDW	WKDW	291 WOODLEE RD.	GLAT	1018290	38-05-41.0	78-54-41.0	280'	1272	N
A-021	Columbia Network Svc.	Little North Mtn.	LITTLE NORTH MOUNTAIN	GLAT	1018299	38-02-35.7N	79-19-41.5W	185'	1688	N
A-022	Crown	Frog Pond/Stover	154 GUERNSEN LANE	MP	N	38°9' 42.6"	79°7' 35.2"	195'	1911	4
A-023	New Life Ministries-WNLR	New Life	RT. 250 2 MILE SE	GLAT	1018648	38-12-39.0N	79-07-52.0W	265'	1614	N
A-024	Crown	Churchville	3490 CHURCHVILLE AVE.	MP	N	38°13' 4.4"	79°9' 6.0"	195'	1905	4
A-025	Verizon	Weyer's Cave	1.4 MILES WEST - NORTHWEST	GLAT	1029676	38-17-44.0N	78-55-49.0W	185'	1599	4
S-026	CRW-NTELOS	Jefferson Street	JEFFERSON STREET, WAYNESBORO	MP	1054987	38-09-14.0N	79-04-49.0W	165'	1765	4
A-027	Crown	Staunton South	1899 GREENVILLE AVE. STAUNTON	MP	1055053	38-06-35.2N	79-4-13.7W	185'	1240	4
A-028	CRW-NTELOS	Verona	4801 LEE HWY. VERONA	MP	1055054	38-11-35.0	79-00-50.0	165'	1565	4
A-029	Crown	Route 2	ROUTE 2, STAUNTON	MP	1055085	38-02-29.5N	79-07-34.1W	165'	1390	4
A-030	Crown	Brand	ROUTE 2 FISHERSVILLE	MP	N	38°6' 47.8"	79°0' 28.5"	195'	1280	4
A-031	CRW-NTELOS	Shendoah	1150 SHEVANDOAD DRIVE, WYNEBORO	MP	1059432	38-09-20.0N	78-56-4.0W	185'	1259	4
A-032	Crown	Williamson	463 INDUSTRY ROAD	MP	N	38°5' 25.94"	78°52' 28.0"	190'	1140	4
RH-033	SHENNAECOP	Mt. Crawford	US 11 & VA HWY. 257	MP	1204046	38-21-55.4N	78-56-24.1W	80'	1454	1
A-034	VEPCO	Fishersville	RT. 250 WEST WAYNESBORO	MP	1205737	38-05-37.4N	78-57-00.0W	96'	2200	1
A-035	Crown	Buffalo Ridge/Swoope	1011 LITTLE CALF PASTURE HWY SW	MP	1206510	38-09-36.8N	79-16-22.6W	185'	1113	4
A-036	Shen. Valley Reg. Airport	Airport	77 AVIATION CIRCLE	Lattice	1208166	38-15-35.4	78-54-5.0W	30'	1939	1
A-037	Crown	Rt.254&Rt.608	1081 HERMAGE ROAD	MP	N	38°9' 23.651"	78°57' 2.919"	195'	1271	4
A-038	Crown	Verona	RT. 254 & RT. 608	Lattice	1208222	38-09-25.2N	78-57-1.7W	150'	1900	4
A-039	Crown	Stuart's Draft	COAL ROAD, STUART'S DRAFT	GLAT	N	37°59' 3.69"	79°4' 34.1"	180'	1830	4
A-040	Crown	Spottswood	599 SPOTTSWOOD ROAD	MP	N	37°57' 56.48"	78°11' 40.11"	190'	1509	4
S-041	Clear Channel Comm.	Clear Channel	271 WOODLEE ROAD	Lattice	1220049	38-10-32.5N	79-04-11.1W	240'	1433	N
A-042	Crown	McDonalds	216 AUGUSTA WOODS DRIVE	MP	1220646	38-7-18.5N	79-2-10.1W	195'	1246	4
A-043	Crown	Wanchay	299 MOUNTAIN CAVE ROAD, GROTTONES	MP	1225540	38-14-10.7N	78-50-41.0W	165'	1902	4
A-044	Crown	Weyer's Cave	765 DICES FERRY ROAD	MP	1226582	38-17-44.2N	78-55-44.0W	165'	1710	4



Augusta County - Inventory of Towers, Silos, Power Mounts, Land, and Water Tanks

Table #1: Continued

Site #	Owner	Site Name	Location	Type	FCC#	Latitude	Longitude	AGL	GLE	Sites
A-045	Crown	Churchville	498 HANKEY MTN.	GLAT	N	38°14'22.45"	79°11'36.15"	190'	1582	4
A-046	SBA	Chinoquin	190 CHINOQUIN ROAD	MP	1230688	38-02-34.9N	79-19-44.8W	105'	1481	2
A-047	Crown	Craigsville	FIRST AVENUE	MP	1233586	38-4-57.8N	79-22-47.7W	180'	1863	4
R-048	US Cellular	Davis	SOUTH DAVIS ROAD	MP	1238372	37-54-8.5N	79-16-19.2W	125'	1472	3
A-049	Crown	Fort High School	181 MORNINGSIDE LANE	Lattice	1248891	38-15-19.9N	78-58-20.4W	185'	1836	4
A-050	American	Kelly Mtn./Mish	418 BROADHEAD ROAD	MP	N	37-59-22.85N	78-10-36.96W	197'	2965	4
A-051	American	Aton	6049 HOWARDSVILLE ROAD	MP	N	38-0-38.09N	78-53-10.58W	112'	1650	3
A-052	American	Ft. Defiance	375 WILLOW SPOUT ROAD	Lattice	N	38-14-33.07N	78-59-23.08W	100'	1200	2
A-053	Verizon	Crimora	166 CRIMORA STATION LANE	Lattice	1260860	38-08-56.3N	78-50-58.1W	195'	2885	4
A-054	SBA	McKinley 2	166 TROXEL GAP ROAD	MP	N	38-2-32.37N	79-19-25.6	175'	1083	2
RH-055	TowerCo	Port Republic	7279 LATAMER ROAD	GLAT	1263243	38-19-36.6N	79-48-91.3	100'	2744	2
A-056	Global Tower	Craigsville	HOLLOW LANE	MP	1265219	38-2-25.8N	79-20-7.9W	180'	1302	4
A-057	Verizon	Weyers Cave	1.4 KM WEST - NWEST	MP	1265447	38-17-42.4N	78-55-44.5W	185'	1792	4
A-058	TowerCo	Augusta Springs	2114 LITTLE CALF PASTURE ROAD	MP	1266089	38-7-16.1N	79-17-6.4W	185'	1417	4
A-059	Verizon	Mont Solon	3962 SCENIC ROAD	MP	1266740	38-19-50.5N	79-3-35.6W	290'	1682	5
RH-060	SBA	Mont Solon	1255 BUNKER HILL ROAD	MP	N	38-19-49.13N	78-52-16.25	175	1640	4
A-061	VSP	Chapin	CHAPIN JUNCTION- N. MAIN STREET	Lattice	1268311	38-09-55.0N	79-18-49.7W	140'	4110	N
RH-062	Nat. Comm. Towers	Mt. Crawford	SR 989	Lattice	1268908	38-21-47.1N	78-54-43.8W	190'	1137	4
A-063	NTELOS	Waynesboro	SR 101 MTSO	MP	1274172	38-3-20.5N	78-56-4.6W	190'	1284	4
A-064	Global Tower	Lynchurst	2994 LYNCHURST ROAD	MP	1270360	38-1-38.2N	78-57-21.7W	190'	1915	4
A-065	CTI Towers	Waynesboro	763 CALF MOUNTAIN ROAD	Lattice	1280482	38-3-54.0N	78-48-14.0W	75'	2681	1
A-066	Beacon	Weyers Cave	95 Suller Pump Rd.	MP	N	38-15-56.8	78-52-8.38W	150'	1,142	3
A-067	Global Tower	Lynchurst	3251 Lynchurst Rd.	MP	N	38-1-38.196	78-57-21.75	195	421	4
A-068	Verizon	Deerfield	95 Marble Valley Rd.	Lattice	TBD	38-11-10.3	78-24-38.0W	285'	2202'	5
A-069	Verizon	Aton	Royal Orchard Land corp.	MP	N	38-2-29	78-52-11.63W	195'	1775	4
A-070	Verizon	Sherando Lake/Miller	Howardsville Turnpike	MP	N	37-59-5.31	78-58-14.62W	195'	1483'	4
A-071	AT&T	Grottoes	139 Teter Rd. Grottoes	MP	N	38-15-8.25	78-48-10.96	195'	1203'	4
A-072	Sherwallcop	Intl. Lane	28 International Lane	MP	N	38-6-18.2	79-4-13.4	100'	1520'	2
A-073	Local TV	Round Hill/Stuarts Craft	420 Pound Hill	Lattice	N	38-9-6.2	79-1-4.2	120'	1481	1
A-074	WVPT	Ellics Kob	1055 Little Calpasture HWY	Lattice	N	38-10-0.0	79-18-51.85	40'	4439	1
A-075	ACSA	Snead	1563 White Hill Road	MP	N	38-2-20	79-9-20	140'	1641	2
A-076	ACSA	Harrison Road	303 Harrison road	Water Tank	N	38-7-38	79-4-36	90'	1582	2
A-077	Columbia Nat. Gas	Craigsville	760 Troxel gap road	GLAT	N	38-2-35.2	79-19-40	190'	2760	4
A-078	Crown	Laner	1382 New Hope rd, Staunton	MP	N	38-9-28.7	79-0-41	195'	1362	4
A-079										
A-080										

# Potential Sites for Co-Location of Antennas

## 1. Power Transmission Line Towers

Virginia Power Company has several large power transmission corridors which cross the County in which power mounts could be added to serve as telecommunications facilities. These corridors consist of easements and right-of-ways and combined are over several miles in length. These corridors offer many opportunities for co-location of transmission towers and communications antennas. Virginia Power has worked closely with the telecommunications industry in facilitating co-location of transmission towers and communication antennas, as well as, co-location within its right-of-way.

## 2. Buildings

Antennas can be mounted on the roofs or sides of buildings. While most buildings in the County are less than 35' tall, there are some structures that are taller and could be used for co-location opportunities.

## 3. Churches

Many churches in the County present the wireless provider with the potential for locating antennae inside of existing steeples or of building a steeple for a church that does not presently have one. The church community may welcome these suggestions, as it provides a source of income for a non-profit organization.

## 4. Public Sites

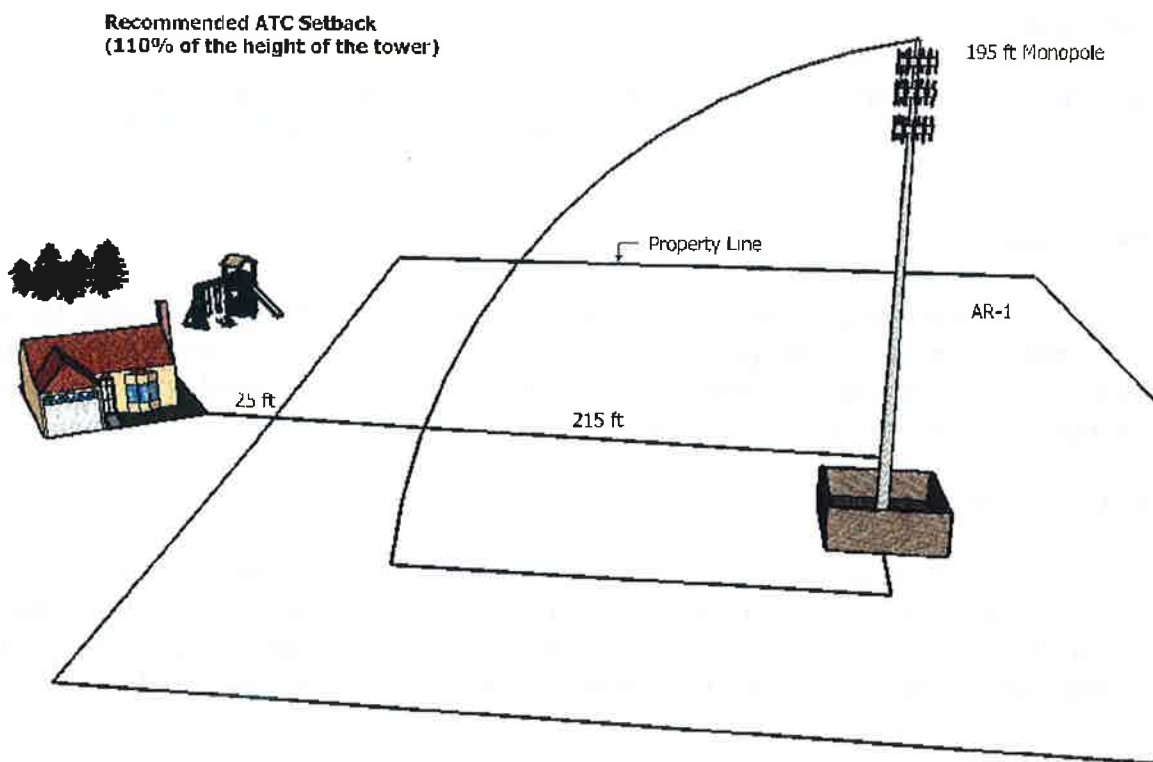
The governmental sites within the County that may be appropriate for siting commercial wireless communications facilities include selected fire stations, libraries, landfills, post offices, water tanks and other public facilities. These facilities are often large enough to allow sufficient separation from surrounding residential uses or are located adjacent to industrial land use.

## 5. Private Land

Although the use of existing facilities is to be preferred to the construction of new ground-mounted facilities, there are opportunities for the development of freestanding mounts on private land. In particular, there are several acres of land zoned for industrial use that could be used for new tower locations.

## Structural Hazards

The structural hazards associated with wireless facilities include the potential collapse of the antenna mount and the potential of equipment or debris falling from the structure. Tower structures are constructed to BOCA National Building Code Standards and can withstand hurricane force winds up to 110 mph. Structures are also designed to collapse into themselves if there is a failure. In response to potential hazards, some local governments designate a "fall zone" around the base of the antenna mount. These are generally expressed as distance-to-height ratios. The County of Augusta Zoning Ordinance currently requires fall zone setbacks.





## New Construction in PCTDA

The purpose of this analysis is to identify areas of the County with little or no service of wireless voice or broadband and to identify potential sites that would fill in the gaps of the current service and address the next generation (4G) services.

Twenty one (21) Potential Commercial Tower Development Areas (PCTDAs) are identified in the analysis as areas suitable for future tower development. (Table 2.) These have been identified as a “community” site generically to that area and not specifically to any individual property. Any property that is within a one (1) mile radius of the Latitude and Longitude of the PCTDA site indicated on the maps may be suitable for a tower site. The mark on the map is the center for a 1-mile radius to locate a potential tower site. (See PCTDA site maps pages 19-39 and Exhibit 4-1.)

These sites were selected from a study of the existing structures, the propagation analysis that results from existing 3<sup>rd</sup> Generation of 3G service, and the movement by all carriers to provide 4G service within the next few years.

When studying the county, topography becomes a major factor. Because of ridgelines, valleys, roads and community locations, the topography becomes a major concern. If you look at most of the rural areas where service is not currently adequate, most are located in areas where topography is a challenge.

The lack of service begins with 3G service but 4G service will be provided for when the carrier co-locates the new equipment for 4G on the proposed 21 towers and the existing tower sites that they occupy. Wireless broadband can be transmitted from a 3G network, however the 4G equipment will provide greater bandwidth and more users.

These sites in Table 2 are representative and not in any order of priority, meaning that a tower of the specified height built within a 1 mile radius will provide the signal indicated per carrier. These locations are approximate and should not be considered as an absolute. All tower site PCTDA will follow all existing submittals to the Department of community Development.

## Potential Communications Tower Development Areas

**Table #2**

<b>PCTDA</b>	<b>Name</b>	<b>Latitude</b>	<b>Longitude</b>	<b>AGL.</b>
1	<b>West Augusta</b>	38-16-34.5	79-18-22	195'
2	<b>Marble Valley</b>	38-7-55.0	79-25-32.5	195'
3	<b>Summerdean</b>	38-4-29.0	79-15-24.2	195'
4	<b>Middlebrook</b>	38-3-2.8	79-12-52	195'
5	<b>Deerfield</b>	38-8-3.9	79-25-26.2	285'
6	<b>Stokesville</b>	38-21-6	79-8-52	195'
7	<b>Todd Lake Rec.</b>	38-21-53.2	79-12-25.7	195'
8	<b>Camp May Flather</b>	38-21-57.1	79-9-51.8	195'
9	<b>Stribling Springs</b>	38-18-26.3	79-10-31.2	195'
10	<b>Parnassus</b>	38-17-39.4	79-07-5.1	195'
11	<b>Moscow</b>	38-19-12.5	79-5-33.7	195'
12	<b>Spring Hill</b>	38-15-27	79-2-56.8	195'
13	<b>Roman Road</b>	38-16-58.1	79-00-52.9	195'
14	<b>Centerville</b>	38-20-22.1	79-00-9.3	195'
15	<b>Arbor Hill</b>	38-6-11.5	79-9-29.4	195'
16	<b>Sherando</b>	37-56-34.8	78-57-48.1	195'
17	<b>Crimora</b>	38-10-22.7	78-50-50.5	195'
18	<b>New Hope</b>	38-11-57.3	78-54-11.3	195'
19	<b>Steeles Tavern</b>	37-55-34.7	79-11-53.7	195'
20	<b>Stoney Creek</b>	37-59-11.8	79-6-57.4	195'
21	<b>Rivermont /Lake Road</b>	38-0-27.8	79-1-38.4	195'

Any proposal to construct a new tower in one of the twenty-one (21) PCTDAs is not exempted from being processed through the normal County Zoning review process. The purpose of this review is to ensure conformance with applicable ordinances and standards. The basic steps and information required in order to process an application for new tower construction is described below.

# Potential Commercial Tower Development Area

**PCTDA SITE #: 1.**

**NAME: West Augusta**

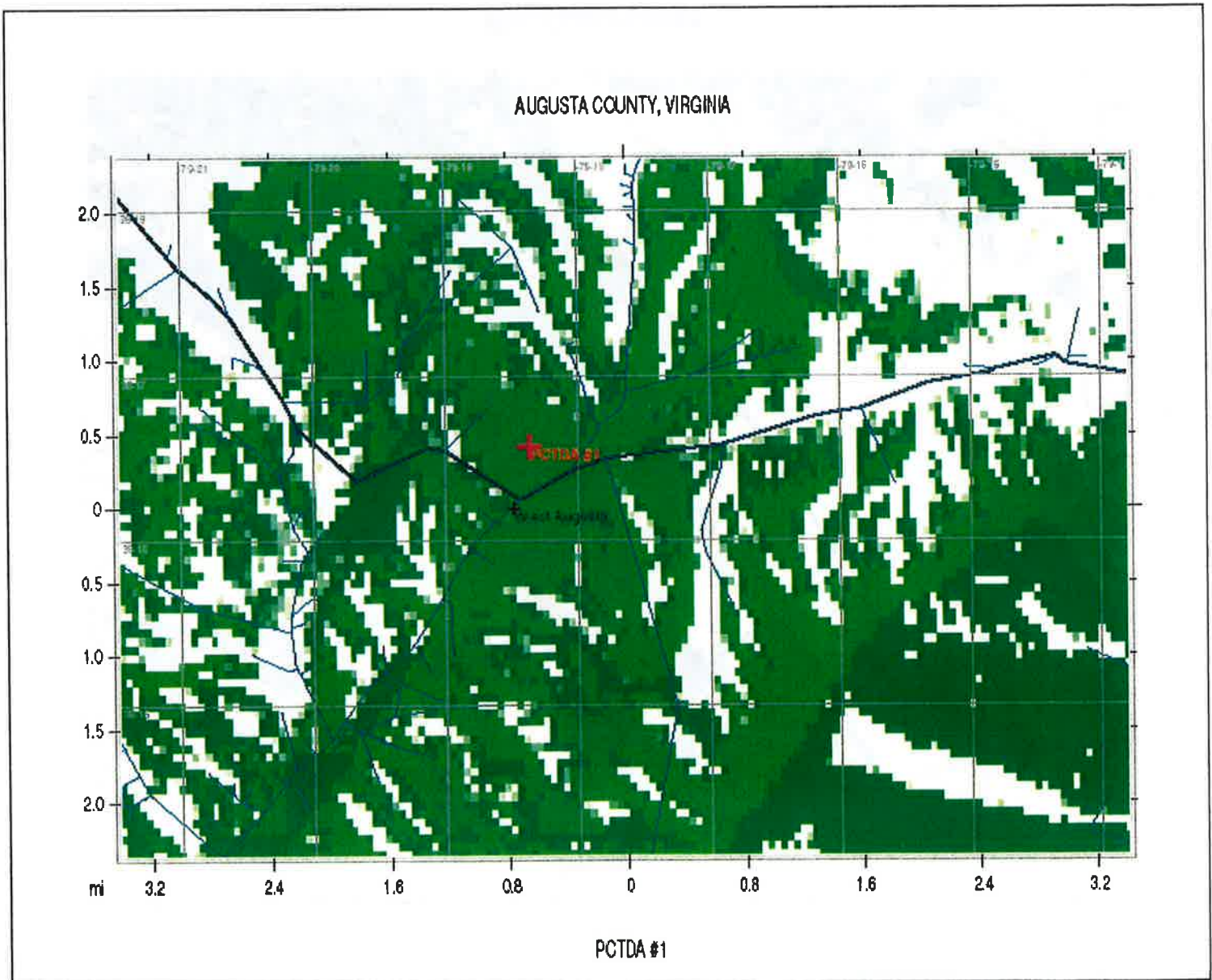
**Latitude: 38-16-34.5**

**Longitude: 79-18-22**

**Height of Tower: AGL: 195'**

**Co-Location Slots Available: 5**

**Community Served: West Augusta**



**PCTDA SITE #2.**

**NAME: Marble Valley**

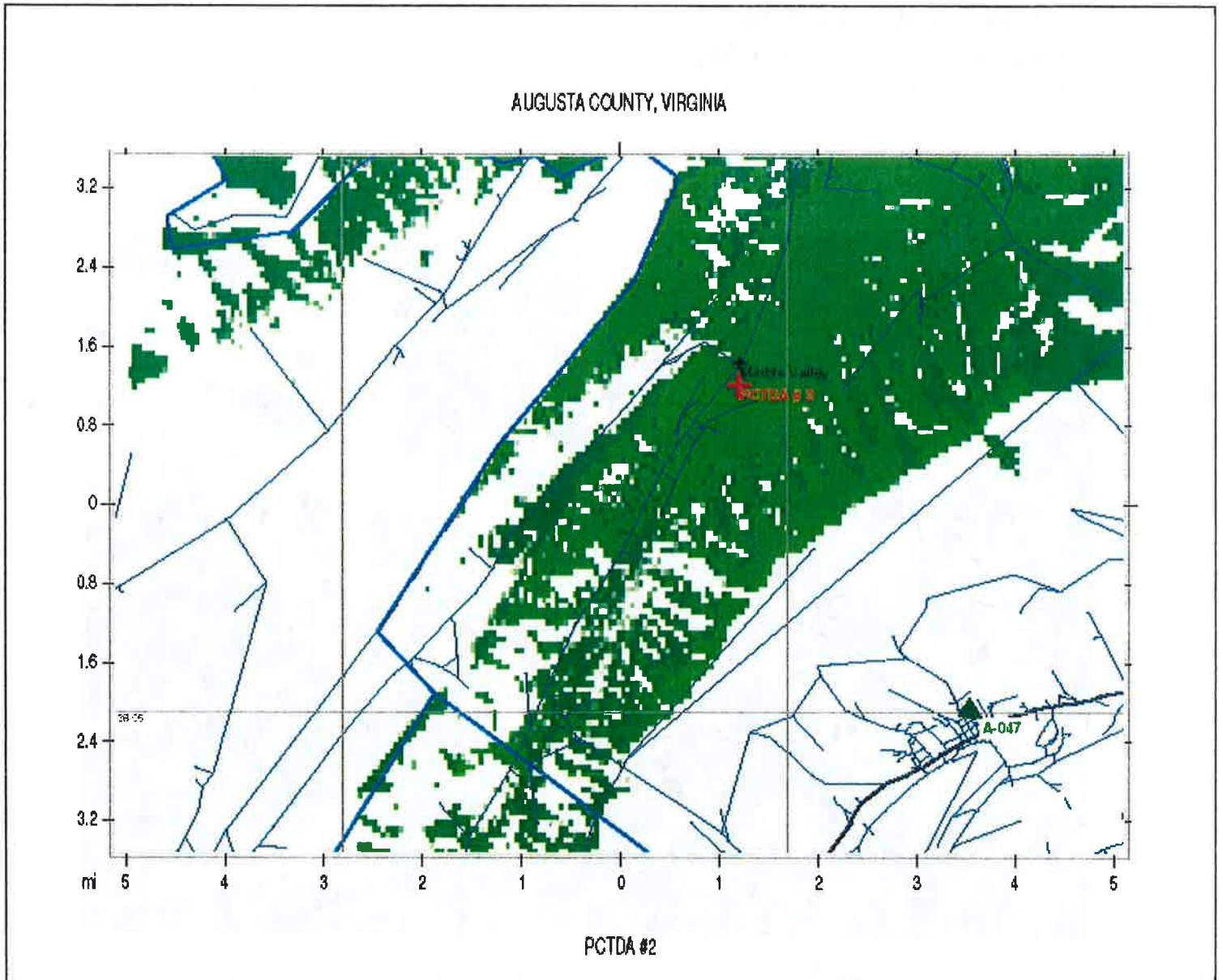
**Latitude: 38-7-55.0N**

**Longitude: 79-25-32.5 W**

**Height of Tower: AGL: 195'**

**Co-Location Slots Available: 5**

**Community Served: Marble Valley**





**PCTDA SITE: #3.**

**NAME: Summerdean**

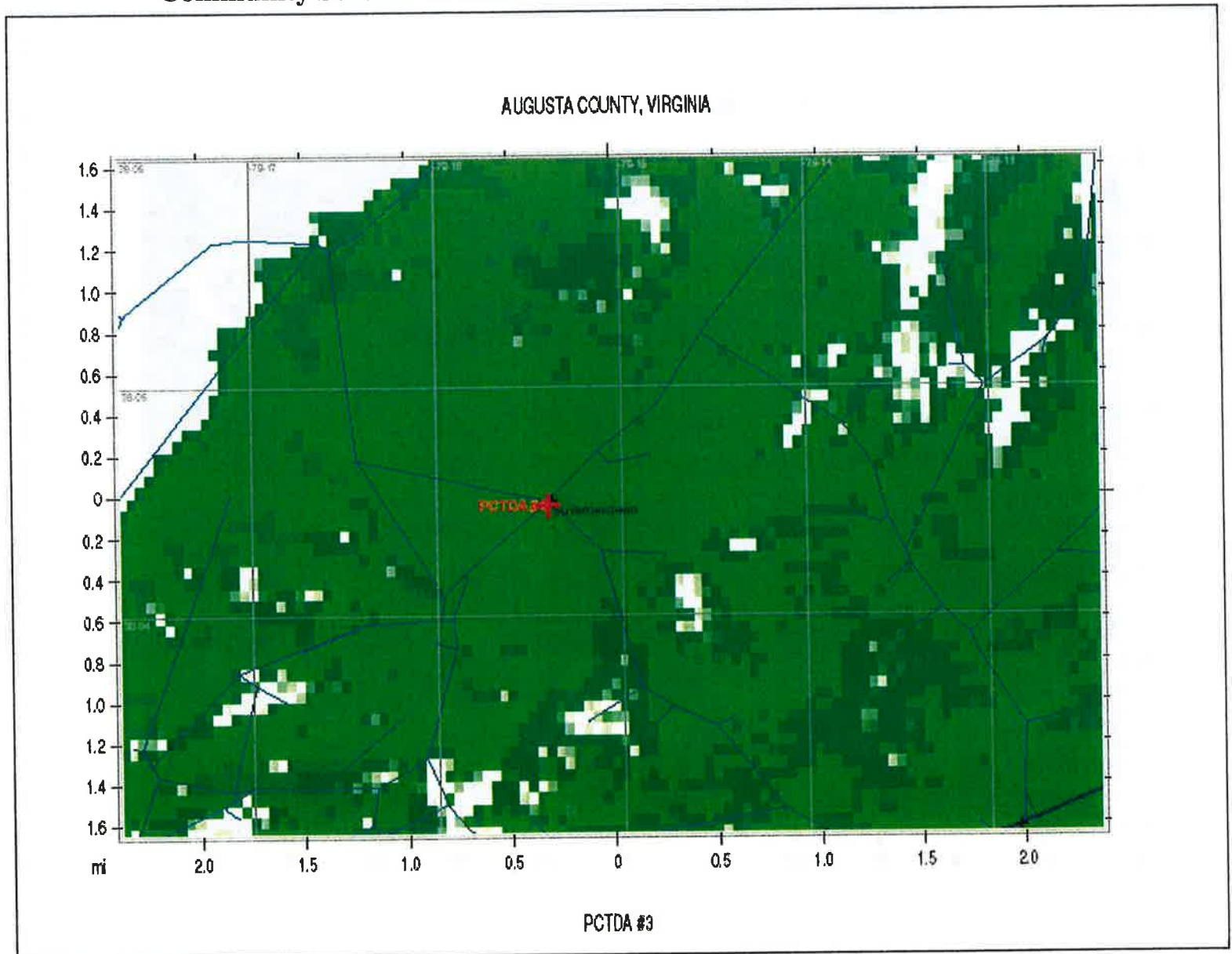
**Latitude: 38-4-29N**

**Longitude: 79-15-24.2 W**

**Height of Tower: AGL: 195'**

**Co-Location Slots Available: 5**

**Community Served: Summerdean**



**PCTDA SITE #4.**

**NAME: Middlebrook**

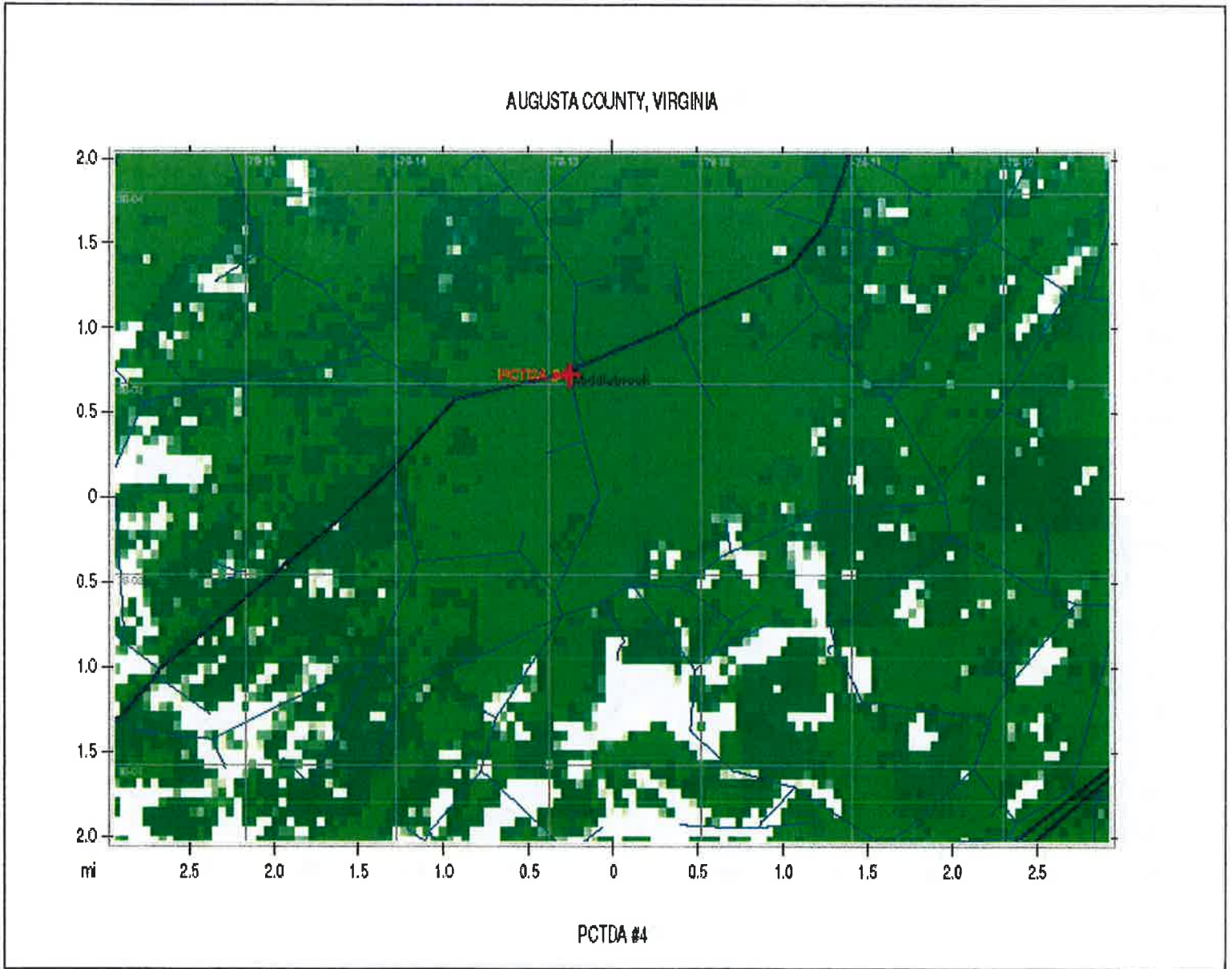
**Latitude: 38-3-2.8 N**

**Longitude: 79-12-52 W**

**Height of Tower: AGL: 195'**

**Co-Location Slots Available: 5**

**Community Served: Middlebrook**



**PCTDA SITE #: 5.**

**NAME: Deerfield**

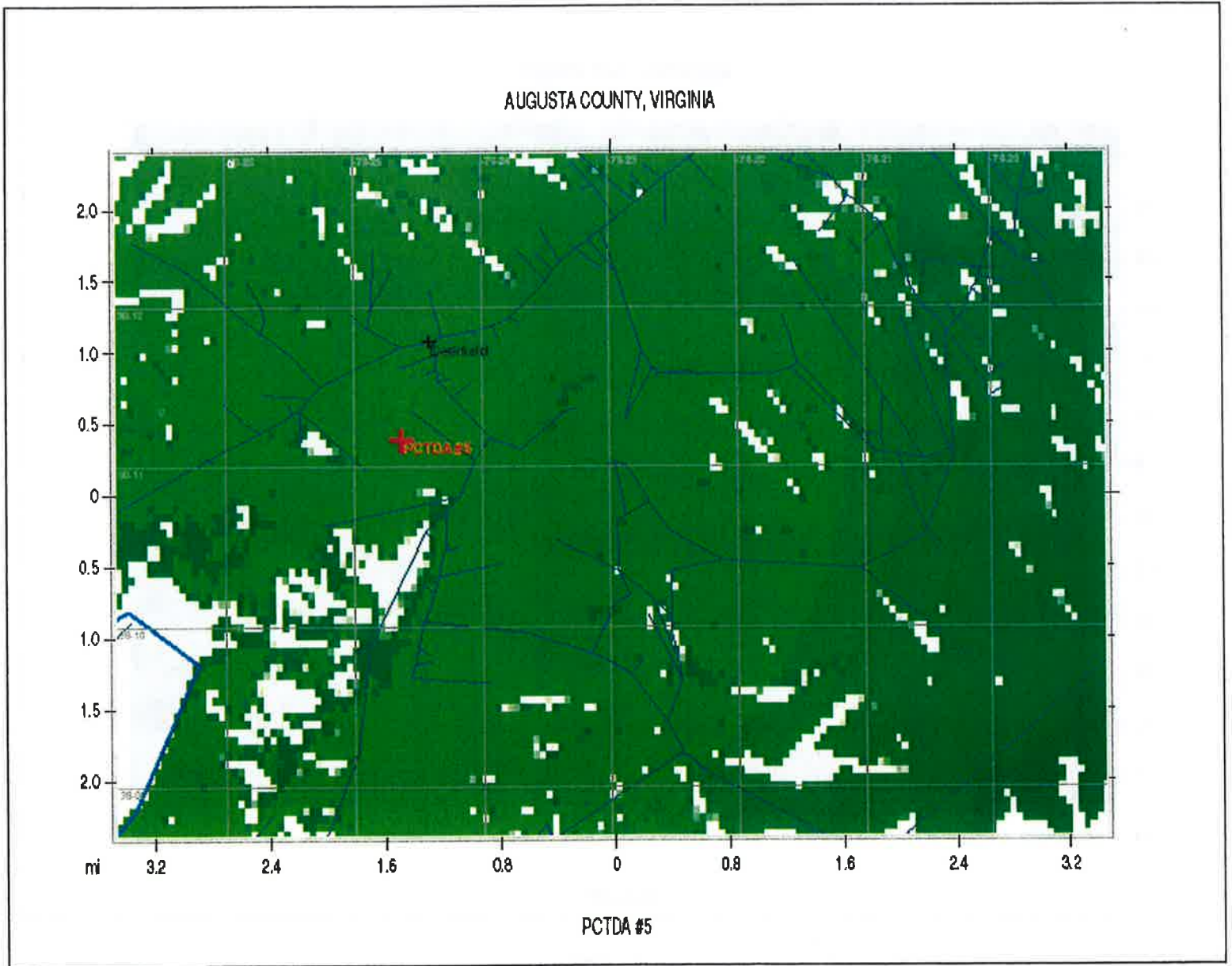
**Latitude: 38-8-3.9 N**

**Longitude: 79-25-26.2 W**

**Height of Tower: AGL: 285'**

**Co-Location Slots Available: 5**

**Community Served: Deerfield**





**PCTDA SITE #: 6.**

**NAME: Stokesville**

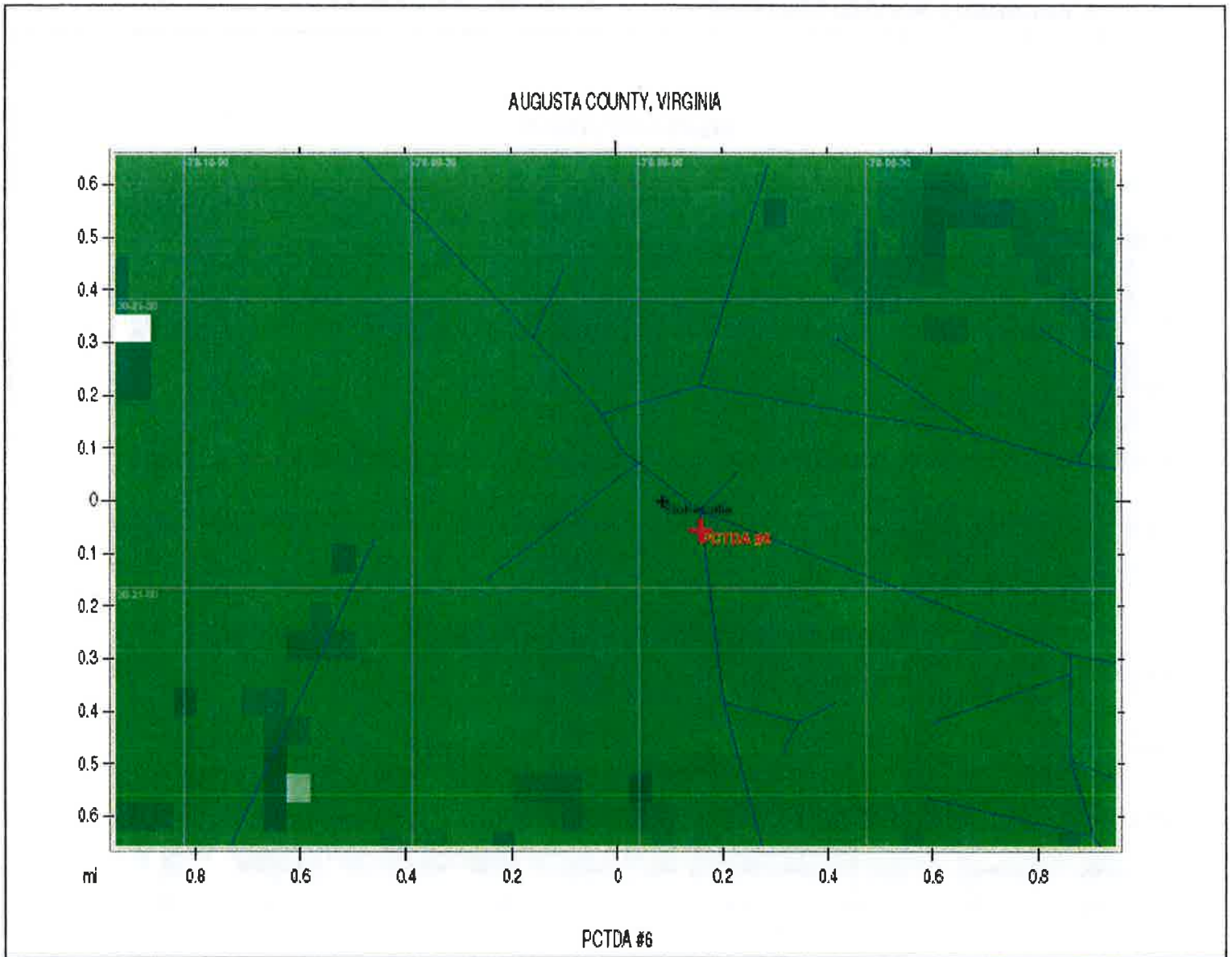
**Latitude: 38-21-6 N**

**Longitude: 79-8-52 W**

**Height of Tower: AGL: 195'**

**Co-Location Slots Available: 5**

**Community Served: Stokesville**







**PCTDA SITE #: 8.**

**NAME: Camp May Flather**

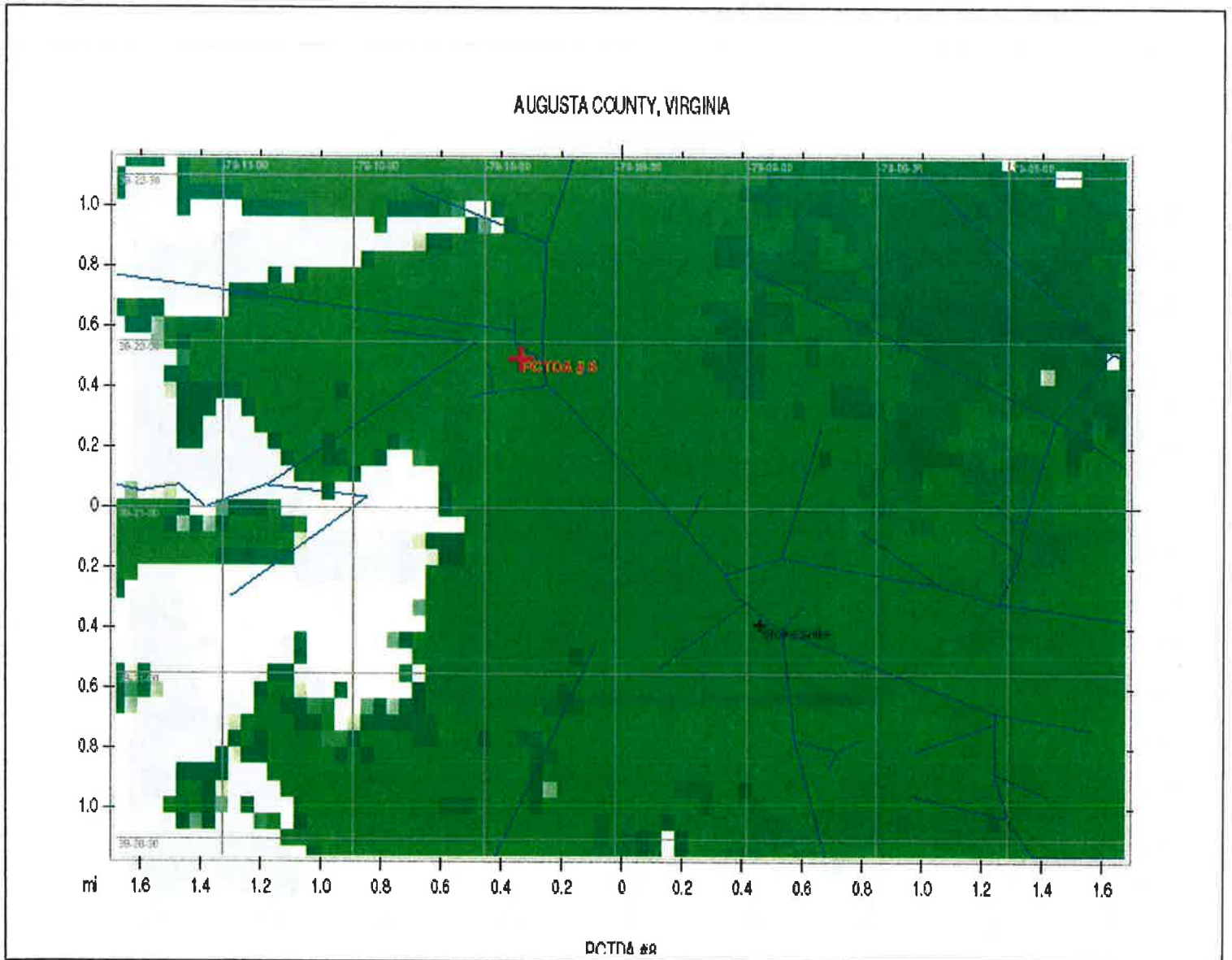
**Latitude: 38-21-57.1 N**

**Longitude: 79-9-51.8 W**

**Height of Tower: AGL: 195'**

**Co-Location Slots Available: 5**

**Community Served: Camp May Flather**



**PCTDA SITE #: 9.**

**NAME: Stribling Springs**

**Latitude: 38-18-26.3 N**

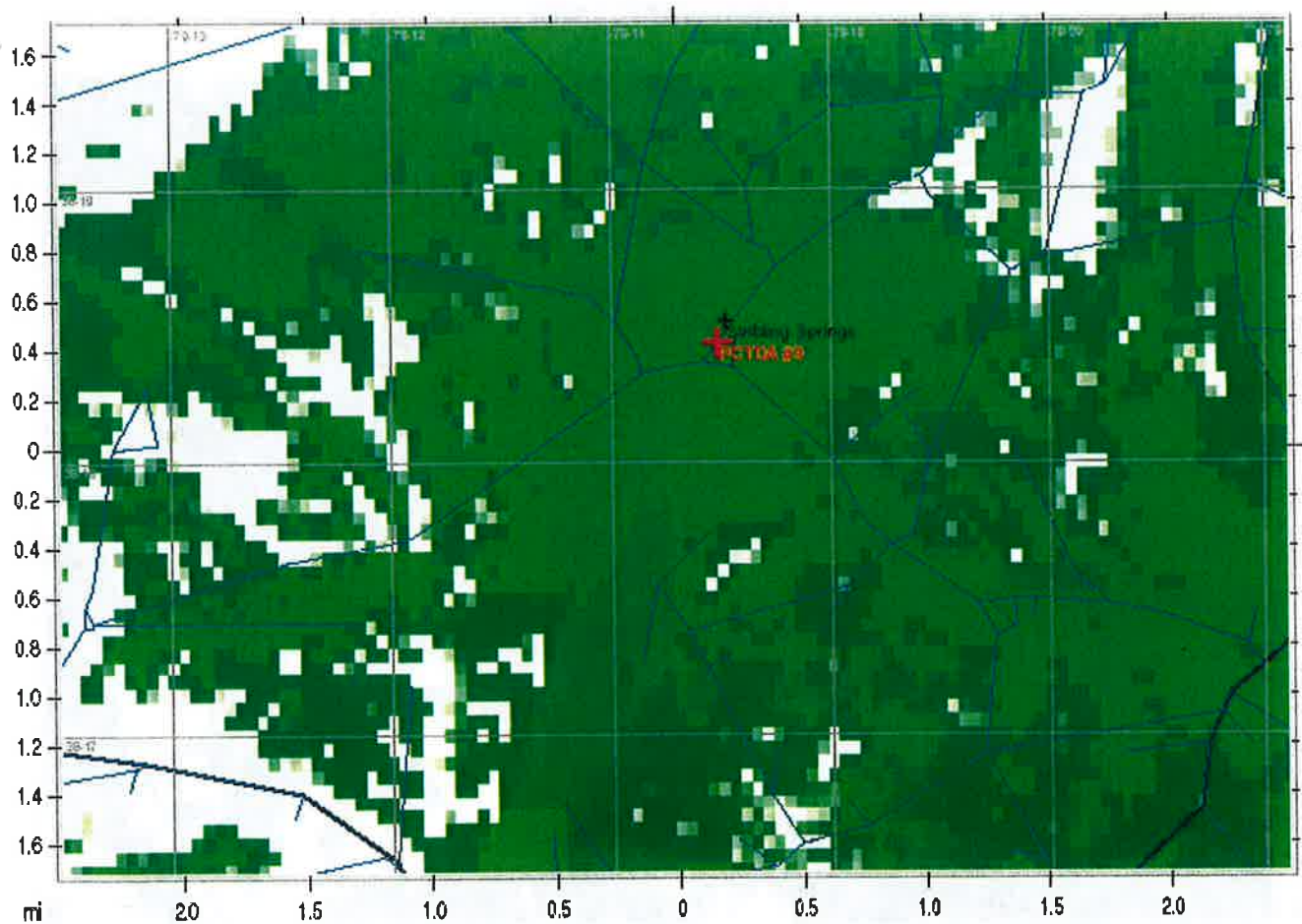
**Longitude: 79-10-31.2 W**

**Height of Tower: AGL: 195'**

**Co-Location Slots Available: 5**

**Community Served: Stribling Springs**

**AUGUSTA COUNTY, VIRGINIA**



**PCTDA #9**



**PCTDA SITE #: 10.**

**NAME: Parnassus**

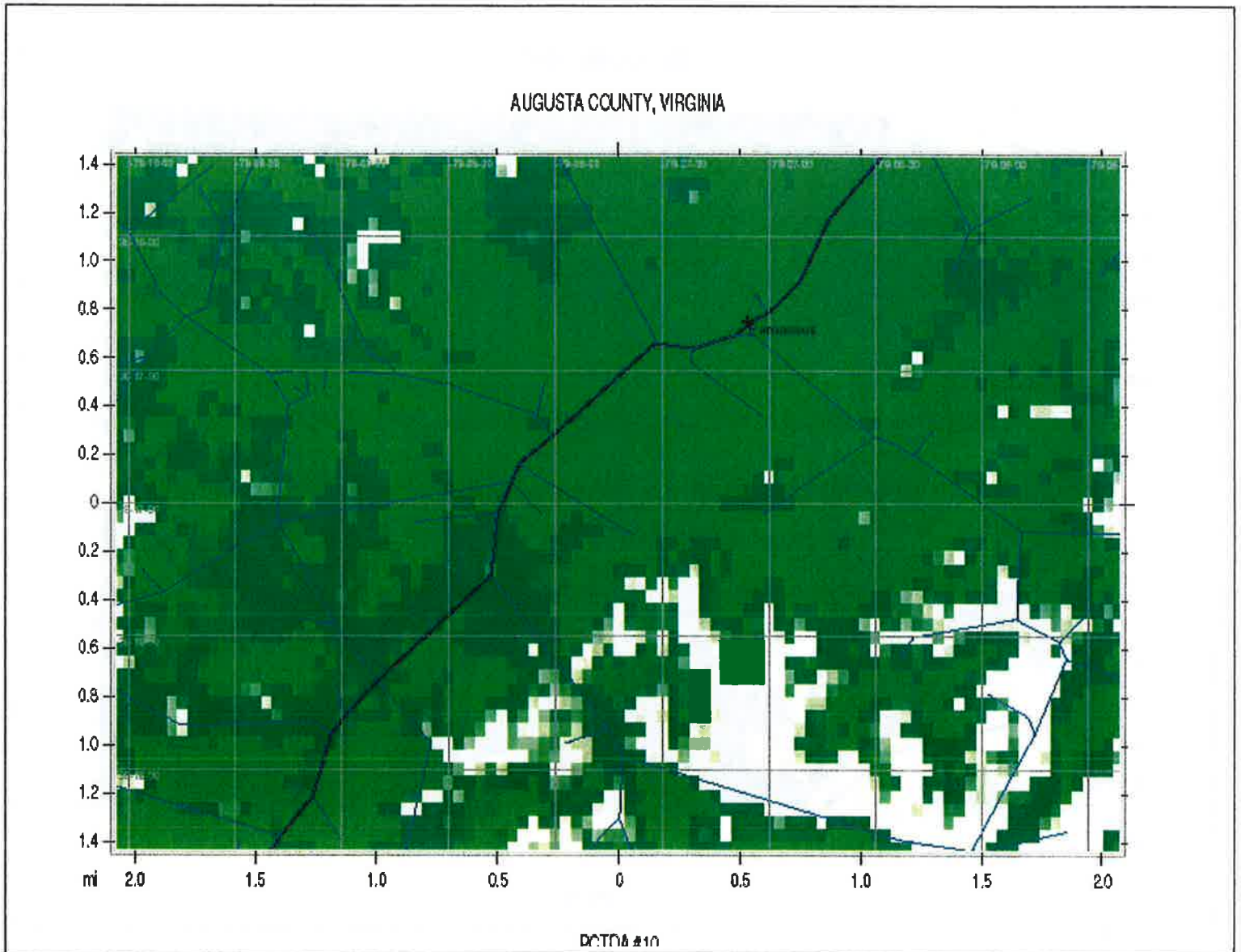
**Latitude: 38-17-39.4 N**

**Longitude: 79-07-5.1 W**

**Height of Tower: AGL: 195'**

**Co-Location Slots Available: 5**

**Community Served: Parnassus**



**PCTDA SITE #: 11.**

**NAME: Moscow**

**Latitude: 38-19-12.5 N**

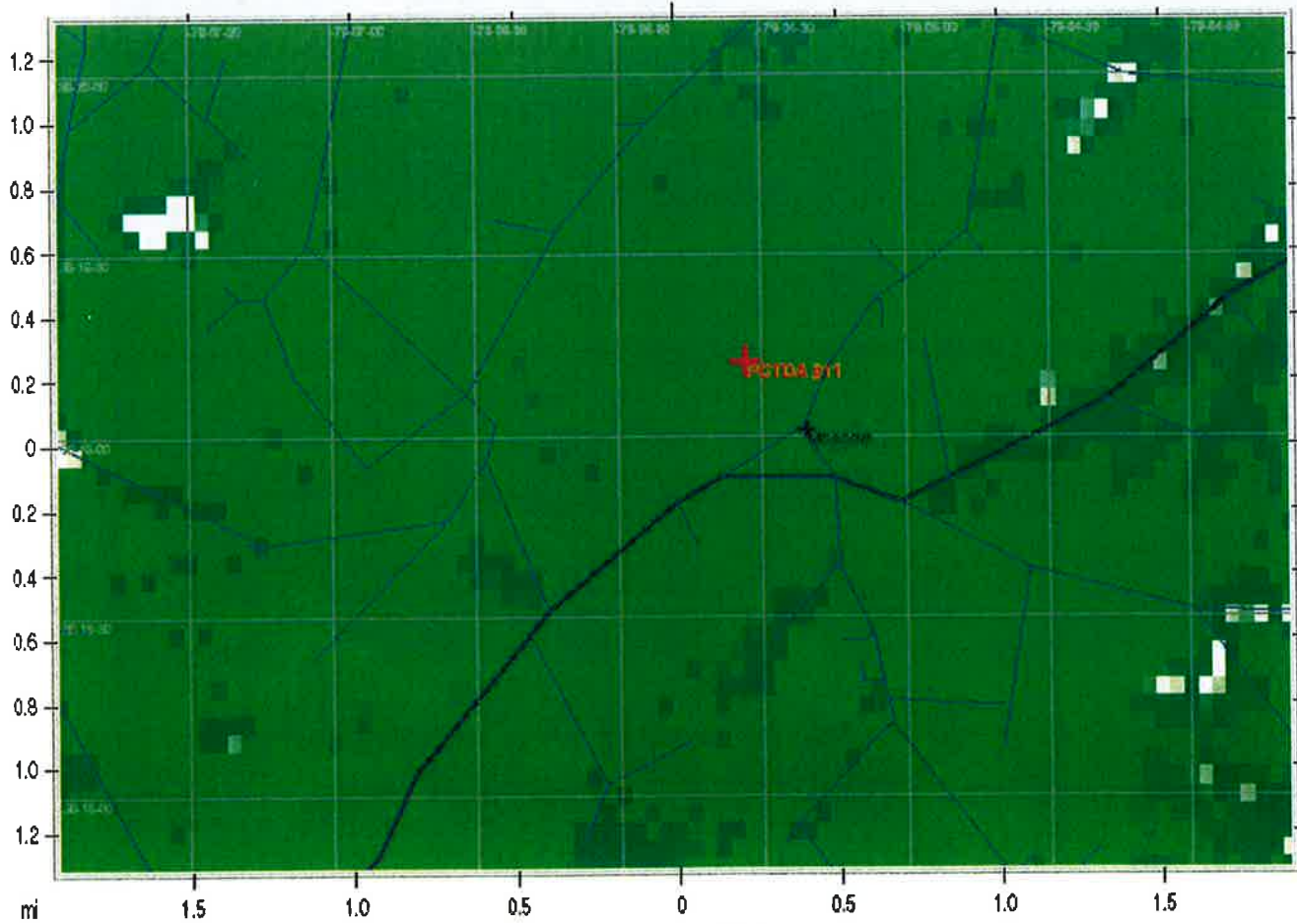
**Longitude: 79-5-33.7 W**

**Height of Tower: AGL: 195'**

**Co-Location Slots Available: 5**

**Community Served: Moscow**

**AUGUSTA COUNTY, VIRGINIA**



**PCTDA #11**

**PCTDA SITE #: 12.**

**NAME: Spring Hill**

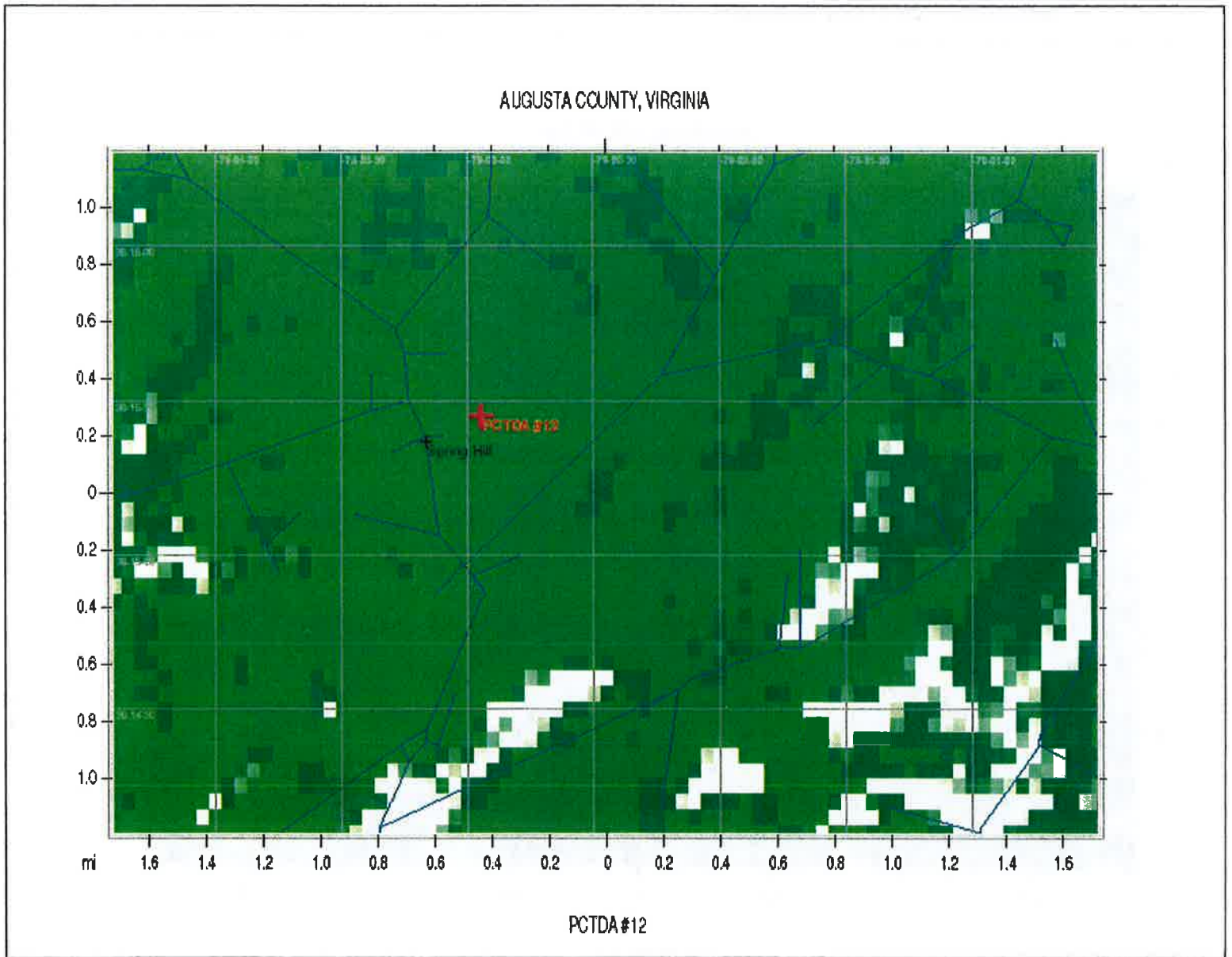
**Latitude: 38-15-27 N**

**Longitude: 79-2-56.8 W**

**Height of Tower: AGL: 195'**

**Co-Location Slots Available: 5**

**Community Served: Spring Hill**





**PCTDA SITE #: 13.**

**NAME: Roman Road**

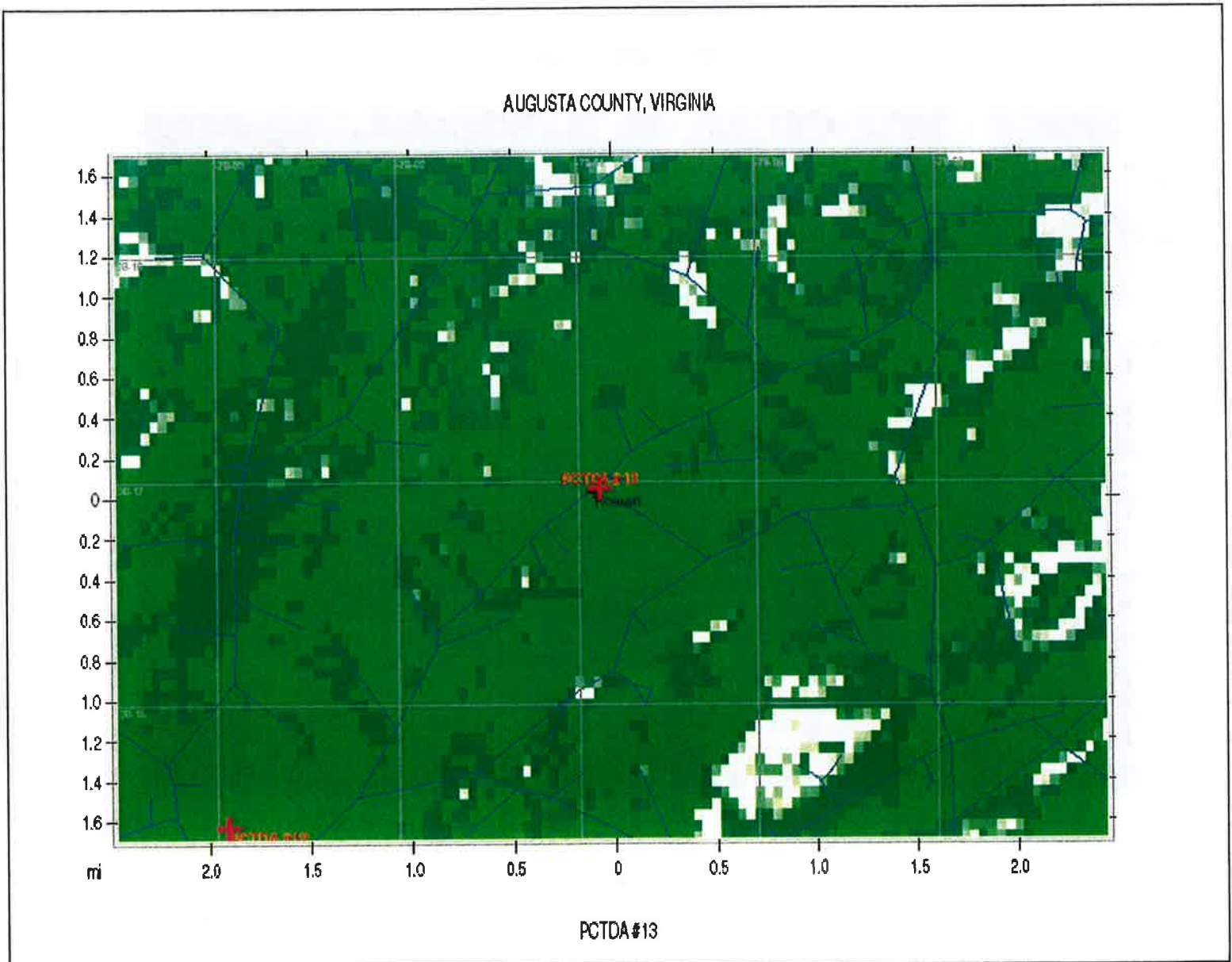
**Latitude: 38-16-58.1N**

**Longitude: 79-00-52.9 W**

**Height of Tower: AGL: 195'**

**Co-Location Slots Available: 5**

**Community Served: Roman Road corridor**



**PCTDA SITE #: 14.**

**NAME: Centerville**

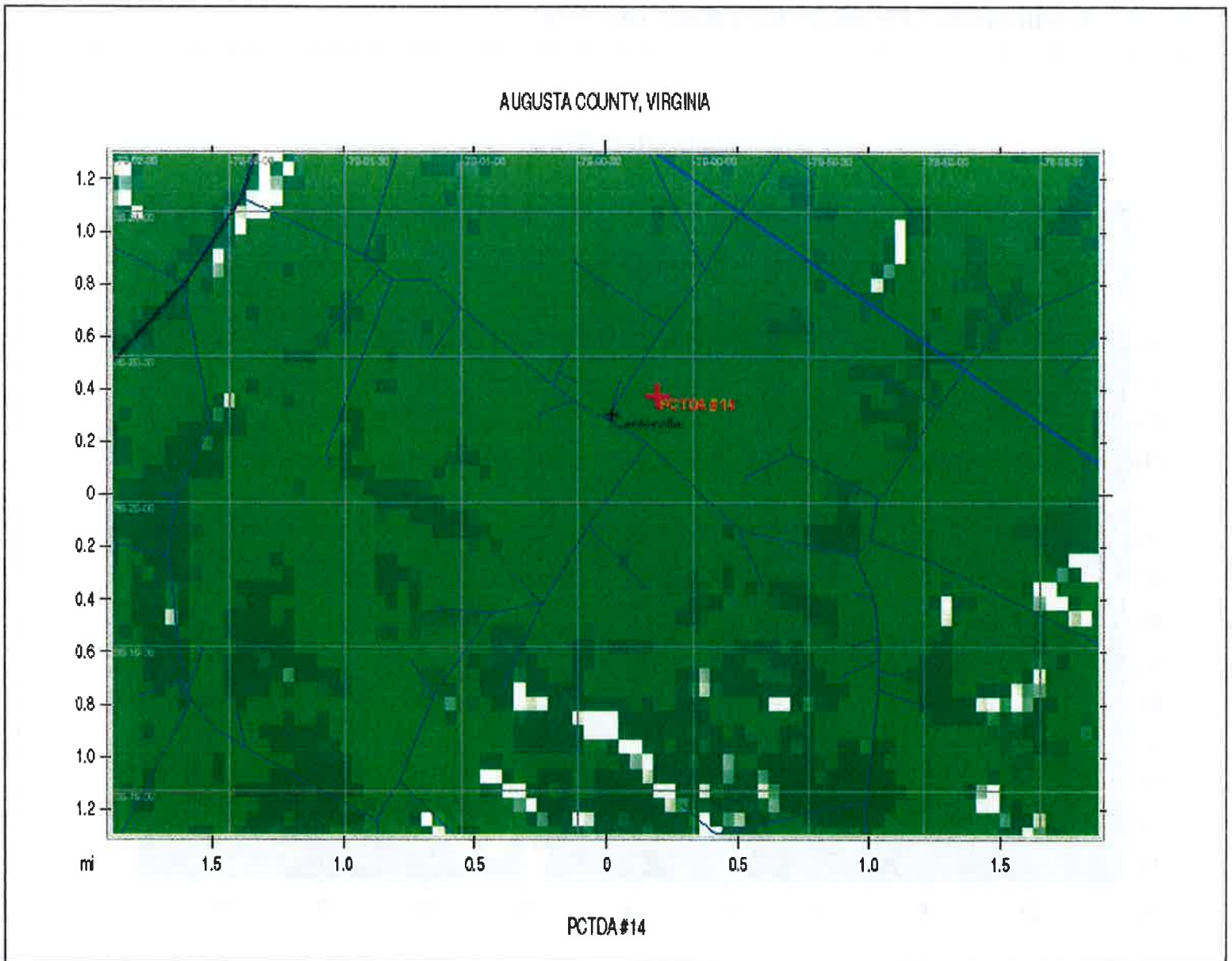
**Latitude: 38-20-22.1 N**

**Longitude: 79-00-9.3W**

**Height of Tower: AGL: 195'**

**Co-Location Slots Available: 5**

**Community Served: Centerville**





**PCTDA SITE #: 15.**

**NAME: Arbor Hill**

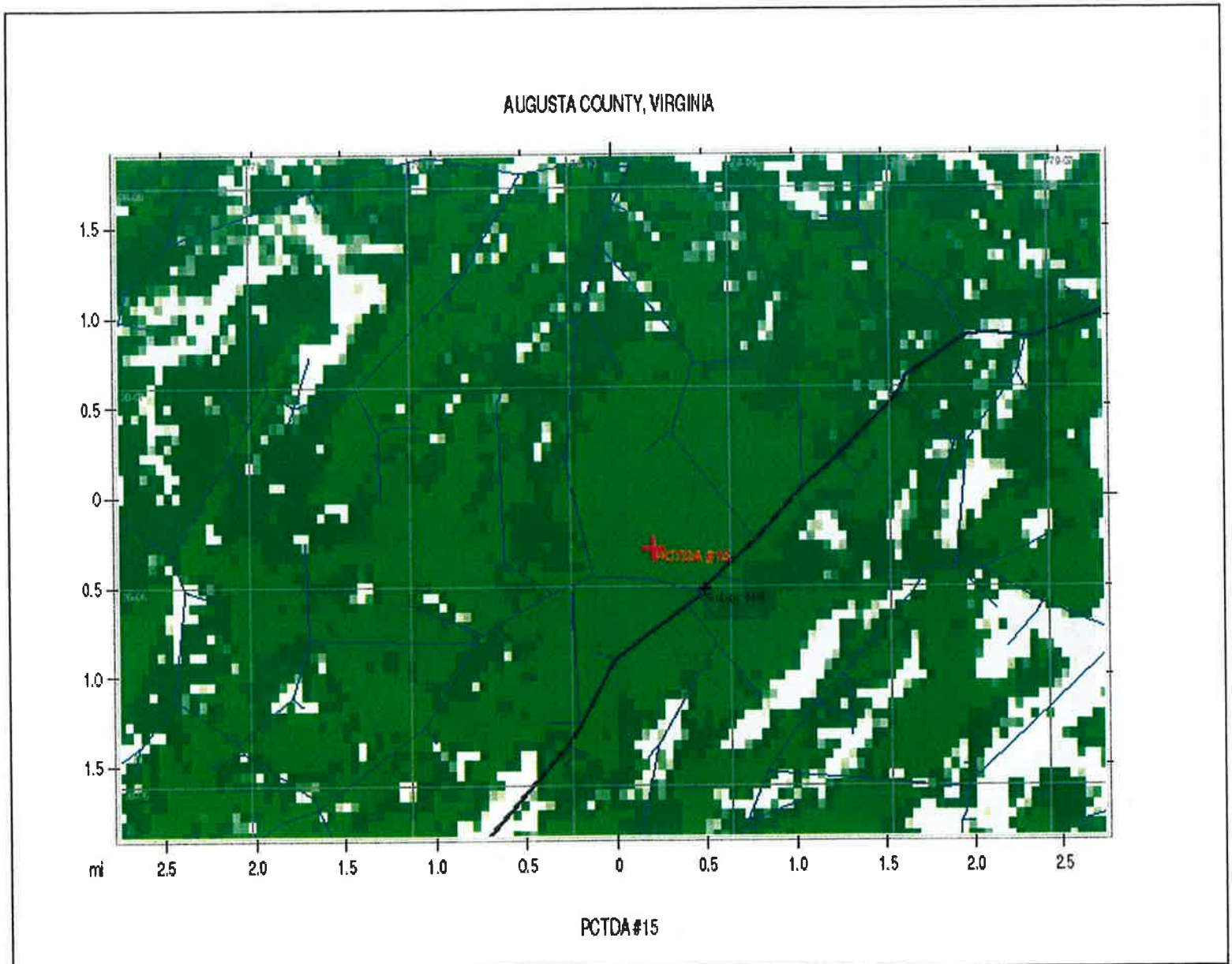
**Latitude: 38-6-11.5 N**

**Longitude: 79-9-29.4W**

**Height of Tower: AGL: 195'**

**Co-Location Slots Available: 5**

**Community Served: Arbor Hill**



**PCTDA SITE #: 16.**

**NAME: Sherando**

**Latitude: 37-56-34.8 N**

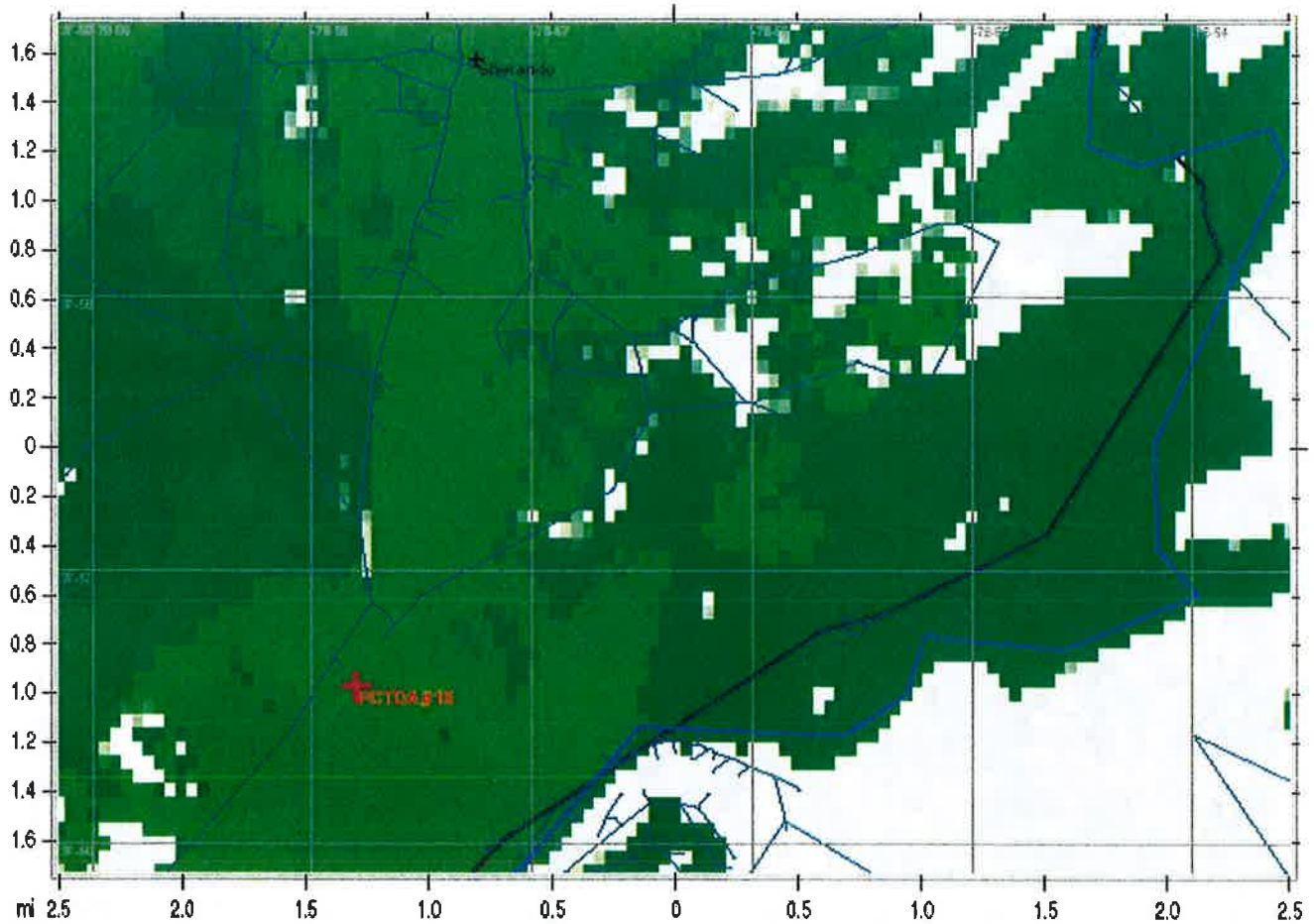
**Longitude: 78-57-48.1 W**

**Height of Tower: AGL: 195'**

**Co-Location Slots Available: 5**

**Community Served: Sherando**

AUGUSTA COUNTY, VIRGINIA



PCTDA #16

**PCTDA SITE #: 17.**

**NAME: Crimora**

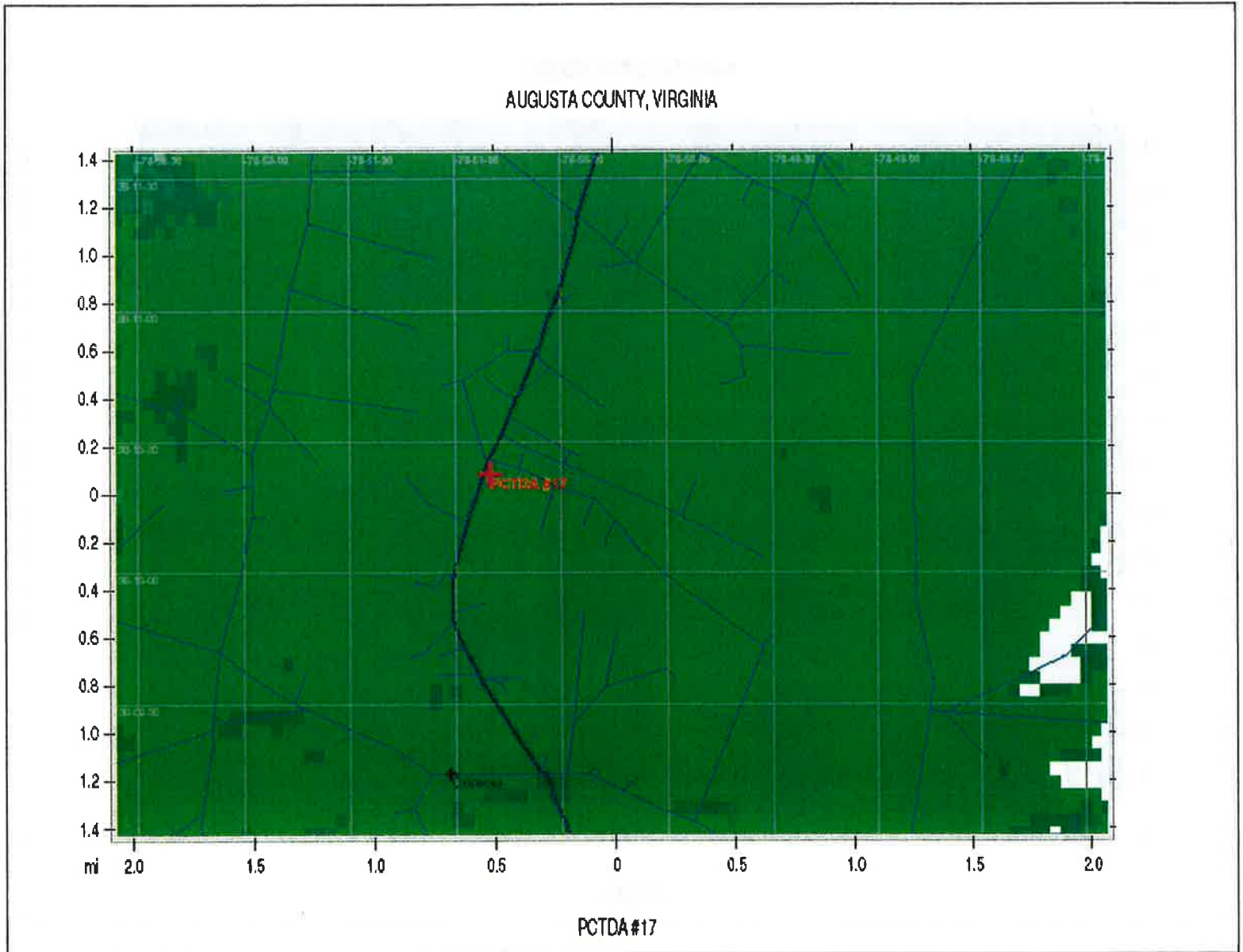
**Latitude: 38-10-22.7 N**

**Longitude: 78-50-50.5 W**

**Height of Tower: AGL: 195'**

**Co-Location Slots Available: 5**

**Community Served: Crimora**





**PCTDA # 18**

**NAME: New Hope**

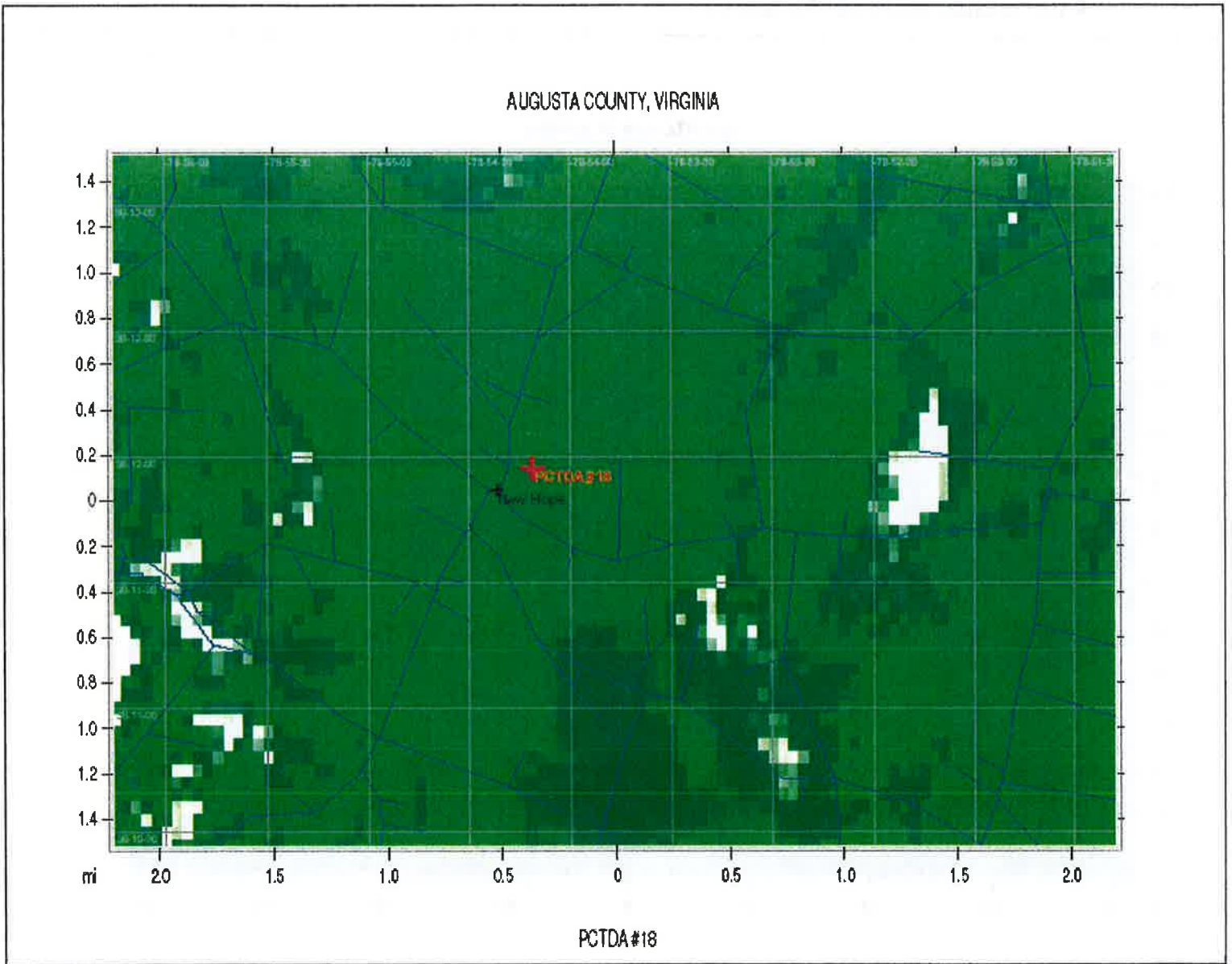
**Latitude: 38-11-57.3 N**

**Longitude: 78-54-11.3W**

**Height of Tower: AGL: 195'**

**Co-Location Slots Available: 5**

**Community Served: New Hope**



**PCTDA SITE #: 19.**

**NAME: Steeles Tavern**

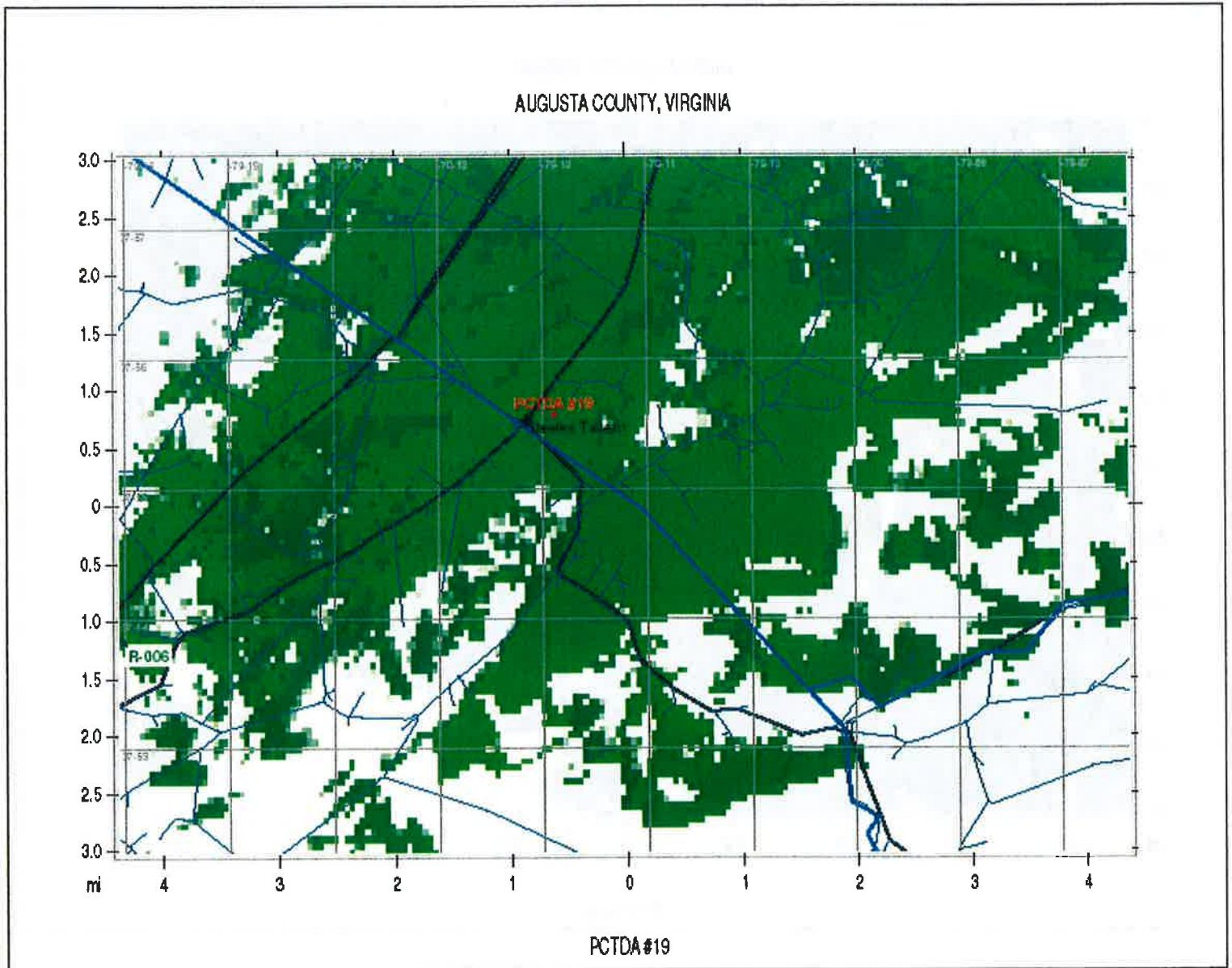
**Latitude: 37-55-34.7 N**

**Longitude: 79-11-53.7W**

**Height of Tower: AGL: 195'**

**Co-Location Slots Available: 5**

**Community Served: Steeles Tavern**



**PCTDA #20**

**NAME: Stoney Creek**

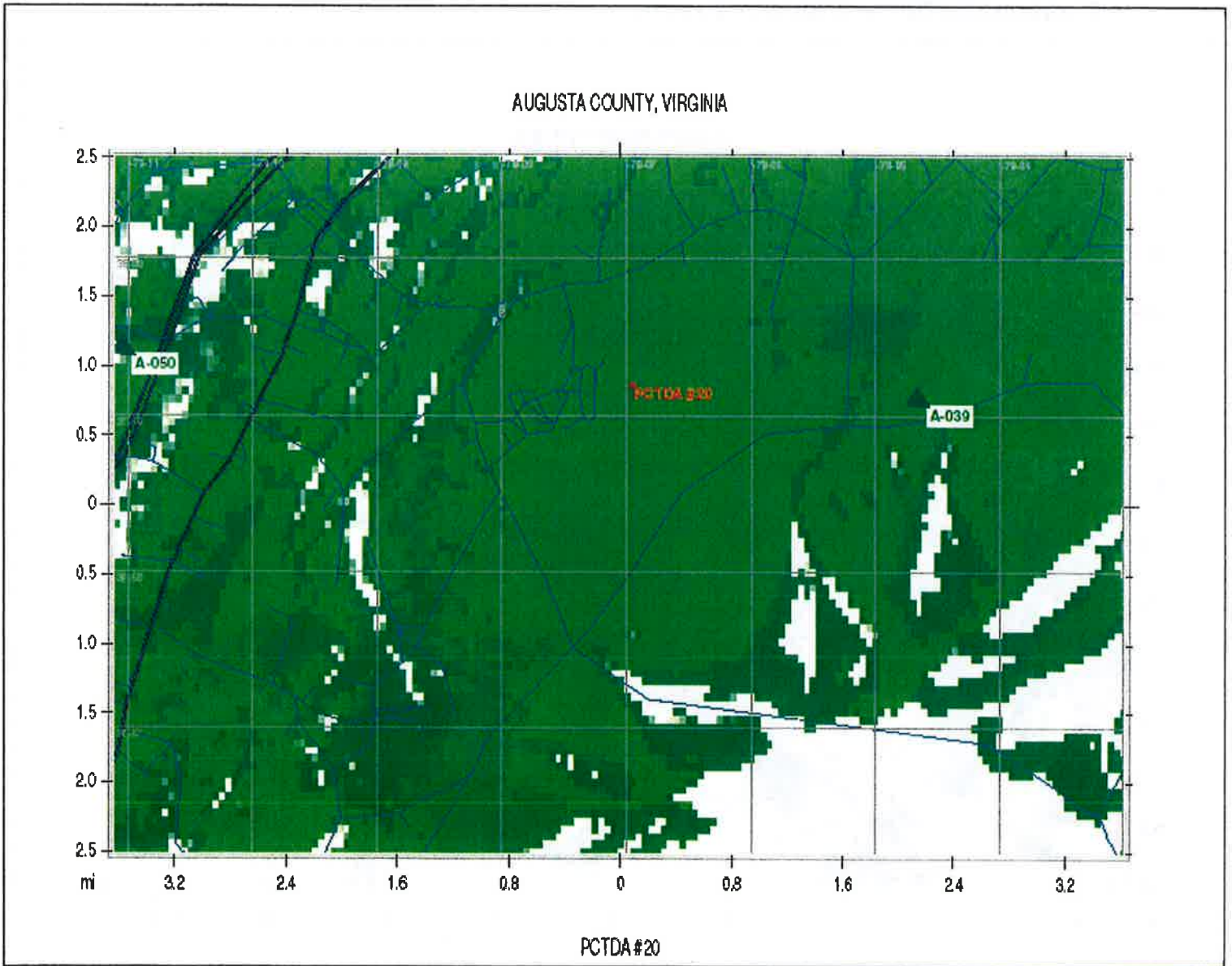
**Latitude: 37-59-11.8 N**

**Longitude: 79-6-57.4**

**Height of Tower: AGL: 195'**

**Co-Location Slots Available: 5**

**Community Served: Sengers Mtn. Lake**





**PCTDA SITE #: 21.**

**NAME: Rivermont/Lake Road**

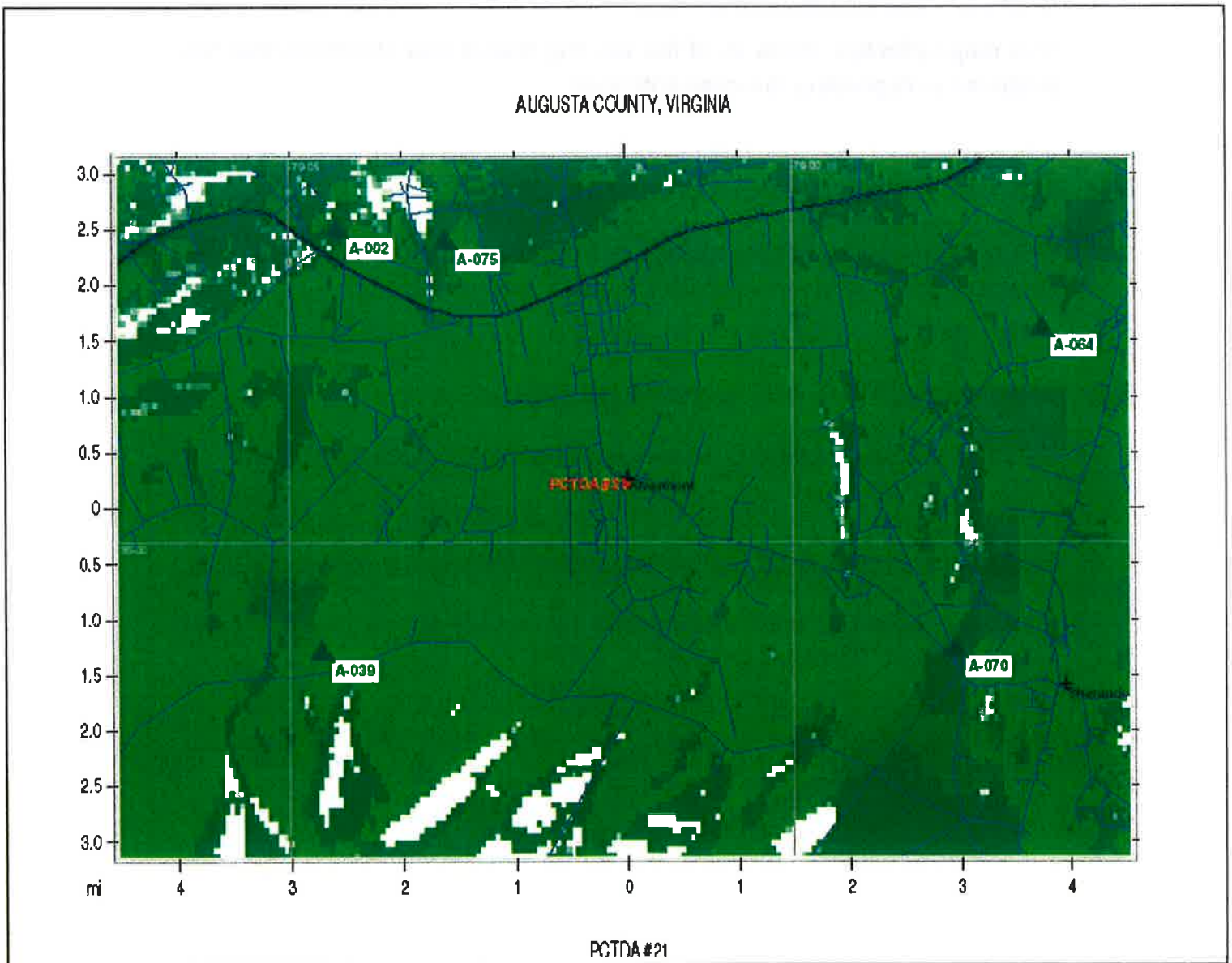
**Latitude: 38-0-27.8 N**

**Longitude: 79-1-38.4 W**

**Height of Tower: AGL: 195'**

**Co-Location Slots Available: 5**

**Community Served: Rivermont**



## **Exhibits:**

### **4.0 FCC License Holders**

#### **4.1 Map of Existing Towers + PCTDA Structures**

This map indicates where all of the existing towers and structures that has antennas or is pending to house antennas.

#### **4.2 Map of Existing 3-G Coverage Only**

This map indicates what the existing 3-G coverage is and what potential 4-G coverage will be when this service comes to Augusta County.

#### **4.3 Map of PCTDA 4-G Coverage Only**

This map indicates what 4-G coverage will be if PCTDA are built in total.

#### **4.4 Map of Future 4-G Coverage for Wireless Broadband**

This map indicates what existing and future 4-G coverage will be with existing and PCTDA sites are built.



## **Exhibit 4.0**

### **FCC License Holders**

The Federal Communications Commission (FCC), established in 1934, is an independent United States government agency. The FCC is charged with regulating interstate and international communications by radio, television, wire, satellite and cable. Among its responsibilities, the FCC grants licenses to license holders to operate at certain frequencies or within certain frequency ranges. The FCC also ensures that wireless telecommunication service providers comply with the Communications Act and Commission rules, orders and policies. The Wireless Telecommunications Bureau is a branch of the FCC and is responsible for all domestic wireless telecommunication programs, except those involving satellites. Listed below are the current wireless communication providers licensed by the FCC to operate in Augusta County. They are:

1. AT&T Wireless (merged with New Cingular)
2. Verizon Wireless (merged with GTE and ALLTEL)
3. NTELOS Wireless
4. Sprint/Nextel
5. T-Mobile
6. US Cellular

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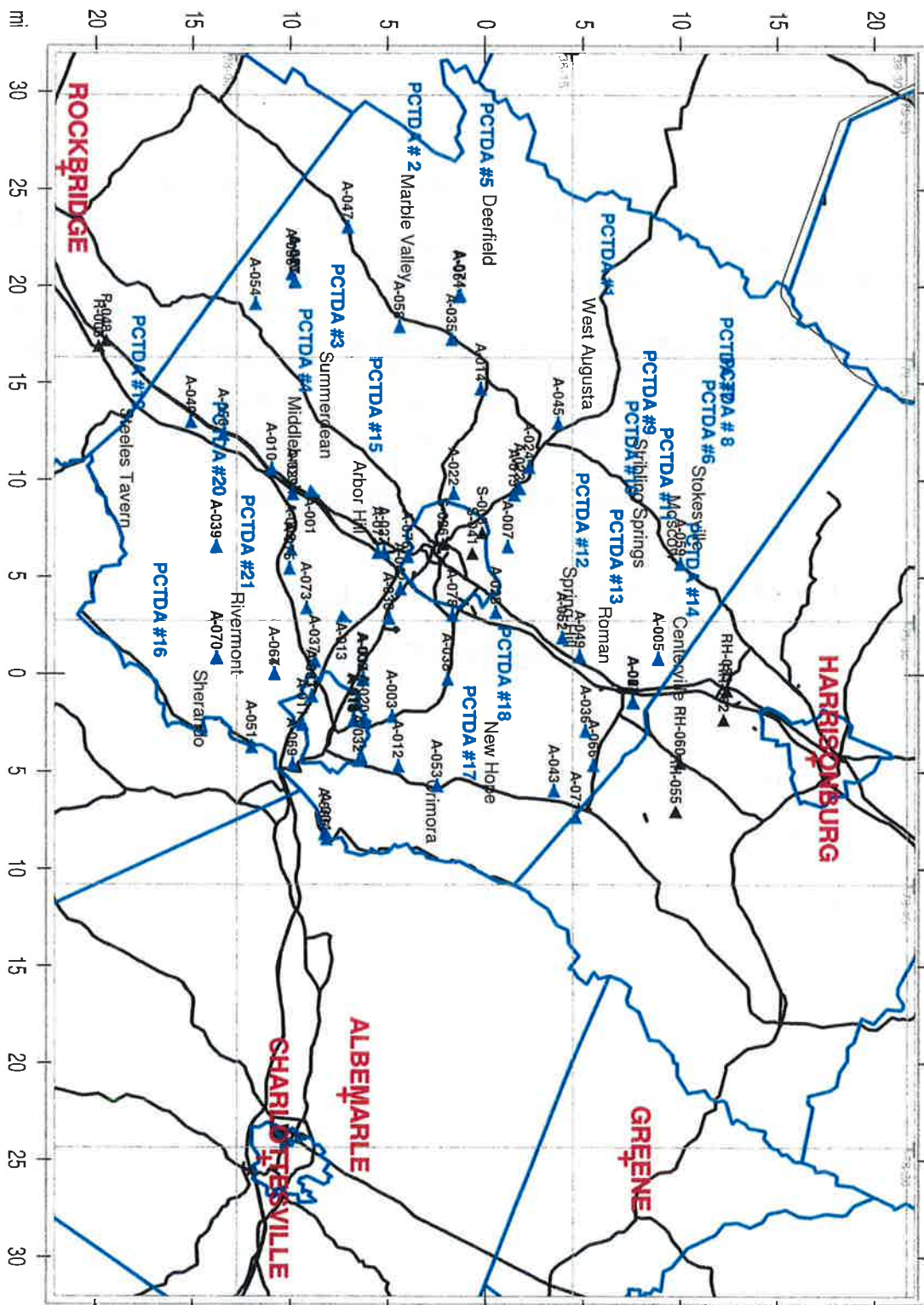


EXHIBIT 4.1- MAP OF EXISTING TOWERS + PCTDA STRUCTURES

AUGUSTA COUNTY, VIRGINIA

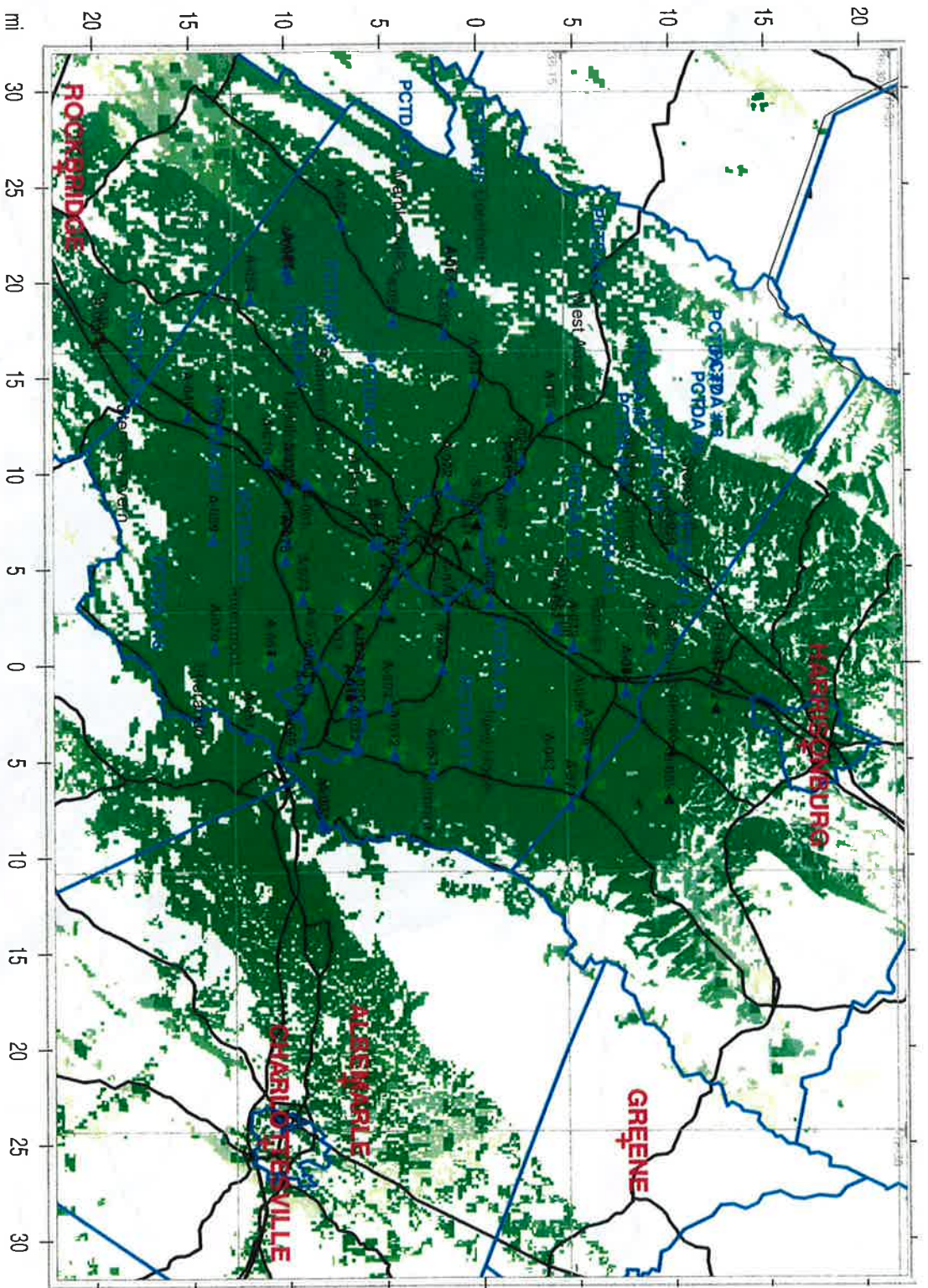


EXHIBIT 4.2- MAP OF EXISTING 3-G COVERAGE



AUGUSTA COUNTY, VIRGINIA

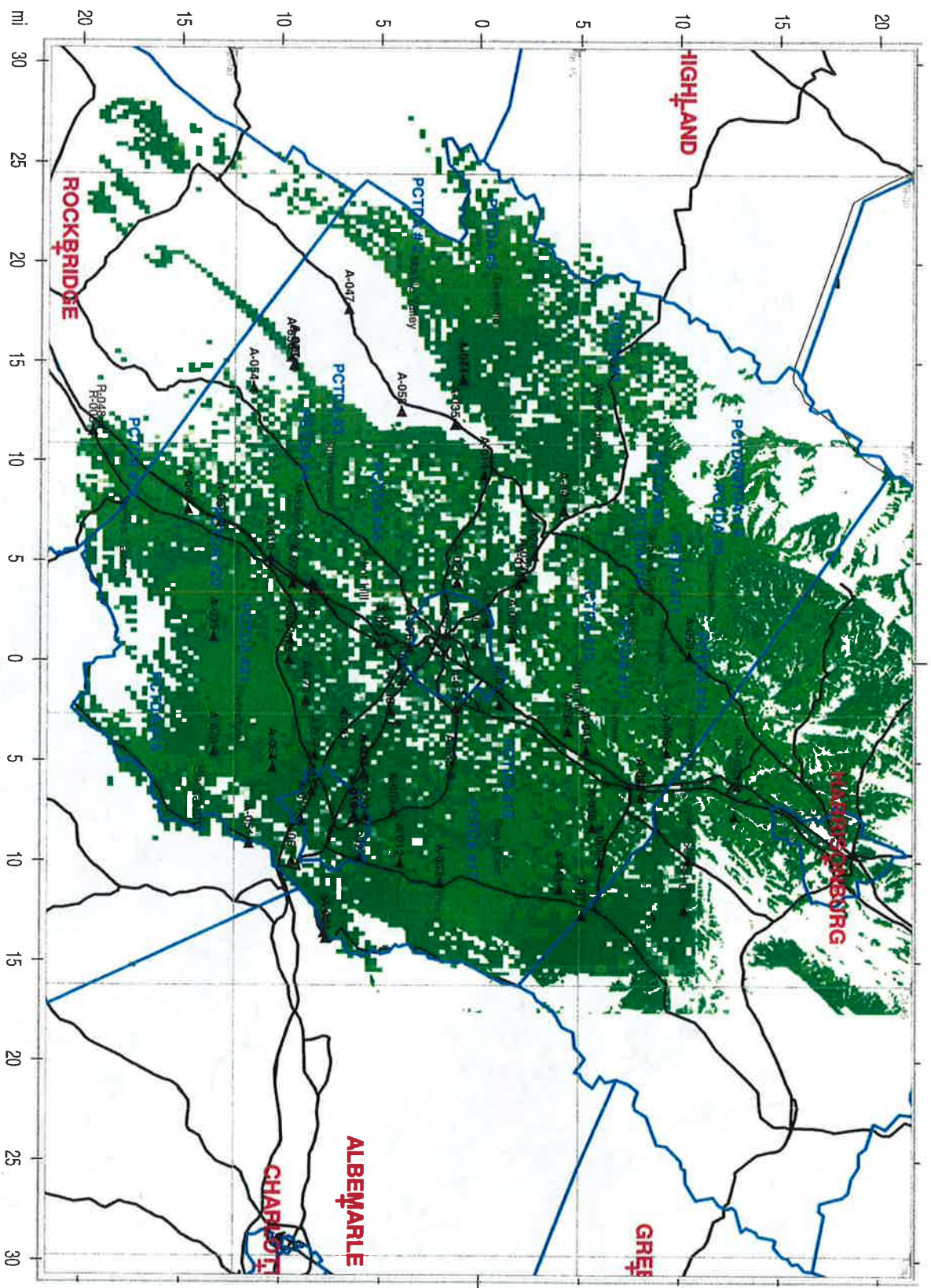


EXHIBIT 4.3 - MAP OF PCTDA 4-G COVERAGE ONLY



AUGUSTA COUNTY, VIRGINIA

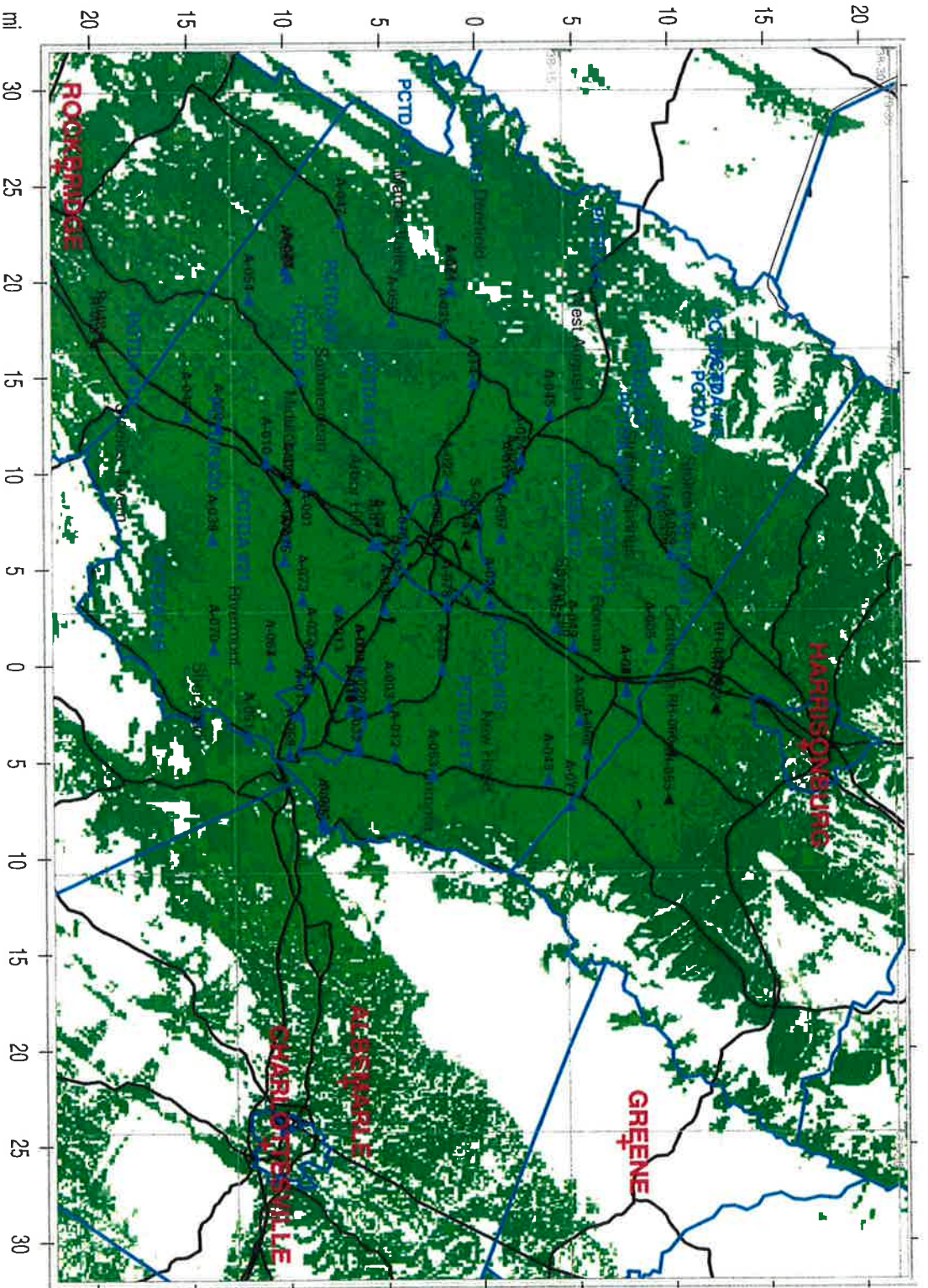


EXHIBIT 4.4 FUTURE 4G TOTAL COVERAGE: WIRELESS BROADBAND WITH EXISTING TOWERS & PCTDA STRUCTURES