



California Broadband Analysis Federal Funding Account Priority Areas

Process Overview and Methods

Developed for:

State of California Public Utilities Commission

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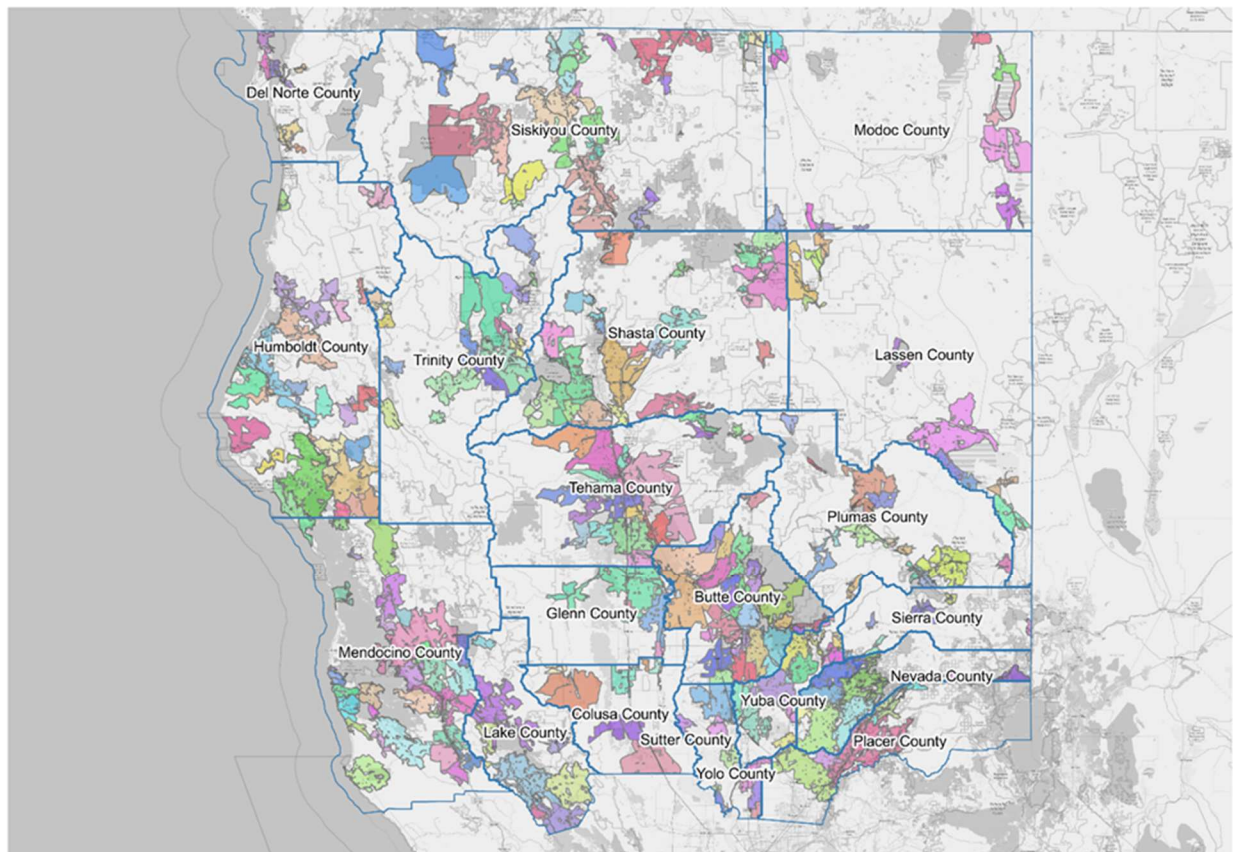
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Executive Summary

Utilizing the results of the service area clusters middle and last mile model,¹ CostQuest determined the investment needed to bring fiber to unserved locations within the state of California. CostQuest then established geographic groupings of unserved locations throughout the state based on financial thresholds. This created 892 priority areas for 506,029 unserved locations within the state. The following image depicts an example of priority areas (colored regions) in northern California.



¹ See *California Broadband Investment Model – Federal Funding Account Last Mile Funding Analysis* (published December 2022).

The results of the analysis for the entire state are as follows:

	Statistic
Priority Area Served Locations	1,404,503
Priority Area Unserved Locations	506,029
Priority Area Total Locations	1,910,532
Priority Area Served Total Network Investment	\$ 3,526,426,226
Priority Area Unserved Total Network Investment	\$ 3,857,715,348
Priority Area Total Network Investment	\$ 7,384,141,575
Priority Area Est NPV_EBITDA	\$ (1,971,517,701)
Priority Area Est NPV_ContMargin	\$ (9,959,436,208)
Priority Area Est Cumulative_EBITDA	\$ (2,627,036,167)
Priority Area Est Cumulative_ContMargin	\$ (14,801,239,449)
Priority Area Est Cumulative_Revenue	\$ 6,904,684,701
Funding Needed	\$ 2,643,486,085
Funding Needed Per Unit - Average	\$ 5,224
Priority Area - Housing Units	1,957,598
Priority Area - Households	1,730,893
Priority Area - Population	5,037,566
Priority Area Median Income - Average	\$ 78,727
CalEnviroScreen Index - Average	23.8
Socioeconomic Vulnerability Index - Average	45.8
Census Blocks with No Housing Units	14,394
Feature Class Code Count	68,517
Tribal Census Blocks	851
Total Priority Areas	892

The content below will detail the steps taken to create these priority areas.

Project Scope and Background

The California Public Utilities Commission (CPUC) engaged CostQuest Associates (CostQuest) to determine priority areas and the associated business case metrics to serve the priority areas.

CostQuest first used a series of models to develop an investment model.² Using CostQuest's BroadbandFabric as the basis of broadband serviceable locations, the models create Service Area Groups and estimate the cost of deploying fiber to the premises (FTTP) service to all serviceable locations. The model also provides for a connection from the Service Area Groups to the nearest statewide middle mile network access point to support FTTP based service. The California proposed routes for a statewide middle mile network³ are used in the modeling. Investment in the unserved areas was then identified based on location.

The modeling of the last mile and incremental middle mile connections to the statewide middle mile used forward-looking, efficient design practices that represent the costs that a potential service provider would incur to deploy a FTTP network.

CostQuest then used these Service Area Groups as the basis of developing the priority areas along with preparing business case metrics for potential service deployment. The following sections cover the business case metrics and priority areas development.

Financial Evaluation

The next sections describe the process of determining funding needs to support broadband deployment with limited state funds. Capital investment to build the network represents only a portion of the money required to operate and maintain a broadband network. For example, annual operating expenses and capital recovery are ongoing costs that must be included in realistically model network costs. Once the network is built, customer subscriptions will provide revenue. The amount of revenue will vary according to the level of competition and available subsidies (income or location-based). While revenue is sufficient to cover costs in many areas, high-cost areas will require subsidies – either cross subsidies from nearby low-cost areas or explicitly from public broadband funds – for full cost recovery. Understanding the potential stream of ongoing costs and revenue will help direct subsidy allocation and ensure long-term network viability.

After calculating investments and ongoing costs, and identifying areas that are eligible for funding, the next step is to determine a logical means of allocating the budgeted funds to the areas a potential provider may pursue. To determine how to allocate the funds, we must look at several factors. From an Internet Service Provider's perspective, these factors include where costs are preventing deployment, likely subscription rates, and potential return on

² The investment modeling is explained in detail in *California Broadband Investment Model – Federal Funding Account Last Mile Funding Analysis* (Published December 2022).

³ <https://middle-mile-broadband-initiative.cdt.ca.gov/>

investments. To accomplish this, CostQuest performed a 10-year business case for each census block. The census block level results were aggregated through a clustering process where the results determine funding areas and potential funding needed. The result of this analysis breaks up the eligible areas into priority areas that blend low cost and high-cost eligible areas with served areas to produce logical geographic areas that may be used as funding areas.

Unserved Areas Definition

A number of data sources were combined to identify the serviceable locations, the unserved locations, and to develop the service areas used in the study. These data sources include:

- CostQuest Associates' BroadbandFabric V3 - A data source that provides the geospatial position of serviceable locations.
- December 31, 2020, CPUC data on service availability—CPUC supplied block level broadband service information. The CPUC also determined the technologies that should be considered when defining unserved areas, consistent with the Federal Funding Account's program rules.
- CostQuest Associates' Technology Availability Likelihood (TAL) V3 - A data source that estimates the probability of broadband technology at a location.
- FCC's Form 477—June 2020. A data source filed twice yearly by providers. It indicates at a census block level where a provider does, or can, provide broadband service.

Through the combination of the above sources and the below definition provided by the CPUC, CostQuest identified 777,292 unserved locations:

Table 1. Quantity of Unserved Locations in California

	California Service Definition	Locations
Unserved	Service < 25x3Mbps. Lacking access to at least 25Mbps downstream x 3Mbps upstream using FTTP or DOCSIS 3.0.	777,292

Locations supported through the California Advanced Services Fund (CASF) and awarded in the Rural Digital Opportunity Fund (RDOF)⁴ are not included in the unserved location counts. Because they are already funded, 33,306 locations are not included in the unserved count.

Table 2. Previously Funded Locations Excluded from Funding Allocation

Program	Locations
CASF	13,401
RDOF	17,901
RDOF and CASF	2,004
Total	33,306

⁴ Areas identified by the CPUC and/or not in default are presumed won as of June 14, 2022. RDOF default areas source: <https://www.fcc.gov/file/23418/download> (accessed 6/30/2022).

Operating Expenses and Capitalization

In addition to the upfront investment needed to construct the network, additional costs are incurred through ongoing operations and maintenance of the network and supporting assets as well as any capitalization expenses associated with income taxes, depreciation, and the cost of money. Operating expenses (Opex) and Capitalization expenses (Capex) are accounted for through factors applied to the investments. The Opex and Capex factors are based on those used for Connect America Cost Model (CACM) and RDOF-adjusted for current income taxes. By applying these factors, we can determine ongoing cost recovery requirements and compare them to potential revenue to understand which areas may incur a profit or loss, and whether achieving adequate profit will require subsidy.

The application of both factors to the investment converts the investment to a recurring cost that represents the minimum payment necessary to break even over the economic life of the assets. We can also calculate financial metrics of earnings before interest, taxes, depreciation, and amortization (EBITDA)⁵ -- a common measure of financial return--and contribution margin, which is the amount of profit an area may contribute to a firm's total profit. Further detail of the methods and procedures are discussed below.

Operating Expenses

Operating expenses include network specific, network nonspecific, marketing, and bad debt. Network specific operating expenses are those directly related to various assets, like poles, conduit, cable, or electronics. Network nonspecific expenses are overall network costs that cover multiple assets and cannot be specified to one type of network component, like overall network expenses or general and administrative expenses. Marketing expenses include those related to advertising for the service and customer-related expenses. Bad debt expense includes collection expense and write downs for non-payment of service.⁶ The expense factors come from California specific results of CostQuest's State Broadband Investment Model, which uses the California Broadband Cost model adjusted for current demand and material and labor costs.⁷

Capital Expenses

Constructing a network requires capital to pay for material and labor. This may be sourced from equity (stock) or debt. Investors and lenders expect a return on their funds. By including the impact of capex, a minimum acceptable net return after interest, depreciation, and taxes may be calculated.

⁵ EBITDA excludes the impact capital expenses while contribution margin includes the impact of all costs.

⁶ Bad debt expenses were set to zero at the direction of the CPUC.

⁷ The factors produced are consistent overall demand in California and the inputs used to determine investment (i.e., poles, conduit, trenching, electronics, and the proportion of each that comprises investment).

Capex factors include cost of money, income taxes, and depreciation. The cost of money includes interest on debt and service to equity through retained earnings (which contributes to the company's value) and dividends. Income taxes are due for the income after deductions for interest and depreciation. The tax calculation is based on the current corporate income tax rates. Both are the costs of doing business. The cost of money is based on an average expected for a blend of different provider types and set to 8.5 percent, based on discussions with CPUC staff. Depreciation represents the length of an asset's economic life and is used to spread the recovery of the investment over time. The combination of all three comes from California specific results of CostQuest's State Broadband Cost Model, which uses the California Broadband Cost model adjusted for current demand, material prices, and labor costs.

Replacement capex accounts for a rebuild of the network over time. As new technologies are developed and as networks age, network operators plan for replacement. Facilities may also be destroyed by accident, weather, etc. This factor is included as part of the EBITDA calculations.

Additional Expenses

Additional expenses include the cost of dark fiber leases from the state middle mile network that connects the last mile providers to the internet access points and the internet.

The State of California is constructing a middle mile network that covers the state. For the funding allocation analysis, it is assumed that this network will have been completed as proposed in 2022. The last mile providers will build extensions from their networks to the state-owned network. The business case includes a dark fiber lease cost from the statewide middle mile network. As a proxy for a lease expense, an average investment for a pair of strands by county was used and converted to a recurring operating expense. The county proxy reflects a discount on current market rates. This cost for a pair of fiber strands was then evenly spread among all locations in a county.

Internet access investment accounts for the investments made by carriers to provide connections to and among Internet Peering locations, which they recover by charging connecting carriers. The investment per unit value is the same as used in Connect America Cost Model and the model applies them to the subscribed demand.

Market Subscription

Subscription "take rate" for broadband service for a particular carrier is based both on the consumers' willingness to subscribe and competition. Even though broadband is available in many areas, and the network modeled accounts for serving all locations, less than 100 percent of consumers subscribe to broadband service. Assuming broadband is available, consumers may not subscribe for a myriad of reasons which include affordability or digital literacy. CostQuest relies on income data to represent the ability of consumers to afford to subscribe

to broadband. As illustrated below, Pew Research⁸ identifies how overall market penetration varies by income level.

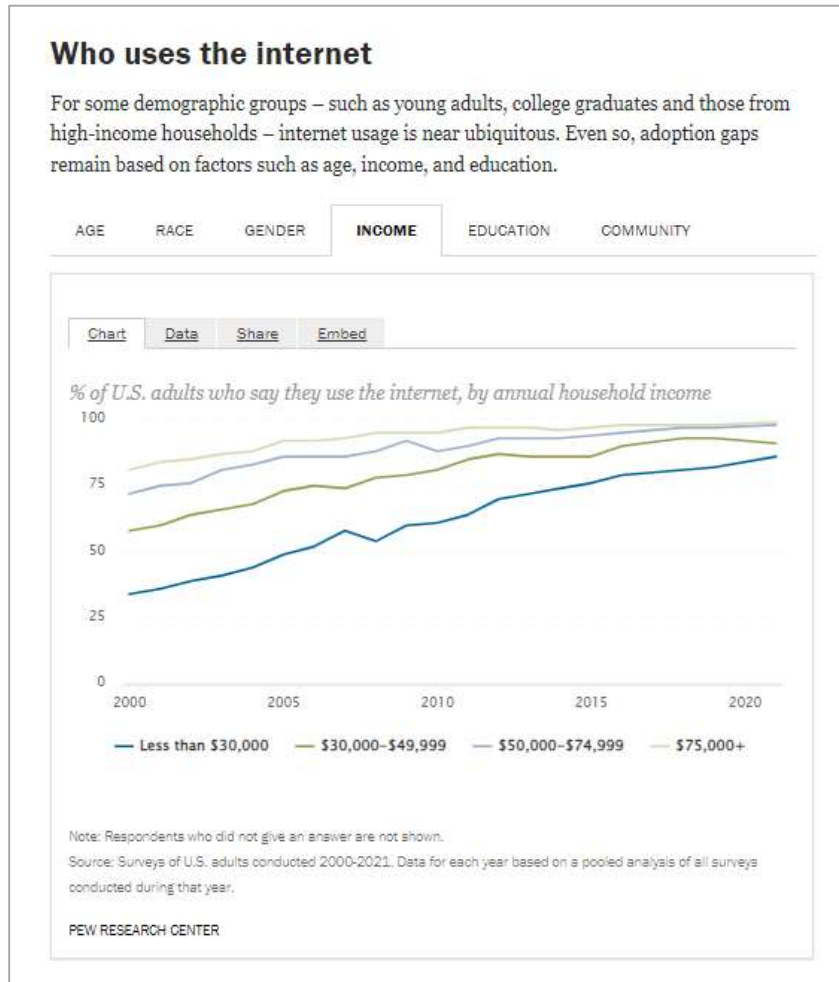


Figure 1. Consumer Market Subscription

Competition also drives rates of subscription to individual providers and determines market share. In areas that are served, the consumers may have a choice over providers. Simply because a provider builds an FTTP network capable of providing gigabit or better levels of service, there is no guarantee consumers will subscribe when other choices are available. As depicted below in a study of the FCC's Form 477 data from USTelecom,⁹ market share varies by technology.

⁸ Who uses the internet: <https://www.pewresearch.org/internet/fact-sheet/internet-broadband/?menuitem=480dace1-fd73-4f03-ad88-eae66e1f4217>, accessed 06/08/2022.

⁹ <https://www.ustelecom.org/wp-content/uploads/2020/04/USTelecom-State-of-Industry-2020-Update.pdf>, accessed 06/08/2022.

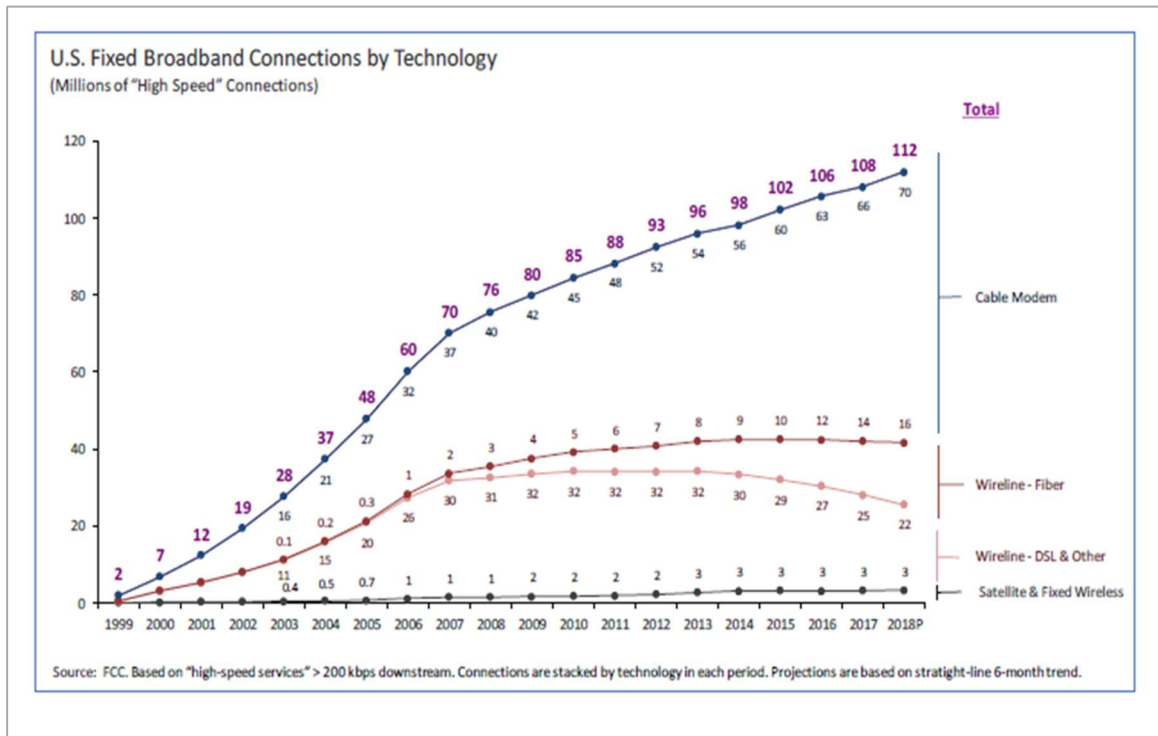


Figure 2. Market Share by Technology

The amount invested in the network must be recovered from the revenue producing units. Revenue producing units are determined by the rate of subscription. These two variables – income and technology market share – determine the rate of subscription for the purposes of the model.

Rates of subscription will vary differently between served areas and unserved areas. To better understand the impact subscription has on return on investment, both need to be acknowledged in any revenue analysis. To identify potential subscription of broadband service in served areas, CostQuest analyzed the locations by census block and calculated a potential take rate that a provider could expect to obtain with a new FTTP network.

Using Form 477 data, CostQuest obtained the quantity and types of competitors present in served areas. Using Census income data further refined the potential take rate. The formulas which estimate the last mile provider's take rate account for both income and competition. In served areas, the type of competitor – cable, FTTP, fixed wireless, and xDSL – identifies the potential share of each. Income levels then constrain the overall demand. The result is that in served areas, less than 100 percent of potential subscribers will subscribe to one carrier as some consumers may opt for service from a different carrier. The result is a market share percentage applied to the served demand in each Census block.

In unserved areas where there is little or no competition, the model uses an expected take rate of 90 percent. This figure acknowledges that one carrier will enjoy a high rate of subscription but also acknowledges that—on average—not all locations will subscribe to service.

Since a census block may have a combination of served and unserved locations, different take rates were applied based on the quantity of each. In the analysis, Potential Demand is expressed as:

$$\text{Potential Demand} = \text{Served Locations} * \text{Market Take Rate} \\ + \text{Unserved Locations} * 0.9$$

This potential demand is the basis of revenue.

Revenue

Revenue is based on the price of broadband service and demand. Three values were used to determine a possible price of service: Market Price, Low Income Price, and Tribal Price. Once the price is known, it can be multiplied times demand to calculate revenue.

Price

The Market Price for broadband service applies to normal income areas and non-Tribal areas and is based on a survey of current prices. The average price used in this analysis is \$71 per month and is based on a blend of possible service levels, knowing that not all consumers subscribe to \$75 or \$80 or more gigabit or multigigabit services. Some consumers may opt for lower priced, lower bandwidth options. As a result, \$71 per month per subscriber is a reasonable revenue benchmark for a Market Price. A summary of the fiber-based broadband services offered in the FCC's Urban Rate Survey for Broadband services¹⁰ provides further context:

¹⁰ FCC Urban Rate Survey. <https://www.fcc.gov/file/22208/download>, accessed 7/11/2022. While results are narrowed to FTTH for the summary table, performing the same analysis when Cable and FTTH (the technologies CPUC defines as served) are summarized produces an average monthly price of \$70.58. This figure further supports \$71/month.

Table 3. 2022 Broadband Urban Rate Survey Summary for California

Broadband Urban Rate Survey - California "FTTH"			
Down x Up Mbps	Frequency Offered	Average Price	
20x20	4	\$	66.45
25x25	3	\$	18.33
30x30	5	\$	73.15
50x50	12	\$	64.39
75x8	43	\$	59.99
78x8	1	\$	59.99
100x100	3	\$	99.62
250x250	3	\$	115.95
300x300	6	\$	60.00
500x500	13	\$	64.23
940x940	2	\$	119.99
1000x1000	73	\$	68.81
2000x1000	2	\$	100.00
5000x5000	1	\$	350.00
10000x10000	1	\$	495.00
Weighted Average	172	\$	71.21

Low Income Prices are determined from the average household income by census block. Low-income households may qualify for the Affordable Connectivity Program (ACP) program, and either be allowed to purchase a low-income service option or receive a discount up to \$30 from a market price of a service.¹¹ Low Income is defined as incomes at or below 200 percent of the Federal Poverty Level or as qualifying for various other support programs. For purposes of analysis, \$55,500 per year for a family of four is 200 percent of the Federal Poverty Level.¹² CostQuest understands that the applicability will vary by household level and that each household must prove eligibility, but CostQuest does not have data to indicate which locations would qualify for ACP or other programs. As determined by the CPUC, if the overall average income for a block is less than or equal to \$55,500/year, a low-income rate for service applies. Based on discussion with the CPUC, the low-cost option for service is \$40/month for 50Mbps download by 50Mbps upload.

Tribal Prices apply in tribal areas. Tribal areas may qualify for monthly discounts up to \$75 per month.¹³ Using geospatial data, CostQuest identified census blocks falling in tribal areas and applied the above described take rates. Where the data indicate a block intersecting Tribal Lands, the price of broadband service was set to \$71 (same as Market Price).

¹¹ <https://www.whitehouse.gov/briefing-room/statements-releases/2022/05/09/fact-sheet-president-biden-and-vice-president-harris-reduce-high-speed-internet-costs-for-millions-of-americans/>, accessed 06/08/2022.

¹² <https://aspe.hhs.gov/sites/default/files/documents/4b515876c4674466423975826ac57583/Guidelines-2022.pdf>, accessed 06/08/2022.

¹³ <https://www.whitehouse.gov/briefing-room/statements-releases/2022/05/09/fact-sheet-president-biden-and-vice-president-harris-reduce-high-speed-internet-costs-for-millions-of-americans/>, accessed 06/08/2022.

Revenue Over Time

While modeled networks can be constructed in a matter of hours of computer processing time, the reality is that the network construction will require much more time. Revenue will also vary over time through consumers waiting for the network construction, time for the carrier to complete provisioning, and normal churn as customers move or drop service.

To acknowledge that network construction will take time, CostQuest's modeling incorporated a revenue delay for construction and then a period of demand ramping up to the level of potential demand. To represent the delay for construction, the calculated revenue stream was delayed for the first year of the business case; no revenue applies during the first year of the 10-year study. During the second year of the business case, demand increased to a level of potential demand. Based on discussion with the CPUC, CostQuest assumed that demand would ramp up over a six-month period to potential demand, then an annual rate of net churn of 1.5 percent applies for the remaining period of the business case. This demand was multiplied times the price (Market, Low Income, or Tribal) to calculate revenue and summarized for a 10-year period.

Business Case Variables

Several variables were created to tailor the business case to California's needs. These variables help reflect current market conditions and allow for scenario analysis through adjustments. The following are the default values¹⁴ assumed for the funding allocation analysis, definitions, and support information:

Table 4. Business Case Variables

Business Case Variable	Value	Definition
Discount Rate	8.5%	Discount rate in NPV calculation
PovertyIncThreshold	\$ 55,500	200% of Federal Poverty Level
GrowthRampMonths	6	Time for demand to grow to potential demand based on take rate after construction completes.
Churn	-1.5%	Annual net churn
MarketPrice	\$ 71.00	Monthly price for service in served areas.
PovertyPrice	\$ 40.00	Monthly price for service in low income areas. Assumes a 50Mbps x 50Mbps service.
TribalPrice	\$ 71.00	Monthly price for service in tribal areas. Recognizes full discount of \$75/month.
OpexNetworkAnnual	8.0%	Percentage representing annual network operating expenses.
OpexMarketingAnnual	4.9%	Percentage representing annual customer and marketing related operating expenses.
OpexBadDebtAnnual	0%	Percentage representing annual operating expenses related to recovery of bad debt.
CapexAnnual	11.8%	Percentage representing annual capitalization expense associated with cost of money, income tax, and depreciation.
ReplacementCapexAnnual	2.4%	Annualized NPV of the percentage of investment account for replacement of network over time. Explicit to EBITDA. Implicit to Contribution Margin.
HighCostThreshold	\$ 9,300.00	Per unit investment threshold designating high cost
UnservicedTake	90%	Subscription rate in unserved areas
InternetPerSub	\$ 81.00	Additional investment per unit needed for internet access; accounts for internet core.

- Discount Rate – California Board of Equalization¹⁵, adjusted to remove impact of income taxes.

¹⁴ Default values were developed from discussion with CPUC staff, analysis of CBCM, and research of federal funding programs.

¹⁵ <https://boe.ca.gov/proptaxes/pdf/2021capraterestudy.pdf> (accessed 6/30/2022).

- PovertyIncThreshold – Annual income that is 200 percent of the poverty threshold for a family of four.
- GrowthRampMonths – variable of 1-12 that determines how quickly demand will grow after network construction is completed.
- Churn – Annual net churn that accounts for typical disconnects and new connections.
- MarketPrice – discussed above.
- PovertyPrice -- discussed above.
- TribalPrice -- discussed above.
- OpexNetworkAnnual -- Annual network operating expense factor.
- OpexMarketingAnnual – Annual marketing operating expense factor.
- OpexBadDebtAnnual – Annual bad debt expense factor.
- CapexAnnual – Annual capital expense factor.
- ReplacementCapexAnnual – 2.4 percent based on 8.5 percent discount rate.
- HighCostThreshold – Investment amount that determines high-cost areas.
- UnservedTake – Rate of subscription for unserved locations.
- InternetPerSub – Cost of internet access. Value is converted to an operating expense using the above Opex factors.

Business Case Results

Using the above investments and revenue, a 10-year business case was calculated for each census block. Results were then narrowed to census blocks with unserved locations and used as the basis for priority area creation. Using the methods discussed earlier, revenue, Opex, and Capex were developed. EBITDA and contribution margins were also calculated. EBITDA represents revenue minus operating expenses. Contribution margin represents revenue minus operating and capital expenses. Using the above discount rate, the net present value (NPV) of both metrics were developed over a 10-year time frame to express both metrics as a present value.

Prior to further refinement via the priority area identification process and application of potential funding,¹⁶ the results for *all* eligible areas are as follows:

¹⁶ These results also exclude the impact of any additional federal monies allocated to California via BEAD. The BEAD allocation process is currently under review with NTIA. Unserved and potentially underserved areas in California will receive a share of this fund. For more information, see <https://www.internetforall.gov/program/broadband-equity-access-and-deployment-bead-program> (accessed 6/29/2022).

Table 5. Business Case Results

Total Investment											
	\$	8,196,336,011	Last Mile + Success Based + Middle Mile for locations in census blocks with unserved locations.								
Cash Flow											
		Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
Revenue	\$	-	\$ 467,961,159	\$ 802,219,130	\$ 790,185,843	\$ 778,333,055	\$ 766,658,059	\$ 755,158,188	\$ 743,830,815	\$ 732,673,353	\$ 721,683,253
Opex	\$	(1,290,127,806)	(1,290,127,806)	(1,290,127,806)	(1,290,127,806)	(1,290,127,806)	(1,290,127,806)	(1,290,127,806)	(1,290,127,806)	(1,290,127,806)	(1,290,127,806)
EBITDA (Revenue - Opex)	\$	(1,290,127,806)	(822,166,647)	(487,908,676)	(499,941,963)	(511,794,751)	(523,469,747)	(534,969,618)	(546,296,991)	(557,454,453)	(568,444,553)
Capex	\$	(982,460,832)	(982,460,832)	(982,460,832)	(982,460,832)	(982,460,832)	(982,460,832)	(982,460,832)	(982,460,832)	(982,460,832)	(982,460,832)
Contribution Margin (EBITDA - Capex)	\$	(2,272,588,638)	(1,804,627,479)	(1,470,369,508)	(1,482,402,795)	(1,494,255,583)	(1,505,930,578)	(1,517,430,449)	(1,528,757,822)	(1,539,915,284)	(1,550,905,385)
Discount Rate			8.50%								
NPV of EBITDA			(\$4,396,993,960)								
NPV of Contribution Margin			(\$10,843,261,430)								
Unserved Locations		777,292									
Underserved Locations		44,428									
Served Locations		619,658									
Total Locations		1,441,378									
Average Annual Demand with Take		850,111									
Investment per unit - Total Locations	\$	5,686									
Investment per unit - Demand with Take	\$	9,641									

Priority Areas

The priority areas development process selects areas of need using the information gathered from the Last Mile and Middle Mile Models with business case information. The priority areas process uses clustering techniques to find groups of unserved locations which fall within distance, investment, and location parameters that are used to balance potential funding with potential revenue. The initial groups are then carried through an iterative process that agglomerates adjacent census blocks and tests if prescribed investment breakpoints are met. Assessed individually, the clustering for a priority area stops when the breakpoint is triggered. The breakpoints include keeping total investment for an individual priority area below a maximum, only aggregating a census block if the average per unit investment goes down and per unit investment for the priority area is between a maximum and minimum value. The clustering and breakpoint parameters are provided below.

Priority Area Parameters

Initial Clustering

- Minimum Number of locations per priority area
 - The smallest number of locations to be considered as an initial seed cluster.
 - 50 locations
- Clustering Radius
 - The maximum distance between two locations for one to be considered as in the neighborhood of the other.
 - 3280 ft
- Unserved Unit Investment Greater Than
 - Lower unit investment limit for a location to be considered in the initial clustering.
 - \$5,000
- Unserved Unit Investment Less Than or Equal To
 - Maximum unit investment limit for a location to be considered in the initial clustering.

- \$20,000

Iterative Priority Area Selection Breakpoints

- Minimum Per Unit Investment
 - During census block agglomeration the minimum per unit investment allowed to be added to the priority area.
 - \$2,000
- Maximum Per Unit Investment
 - During census block agglomeration the maximum per unit investment allowed to be added to the priority area.
 - \$9,300
- Target Per Unit Breakeven Investment
 - Any amount of per unit investment above the breakeven investment target values needs funding
 - \$2,449
- Maximum Total Investment Unserved
 - Aggregated unit investment within the priority area that is beyond the Target Per Unit Breakeven Investment
 - \$25,000,000

A further evaluation is performed to remove priority areas that are mostly comprised of commercial areas with no 2010 Census Housing Unit data. Specifically, if more than 85 percent of the census blocks within the priority area had no Housing Units, the priority area was deprioritized. This creates the final priority areas where external funding is needed to offset the high costs of construction. The priority areas are optimally designed to mix low cost with high-cost and served with unserved locations to maximize the benefit of funding.

Table 6. Statewide Priority Area Summary

	Statistic
Priority Area Served Locations	1,404,503
Priority Area Unserved Locations	506,029
Priority Area Total Locations	1,910,532
Priority Area Served Total Network Investment	\$ 3,526,426,226
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Priority Area Est Cumulative_ContMargin	\$ (14,801,239,449)
Priority Area Est Cumulative_Revenue	\$ 6,904,684,701
Funding Needed	\$ 2,643,486,085
Funding Needed Per Unit - Average	\$ 5,224
Priority Area - Housing Units	1,957,598
Priority Area - Households	1,730,893
Priority Area - Population	5,037,566
Priority Area Median Income - Average	\$ 78,727
CalEnviroScreen Index - Average	23.8
Socioeconomic Vulnerability Index - Average	45.8
Census Blocks with No Housing Units	14,394
Feature Class Code Count	68,517
Tribal Census Blocks	851
Total Priority Areas	892

Table 7. Regional Priority Summary

Region	Statistic		
	Central	Northern	Southern
Priority Area Served Locations	631,038	211,691	561,774
Priority Area Unserved Locations	232,027	136,147	137,855
Priority Area Total Locations	863,065	347,838	699,629
Priority Area Served Total Network Investment	\$ 1,550,874,430	\$ 622,699,958	\$ 1,352,851,838
Priority Area Unserved Total Network Investment	\$ 1,674,504,161	\$ 1,175,601,370	\$ 1,007,609,817
Priority Area Total Network Investment	\$ 3,225,378,591	\$ 1,798,301,328	\$ 2,360,461,656
Priority Area Est NPV_EBITDA	\$ (818,338,437)	\$ (701,581,485)	\$ (451,597,779)
Priority Area Est NPV_ContMargin	\$ (4,307,050,504)	\$ (2,670,772,258)	\$ (2,981,613,445)
Priority Area Est Cumulative_EBITDA	\$ (1,078,164,090)	\$ (994,208,028)	\$ (554,664,049)
Priority Area Est Cumulative_ContMargin	\$ (6,395,230,089)	\$ (3,995,406,494)	\$ (4,410,602,865)
Priority Area Est Cumulative_Revenue	\$ 3,090,250,243	\$ 1,372,061,220	\$ 2,442,373,238
Funding Needed	\$ 1,119,756,783	\$ 844,678,287	\$ 679,051,015
Funding Needed Per Unit - Average	\$ 8,957	\$ 10,246	\$ 9,629
Priority Area - Housing Units	871,655	357,855	728,088
Priority Area - Households	766,720	313,867	650,306
Priority Area - Population	2,270,648	796,122	1,970,796
Priority Area Median Income - Average	\$ 85,946	\$ 62,580	\$ 80,410
CalEnviroScreen Index - Average	27.6	19.2	22.3
Socioeconomic Vulnerability Index - Average	46.9	43.0	46.3
Census Blocks with No Housing Units	5,910	2,966	5,518
Feature Class Code Count	19,297	6,665	42,555
Tribal Census Blocks	82	224	545
Total Priority Areas	363	288	241

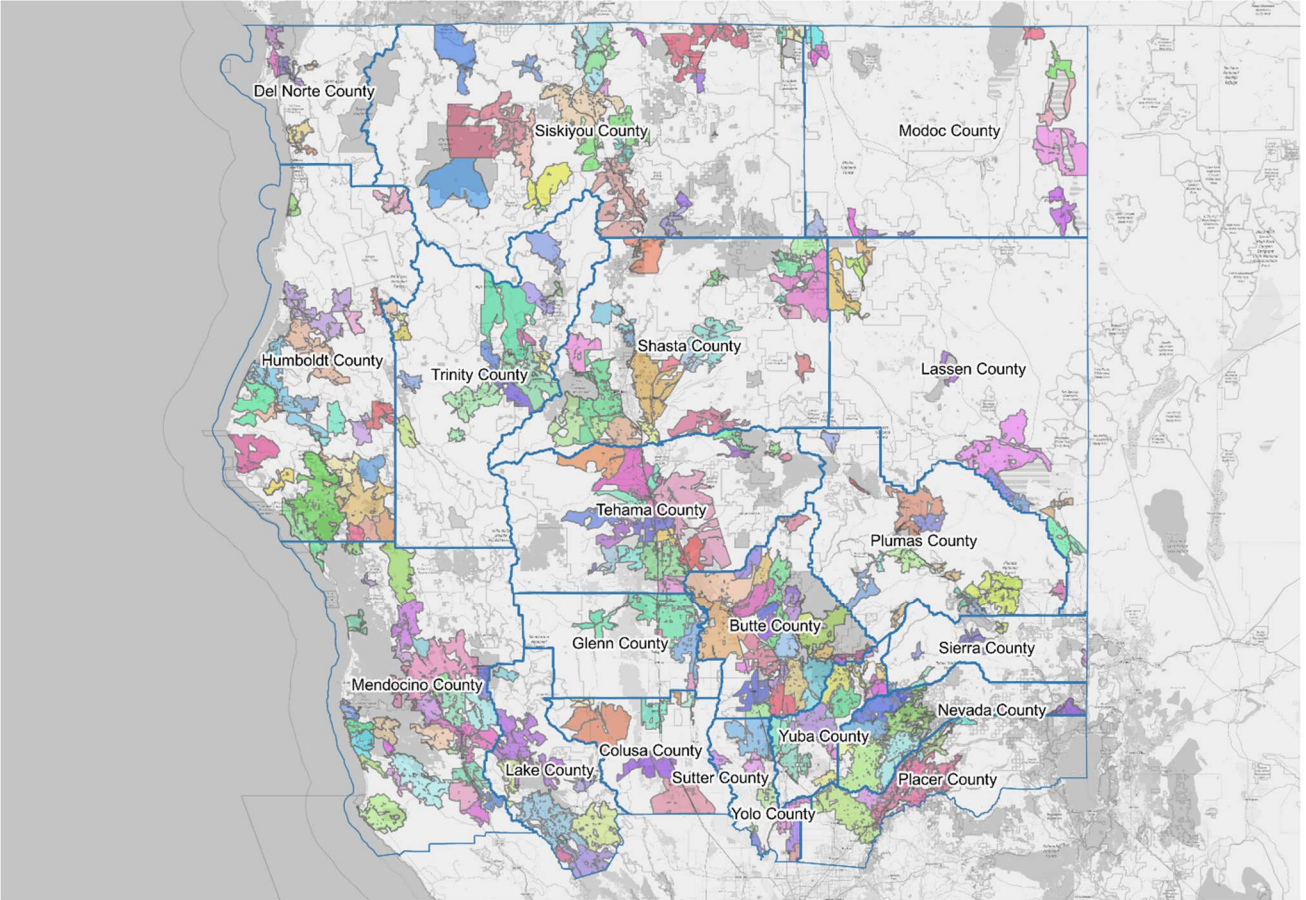


Figure 3. Map of Priority Areas in Northern California

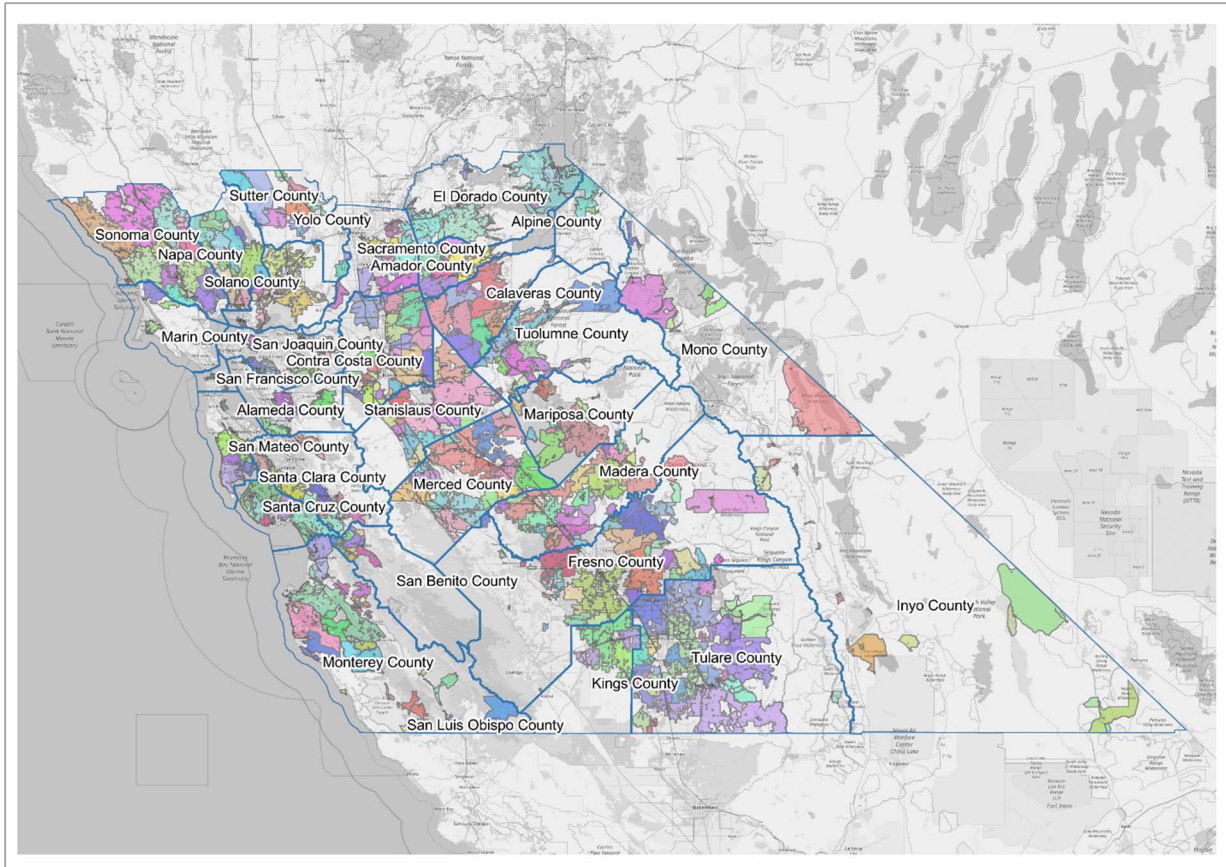


Figure 4. Map of Priority Areas in Central California

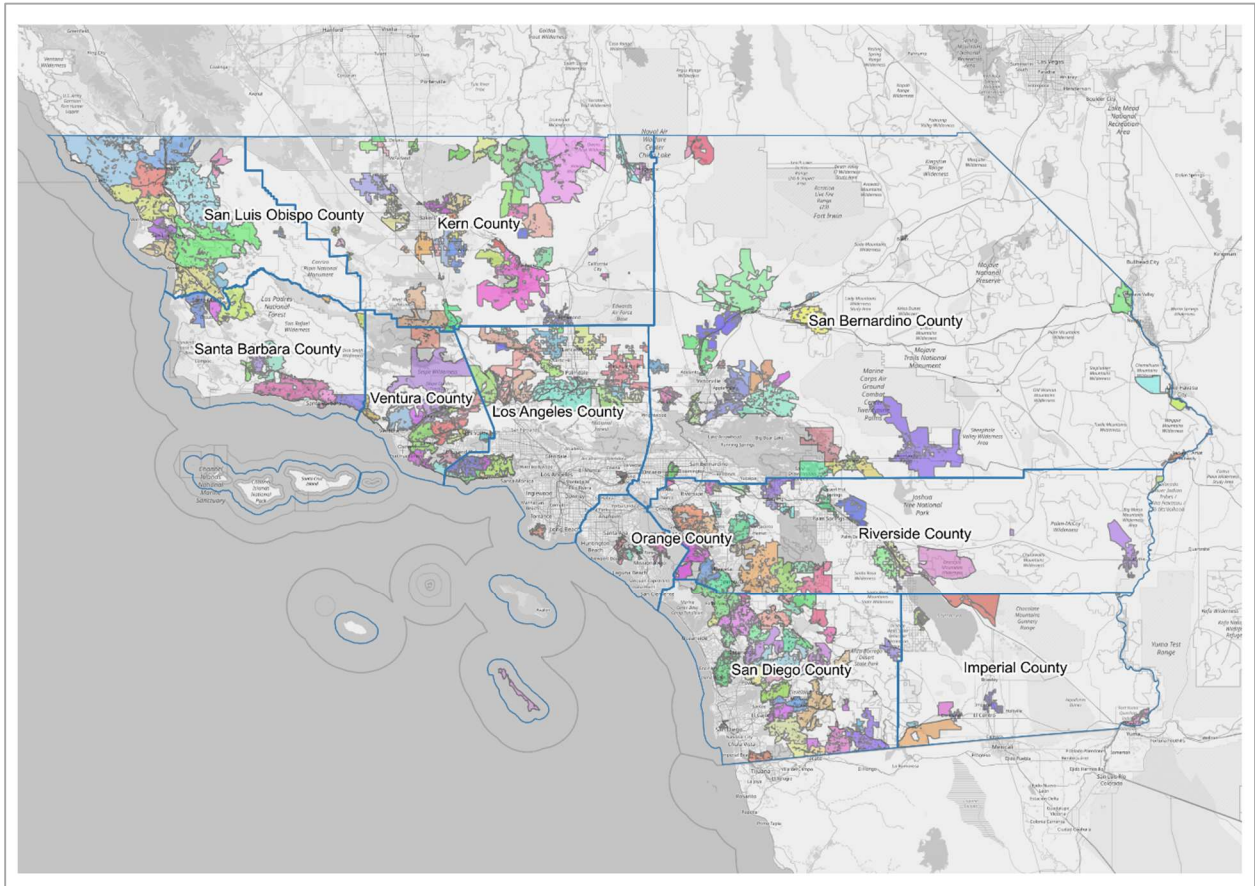


Figure 5. Map of Priority Areas in Southern California

Appendix A—Model Parameters

Item	Value
Block Level	Census Block - using Tiger 2010
Delivery type	Fiber to the prem (FTTP)
Network Type	Greenfield - assumes the builder of the broadband network must purchase and install poles, duct, conduit, and manholes.
Costs / Investments	Where possible we are using the modeling approach used for FCC costs with inputs adjusted for current material and labor. California Prevailing Wage used as basis for hourly rate. Structures adjusted for fire hardening where data indicate.
Last Mile Allocations	Last Mile networks allocated to last mile provider.
Middle Mile Allocations	Middle mile networks split between state-owned and last mile provider owned portions.
Definition of Unserved	All Areas lacking access to at least 100Mbps downstream x 20Mbps upstream <i>using FTTP or at least DOCSIS 3.1 or better</i>
Served or Unserved	Unserved only.
Demand Locations	CostQuest estimates. CostQuest Fabric V3.
Network Buildout	Greenfield
Types/Geographies	All areas
Debt/Equity ratio	Consistent with FCC inputs, 55%/45%
Discount Rate	Consistent with FCC inputs, 8.50%
Poles	Pole space can be purchased/leased. FCC pole investments are used and adjusted for current prices and fire hardening where data indicate.

Appendix B—Service Definition Detail

	California Service Definition
Unserved	Service < 25x3Mbps. Lacking access to at least 25Mbps downstream x 3Mbps upstream using FTTP or DOCSIS 3.0.
Underserved	25x3Mbps <= Service <= 100x20Mbps. Access to at least 25Mbps downstream x 3 Mbps upstream with FTTP or DOCSIS 3.0 or better, but lacking access to at least 100Mbps upstream x 20Mbps downstream with FTTP or at least DOCSIS 3.0.
Served	100x20Mbps <= Service. Access to at least 100Mbps downstream x 20Mbps upstream using FTTP or at least DOCSIS 3.0.