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BROADBAND INFRASTRUCTURE COST GAP ANALYSIS

Minnesota Department of Employment and Economic Development (DEED)
Broadband Task Force
December 18, 2024

CTC OVERVIEW

Firm Background and Experience

28
NUMBER OF STATES CTC HAS EMPLOYEES, INCLUDING CALIFORNIA

1983
YEAR FOUNDED
YEARS IN BUSINESS: 41

116
TOTAL EMPLOYEES

1
WOMAN-OWNED BUSINESS

42
NUMBER OF STATES CTC HAS PROVIDED BROADBAND CONSULTANCY SERVICES, INCLUDING CALIFORNIA

100%
EXECUTIVE RETENTION

0
NUMBER OF CONFLICTS CTC IS BUILT TO BE YOUR INDEPENDENT ADVISER

150+
TOTAL CUMULATIVE YEARS OF BROADBAND EXPERIENCE IN LEADERSHIP TEAM DEDICTED TO SERVING CITY OF SAN DIEGO

CTC IS THE LEADING BROADBAND AUTHORITY SERVING AS A PUBLIC-INTEREST CONSULTANCY, FOCUSED ON BUSINESS AND TECHNOLOGY STRATEGIC PLANNING

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ESTIMATING COSTS FOR UNIVERSAL BROADBAND COVERAGE

The state seeks to estimate the costs to close the broadband infrastructure gap in Minnesota.

The Minnesota Department of Employment and Economic Development (DEED) Office of Broadband Development's (OBD) goal for this analysis is to produce cost models that estimate the costs to close Minnesota's broadband infrastructure gap in all unserved and underserved areas of the state, using both wireline and fixed wireless deployment scenarios.

DEED requests that the estimates include the costs to deploy fiber-to-the-premises (FTTP) and fixed wireless (FW) to all unserved and underserved locations.

GOALS FOR THE BROADBAND INFRASTRUCTURE COST GAP ANALYSIS

1	**Universal coverage**	Bring broadband access to all Minnesota residents, meeting NTIA requirement for universal service
2	**Funding optimization**	Estimate infrastructure cost to maximize the impact of the available BEAD allocation
3	**Technical feasibility**	Determine the most cost-effective technologies for broadband deployment across the state

GRANT FUNDING REQUIRED FOR WIRELINE SCENARIOS COULD RANGE FROM $2.1 BILLION TO $628 MILLION*

1

Universal wireline coverage

193k

passings covered by fiber

Estimated grant funding required:
$2.1B

Estimated total investment needed:
$2.8B

2

BEAD wireline coverage

99k

passings covered by fiber

Estimated grant funding required:
$1.1B

Estimated total investment needed:
$1.5B

3

BEAD broadband coverage

90k

passings covered by fiber

Estimated grant funding required:
$628M**

Estimated total investment needed:
$950M

*Granular cost breakdowns by CBG-based analysis areas are attached in the cost data file. Note that the statewide estimates above reflect the cable expansion model discussed in the previous slide. We find that in Minnesota the economics of deployment will, in general, likely be similar to a cable expansion model, and thus the cable expansion estimate (typically, the middle-cost model) represents the most reasonable baseline for statewide analysis and comparison.
**$628 million represents the state's total BEAD funding allocation minus administrative expenses.

CLOSING THE GAP WITH FIXED WIRELESS COULD REQUIRE $35 MILLION IN GRANT FUNDING

4

Universal wireless coverage

92k

passings covered by fixed wireless

Estimated grant funding required:
$35M

Estimated total investment needed:
$105M

SUMMARY OF FINDINGS

1

- The estimated funding required for achieving universal wireline coverage across the state is more than **3x** the BEAD allocation.
- There are close to sufficient funds for 100% fiber to only BEAD-eligible locations in a best-case, low-cost "Telco Upgrade" model, with an incumbent telco using overlash or new cable on existing attachments and in existing conduit where available.
- A "Cable Expansion" or "New Entrant" model scenario for any provider other than an incumbent telco would require hundreds of millions of dollars in additional funding, largely due to pole attachment, conduit, make-ready and pole replacement costs.

2

- The optimal technology mix model to reach the BEAD-eligible unserved + underserved locations, assuming the most likely, conservative costs (Cable Expansion scenario) and the state's $628 million BEAD allocation, is 90.8% fiber, 0.7% fixed wireless, and 8.5% satellite.
- The model selects fiber in most scenarios and fixed wireless in few, because the cost of fixed wireless with sufficient capacity and coverage, using licensed technology, is also high in most of the cases where fiber costs are high. In this model, ~0.4% of units in Minnesota receive satellite.

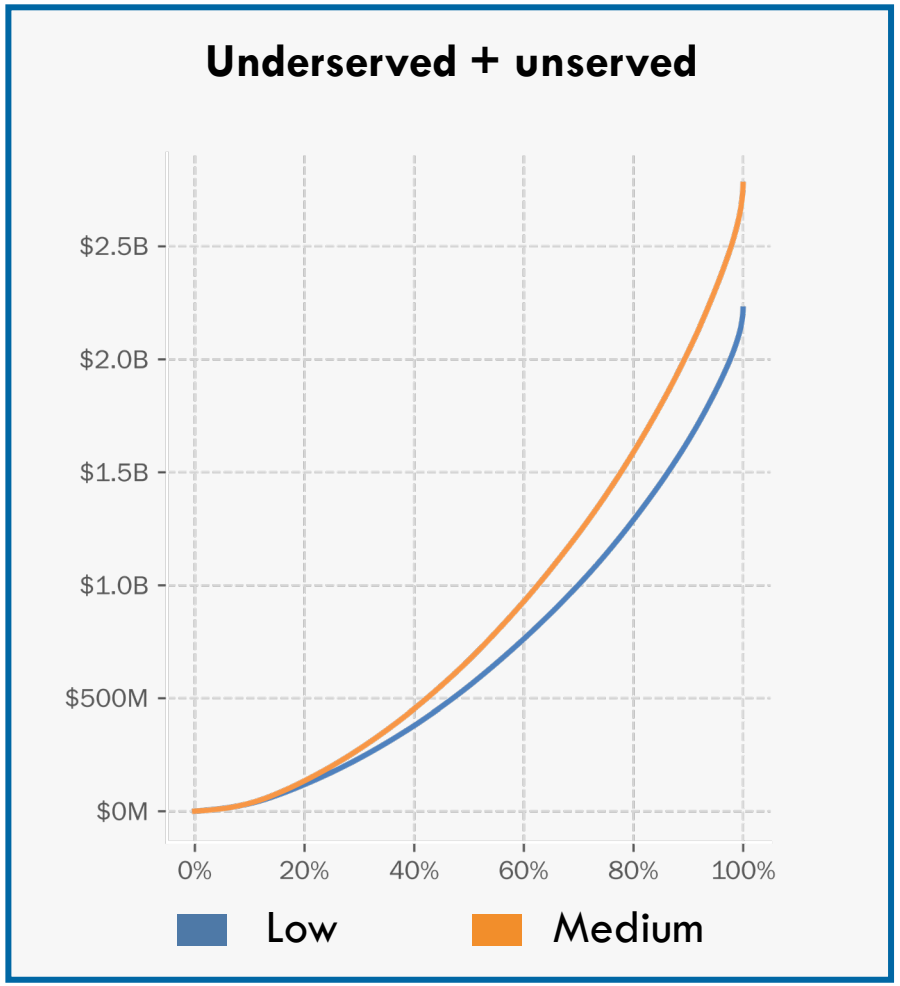
3

- The model estimates an Extremely High Cost Per Location Threshold of $30,000.

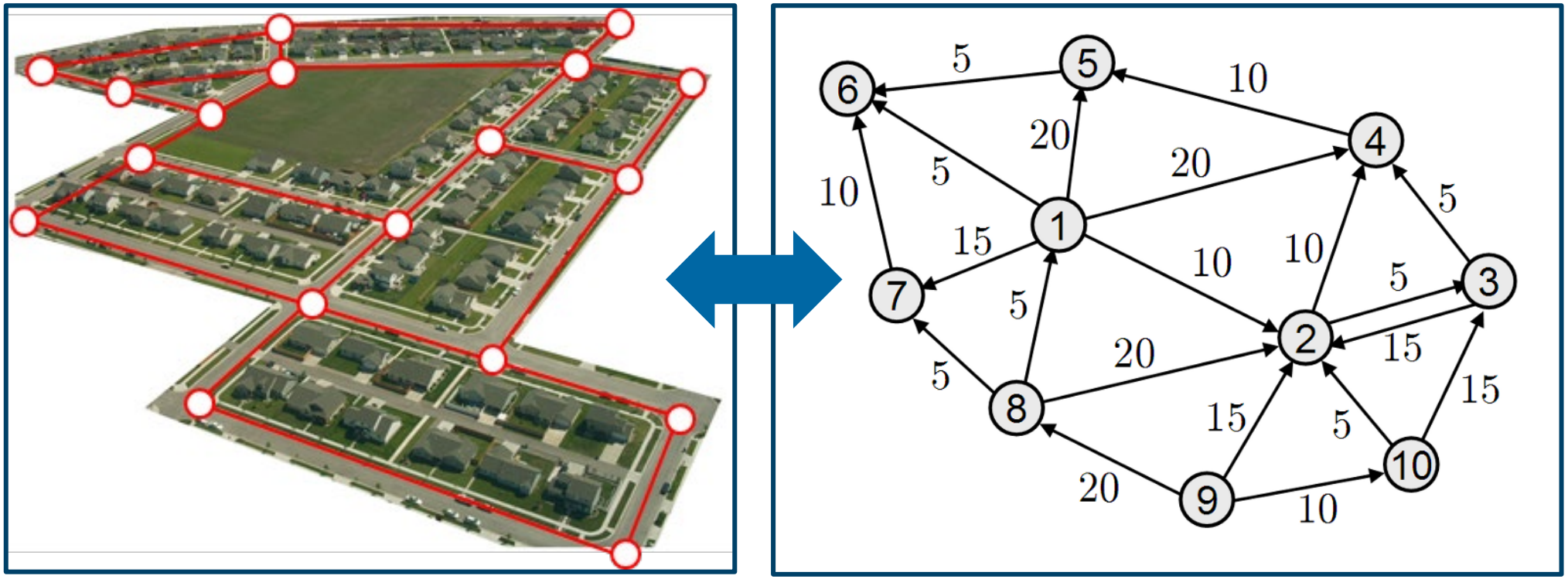
HIGHEST COST 1% OF PASSINGS ACCOUNT FOR 6% OF TOTAL COST

The highest-cost locations significantly impact the overall cost: 10 percent of unserved and underserved passings account for 30 percent of the total investment needed.

Percentile of passings	% of total investment needed	Estimated funding/passing	Funding required
1%	6%	> $64,000	$190M (9%)
4%	16%	> $39,000	$460M (22%)
8%	25%	> $30,000	$730M (35%)
10%	30%	> $28,000	$860M (41%)



PLANNING FIBER ROUTES WITH GRAPH THEORY



As shown above, locations with their service availability status (represented by white dots in the image on the left above) and potential routes on the road network (red lines) can be converted to a mathematical model (shown in the image on the right) of nodes (shown by the numbered dots) and edges (arrows). This model, which specifies relationships between nodes and edges such as distance and other cost factors, can be used to solve for the most efficient way to connect unserved locations to served areas.

ILLUSTRATION: ELK RIVER, SHERBURNE COUNTY

Strong business case

Moderate business case

Difficult business case

Unserved/underserved

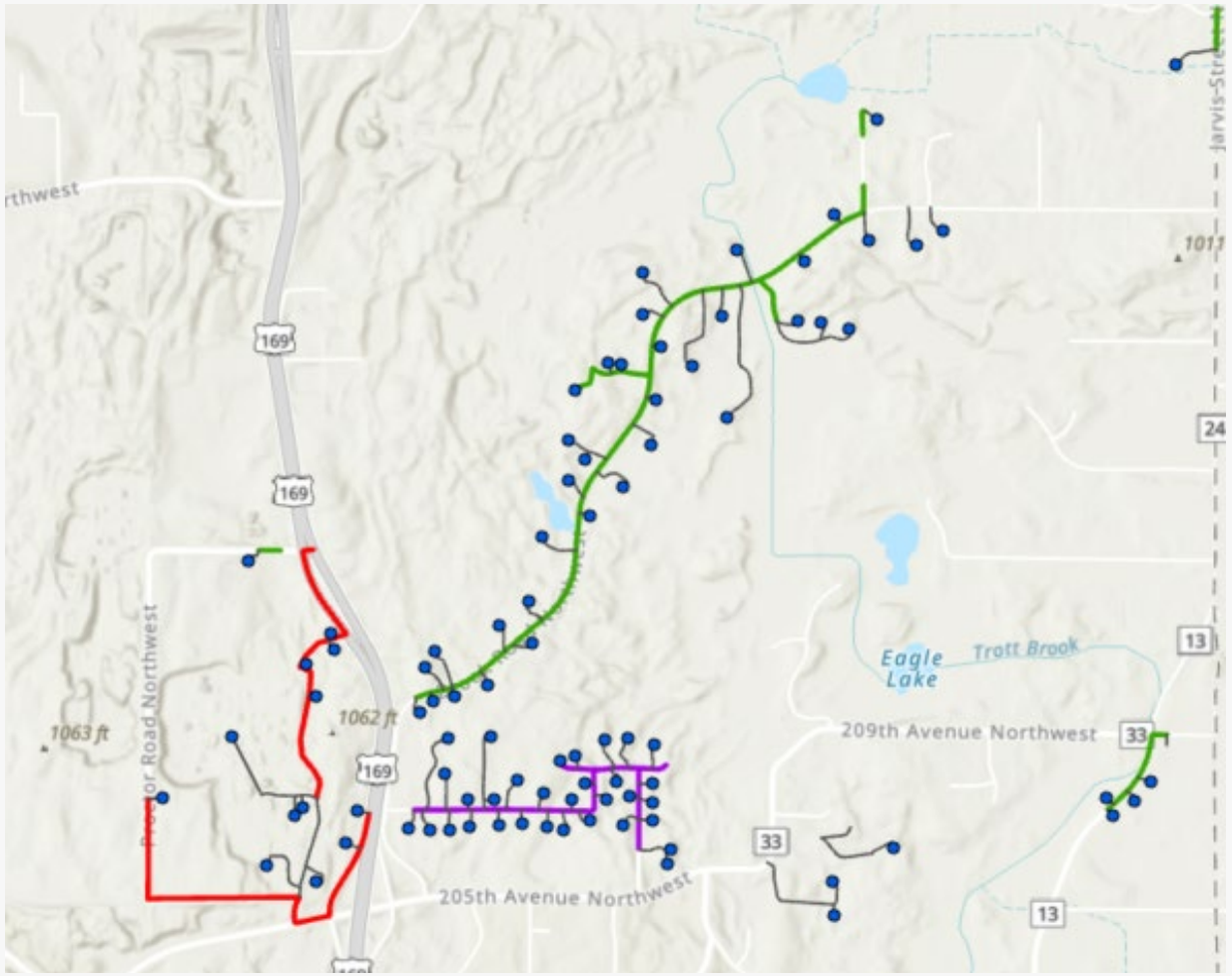
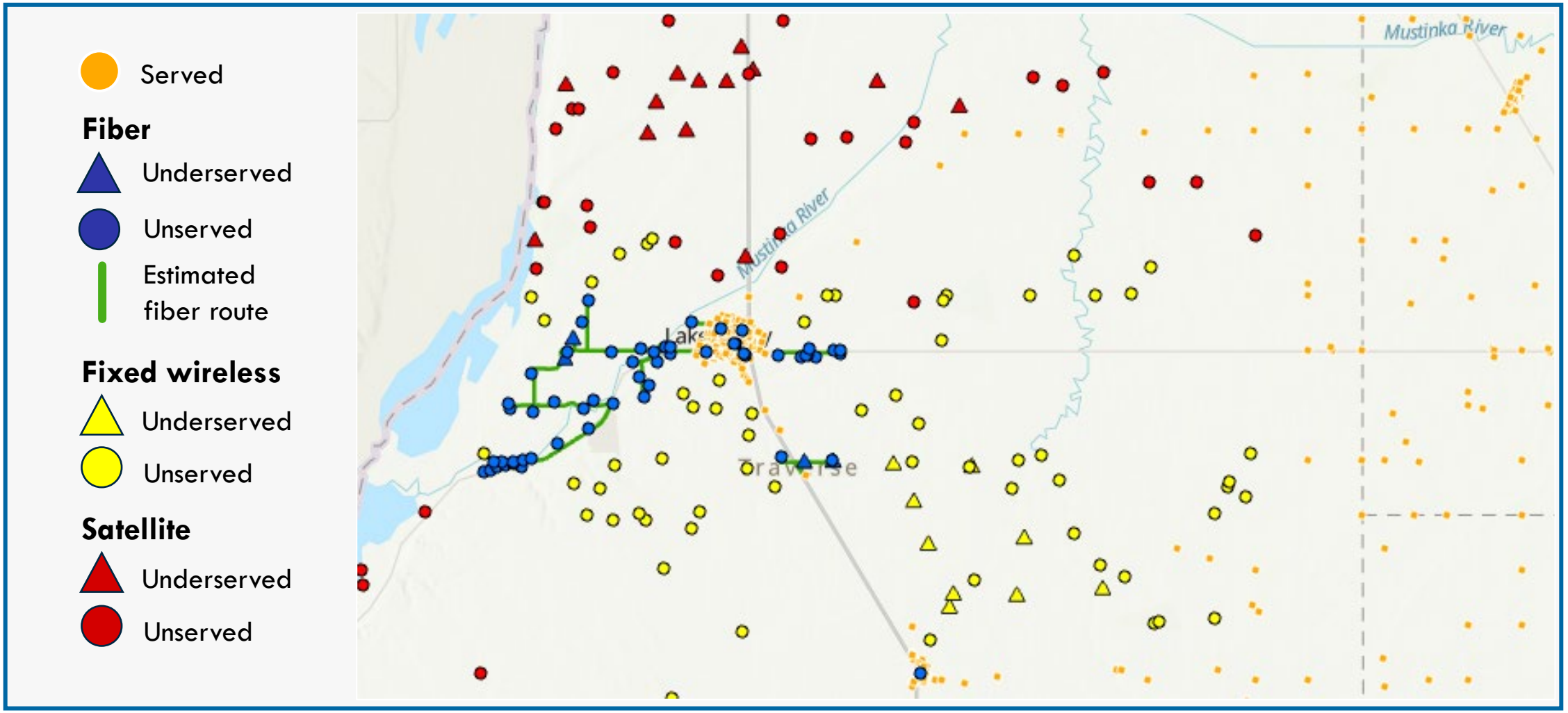
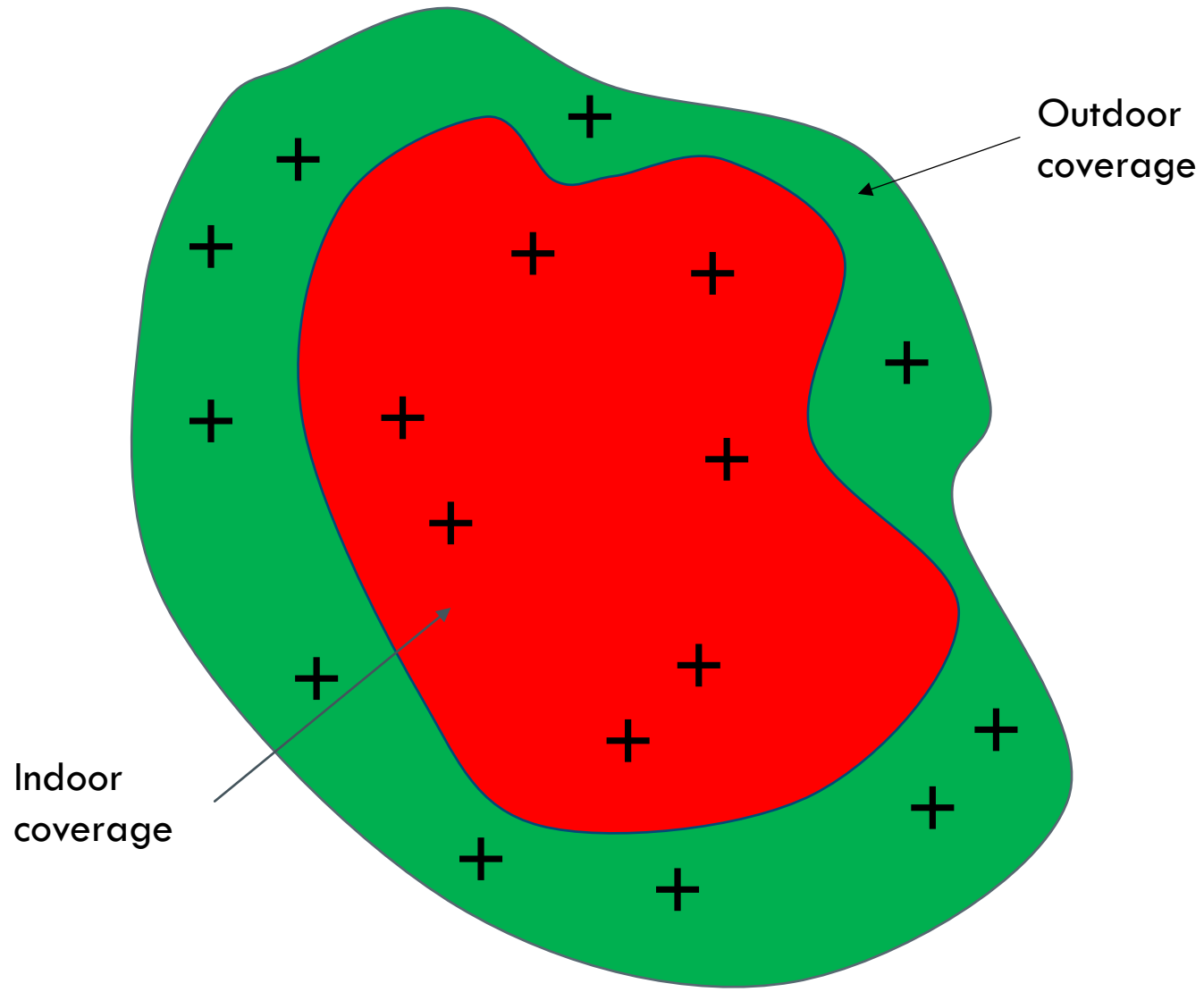


ILLUSTRATION: WHEATON, TRAVERSE COUNTY

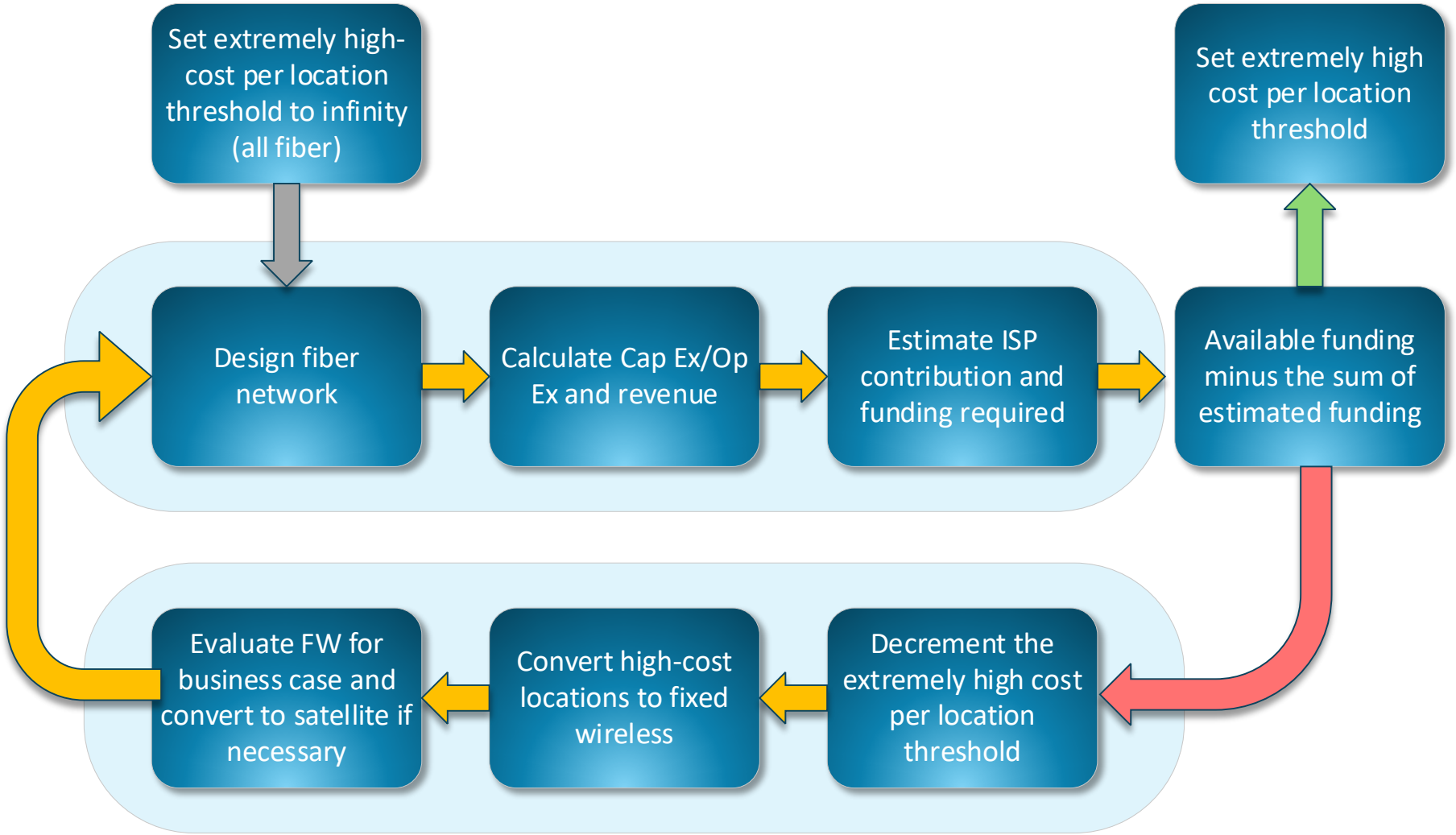


Locations with outdoor coverage that need an external antenna are more costly than locations that have a strong enough signal for indoor coverage.

The model distinguishes which connections need to have an external antenna based on signal intensity.

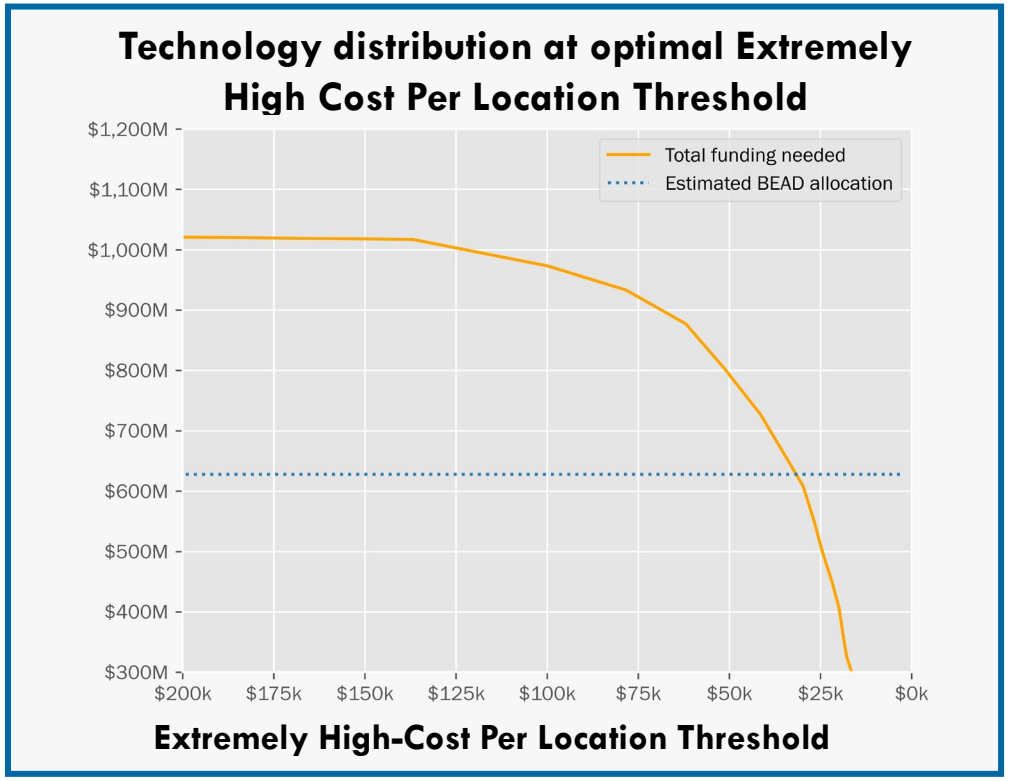


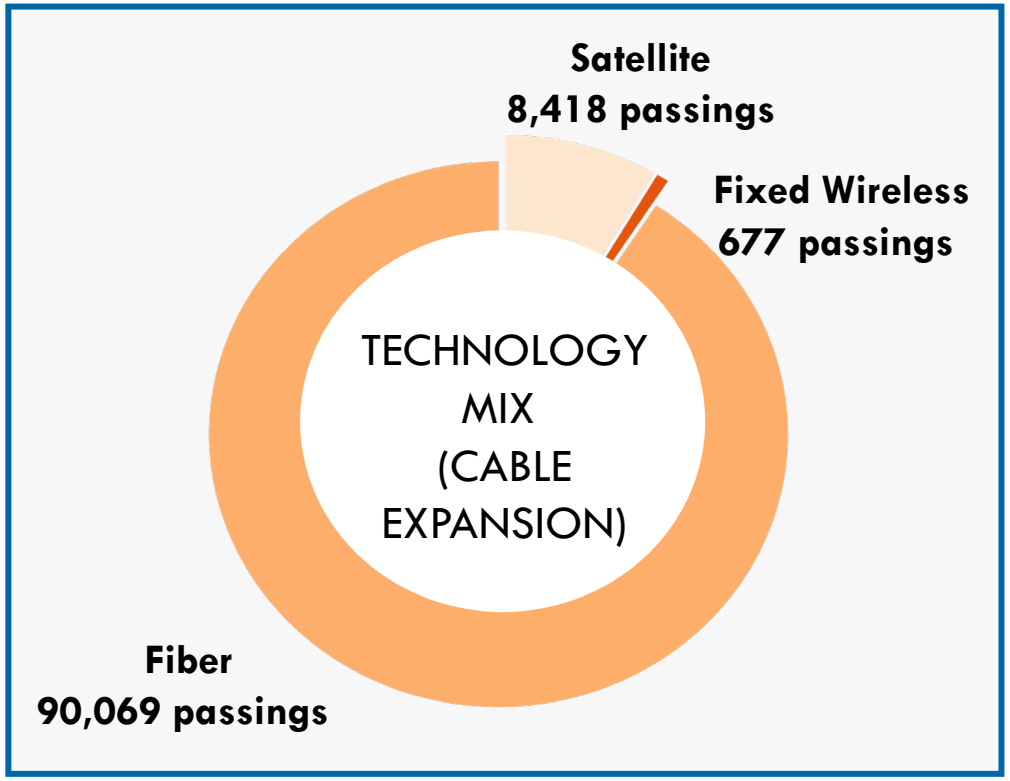
EXTREMELY HIGH-COST PER LOCATION THRESHOLD AND THE TECHNOLOGY MIX



THRESHOLD OF $30,000 MAXIMIZES FIBER WITHIN AVAILABLE BEAD FUNDING

Higher-cost passings convert from fiber to fixed wireless or satellite, depending on cost-effectiveness, as the Extremely High Cost Per Location Threshold is reduced. The optimal technology mix is found when grant funds needed equal the BEAD allocation, as shown in the graph to the left.





METHODOLOGY

Summary of the data collection and analysis processes

Use fiber cost and financial modeling tool, informed by industry standards and desk surveys

Develop estimates based on a cost range of provider economics including Telco Upgrade and Cable Expansion

Deliver multiple network designs for each analysis area for a range of scenarios to reach all unserved and underserved units

Output cash flow statements for each analysis area for a range of scenarios

Estimate take-rate and ARPU based on typical values in unserved and underserved areas

Current analysis incorporates latest FCC data for broadband availability and accepted challenges

Estimate industry projects and BEAD funding for each area and identifies areas with less robust business cases, to enable strategic aggregation for analysis purposes

THANK YOU!

Shawn Thompson

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