



BUG TUSSEL EXPLODES IN GROWTH

A funny thing happened on Steve Schneider's way to retirement: He says he found "the secret sauce" for rural broadband expansion.

If you want to learn more about Steve's "Retirement Project" and the mission that Bug Tussel has undertaken, visit btussel.com/news/bug-tussel-explodes-in-growth to see the full Green Bay Press Gazette Article.

NOVEMBER BUG TUSSEL UNIVERSITY CLASSES

- How to Video Chat | 11/16 | Barneveld Public Library

Learn about our upcoming classes at btussel.com/free-tech-education/attend-a-class

SUBSCRIPTIONS

Over 280 fixed wireless subscriptions.

Over 60 signed up for fiber.

COUNTY PARTNERSHIP

Bug Tussel is a proud partner of Iowa County!

- 2020 Grant (Phase I)
- 2022 Bond (Phase II)

The project, **R.O.A.D. to Digital Equality**, will equip the county with fixed wireless sites to facilitate rapid expansion, followed by multiple phases of fiberoptic cable. These fiber projects will cover more than 130 miles throughout the county and will provide a catalyst for future last-mile expansion.

MARKETING & SALES

Ads & Sponsorships

- Daily Facebook wireless and fiber internet ads.
- "Fiber coming soon" mailers sent out to fiber route addresses on November 14.
- TV Commercial aired regularly beginning November 15 on CH27 WKOW promoting fiber to communities.

News and Promos

- Fiber is live!
 - Free installation for the first 500 feet in qualifying fiber areas.

YOUR SALES REPRESENTATIVES



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Towers

On Air: 22*

*Includes AT&T only towers

- Tower construction and installation complete.
- Internet is live and operational.
- Customers are ready to be connected, with unique installation for each connection taking additional time.

Construction: 0

- Design and plan the tower build (civil construction).
- Construct tower by stacking from bottom to top.
- Install utilities such as equipment, antenna and lines.
- Integrate connections to internet network.

Zoning: 0

- Submit permits.
- Awaiting approval from local and federal agencies.

Site Acquisition: 2

- Search for and determine tower site.
- Negotiate and sign lease in cooperation with landowner.

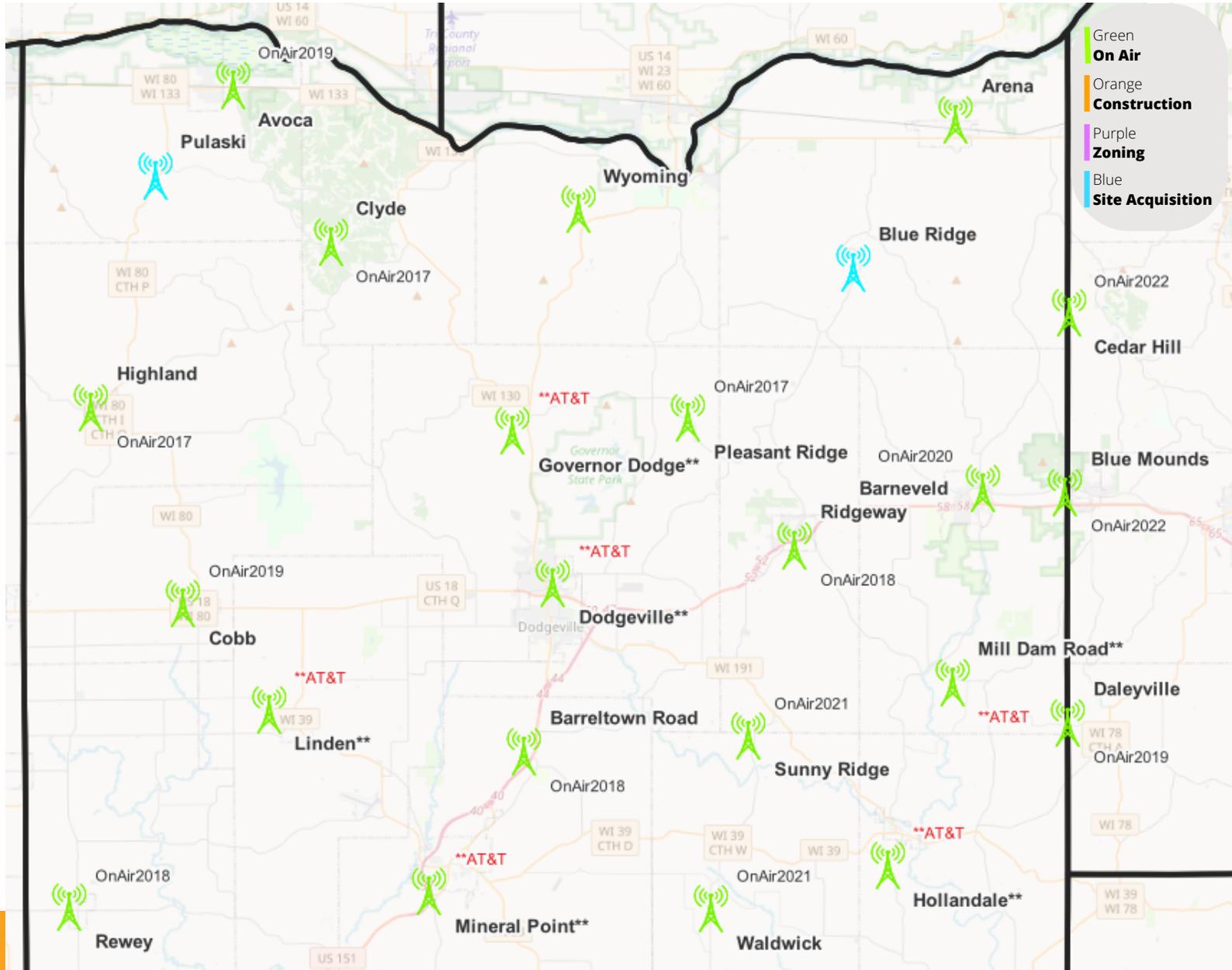
UPDATES

Site Acquisition

Bug Tussel teams are working on analysis and a lease agreement plan for a Pulaski site. Teams are also working on analysis for a Blue Ridge site.

On Air

Wyoming is on air, producing LTE fixed wireless service. Fiber-to-the-home is also live in the Wyoming vicinity.



*This map includes a rough estimate of site locations and may not accurately reflect actual tower placement.

Site Acquisition Timeline



6-12 MONTHS

BOND EFFORT

Meet with county and municipalities, plan funding, provide due diligence, plan county network (towers and fiber). Several votes with different county committees. Final county board vote (often requires supermajority).



1-3 MONTHS

SEARCH

Connect with property owners within a search ring (about 1 month). Evaluate properties, choose preferred location (about 1 month).



1-3 MONTHS

LEASING

Work with landowner to agree to tower layout, lease terms, address title issues, etc. Often requires attorney review.



6-12 MONTHS

GOVERNMENT APPROVALS

Obtain local permits (driveway permit, address, zoning/conditional use permit, etc). Often requires public notice and hearings.

Obtain federal regulatory approval, including from FAA, FCC, EPA, and other entities. Requires on-site soil, archeological, geologic, historical, etc. studies.

Fiber

Connected: 53 miles*

*Additional time required for each customer installation

- Fiber network is complete and connected.
- Internet is live and operational.
- Customers are ready to be connected, with unique installation for each connection taking additional time.

Fiber: 53 miles completed

- Fiber is sent through installed conduit via fiber blowing, a technique using a machine on wheels that blows air to push the fiber through the cable.
- Sections of fiber are connected to each other via Splicing, the fusion of fiber with an optical laser.

Conduit: 53 miles completed

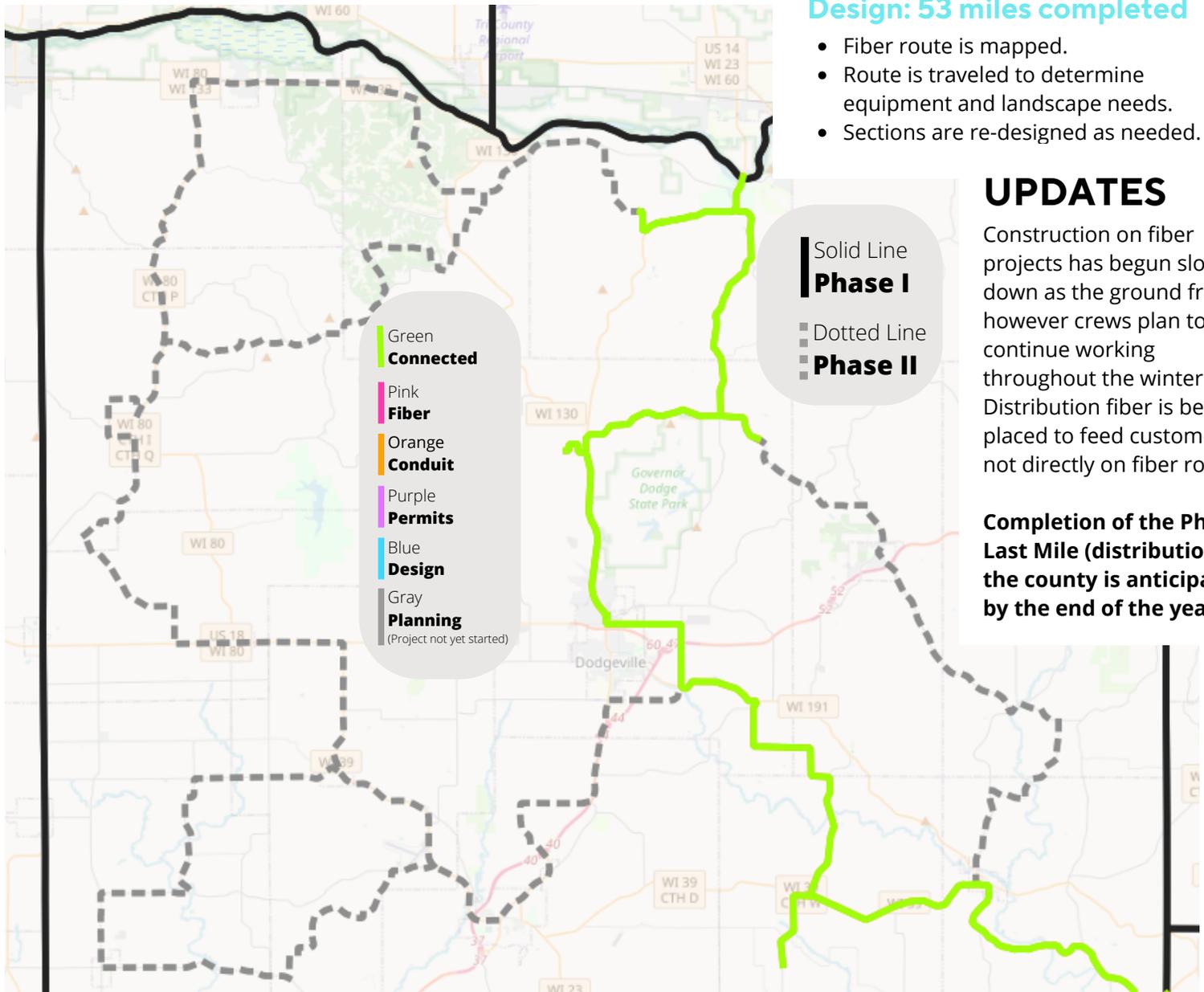
- Conduit, the protection cable that will house the fiber, is installed via boring (with a drill) or plowing.
- Access hatches that house utilities and connections (such as handholes, flowerpots, and cabinets) are installed.

Permits: 53 miles completed

- Permits for work in areas along the route are submitted.
- Awaiting approval from local and federal agencies.

Design: 53 miles completed

- Fiber route is mapped.
- Route is traveled to determine equipment and landscape needs.
- Sections are re-designed as needed.



UPDATES

Construction on fiber projects has begun slowing down as the ground freezes, however crews plan to continue working throughout the winter. Distribution fiber is being placed to feed customers not directly on fiber routes.

Completion of the Phase I Last Mile (distribution) in the county is anticipated by the end of the year.

*This map includes a rough estimate of site locations and may not accurately reflect actual tower placement.

How is a Fiber Network Created?

Did you know? A fiber network is like a highway system. 

Long Haul Fiber is like an *expressway* connecting main points across very large areas together. This is the *core* network that hooks up internet connections from state to state and, on a larger scale, country to country.

 The **Middle Mile** is like a *highway* connecting cities together. This is the *backbone* that connects cities, counties, and states and creates a national network.

The **Last Mile** is like a *road* that travels from the highway to individual neighborhoods, including FTTH (fiber-to-the-home), FTTP (fiber-to-the-premises), etc. This is the *distribution* that connects the internet network to customer's homes, businesses, and government agencies. This is often the costliest and most challenging part of the network to create.

**Bug Tussel specializes in building Middle Mile and Last Mile networks.*

Installing a fiber network requires 4 major steps:

DESIGN THE ROUTE, OBTAIN PERMITS, INSTALL FIBER, AND CONNECT TO CUSTOMERS.

DESIGN THE ROUTE *(Engineering)*

Map the Route

Determine the best route for the network and outline in advanced mapping software.



Travel the Route

Travel the route to determine equipment and route needs based on the landscape. For example, areas with hard rock conditions will require specialized equipment such as a directional drill.

Update Design

Route design is then updated as needed based on landscape requirements, permit needs, etc.

OBTAIN PERMITS *(Zoning)*

Submit Permits

Submit permits to local and federal agencies in order to obtain authorization before beginning installation.

Await Approval

Await approval and re-submit or re-design if approval is denied.



INSTALL FIBER *(Construction)*

Deploy Conduit

Install conduit (a protective cable that will house the fiber) into the ground via plowing or boring (with a directional drill).

Install Access Hatches

Place access hatches in areas (often underground) where intersections will be made, the route changes direction, or fiber will be dispersed. These hatches (which include handholes, flowerpots, and cabinets) will act as utility boxes where fiber connections can be made.

Insert Fiber

Run fiber through the conduit. The most common way to insert fiber is through a process called fiber blowing, which uses a machine to move the fiber through the cable via bursts of air. This reduces friction and the risk of damage to the fiber.

Connect Fiber

Connect sections of fiber to one another by splicing, the process of fusing pieces of fiber together with an optical laser.

Connect to the Internet

Connect the fiber route to the internet, often by hooking up to the larger worldwide network via connection to a switch, a mobile tower, or another connecting point.



CONNECT TO CUSTOMERS *(On Air)*

Connect to Customer

Install fiber from the closest access point (a handhole) to customer's ONT (optical network terminal, which converts light signals to electrical signals) in their home or business.

Set Up Internet

Customer sets up home network system through router and ONT connections.

