State Broadband Initiative Mapping Methodology

For the State of Idaho

Revised September 30, 2012

CostQuest Associates

LinkAMERICA Alliance

Contents

Overview

This document provides an overview of how the sixth required data set was collected and processed for the State Broadband Initiative (SBI) in the state of Idaho.

This submission builds upon prior efforts to increase in state broadband mapping and planning capacity. Although each state has taken a slightly different path to building in house capacity, this cross-state partnership helps the LinkAMERICA team focus on comparable outcomes across the four states, where appropriate and support each state based upon the State's elected transition path. Our intent is not to make the states look and be the same, rather it is to leverage economies of scope and scale among the business processes while at the same time pursuing the longer term goal of transitioning sustainable program leadership to the respective states.

As our team completes the third year of the SBI program, more work has shifted to in state partners. Much of this work focuses upon the capacity building, planning and technical assistance components of the program. One immediate result of this is that in some of our states in-State partners have taken direct responsibility for the survey, validation and development of Community Anchor Institution information. The methods by which CAI data were developed are included as Appendix One. During this third program year we also anticipate at least one in State partner taking over the state web presence, both in terms of content and hosting. We also have States hiring in dedicated resources to support the program.

As expected, this document rests heavily on the prior drafts but has also been updated and expanded.

Significant changes include additions covering:

1. Trends in provider inputs
2. Modification to internal provider tracking
3. Increases in the amount of WISP coverage using propagation estimates
4. Requested changes based upon NTIA guidance
    a. Review of submitted speed with respect to NTIA supplied frequency table
    b. Review of NTIA speed guidelines and provider documentation
    c. Inclusion of Provider Universe Table (Appendix 4)
    d. Expansion of verification methods summary table
5. Transition planning with respect to capacity building within the State for Broadband map development (even while the technical data development components of the program continue to rest with CostQuest and the LinkAMERICA Alliance).

Treatment of the following subjects has been expanded:

1. Verification and validation
2. Data production methods

3. Provider advertised speed and coverage validation

As anticipated, the SBI program continues to mature and evolve. Technical leadership and strong program office guidance has been appreciated. We continue to focus resources on establishing stable business processes to track submissions, verify received and processed data, test for temporal stability and provide reporting deliverables consistent with NTIA expectations.

In our view, the mapping deliverable reflects (1) a good faith effort, which results in a reasoned response to the NOFA, Technical Appendix A, as well as supplementary program office guidance and modifications offered in phone calls, emails, and webinars, (2) a stable foundation for improvement and prioritization of both NTIA and state needs and interests , (3) a valid data processing model to support online mapping, consumer feedback, provider verification and reporting, and finally, (4) a valid use of the evolving data transfer model and its intrinsic validation methods. More importantly, the resulting data and online coverage maps that follow from this work are providing good input and context for the Broadband planning teams working across the states we have the pleasure to serve.

We also note that the mapping deliverable is increasingly important to state policy makers as each of the states we work with continues to assess the policy ecosystem that supports the advancement of broadband access and adoption.

We close this methodology document with 4 appendices. Appendix 1 refers to efforts related to Community Anchor Institutions. Appendix 2 describes data collection challenges. This section describes some of the open issues, challenges and questions we are exploring. Our hope is to receive clarification and counsel from NTIA in how best to confront some of these issues, which are likely common across states. Appendix 3 describes the confidentiality framework explained by NTIA. Appendix 4 details the provider universe, those providers found to be non-NOFA compliant and those providing data.

Purpose of This Manual

This technical document was developed to provide transparency in our data production process.

Our goal is to illustrate a thoughtful process designed to meet the intent of the submission. Our hope is that we have developed a process that is reasonable, with respect to the data it deals with, as well as flexible enough to change with evolving NTIA requirements and lessons learned from the Broadband mapping community.

Data Sources

Developing the Provider List

Broadband provider lists for all states were developed from the following sources:

- Prior comparable mapping/research efforts
- State lists of regulated telecommunications, cable and wireless service providers
- State and national industry organizations (i.e. cable associations, wireless service provider organizations, telecommunications associations)
- FCC Form 477 respondents
- Third party data sources such as Warren Media, Media Prints, American Roamer Coverage Right, GeoResults Wirecenter Boundaries.
- Independent web searches
- Interviews with key state staff members and important community influencers

As one would expect in a dynamic marketplace, provider identification is an ongoing and important component of our work. Mergers and acquisitions, the use of multiple regional DBAs, the lack of any universal identity management attribute, and the generally complex parent-subsidiary structure of many telecommunications companies, make provider identification and tracking very challenging. Because of this dynamic environment, the Provider list is reviewed on an on-going basis and changes are made as necessary to ensure that the list remains current.

At the start of each round, email and telephone contact is made to all known providers. This time consuming, but necessary, process ensures that the list of contact persons remains current, and that providers are aware of data request changes and deadlines associated with each round. Where necessary, we execute new NDAs with providers. We maintain this communication with providers throughout the Data Collection period, providing multiple paths and opportunities for participation in the program. Providers that respond too late to be included in the final dataset are flagged for inclusion in the next submission. Unresolved data concerns are also flagged and tracked so that we can begin working on a plan for resolution prior to the next data collection round.

As contact is made in each round, we qualify each provider by asking a series of questions regarding the type of service and speeds offered. If the provider does not meet the minimum specifications for a

Broadband provider (as defined in the NOFA) we make a note of the change in status.[1] Providers remain on our list and are included in program communications so that in the event that their service is upgraded or expanded their status can be updated accordingly.

Provider Outreach

To meet the program's aggressive deadlines and participation goals, LinkAMERICA believes it is critical to maintain rapport with providers. To do this we reach out to providers with regular project communications, including a program newsletter and links to the various State mapping websites. In several states we have participated in trade association and policy summits.

As described above, individual e-mails and/or telephone calls are made to all providers explaining the status of the program and requesting their continued support. In some instances we've also had the opportunity to support providers in their BTOP / BIP applications. Through these collective outreach initiatives, and our engagement with various industry associations, we continue to enjoy a healthy and appropriate relationship with Broadband service providers.

NDA

To provide protection for all parties involved, LinkAMERICA continues to honor the terms of our NDA. If providers did not execute the NDA in previous rounds they were offered the opportunity to do so in this collection round. New providers were of course also supplied with a copy of the NDA.

To facilitate the execution of NDA's, LinkAMERICA continues to use the DocuSign online document management solution. This system allows providers to review and digitally sign the NDA in a legally binding manner, and has been instrumental in achieving rapid approval and execution of NDAs with the majority of providers. In some cases, NDA's were individually negotiated to address specific provider concerns. In all cases, minimum standards established by the NOFA are honored. In other cases, providers chose to submit data without executing an NDA.

Provider Survey

Since five prior rounds of data collection have been completed, the LinkAMERICA team has a solid base of coverage and speed information with which to begin Round 6. This allowed us to provide flexible response options to participating providers. One option allowed them to review check maps of their coverage and speed data – submitting only corrections and additions to the existing dataset. (For provider convenience the check maps were created in both PDF and Google Earth (.KMZ) formats.) The second option was to allow submittal of completely new datasets, either in tabular form or in multiple other digital formats. For those without CAD or GIS systems, we continued to allow the submittal of printed/scanned maps and other written materials.

[1] As with other Grantees, we struggle with appropriate and consistent classification for service providers who opportunistically provision Broadband services. In this submission we continue to bring them into the analysis as a provider type "other". As the inclusion of this category isn't our primary goal, we are working to process data as we can. We are similarly categorizing and retaining reseller information. Appendix 4 illustrates the categorization of non Broadband providers within our provider tracking and verification systems.

Survey Methods

Once again, we used a secure digital survey process (via our provider portal websites) to collect and display information for providers. The Round 6 survey process was designed to accommodate both new and returning providers, and the different types of information they would be submitting. The following is a summary of the process encountered by each group:

New providers: New providers were routed directly to our standard survey where they were provided with templates for uploading data in tabular NTIA-compliant formats. As in previous rounds, if providers could not supply information in the requested format, alternatives were offered. These alternatives included uploading service-area boundary maps, exchange area maps, CAD drawings or customer address lists. From that information, the LinkAMERICA team developed a geographic representation of coverage and was able to build coverage features for each provider.

Returning providers: For Round 6 we continued to work with participating providers to improve their datasets. Check maps continue to be a useful tool to show providers how their area would be displayed on the resulting interactive state map and to get constructive feedback regarding corrections and changes that need to be made to their coverage and speed data. Generating these customized documents in each round is an extremely time consuming verification process, but it allows us to close many of the gaps that might have otherwise persisted.

Follow Up

After the release of the Round 6 survey in early July 2012, LinkAMERICA launched an extensive effort to encourage responses. Every known provider was contacted at least twice during the months of July and August. The initial data submission deadline was set for mid-August, but we continued to accept "straggler" submissions into September.

No Response Policy

As mentioned above, every effort was made to contact each provider who appeared on our initial list. However, if no current information could be found on the company (i.e. no website, no valid phone number, and no contact person identified) they were removed from the list of "known providers". We believe the vast majority of those we were unable to reach were providers who have simply ceased to exist[2]. If we verify that a company is a broadband provider still doing business and are not able to get a response to our request for data, we make note of that in our datapackag.xls, and continue to reach out to encourage participation.

Summary

In summary, an intensive 45-60 day provider outreach and data collection process is initiated at the beginning of each round. In Round 6, given the data vintage of June 30, 2012, we began this process in June and the last submissions were accepted in September, 2012.

While we continue to successfully engage the majority of providers in each round, the amount of manpower required to solicit complete and timely responses should not be underestimated. This process is one of the most costly and complex within the entire SBI program.

[2]The list of known providers and important submission statistics are contained in the datapackage.xls file.

Third Party Data Used

We acquired the following commercial/restricted use data products:

- American Roamer, Coverage Right Advanced Services (tabular). This data served two purposes. The first was to verify the provider list and help find Broadband service providers not on other lists. The second was to verify the reasonableness of the Broadband service provider's submission.
- GeoResults Wirecenter Boundaries. This data was used in the verification of 'telephone' Broadband provider data. Where a public domain exchange boundary wasn't available, the boundary was used for coverage containment tests.
- Media Prints Cable boundaries. This data was used in the verification of Cable/HFC Broadband provider data. It was used to research valid providers and discover if that provider was offering Internet service. FCC 477 restricted use data were analyzed to find valid providers within a given area.
- Proprietary Provider Serving Areas. Since the first survey, a number of providers have supplied their engineering, serving area and/or franchise boundaries. We have maintained and enhanced these proprietary data sources.

We have included third party data sources which touch on each of the three major technologies analyzed within the SBI program. Each of these data sources tie back to a public domain data source, which provides a cross-verification mechanism for the commercial data product.

Although there are a large number of third party licensed data sources available, we remain conservative in our acquisition plans. From our limited analysis we are concerned about the ability to cross-verify additional third party licensed sources against public domain data. Further, we are unsure of how we may be able to integrate another data provider's view of valid Broadband providers within the definitions used by the NOFA (e.g. Are they using an FRN/DBA identity view or a marketing view? Can the provider supply in a 7-10 day window? Are they facilities based or not?). This leads us back to a statement we made in a 'lessons learned' Webinar (April 2010) about exploring a consortia to lower the cost of data acquisition and allow multiple entities to peer review the quality and methodologies behind licensed data products.[3]

Beyond these commercial data sources, we used a number of public domain sources. These included:

Geographic Data Files

- US Census TIGER data[4]

Sources that helped isolate providers, identity management or provider service areas

- NECA Tariff 4
- State produced exchange boundaries
- Carrier produced wirecenter boundaries (sometimes proprietary to provider)

[3] We also suggested forming a technical standards committee and a consistent system for confidence reporting.
[4] Census data were derived from < http://www.census.gov/cgi-bin/geo/shapefiles2010/main>, Census 2010 files. Roads were derived from the county faces and edges file downloaded at the same location and tiled for a full state.

- FCC Coals reports (321/325)
- FCC FRN API lookup tool
- FCC/FAA Antenna Registration System
- FCC FRN Lookup Tool (plain text search)
- USAC High Cost FCC Filing Appendices

Sources that helped isolate anchor institutions

- USAC Grant lookup tool
- USAC High-Cost FCC Filing Appendices
- HRSA data warehouse
- NCES data lookup
- State managed lists of schools (K-12), post-secondary institutions and libraries
- List of museums, conventions, and visitors bureaus from www.onlineatlas.us
- In state relationships to key stake holders.

Finally, challenges exist when dealing with the inevitable conflicts between provider-submitted data and third party sources (public or commercial). There is no guarantee third party sources are more accurate or timely than the providers' own reports. Indeed, some third party sources are based upon different standards than those specified in the NOFA, perhaps making them less reliable than information collected directly from providers. At the very minimum, provider data has a lineage and temporal status that we can identify. A concern we have with increasing use of third party data is that we have no way to verify its quality or development methodology. Particularly in rural areas we are concerned about what third party data may reflect based upon what we assume to be a small sample of information.

In other words, we may hit a wall in which we can't determine how the commercial source derived its coverage conclusion. To us this means that third party data sources are beneficial, but represent a supplementary view, not an authoritative one, of the NOFA defined Broadband market.

In short, we have chosen to use provider data as the baseline. We will challenge provider reports when third party data shows major anomalies, when submitted data conflict with prior submissions or when a consistent volume of consumer feedback points to a potential error.

Confidentiality and the Use of Licensed Materials

As a mapping vendor, we are reliant upon the cooperation of Broadband service providers. In large part, what underlies this cooperation is trust that we will not violate the proprietary and confidential nature of the data provided to us.

We are thankful for the confidentiality clarification that NTIA shared with us (included as Appendix 3). We use this as a guiding document to help us communicate with providers about what information NTIA considers to be confidential. Our suggestion is that NTIA publish this, or something comparable, to ensure a consistent interpretation of the NOFA and how it guides NDAs.

As some providers are non-responsive to requests for information, or lack resources necessary to put data into NTIA compliant formats, we have fallen back to the use of commercial data sources in several places.

For incumbent telephone providers we have used commercial wirecenter boundary products to filter Census Blocks and segments that are clearly out of their exchange areas. For cable providers we will use an estimate based upon Census Designated Places within MediaPrints named areas.

Public Engagement: Crowd Sourcing, Surveys and Social Media

Crowd sourcing (i.e., an intentional and carefully designed effort to tap into the collective intelligence of the public at large to expand our knowledge base) continues to be an important element of our data collection and validation process. An expanding use of social media is also an important strategy in our efforts to promote the state programs overall and engage more citizens in the work at hand. In addition to the various opportunities the public has to provide input via the online service coverage maps and the related 'Broadband story' process, our crowd sourcing efforts are grounded in a time tested telephone survey approach focused on the consumer market. In addition, we continue to advance our process to include certain initiatives centered in two social media outlets – Facebook and Twitter. These initiatives are discussed below.

Consumer Surveys

Working under contract for the state of Alabama in 2009, our initial consumer survey was performed before the NTIA SBI grant was in place. Subsequent consumer surveys funded by the SBI grant were hosted in 2010 for the states of Idaho, Wisconsin and Wyoming and then again in 2011 for Alabama (as noted below). These surveys will be repeated after two years to establish and evaluate trends. These primarily telephone based surveys include two distinct and carefully scripted tracks: one for Internet users and one for non-users. The telephone survey approach allows us to reach the non-Internet user group as well as the current Internet user. A secondary online approach is also used to augment input from current Internet users. In the most recent Alabama survey we added a third tier to our approach as we equipped local field survey teams with an iPad-based survey tool and targeted their time to reaching the younger market. For non-users, the surveys help determine why they don't have or don't use Broadband. For current Broadband users, the survey helps determine the nature of their Broadband access and how they use that connectivity in their daily lives. In addition to our state-specific surveys a nation-wide survey was also hosted to provide a broader view of consumer views for comparison purposes. State-specific surveys are, where possible, framed to match the state's regional Broadband planning structure (e.g., the updated consumer survey in Alabama was designed to produce results relevant to the state's twelve Broadband planning regions).

The resulting data is helpful on a number of fronts in the SBI's mission to advance the access and adoption to Broadband. Survey data provides an important, albeit broad, gauge for assessing coverage information obtained by providers. For example, areas with widely available coverage (according to provider information), but lower consumer subscription levels (according to survey results), or perhaps where survey results suggest Broadband is not available, can be examined in more detail. Survey results

are also very important to the broadband planning (and capacity building) components of the SBI program in that they help inform and formulate Broadband advancement priorities. Survey results also help inform Broadband policy discussions on both the local and state levels. Finally, survey results provide important information to the service provider community regarding market demand and specific Internet use in specific communities (i.e., regions).

Our ongoing consumer survey process adheres to a consistent process. For example, consistent with prior practice the 2011 Alabama survey was launched in June 2011 with a test number of survey calls to confirm (and adjust as needed) the structure of the survey and the underlying survey process. Our surveys typically run for three to four months. All telephone surveys are completely random beginning with the acquisition of a list of state-specific, randomly selected landline telephone numbers. Mobile phones are not typically included in the surveys. Upon evaluation of the survey statistics, auxiliary surveys are executed to ensure appropriate representation is achieved on both demographic and geographic fronts. For example and as noted above, the recent Alabama survey was augmented with a field effort to ensure the younger demographic (i.e., age 18 – 25) was adequately represented. This secondary step is required because of the continued migration (by younger markets) to non-landline based communications. This younger market is also surveyed by reaching out through social media outlets (primarily Facebook and Twitter) to encourage their participation in an online survey process.

As noted above, our telephone survey process is augmented by providing online access to the survey. Participation in the online survey is promoted on all of our state-specific public web sites and selected social media.

As a final relevant point with respect to the consumer survey process the length of the survey is noteworthy. By survey standards, these tend to be long surveys. The surveys typically average just over fifteen minutes. While this clearly contributes to the number of survey call attempts that were required to reach the level of statistical validity, it is not insurmountable.

Social Media

The phenomenon of social media is widely documented and yet still emerging as an effective access point for public engagement. We continue to explore appropriate ways to use a variety of social media venues in our SBI efforts. All of our efforts are informed by and consistent with relevant state statues and guidelines. Different states have different perspectives on if and how the state will participate in the use of social media. Some state requirements are well defined and some are still being formed. Where appropriate, we use LinkedIn, Facebook and Twitter to support our work. A central focus is on promoting awareness of the program and seeking to expand engagement. In some situations we find that sub-program initiatives (e.g., regional planning teams) are making very effective use of Facebook to help inform and engage citizens impacted by the SBI program. As noted above, we are able to promote additional input on the consumer surveys through a social media outreach program aimed at our younger market segments.

In addition, we continue to evaluate how Facebook and Twitter can be used to drive public input on two important crowd sourced issues: online speed tests and input on map accuracy. Based on data obtained

through our web site traffic monitoring process and readily available social media tracking processes, results are promising.

Capacity Building and Transitioning to State Partners

A fundamental goal of LinkAMERICA has always been to transfer knowledge and capacity to our in-State partners.

Within each State, transition planning and responsibility for specific activities is on a slightly different timeline. Much of this is driven by resource availability and partner identification within the State. For example we began transitioning the responsibility for Community Anchor Institution data to the State of Alabama in Round 3, starting with the use of interns to validate Community Anchor Institution data. In Round 4 the state's responsibility expanded to include collection of all CAI data, and in Round 5 the effort culminated with Alabama assuming responsibility for the CAI submission. LinkAMERICA supported this process with detailed transition documents and technical support.

Alabama plans to continue the transition process though the end of year 3 assuming more responsibility for the interactive State maps and website. In Idaho the SBI Framework Coordinator took on the responsibility of reaching out to CAIs in round 5. In round six the outreach became more relationship based and face to face. Other States are looking more towards program year 4 and/or the in-State hire of a Broadband Coordinator as the initiation point to support their transition efforts. Broadband Coordinators were brought on board in both Idaho and Wyoming in year three. An open position was recently filled in Wisconsin. Alabama has had a broadband coordinator in place for nearly two years.

Data Sharing With Other States

Where possible, LinkAMERICA works to share data with other state mapping entities. This data exchange tends to take two routes.

First for wireless providers if we find a fair amount of coverage that crossess into an adjacent state, we will ask the provider's permission to convey this information to the neighboring states. If the permission is received, we send the data to the mapping agency.

Second, in circumstances where we receive a speed that is outside of the technology speed 'norms' and this provider offers service in another state we try to check with other covered states to find out if the service is comparably marketed.

Trends in Submitted Data

Overall we note several important trends in this data submission. The list below represents general trends and not a scientific survey.

We note the following trends:

The coverage of advertised speeds is increasingly important. More and more providers are specifically concerned about where the submitted NTIA footprint shows available of 4 x 1 Mbps or 6 x 1 Mbps service.

Large national providers are beginning to submit block level speed information. In round 6 AT&T submitted block level coverage and speed. Other national Wireline providers, such as Frontier improved their submission based upon the completion of system conversion of acquired properties.

xDSL speeds are increasing. More and more xDSL is likely ADSL 2+, VDSL, shortened loops, pair bonded or some combination of these. As we talk to providers who trigger speed/technology tripwires, we receive more and more feedback about the presence of these new technologies to enable speeds comparable with DOCSIS systems.

DOCSIS 3 is becoming the norm. Most cable systems are becoming DOCSIS 3.0. Over time we are seeing the DOCSIS 2.0 areas diminish. In some DOCSIS 3 areas there tend to be pockets of non DOCSIS 3 in predominant DOCSIS 3.0 markets.

There seems to be an increase in acquisitions among fixed wireless providers. A large consolidation with respect to T6/Digis/Skybeam/JAB has changed the provider landscape in several of our states. As much of the system consolidation has not yet taken place our coverage remains largely in tact but we anticipate changes in the next submission.

Fixed wireless providers are offering broadband services approaching 1 Gbps. This is occurring both in terms of licensed and unlicensed spectrum. Part of this is driven by where a provider has fiber or high capacity wireless backhaul but we are receiving more and more information from providers and radio manufacturers specific to very high speed wireless services. Although the service can be deployed within the 7-10 day NOFA window, these higher speed services tend to be purchased by high capacity customers. It may be worth reconsidering the speed norms in this category as well as adding a field in the datatable to indicate when a speed value is geared toward a specific end-user class.

There is less and less of a distinction between fixed wireless and mobile wireless. As firms market LTE and/or WiMax as home DSL alternatives we are a bit unsure how these two classes are to be established-what is the operating distinction between Transtech 80 (mobile licensed) and Transtech 71 (fixed licensed) when both are used as in in-home Broadband service?

Satellite providers are advertising broadband services exceeding the speed ranges in the data model. Further the spectrum used isn't available in the NTIA data model.

We continue to see a number of national Broadband providers who do not show broadband coverage within pockets of otherwise covered areas. In the figure below, the orange represents Census blocks which are NOFA broadband covered. The transparent areas have no NOFA broadband coverage from the same provider.

Figure 1--Uncovered pockets within urban, covered areas

This coverage drop-out appears to be happening in urban Census blocks typically with schools, shopping malls, universities and large businesses. We don't know what his is happening, but it could be an impact of the NOFA restriction on 7-10 provisioning. This is a noticeable artifact in the data and does challenge the notion of some who see NOFA compliant Broadband coverage as a uniform surface across an area.

Data Production Process

To support our objective of transitioning the data development process to our State partners, we continue to model, refine and document our data production process. We find this to be a very beneficial step for two purposes.

First, it helps us understand why (and if) a task is being done, and if it is being done efficiently. Much of this program started so quickly that it was difficult to plan logical integration and hand off points among the various workgroups. Further, we are currently in the process of consolidating much of the process data (check-ins, check-outs, metadata) and we can use this process model to efficiently plan cohesive information architecture.

Second, our process documentation and modeling helps explain why resources are being consumed in a particular way. This helps our State partners plan for in-sourcing specific tasks as their time and

budgetary constraints allow. It also helps our LinkAMERICA team better plan and cross-train members to deal with the work surge that occurs 30-45 days prior to submission.

Finally, documenting and modeling our process helps us to take advantage of increasing specialization and proficiency with certain types of data and management responsibilities. In submission 3, we had identified data "czars" responsible for check-in and check-out of data. That data czar helped to bridge the gap among receipt functions, provider feedback, production and DBA. In round 5 the data czar was also tasked with alerting on speed/technology tripwires. This individual was responsible for taking the initial review of each submission and determining if an NTIA speed/technology warning would be triggered.

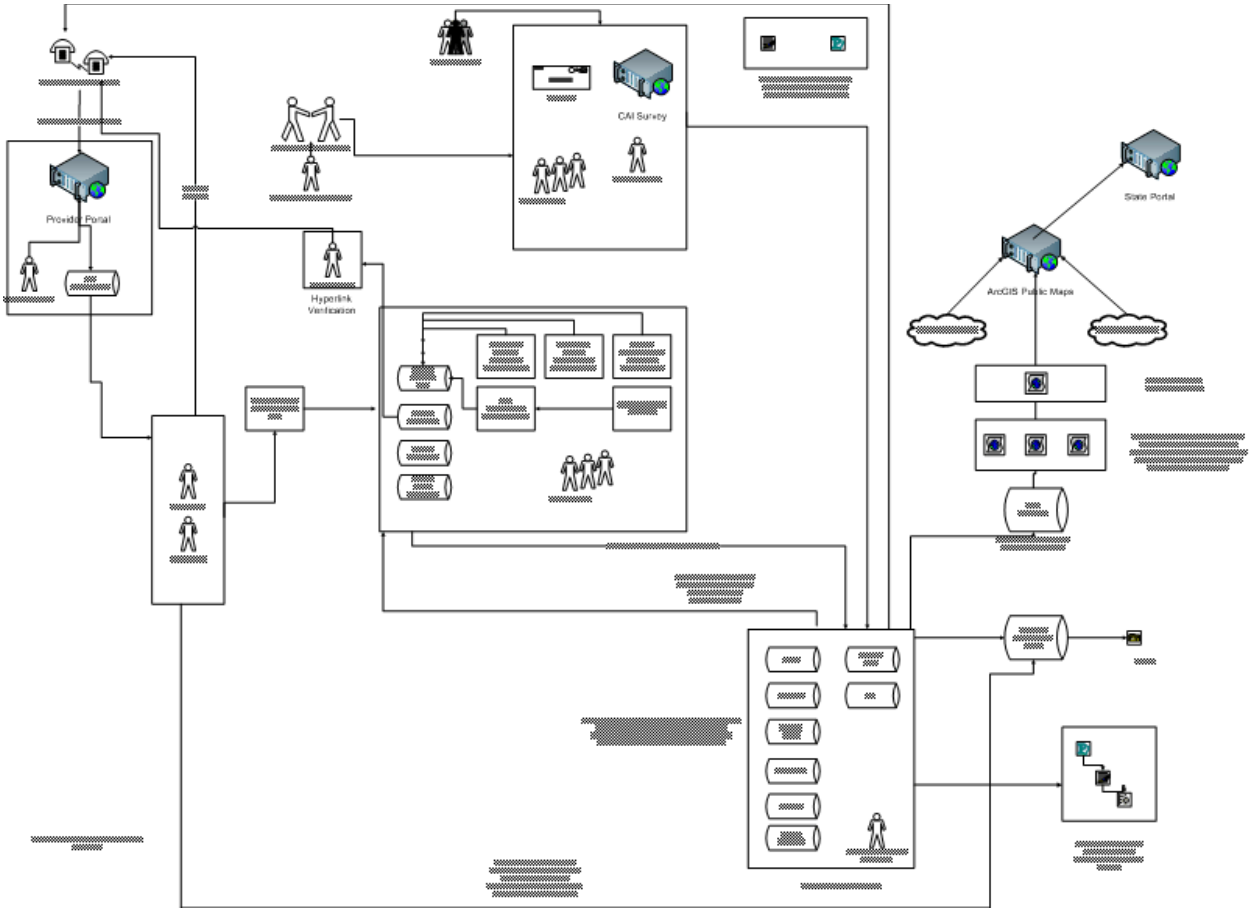


Figure 2—SBI Data Development Business Process Diagram

Provider Tracking In the Cloud

Prior to initiating the Round 5 survey, LinkAMERICA transitioned in house provider tracking systems to a Cloud based application, TrackVia.

The movement away from desktop solutions was based upon several factors. First, the architecture these systems were designed under no longer met the program realities. For example, deliverables like

Datapackage.xls were not contemplated when the original provider tracking system was developed. Second, the ability to share data across multiple geographic areas and organizations was becoming increasingly important as the program evolves and responsibility moves to in-State partners. Third, portions of this data need to securely transition back to State resources who may or may not be able to support a specific IT infrastructure. These factors combined to make the Cloud applications a valuable alternative.

As with any IT transition, the process has not been without challenges. Nonetheless the investment in time and resources has proven to be effective and worthwhile. We anticipate further movement away from desktop oriented architecture to a more open, Cloud type solution.

Data Production Methods

As raw data were received from the provider community, attention turned to normalizing the disparate submission formats[5]. The team considered each submission with respect to the following criteria. These criteria are important because they perform the basis for our verification and quality assurance process. In other words, we have to appropriately scale our data verification efforts to match the scale or ambiguity of the following:

- Locational certainty
- Speed certainty
- Temporal certainty
- Provider and network ownership certainty

The team's goal was NOT to quantify a particular degree of precision with respect to any of these criteria. Rather, we are working to attribute the above "certainty attributes" to each submission, and will continue to implement quality assurance and verification mechanisms that are resource-appropriate for each.

Deriving Broadband Coverage Information

Broadband Coverage[6] was normalized into four formats:

1. Coverage in Census Blocks (2010) of 2.00 or less square miles
2. Covered Street Segments (2010) in Census Blocks greater than 2 square miles[7]
3. Address Level Coverage (point data)
4. Wireless Service Areas (SHP file format)

[5] In line with NTIA Best Practices we continue to request and receive a large number of data input formats. This ranges from tabular Block lists to hand drawn maps.

[6] Speed, Anchor institutions and Middle Mile facilities are discussed in later sections.

[7] To help clarify issues relating to Census block area and vintages in use, our team published a technical paper to the Grantee workspace. Because we were unsure if this standard should be implemented uniformly, this document was never distributed to the provider community.

With each submission, the team went through a series of steps to normalize and categorize the data. Since data arrived in many different formats, and at many levels of granularity, the following normalization procedures were used:

- Determining the nature of service being provisioned (who is providing service and what technologies are in use)
- Planning an attack strategy for the submission –understanding the data and assigning team members to various tasks
- Alert provider relations staff if the received data trigger an NTIA speed/coverage tripwire.
- Geo-referencing the data; QA the geo-referenced data
- Geoprocessing the geo-referenced response
- Segregating the submission into the correct NOFA-compliant submission formats.
- Apply appropriate source metadata[8]

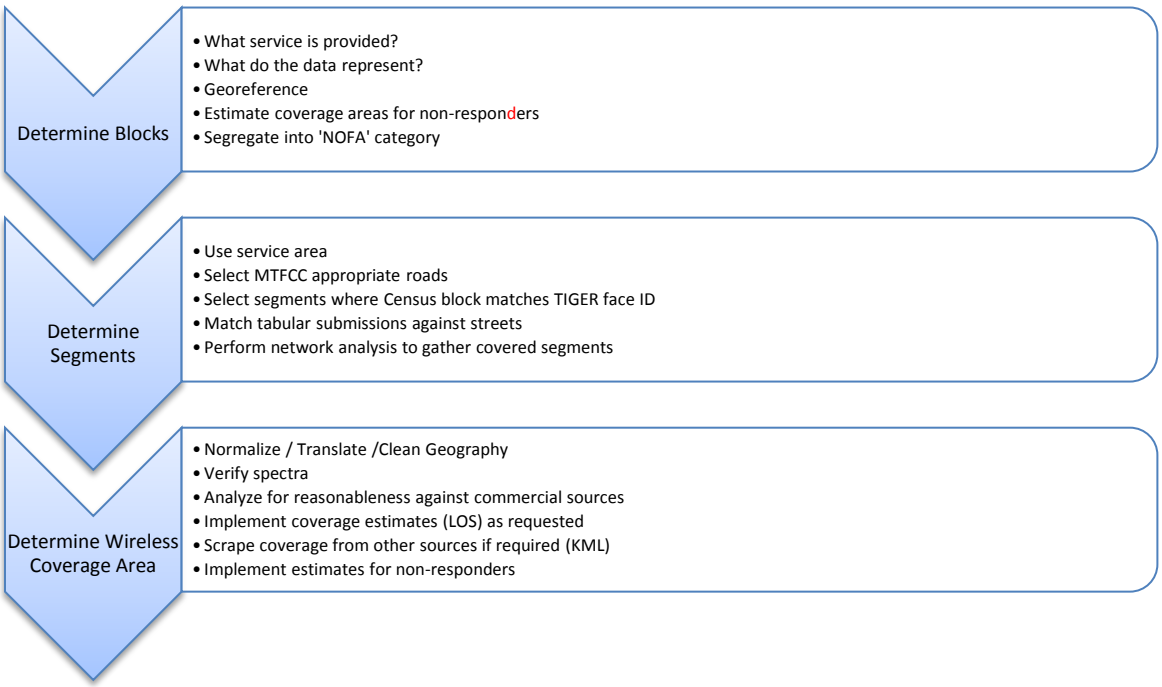


Figure 3-Components of Broadband Coverage Process

Impact of Program Change

There were several important program changes that impacted how Broadband coverage was developed and submitted to NTIA in Round 6.

[8] When our team logs a submission into the staging database we record at least two attributes. One records the method used to derive the coverage, the other records the method by which speed was attributed to that object. Other attributes carried to NTIA carry source meta values as well.

Speed Examination

Given recent concerns about the depiction of speed and what that mapped speed represents, LinkAMERICA invests considerable time requesting detailed information on speed which appeared to be beyond normal speeds for a given Technology of Transmission given the NTIA supplied frequency tables.

Based upon these conversations we learned

A) For incumbent telephone providers; the speeds beyond the normal xDSL range represent significantly shortened copper loops, as well as upgrading DSLAMs and modems to support ADSL2+ or VDSL.

B) For cable providers the intermixing of DOCSIS 3.0 and non 3.0 systems in a market area is typical and sometimes reflects a circumstance where segments of plant cannot be upgraded to DOCSIS 3.0. This variance can be at a level below the Census block. In these cases the maximum advertised speeds remain to represent the market area but the plant variance is typical. We also have one 'cable' provider who is delivering DOCSIS 2.0 over fiber plant.

C)There exists a fundamental disconnect between some providers reporting a service qualified speed--the maximum speed available at a structure versus other providers submitting their maximum speed at the market (MSA/RSA level). Both submission paths are available to providers but the likelihood of providing a speed incompatible with a technology is much greater for providers submitting market level speed.

D)Fixed wireless provides are using new radio technology to quickly deploy services which rival and sometimes exceed those of wireline service providers. These speeds are being advertised, sometimes on public facing websites as well as using direct field sales staff to target specific high demand customers. These services are actively marketed but they challenge the data model in that the speed is marketed and available within 7-10 days of request but the nature of the fixed wireless submission forces attribution of this speed within a potentially large geographic area.

E) There exists a minority of providers who submit a theoretical speed that is unmatched by their web advertising. In these cases we request clarification from the provider on the inconsistency. Our experience has been that providers will modify the speed to be consistent with their marketing and advertising.

F) The maximum advertised speed offered is not always clear. Sometimes the speed is described in advertisements in terms of a combination of video and data. Other times it is data not video. Some providers allow a customer to select how much bandwidth they want to allocate to their data stream versus video stream. In other words the bandwidth available to a household is constant but how it gets allocated among the data versus video becomes a customer or service directed choice. This makes getting Maximum Advertised Downstream speed very difficult because it is not just a product of the broadband network which we are mapping but also the customer's selected service package.

Provider Definitions

Within our provider verification process we work to derive a state level provider match against third party data sources. As discussed in the early pages of this manual, there is no guarantee that a third

party data source is any more accurate than submitted data, nor does it necessarily reflect the provider ecosystem specified in the NOFA, Technical Appendix A. We devote significant resources to matching our submitted data against outside data sources. In many cases this becomes a judgment call trying to match provider names across systems. It is a difficult and somewhat arbitrary process. Nonetheless we do believe it has value because it forces a re-examination of who we believe is an appropriate provider within a non-NOFA context[9].

The use of a provider match system, as well as the webinar comments (3/17/11)[10] directing grantees to estimate, wherever possible, non-participating providers have made us back away from one of our fundamental assumptions in data collection. As discussed in prior versions of this manual, we had developed a certain "hold-out" class of data when a provider's data wasn't of sufficient quality to verify, or we were unable to put it into the data model (e.g. address points submitted for fixed wireless). In submission four, much of this hold-out data was included[11]. In some cases this involved using simple polygons to capture a wireless ISPs serving area. Other times, if we are confident in the coverage, but can get little clarification on the submitted speeds or frequencies, we release the coverage and note in our internal metadata the source issues with the other attributes.

In the weeks leading to submission 5 we received a request from NTIA to clarify the presence of unusual shaped wireless polygons. Our interpretation of this was a request for information relating to the source of these data which do not appear as propagated coverage. Although the 'unusual shapes request' represents a very small portion of the submitted data, it begs an important question about the expectations with respect to wireless coverage patterns. We look forward to working with NTIA to address these issues in a fair way across States and providers. We would not want to create a coverage dichotomy where advertised coverage was disallowed from the NTIA submission because of an expectation about how advertised coverage should appear. One concern we have when we develop a coverage estimate which differs from a providers advertised coverage pattern, which should we submit?

Finally, we use the provider type classification of 'other' to bring specific aspects of certain provider's data into our submission. There still seems to be confusion on how to handle provider types where a provider offers multiple paths to provision Broadband for typically business customers. Rather than waiting for certainty on the answer, we bring the provider in and list them as provider Type "other". Our sense is provider Type "other" will continue to expand in subsequent submissions.

Clearly one challenge is the data, but an equally significant challenge is appropriate messaging around this "other" provider type category. We do not want to leave consumers with the impression that they

[9] We have requested from NTIA information on how provider matching is done within their QA process; beyond the relatively short whitepaper posted with the national map <http://www.broadbandmap.gov/blog/wp-content/uploads/2011/02/DataComparison_Methodology2.pdf>, we have not received any more detailed information on how providers are cross verified between submitted and third party sources at the national level. Our understanding is licensing concerns are holding the release of this information.

[10] Clarifying comments from Akins Lawl indicate the Program Office does not want Satellite providers estimated if the provider is non-responsive to data requests (email 9/12/12).

[11] We continue to process older submission data looking for information and methods by which we can estimate coverage information. This will be an ongoing process.

can get a high capacity fiber or microwave link despite the fact that the hospital next to them or in a nearby Census block can get this service.

After the April 2011 Grantee conference, LinkAMERICA submitted a paper describing our provider classification system[12]. It is our feeling that understanding the type of provider is essential to appropriate verification methods.

Coverage Geoprocessing Methods

The next section discusses how data were georeferenced and geoprocessed given a particular submission format. We have yet to find a particular method that works across all submissions. Rather we tend to tailor our geoprocessing to meet the specifics of the service provider and data submitted.

In most cases, in Round 6 we were not provided with street segment geographic objects for Blocks greater than two square miles (large Blocks). This necessitated subsidiary geoprocessing. As stated before, our first goal was to derive block level coverage. Then, for Blocks greater than 2.00 square miles, we moved to a segment gathering processing. The segment process will be described in the last section.[13]

Block Level Coverage Derivation Using Service Point Data

A number of providers submitted point level customer data.

In some cases the submissions themselves were not internally consistent. For example, in the image below, unprojected points are shown, while the Census block polygon to which the points are supposed to "belong" is highlighted. In this case, one of the following scenarios has occurred: block attribution is wrong, the points are not in the location to which they are attributed, or different block shapes were used than what is assumed.

[12] https://sbdd-granteeworkspace.pbworks.com/w/file/42309493/provider%20ClassificationFINAL.docx

[13] As has been discussed previously, we note inconsistency in how providers are supplying information at the block and segment level. Beyond the temporal differences, we see that providers are computing area differently, as well as including or excluding water areas. This provides an inconsistent measure across providers for the 2.00 sq mile cut off. Our preference would be to provide guidance to service providers within our states, but our concern is that we will inconsistently message this with grantees in other states. We would appreciate consistent guidance from FCC/NTIA on this topic.

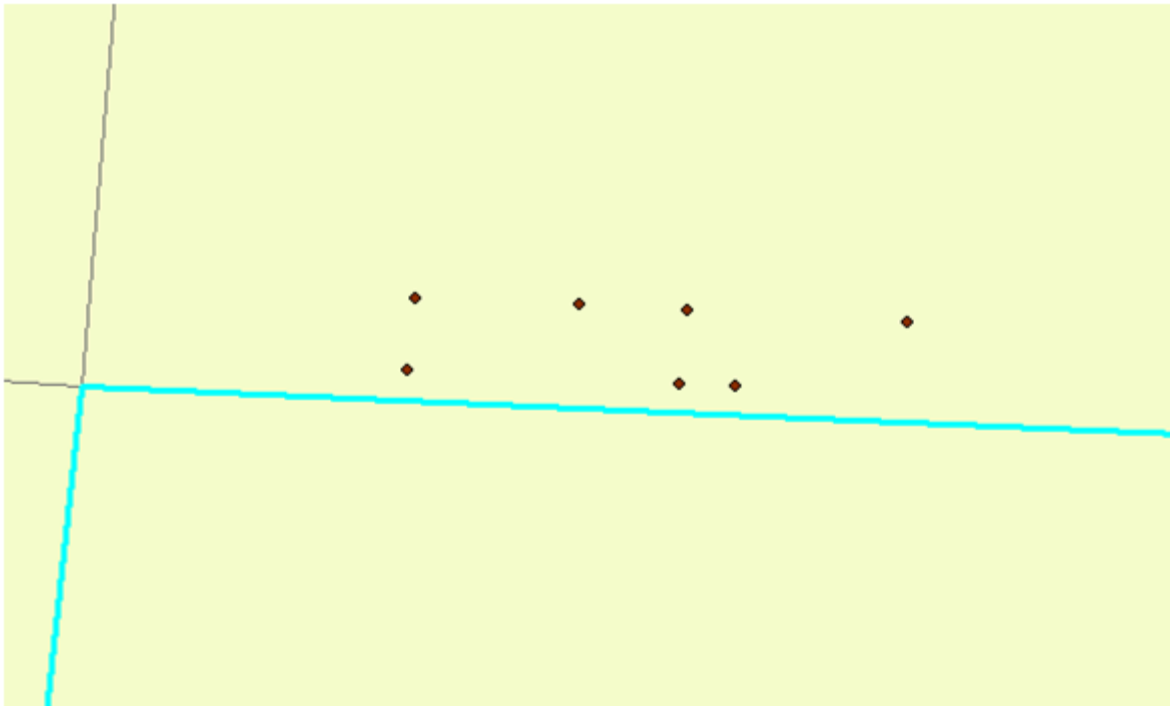


Figure 4-Internal inconsistency in submitted data

In other circumstances, we found that inconsistent geocoding standards may produce misleading results. The next image shows point level data, and the Blocks are colored based upon the counts of points intersecting Blocks. The challenge this presents is that if geocoding was performed on a different dataset than the block boundaries (the road traces are not coincident with block boundaries) and/or geocoding was done without an offset, it becomes problematic to assign coverage to a Census block based upon only the point locations.

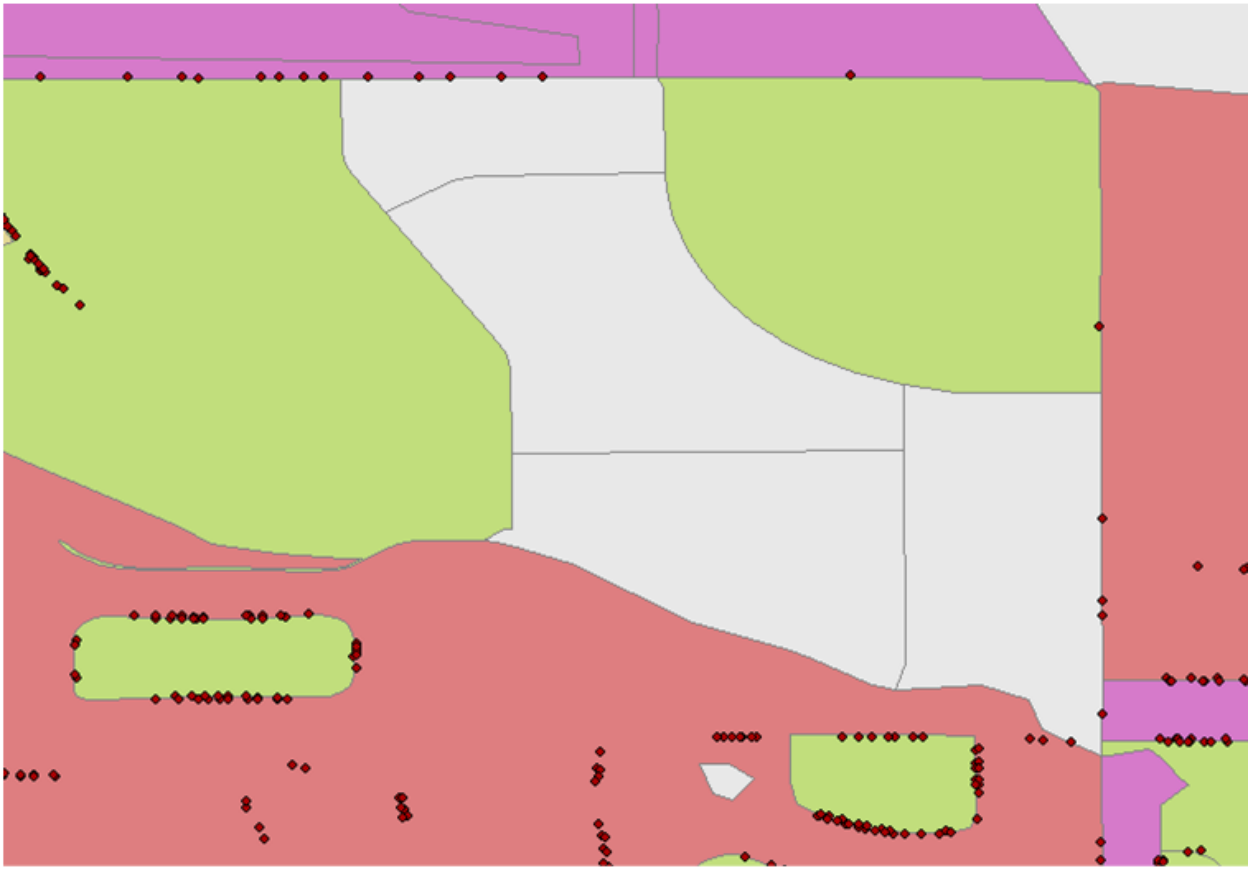


Figure 5-Block Coverage

For this reason, where we were provided address point data and asked to generate covered Census blocks, we elected to use a 200-foot buffer to select Census Blocks that intersect our points.

We also see a number of providers submit customer data and facility data. Their intent is to allow us to have two primary sources from which to derive the most accurate coverage. In these cases we tend to look for clusters of customers in areas where we see no facility based coverage.

With respect to deriving Block level speed from sub-Block data, we have instituted a business rule where the predominant speed in a Block is the speed we attribute to the Block.

Block Level Coverage Derivation Using Customer Facing Plant Level Point Data

In other circumstances, providers submitted point level plant data. From what we could gather, these points tended to be customer-dedicated terminals. Typically, these providers were high speed Broadband producers—which may somewhat strain the definition of Broadband as other providers supplying comparable services specifically disclaimed the ability to provide high-capacity Broadband services in the required 7-10 day interval. In these plant point data submissions, we had similar concerns to the point level customer data, but two factors tended to make us use a more conservative intersection buffer. First, we tended to have far fewer points to work from, so our concern was grabbing too many covered Blocks as the Blocks tended to be much smaller in these urban areas.

Second, these plant points tended to be dedicated to distinct customers, but it was difficult to know which element of the customer's campus to attach coverage to.

In the case of the image below, given a small shift to the left, it would be easily possible to gather 1 to 3 Census Blocks from this point. Although orthoimagery is helpful in a circumstance such as this, it is still indeterminate.

Thus, in the circumstance of plant level point data, we used a 100-foot intersection buffer.

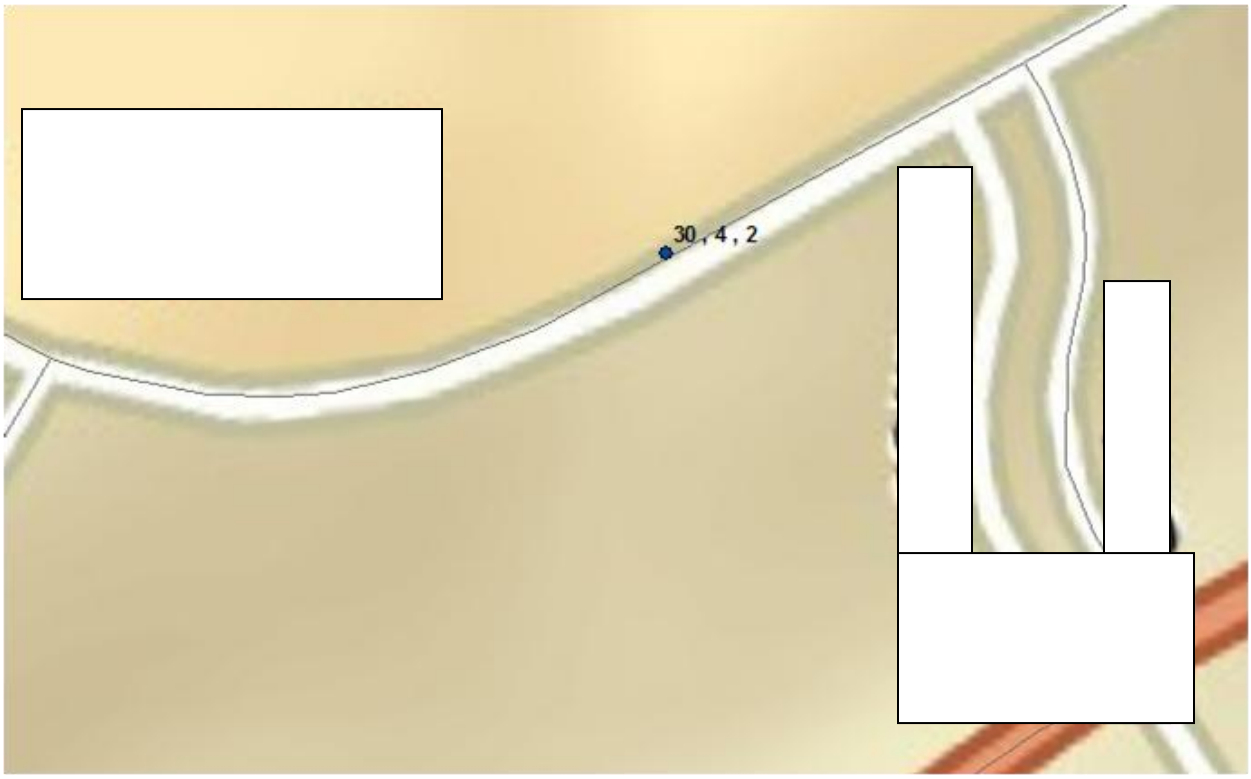


Figure 6-Plant Point level data

Coverage Derivation Using Linear Facilities Data

A number of providers submitted facilities data. We handled this data in different ways depending upon what we believed the facility data represented.

Most telecommunications networks are divided into two components. Feeder - supplies higher capacity nodes (eg. DSLAMs, Fiber Nodes). Distribution - usually supplies customer premises (NIDs, Pedestals, Taps, ONTs). Where we could discern what facilities we were provided, we used different methods.

The next image demonstrates a geo-referenced CAD image as given to us by a service provider. Note the light and dark green shading. We would infer that the lighter segments represent distribution and the dark green represents the feeder network.

In the case of a combined strand map, we used a relatively tight buffer of 200 feet to gather covered Census Blocks. Our intersection tolerance is based upon an assumption that our data likely represent a

situation comparable to customer point level submission in that we have most of the network footprint captured.

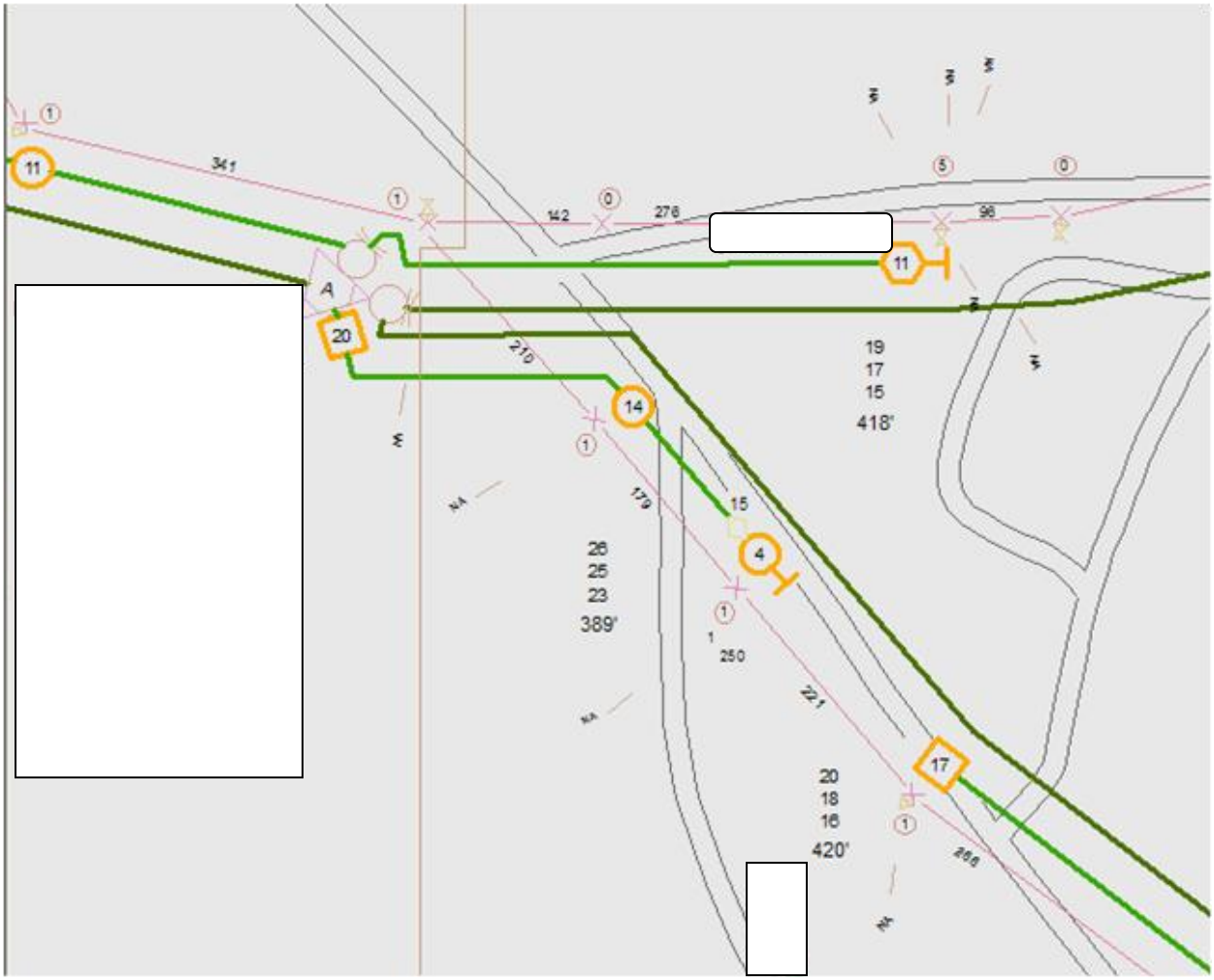


Figure 7-Georeferenced CAD information supplied by Broadband provider

In other circumstances, we were provided engineering information that we inferred to be feeder only. This inference was typically based upon the presence of fiber optic equipment only. In these cases, we used a more generous 2,000 meter Census block intersection. The 2,000 meter criteria was based upon an informal survey of population in proximity to the geo-referenced strand data, but it could be varied based upon a more complete survey.

Coverage Derivation Using Covered Street Segment Data

In some cases we were provided with covered street segment data. Covered segments tended to come from two sources.

In some circumstances, providers gave us CAD data, which was not drawn in a projected manner. This is relatively common for older engineering data derived from hand drawn records. This meant that our

team geo-registered the image into an approximate position. In this case, the boundary streets were selected, and an enclosing polygon was derived. The intersection of this polygon and the Blocks within became the geoprocessing method to derive Blocks.

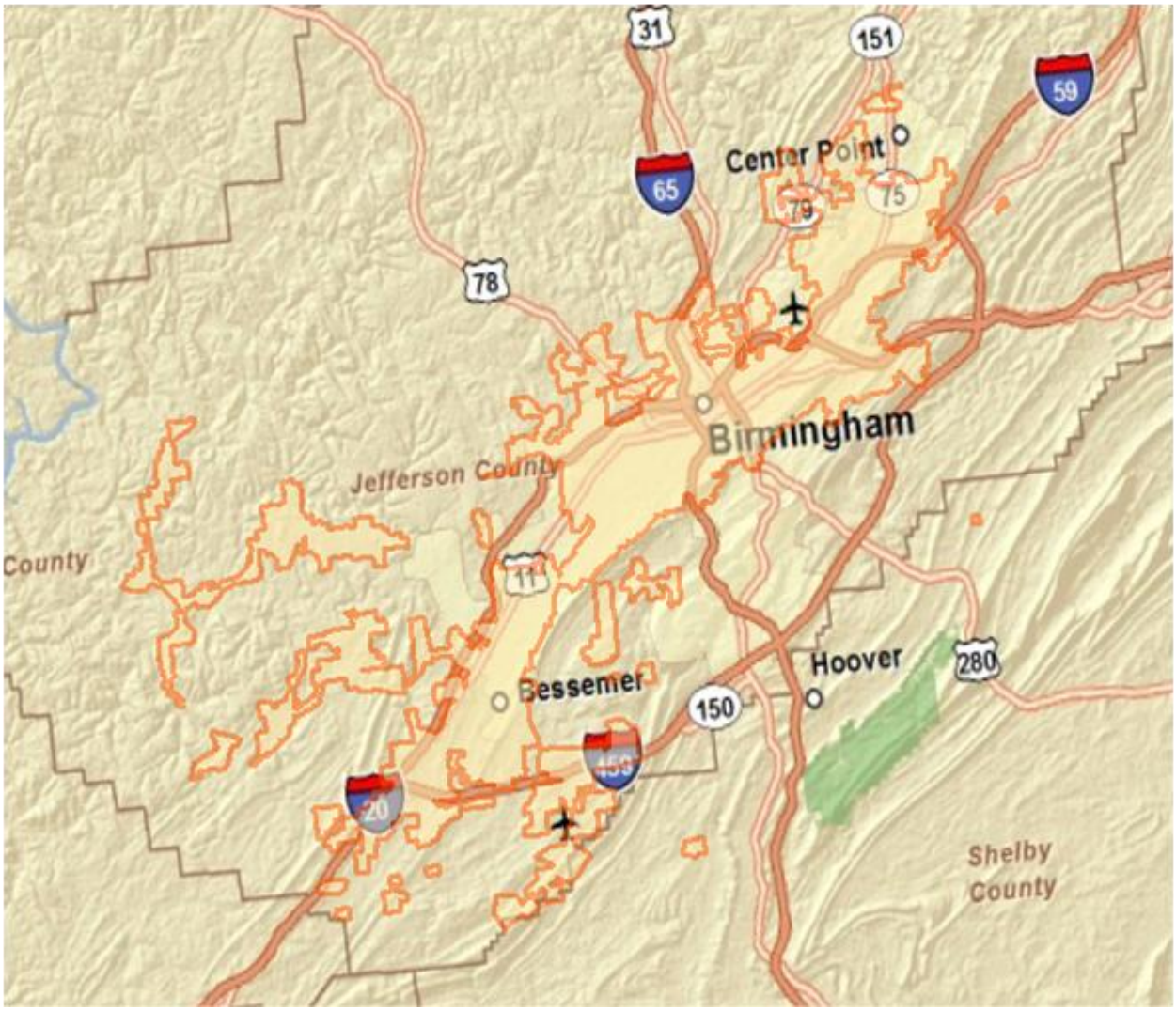


Figure 8-Coverage derived from street segments

In a second circumstance, street segment data was developed during coverage estimation. Handling the estimated data is discussed below.

Coverage Derivation Using Serving Area Point Submission Data

In other cases we worked with providers to derive service areas based upon point plant data. In these cases we were given a serving node and an appropriate road length service boundary. There is an important distinction from the plant data discussed above. In this specific case, the data submitted was a node that served many locations--such as a Central Office or DSLAM. This is contrasted with the earlier example in which the point represents a node serving only a few customers.

When trying to derive coverage from Central Office or DSLAM nodes, the team used ESRI Network Analyst to derive covered road segments honoring these road engineering parameters.

The figure below shows street level coverage derived from Central Office and remote DSLAM point data.

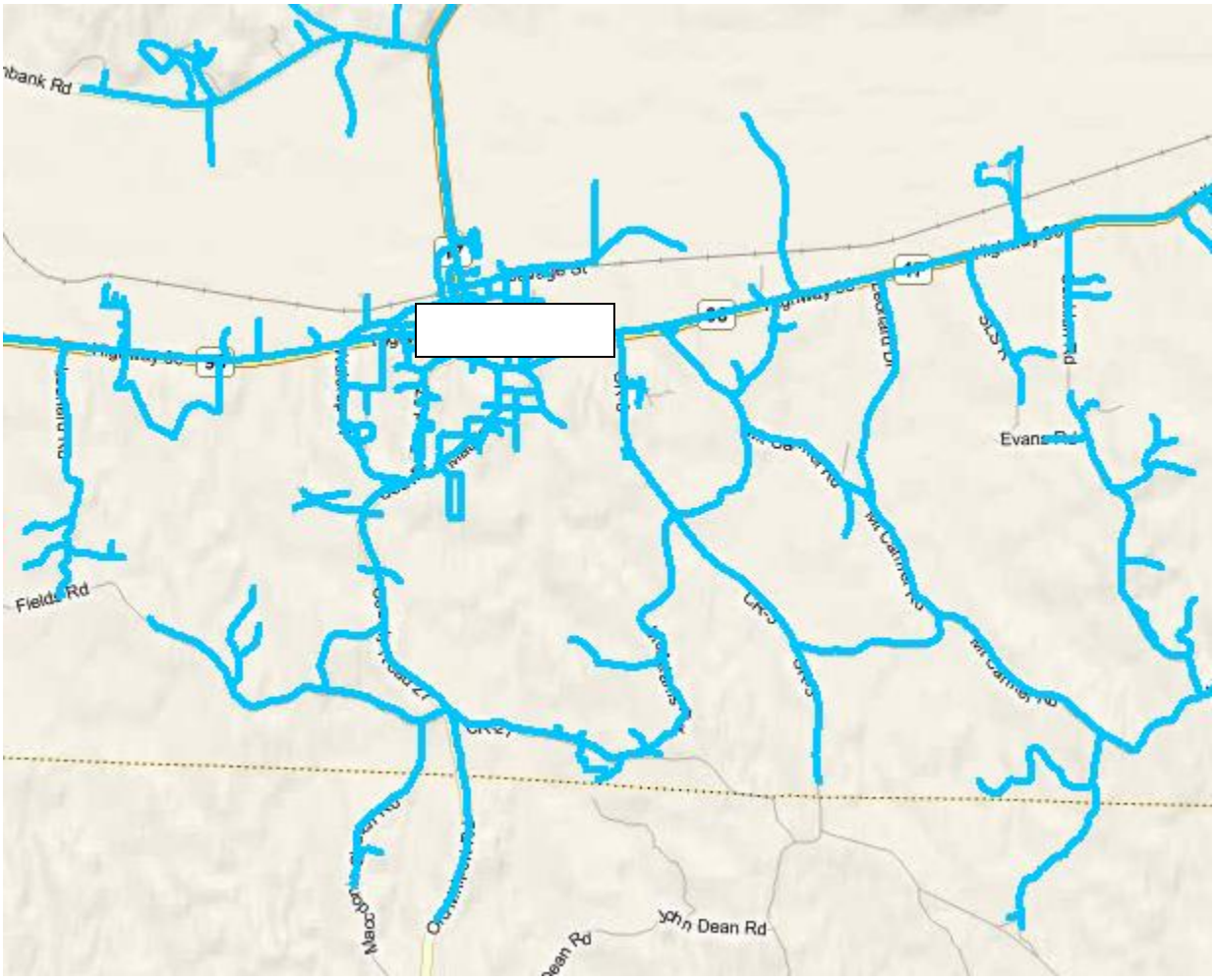


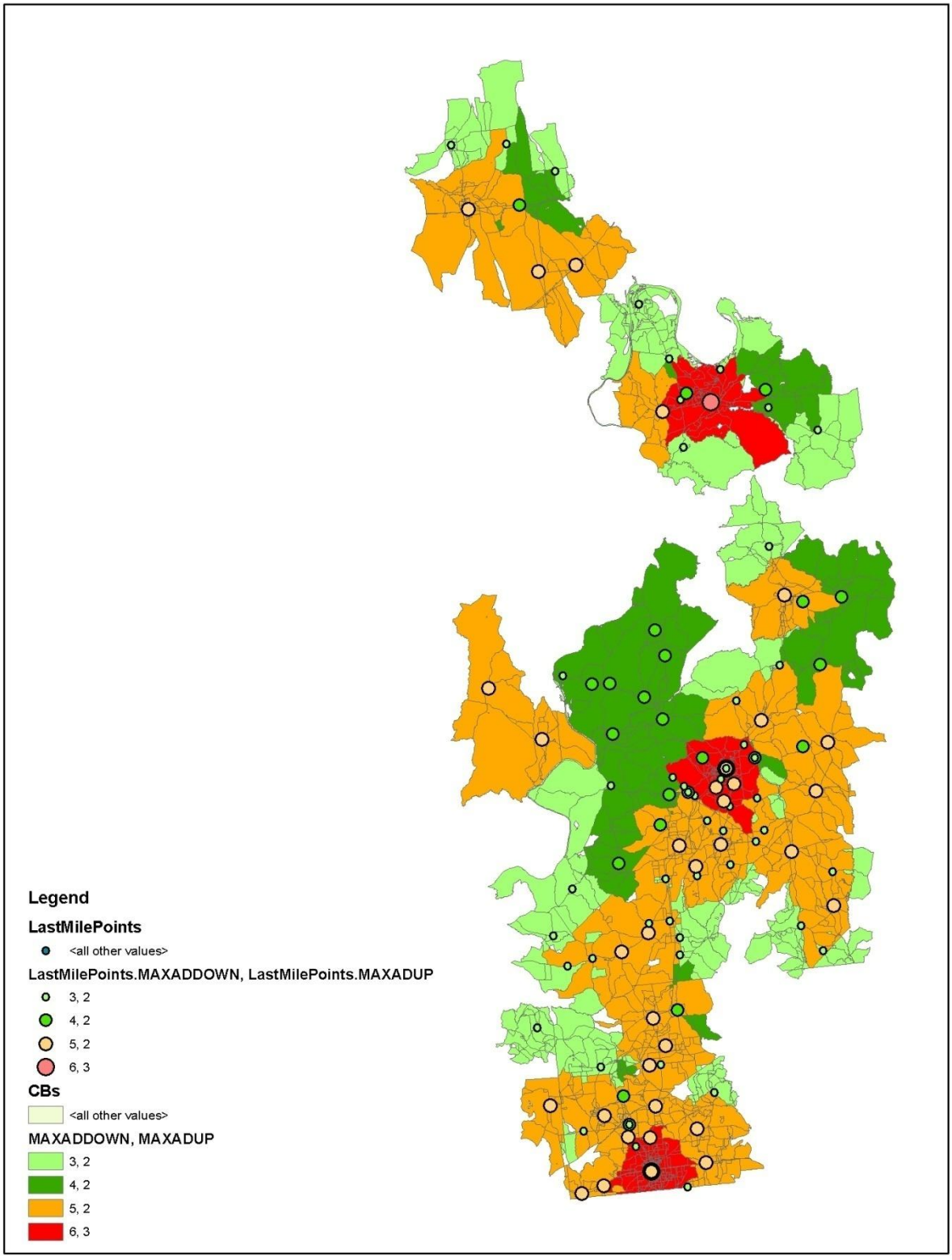
Figure 9-Coverage derived through road paths

In response to Provider feedback we revised this process to include a larger variety of TIGER road types. In Round 1, unimproved roads were not used. In the current submission -- particularly to improve estimates in areas bordering parks and public lands -- a wider class of TIGER roads was used.[14]

The segment level coverage is easily extendable to derivations of Census block level speed. The figure below shows the attributions of block level speed based upon the Maximum Advertised Speed available from a DSLAM. Although the methodology isn't perfect, it does provide insight into the value of granular infrastructure data.

[14] Only TIGER features of MTFCC type S1100 and S1200 were excluded from use.

Over time we have seen an increase in the number of providers submitting this type of data for our use. Our sense is some providers find plant level data easier to generate and are satisfied with the results of derived coverage.


Legend
LastMilePoints
<all other values>
LastMilePoints.MAXADDOWN, LastMilePoints.MAXADUP
3, 2
4, 2
5, 2
6, 3
CBs
<all other values>
MAXADDOWN, MAXADUP
3, 2
4, 2
5, 2
6, 3

Coverage Derivation Using Polygon/Polyline Serving Areas

Broadband service providers sometimes submitted coverage in terms of served areas. This was either in direct geospatial formats, CAD files, or paper maps. The image below reflects a carrier's service area. Within that service area, there are variations in technology of transmission and served speeds. When polygons with speed data and technology of transmission were available, we used a spatial intersection to gather covered Census Blocks. In many cases, using covered Census Blocks resulted in a loss of the speed variation (sometimes the speed variation was at a level smaller than a Block and did not get picked up within a spatial query).

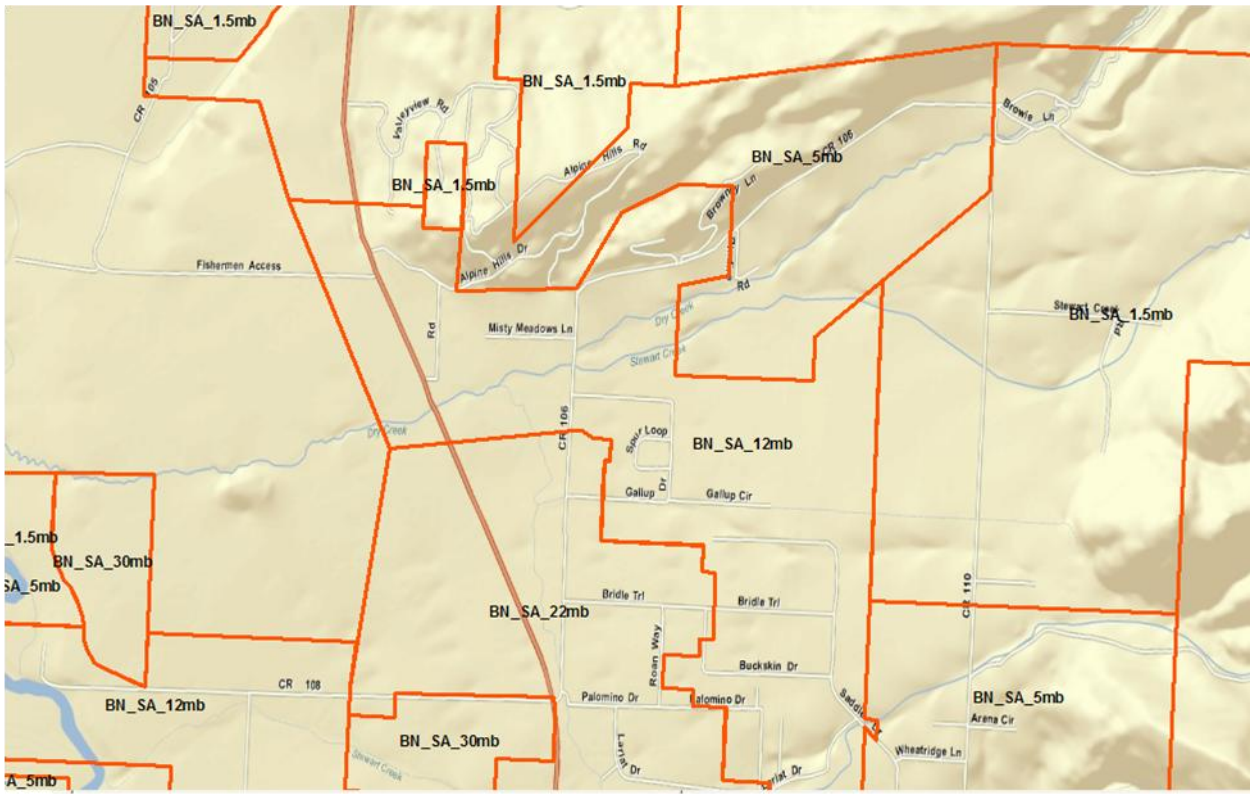


Figure 10-Coverage derived through serving area polygons

Although we cannot directly solve the loss of speed granularity due to Block shapes, we honor a business rule wherein we always select Blocks from the highest speed areas first, and then allow the lower speeds to select from the remaining Blocks. This is an arbitrary rule, but our feeling was that it should be a consistent selection, rather than an unordered selection.

Street Segment Derivation, Large Blocks

For those calculated Blocks greater than 2.00 square miles (large Blocks), we provided coverage in terms of covered street segments and corresponding geography.

With respect to segments we had four sources of data:

1. Covered large Blocks
2. Tabular street segments and address ranges for large Blocks

3. Geographic segments either with street attributes or without
4. Service area boundaries

A few providers only provided a list of covered large Blocks without corresponding segment information beneath the block. This provided the choice of either selecting all segments in the block, or none. Because we had little information from which to make the selection, we elected to be conservative and did NOT pass any covered segments to NTIA from this submission format.

Some Broadband providers submitted covered street names and street ranges. In these cases we performed a manual analysis trying to link to specific segment names and address ranges within covered Blocks. Sometimes this was a simple process because a provider used a TIGER derived street database. In other cases we could not determine the source of the provider's street data. Street and Address matching tended to yield a relatively good result (typically between 30% and 100% of possible segments in the Block), but was very time consuming. Where yield rates were low, our result was a shredded

segment coverage pattern, like the image shown below.[15]

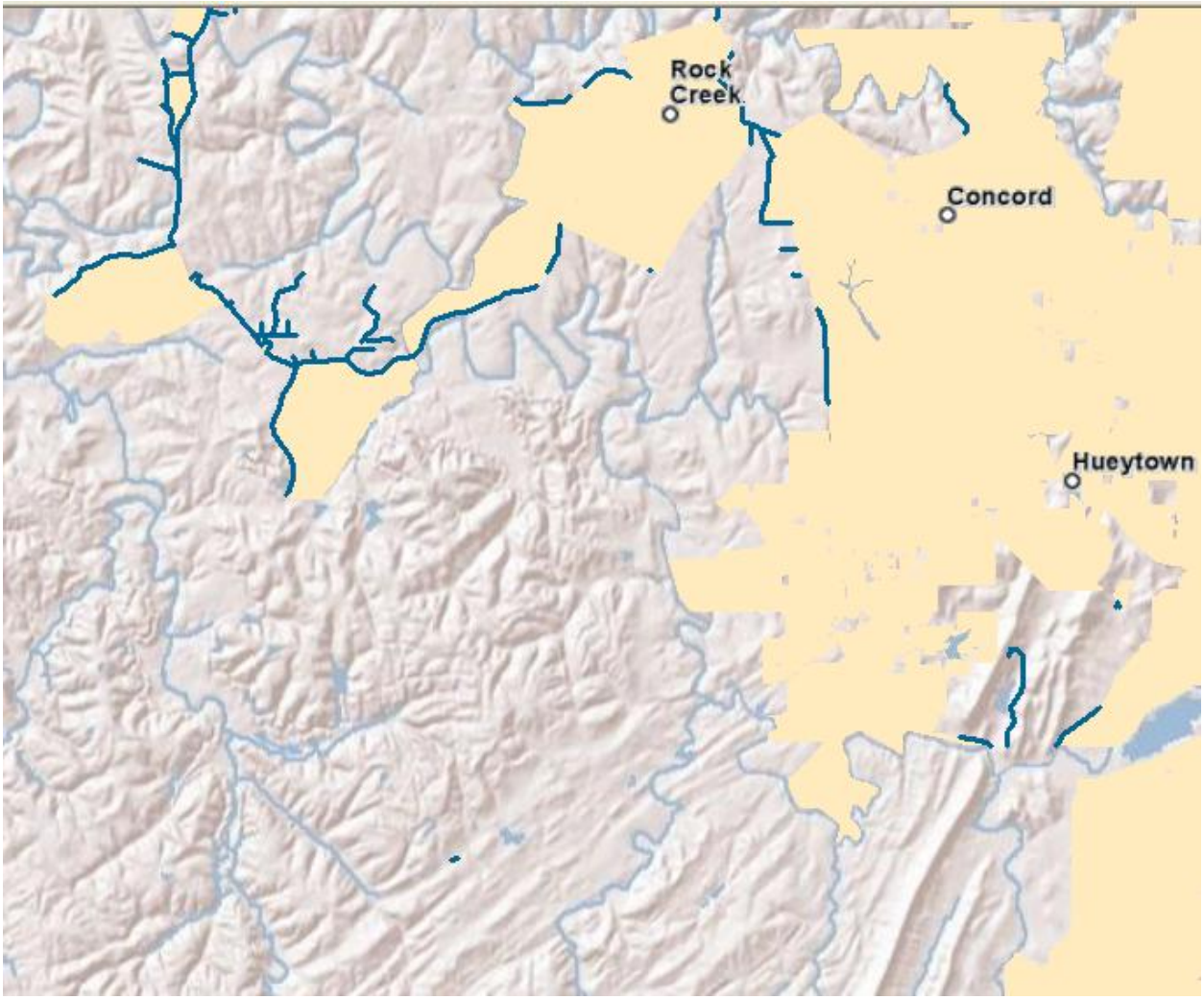


Figure 11-Blue road segments adjacent to peach covered small Blocks

A number of providers submitted geographic objects. In this case, our manual process was directed toward a conflation of data sources. The goal was to take provider submitted segments and put these segments in terms of our TIGER 2010 basemap. Although there is a trade-off in the accuracy using non-provider submitted segments, we felt it was more important to have a license-free road set that would edgematch our Block features, the TIGER state boundary and remain consistent with the block size standards we used for other providers. This is important for the appearance of the online maps, as well as potential verification work where we are attempting to judge a feature based upon its attachment to a covered small Census block. The figure below shows street segment input data.

[15] We continue to hear providers expressing concern that our request for either a geographic object or TIGER Line ID is beyond the scope of the NOFA clarification. Therefore, they cannot supply additional information to us.

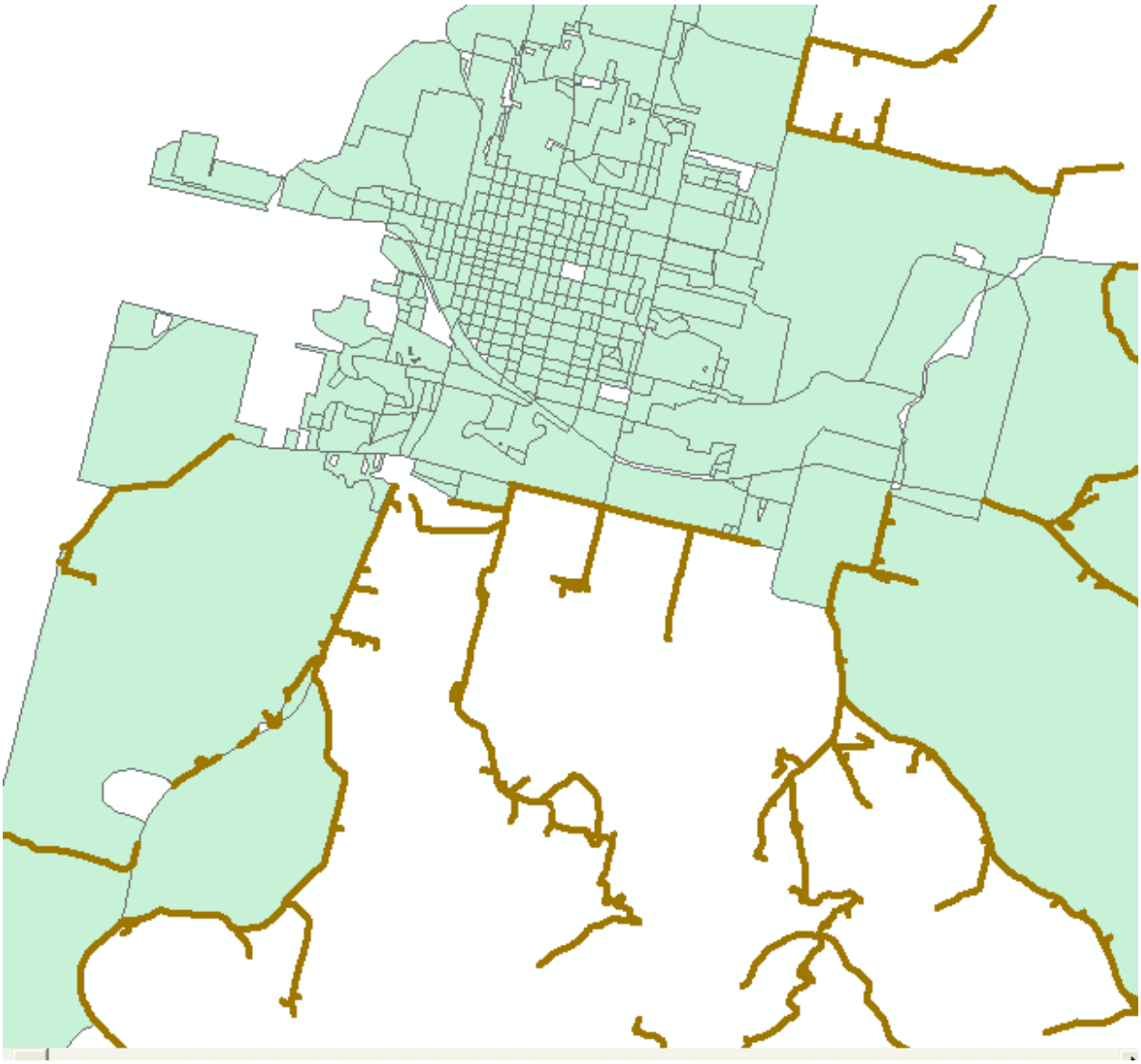


Figure 12-provider Submitted Street Segment Objects. The segments don't edge match the Blocks nor are they continuous.

The figure following demonstrates the same area after the conflation process. Blue segments are the conflated TIGER roads which will be passed to NTIA.

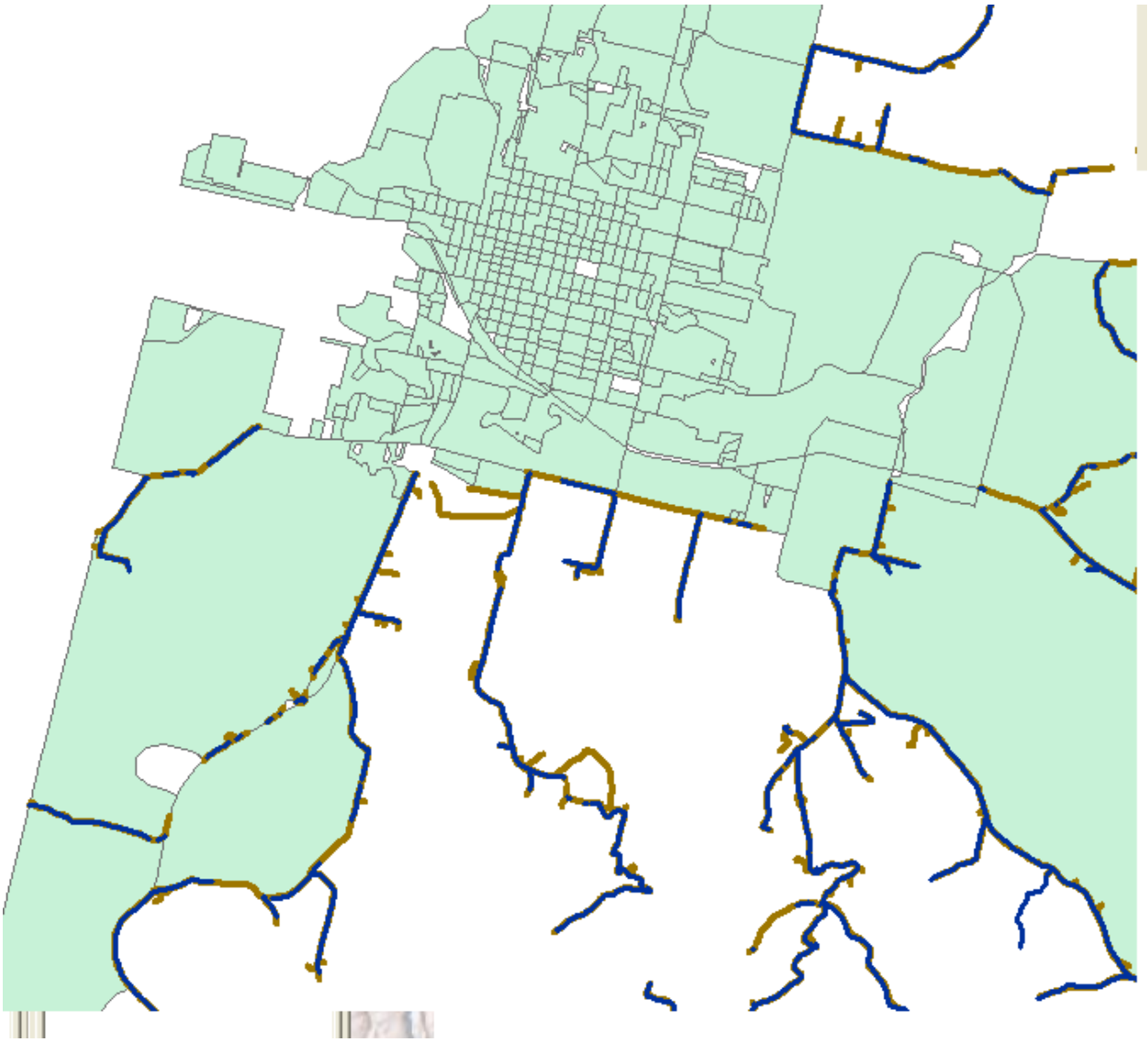


Figure 13-provider submitted segments in gold, selected TIGER in blue—Conflation result; in many cases what was a continuous segment is made discontinuous because even with a distance buffer the TIGER segment doesn't always intersect the provider segment

The final segment process was used when we were supplied with a Broadband covered area polygon. In this case, we found the segments within covered areas and eliminated those segments inside of Blocks less than or equal to 2.00 square miles.

Because there was more control over the format of the inputs (we knew we had a boundary and were working with TIGER segments), this was an automated process that followed this general format:

- Select large covered Blocks by provider ID (from updated Large Block table)
- Select TIGER 2010 road segments (MTFCC like 'S%') that face (CB = CBLeft2010 or CB = CBRight2010) covered large Blocks for provider

- Select segments as distinct records, max speed with corresponding technology, join in feature names, export selected records to temporary DBMS table
- Join TIGER roads feature class to temporary table on TLID
- Select covered segments (Python script)
- Select service area polygons for provider
- Clip selected facing segments with selected service area
- Export clipped segments to staging feature class, keyed by providerID

In this figure, orange represents covered small Blocks; black lines are covered segments in large Census Blocks (light blue). The service area boundary is shown in grey. Based upon feedback from providers, we have elected to clip segments at the end of a coverage boundary.[16]

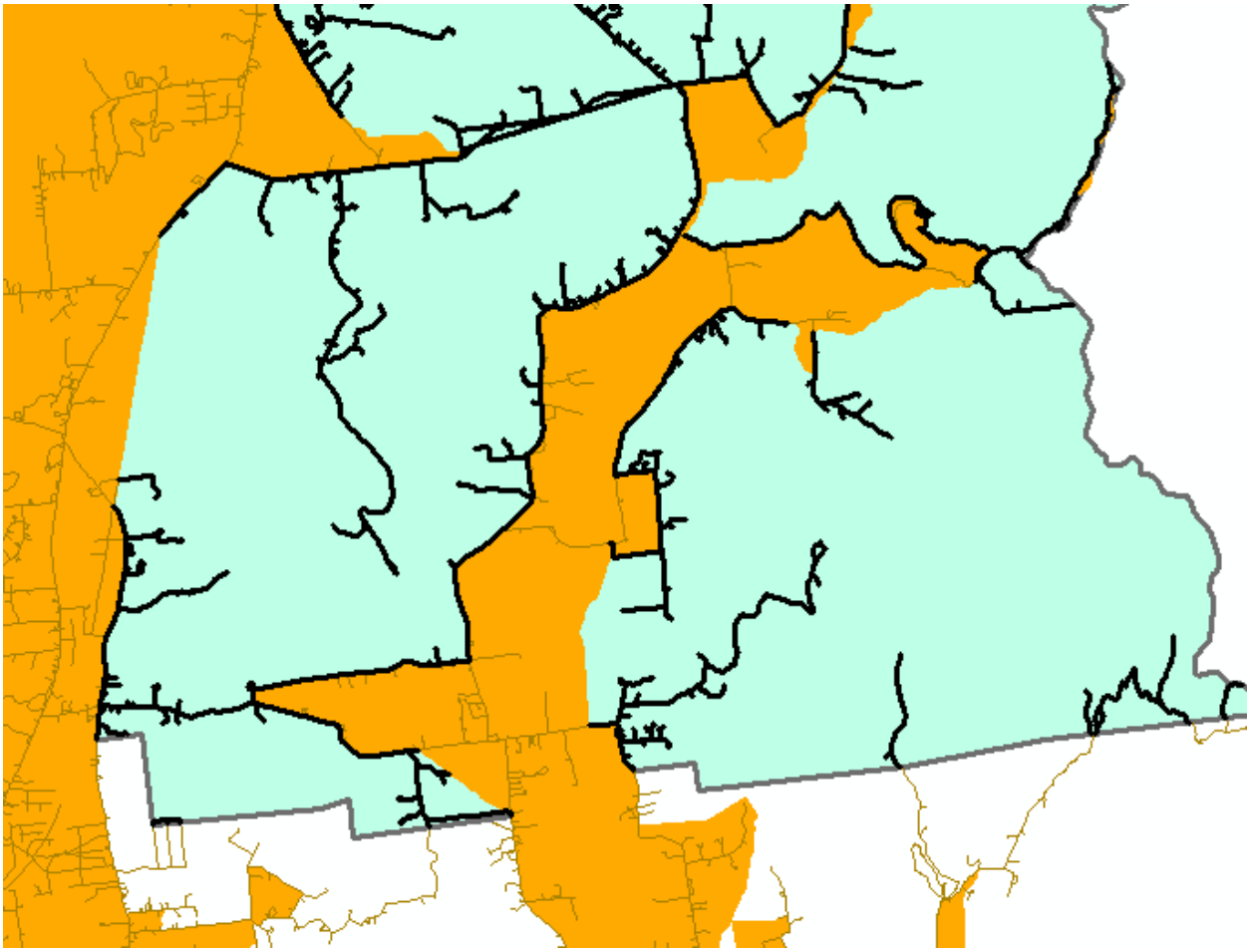


Figure 14-Output of the Segment Process

Wireless Coverage Process

In general, most providers of mobile Broadband submitted coverage information in a NOFA-compliant format. Other than attributions for spectrum and speed, little was done to this coverage.[17]

[16] An outcome not discussed here is how to handle address ranges on segments. As NTIA has asked for a Min and Max on the segment, deriving theses values for clipped segments is very problematic. Also the prevalence of alphabetic characters in addresses makes the min/max selections very arbitrary. We are grateful that addresses are nullable data elements.

Per Program Office direction, LinkAMERICA followed up with wireless providers where we determined that submitted data did not edgematch TIGER 2010 state boundaries. For the most part providers were unable to submit coverage data that edgedmatched as requested. In this case, we left the submitted data alone and did not perform any adjustments.

LinkAMERICA continues to make aggressive efforts to bring additional WISP coverage into the NTIA dataset. For the most part, our outreach was with providers who were unable to supply sufficiently granular data in the past or those that could only submit wireless address points which is no longer a valid submission format.

In Round 6 fixed wireless providers generally either supplied coverage information or infrastructure from which coverage estimates could be derived. Many allowed us to use their tower locations, antenna heights and direction/spread of coverage to derive a line of sight coverage estimate. In our experience, this is a conservative and reasonable derivation of coverage.

Some wireless providers submitted RF propagation studies. When this was done, there was a request that the signal strength be removed from coverage data. The request was honored. We note that some providers are very careful in that their coverage is an estimate of the probability of receiving an upstream link to their network. It is not intended as a depiction of any particular speed availability.

Other fixed providers were able to supply us with hand drawn maps or polygons/polylines drawn in Google Earth format. In these cases we did our best to georeference and verify the coverage areas with the WISP.

When we received coverage information in KML format, like the image below, we accepted the data as it was presented to us as the submitted coverage patterns were used in the provider advertising.

[17] Some polygon data did exceed the node count threshold. In these cases, data was rasterized to 100m cells and then converted back to polygons. The polygons were dissolved to multi-part geometry. This addressed the node count concern.

As the image above shows, in some cases we were provided hand-drawn coverage, as well as infrastructure. Instead of estimating their coverage using a line of sight or RF study, we elected to stick with the provider's supplied information. Our decision was guided by two primary factors:

If the provider is advertising using this coverage they must have specific confidence in its accuracy.
If the provider can supply coverage, as well as infrastructure that reasonably supports the coverage, there is a very high likelihood in the accuracy of the information.

The downside, of course, is the polygon shown on the map may not represent our notion of how wireless coverage should appear.

In general we note several interesting trends in the wireless data. First, we can be successful in increasing the amount of WISP coverage when we aggressively pursue WISPs. This means we have to be willing to accept data on their terms and convey it into SBI formats. Some of our WISP submissions have taken over 12 hours to normalize into SBI formats. Second, we have to accept that some WISPs will not be able to supply FRNs. Third, there appears to be some variation on how the NOFA coverage definition is met. In other words, there seems to be a disparity on the necessary link budget necessary (e.g. -80 dB, -98 db, -120 dB, etc) to provide the appropriate quality of service for data services to be provided at a location/inside a location.. Fourth it was very difficult getting providers to identify spectra used for

Broadband data services[18]. We are unsure if this is a competitive concern, or if the same coverage pattern is yielded for multiple frequencies. Typically, the spectra returned were those that a provider was licensed for. At this point, we have no reliable way to locally determine what set of frequencies are used to provide Broadband data services in a local area at a specific point in time.

Service Address Point Process

A handful of providers have requested that customer level, service address point data be submitted to NTIA. In these circumstances we have done minimal processing to preserve the provider's intent with this deliverable and not bias downstream NTIA use.

Our verification included checks against commercial or Public Utility/Public Service Commission exchange boundary maps. Points not contained within three miles of a boundary are not submitted to NTIA. The percentage of excluded data varies cross providers, but it tends to be under 1% of the total submission.

We retain from the provider the provided latitude and longitude, as well as Census block. For some coverage data, if a provider is unable to supply a longitude, latitude or Census block, we fill in these attributes. In those circumstances where we do not have a Census block, but we do have a longitude and latitude, we accept the given longitude and latitude and use that as the basis for our Census block assignment.

With point data we have tested for comparable geocoding success rates but do not overwrite provider information.[19] From this type of analysis we note the amount (usually little more than 10%) of addresses that seem to locate with less than street segment certainty. Deriving a thematic representation of the points on speed also illustrates some of the locational certainty issues in this point level data.

Coverage Estimation Process

Although the derivation of Broadband coverage into Census Blocks, street segments, or wireless coverage files is, in itself, a bit of an estimation process, there was an explicit estimation process required in cases where a Broadband provider either refused to participate in our survey, or provided such a threadbare submission that no carrier-based coverage information could be gleaned[20].

We typically resorted to three possible estimation paths.

---

[18] One provider responded by email, "This mapping program is to provide the coverage area for Broadband provided by a company. Not to keep a detailed account of every aspect of a companies (sic) network."

[19] We will make a second geocoding pass on locations with no longitude or latitude from provider. We typically pick up ~5% from our second geocoding pass. Typically the issue is address quality but also difficulties in geocoding in very rural areas.

[20] We report estimated submissions to NTIA as a non-responsive provider but we have data in the submission for them. This is the reason for datapackage.xls entries which are non responsive but contain submitted data.

For Cable (HFC) providers who did not provide any coverage information, we fell back to Media Prints data. Rather than using the entire Census Block Group gathered by Media Prints, we used only those Census Designated Places carrying the same or similar names to the Media Prints p_com field. Our reasoning was that Cable systems tend to be franchised on a municipal or at least administrative basis so the coverage will likely follow a governmental boundary. As a general rule, cable infrastructure is not available in the public domain[21] and what could be found was poor in quality and difficult to ascertain for validity.

For DSL providers who did not provide any coverage information, we estimated road-based coverage from their Central Offices[22]. We only used Central Offices that showed evidence of DSL or fiber-based services in the NECA 4 tariff. Road-based engineering areas were derived via ESRI Network Analyst to 18kft. These segments/boundaries were clipped to commercial wirecenter boundary edges.

For fixed wireless providers who provided no coverage information, we relied on their public websites to derive coverage maps. When these maps were available, we georeferenced them and tried to use the outer polygon boundary to represent their serving area. In other cases, when only a tower could be provided, we used a view shed analysis and estimated line of sight coverage at 10mi per tower[23]. Because much wireless propagation is driven far below the Census Block and much engineering information isn't known (frequency in use, polarization of the signal, coverage pattern of antenna(s), local terrain/land cover) this was the most complicated group to estimate.

Speed

Speed attributes are reported both at the block (typical) and higher levels (maximum advertised and subscriber weighted). We note that in many cases, providers did not supply typical or subscriber-weighted speeds. In some cases, it appears--although we cannot verify--that their maximum advertised speeds were used to populate typical speed columns.

We do have limited testing data on reported speeds, but we have been careful to not use our typical reported values with carrier-provided information. If we do not have a speed value from a provider, we report an empty value.

Several service providers claim they do not have data on typical speeds available, but estimate a 20% overhead factor between the advertised speed and what may be experienced by an end user.

We continue to request advertised speed at the block level. Nevertheless we appear to be getting speeds that do not vary over a large geographic area – leading us to believe that providers may still be submitting the maximum speed advertised in local media for the entire market. For the most part, we

[21] The team tried to use data from the FCC Coals system and 321/325 fillings but this seemed to be a bit non-uniform in quality.

[22] Central Office location was derived from GeoResults. Wirecenter boundaries also came from this commercial product.

[23] In some cases we had an approximate radius of coverage but no height. In this case we used a 50' height estimate and then clipped the coverage to the provided coverage range. We also clipped wireless coverage to honor state boundaries but did not look for providers serving coverage with out of study state facilities.

have been unsuccessful in messaging that advertised speed should not correspond to a market area, but instead, the maximum speed, which can be provided to a household—what some may describe as a 'qualified speed.'[24]

As a general rule, in circumstances where a provider supplies a range of speed attributes, we assign NTIA categories based upon the midpoint of the range. We follow this rule unless we can determine other grantees are handling the same submitted information differently.

To support NTIA program office requests, we have also modified the structure of the Service Overview table. Even if Maximum Advertised Speed is supplied at the market or county level, we push that speed down to the contained Blocks. The only records that remain in this table, will be those wireline records with either a non NULL nominal weighted speed or ARPU value.

Middle Mile

Middle Mile information was collected directly from providers via survey or interview. Middle Mile is a "chicken or egg" type of challenge in that it is possible to verify that the infrastructure exists, but extremely difficult to know what the site is doing without engineering level assistance. Although most providers submitted "something," there was a significant variance in what that "something" represented.

The purpose of this section is to record some of the comments and questions we have received about Middle Mile. We hope this provides better context for our data submission.

Within the NOFA, Middle Mile was defined as (a) a service provider's network elements (or segments) or (b) between a service provider's network and another provider's network, including the Internet backbone. (Collectively, (a) and (b) are "middle-mile and backbone interconnection points.")[25]

Given the existence of the "or" in this definition, providers submitted a variety of information. Based upon the NOFA example, several fixed wireless providers interpreted Middle Mile in terms of the connection points from their towers to their own serving backhaul location. The topology was commonly Microwave from their distribution towers to their NOC. The NOC and towers were listed as the Middle Mile points. This seems to be consistent with the first definition clause (a).

Telephone, Mobile Wireless, and Cable providers tended to remain either silent on the question, or would provide a single location in which Internet peering occurred (clause b). A number of participants explained that the NOFA was quite ambiguous with data traffic moving back and forth over both TDM

[24] As an example of a response to our request for Block level advertised speeds, we received the following comment from one anonymous provider, "This is and of itself does not require anything new of us – just states the NTIA supports efforts focused on getting that information on the CB level." It would be helpful to have broader messaging so that providers understand this new direction.

[25] From http://broadbandusa.gov/files/BroadbandMappingNOFA(FederalRegisterVersion).pdf at 54, visited March 28, 2010

and IP networks--it was unclear where the distinction should be drawn. As a general rule it seemed like many providers listed a single location where Internet Peering occurred.

A number of providers refused to answer the question on grounds of confidentiality[26]. Others would not disclose as their Middle Mile points are not owned--another company provides the physical and electronic connection to their network. In other words, the entity providing Broadband is not the entity providing Middle Mile.

Additionally, based upon the new Provider Type classification of "other," we have started to integrate points provided by Broadband service providers not meeting the NOFA definition. This includes POP locations and aggregation points for public / private networks.[27] Within a given submission there were two final attributes that tended to concern respondents. First, speed should be measured in terms of only data capacity and what exactly is "data" (e.g., can/should you segregate out voice or video), and is the relevant capacity of the physical connection, channelized to a specific virtual circuit on their network.

Finally, a number of other providers were unsure of the height above grade measure (is this their floor, the street outside, etc). We seem to have a combination of height above or below grade, as well as heights above mean sea level (AMSL).

To the extent possible in our timeframe, we verified the location of a sample of Middle Mile points. Where we could see infrastructure that appeared to be consistent in location with other provider infrastructure, we felt that the location was accurate. In some cases, the point provided seems sensible (is on a road, near other equipment), but using imagery, we couldn't find a place where this type of connection could occur. This wouldn't be unforeseen, in that Middle Mile connectivity likely takes place in a protected environment much smaller than a standard Central Office installation.

Mobile Wireless Coverage

We have received mobile wireless coverage from most mobile Broadband providers in each state. At this point we have cleaned the geometry of the data and attributed it with spectra, NTIA speed categories and FRN as required.

Where possible, provider derived coverage has been reviewed for consistency against the commercial licensed product.. To a limited extent we also use licensing locations and tower infrastructure to spot-check supplied coverage. This mode of verification remains complex, given the lack of facility-based information with mobile wireless.

[26] As received in email 9/30/10, "Due to security concerns and the risk of public disclosure of highly sensitive data, whether inadvertent or otherwise, ***REDACT***response to the Middle Mile and backbone interconnection request is limited to publicly available information available on {remainder not included}"

[27] As discussed in our readme.txt file, a number of middle mile points were lost in validation due to their location in adjacent state. This will cause a decrease in some providers relative to prior submission.

Finally with respect to mobile Broadband services, we note several trends.

First LinkAMERICA used the NTIA supplied frequency tables to report speeds consistent with other grantees. In circumstances where a provider supplied a range of experienced speeds, we used the portion of the range consistent with the most frequently reported Grantee value.

Second where a provider reports multiple frequency bands in use but doesn't distinguish these bands by submitted SHP file, we submit identical geometries but attribute one geometry to each submitted spectrum value.

Third we are seeing a trend toward increasing Broadband speed. As of this writing, there is not consistency across providers in how they attribute the advertised 4G speed values. In other words, for some providers 4G means advertised speed categories increase. For other providers the speed value did not change.

Fourth, we have requested providers submit SHP files that are consistent with the TIGER 2010 boundaries. For the most part, providers have not done this. As the request came late in the round six submissions our hope is this request will be honored for round 7. We have not modified the submitted data to impose the TIGER 2010 state boundary.

Verification

Data verification is an ongoing and evolving process. Clearly, with each new data submission there will be a validation process at hand and at the same time, our team continues to expand and improve the efficiency and effectiveness of our data verification routines. Consistent with the movement toward an fGDB export database and use of a data receipt script, much of our validation effort is spent in supporting the ETL processes into the required formats. In future data submissions we will continue our work to stabilize and improve the business process that normalizes provider submissions into NOFA formats and expands in more depth on the confidence analysis within the data.

Verification Methods Summary

Our overall verification standard is focused on the level at which we supply processed data to NTIA. This means that the vast majority of our verification process and resources will be focused on verifying provider identity, coverage, advertised speed and appropriate metadata for Census block's less than or equal to 2 square miles.

We believe three broad verification themes are important to consider

a) The first step of broadband service verification is a consistently applied market definition—we call this provider identity verification.

b) There is probably not a single dispositive method of verification. Rather, a number of verification approaches are needed to appropriately classify confidence in data submitted to NTIA.

c) Verification approaches tend to meld together. As an example a web survey is complimented by a phone survey but expert review and external data may be necessary to reach a final informed judgment.

The table below demonstrates the various methods used across each feature class submitted to NTIA.

	Data Types			
Verification Method	**Census Block, Road segment or, address specific service availability**	**Mobile wireless service availability**	**Middle mile infrastructure locations**	**Community anchor institutions**
Provide/Subscriber Identity Verification	METHOD USED	METHOD USED	METHOD USED	METHOD USED
Internal data consistency check	METHOD USED	METHOD USED	METHOD USED	METHOD USED
External data consistency checks	METHOD USED	METHOD USED		
Carrier confirmation	METHOD USED	METHOD USED	METHOD USED	
Public review	METHOD USED	METHOD USED		METHOD USED
Anchor institution review				METHOD USED
Expert review	METHOD USED	METHOD USED	METHOD USED	METHOD USED
Telephone sampling	METHOD USED			METHOD USED
Purchased Datasets	METHOD USED	METHOD USED	METHOD USED	METHOD USED
Developed Datasets	METHOD USED			
Web-based surveys	METHOD USED	METHOD USED		METHOD USED
Field Surveys	METHOD USED	METHOD USED		METHOD USED

The following table defines each of these methods and provides a summary of why this method is used, and the value we gain from it.

	Definition	Methodology	Purpose	Benefit
Provider Verification	Provider verification is the process of assembling a broadband provider database, determining which providers are properly classified into SBI eligible providers and developing contact information.	Provider verification involves combining multiple data sources, interviewing providers and classifying the broadband provider type.	Without a consistent understanding of the provider 'market' it is impossible to appropriately classify the coverage data. It is also impossible to explain to consumers of the data why a given provider is or isn't available in the submitted data.	The main benefit of this verification process is understanding who is providing broadband services, are the broadband services NTIA compliant and how do you 'contact' this provider (Name, DBA, FRN, Holding Company)
Internal data consistency check	An internal data consistency check is a validation measure across at least two dimensions. First is the provider data consistent with prior submissions. This would be an examination of this submission relative to a prior submission. Second is this submission	Most of this validation is performed using our spatial databases and running queries that compare submissions. We also use a similar set of queries to isolate transmission of technology outliers. These would be data sets which offer speed technology combinations	The purpose of this type of validation is to understand how things change over time and why. It also helps inform us for circumstances where we have data points which appear to be outside of the norm. If these outliers are	The main value is understanding why something changes and providing an opportunity to engage with the provider to understand why there has been a change.

	consistent with the technical specifications of the service offered.	which are unusual relative to other data received across all states.	detected, they can be pursued directly with the provider.	
External data consistency checks	An external data consistency check is a measure of the provider data against external sources (not from the Provider). The distinction between internal and external isn't pure, but our typical experience has been that External checks involve the acquisition of additional data sets and a comparison across multiple sets.	External validation can be performed by verifying supplied coverage against third party data sources. An example would be to test provider claimed DSL Census blocks against a commercial source of exchange boundaries. Wireless coverage is also compared to tower locations.	We don't believe a single, exhaustive third party data set is available for validation. We do believe a combination of external datasets can be used to inform and help filter out the false positive cases from provider data. We also note that the external data appears to diminish in accuracy as the area of analysis becomes less urban.	External validation provides an external measure of data quality assessment not influenced by internal data sources. It can be one of the more effective means of isolating false positives in submitted data.
Carrier confirmation	Carrier confirmation is the process of sending processed data back to the service provider	We use two techniques to accomplish this. First a provider's data is summarized in a tabular format. This lets the	One of the more critical steps in broadband mapping is translating carrier	Carrier confirmation gives the provider information on how their data will look when submitted to NTIA. It also helps short circuit complex problems like

	to ensure that translation into NTIA formats is fair and appropriately accurate.	provider quickly verify firm information (FRNs, DBAs, counties served). We also develop two sets of check maps. One is a PDF version and the second is a Google Earth (KMZ) version. Both versions display the NTIA reported coverage and speed. A different map is developed for each technology of transmission	supplied data into NTIA formats. Providing verification deliverables to the service provider (carrier) isan important external feedback process. Several providers also ask us to repeat this process before data are submitted to NTIA so they can see what will be submitted to NTIA.	online map display problems—which tend to come from FRN issues or incorrect data entry. This process also helps to strengthen the sense of ownership and participation with providers.
Public review	Public review is the process of collecting structured feedback from the general public in a manner which can be analyzed and used to improve/validate the submitted data.	Currently we use an online map 'layer' which provides consumers the ability to feedback about the coverage and provide in depth information about their concerns. The maps are also discussed within the context of planning teams within each state. We receive	As with other crowd-source approaches the intent is to allow the general public to feedback and improve the displayed and submitted data.	The benefit is to provide feedback and also display real time the comments of the general public. As a mechanism for validation the key is to develop feedback data which is structured in way that informs the mapping process.

		feedback from these meetings.		
Anchor institution review	Anchor institution review is targeted surveys intended to better understand the Anchor Institution broadband market.	We have used three methods to verify anchor institution data. The first is a targeted series of telephone calls. The second is specifically targeted mailers. The third is direct interviews with stakeholders. Schools for example, may have someone at the state level who maintains information about broadband connectivity.	As Anchor Institutions represent a different class of coverage information as well as a very different type of end user, a focused stakeholder management, data acquisition and data review process is advantageous.	Because CAIs represent a very distinct stakeholder community, building identifiable connections between the SBI program and the anchor institution community is important. Tailoring a specific data acquisition/ data review process helps Anchor Institutions establish a reliable set of infrastructure benchmarks which they can use to fulfill their mission.
Expert review	Expert review is the process of using subject matter experts to review submitted or processed provider data.	The method of subject matter review will be dependent upon the type of data in question. In the past this has taken the form of conversing with a wireless engineer to ensure that the coverage pattern appears plausible for a given technology. It may also involve a cross check on data from a second source—	The purpose of expert review is to get a second opinion regarding some aspect of submitted or processed data. Given the large number of submission formats and innovative ways to supply broadband, it is always	The most significant benefit is to have a secondary source for back checks and verification. For the most part expert review is from an engineering or deployment resource. Expert review also helps support process transparency so there isn't a closed GIS driven process making all the decisions.

		can this type of middle mile infrastructure support the maximum advertised speeds in this area? SME validation is also helpful trying to understand ambiguous information in submissions.	helpful to have multiple sets of eyes available to reduce errors from misunderstanding.	
Telephone sampling	Telephone sampling is the process of using targeted phone calls to verify aspects of submitted or processed data.	Telephone methodology tends to be consistent across the type of data being verified. A subject location or individual is identified. The phone number for that location is identified and a call is placed. The person performing the survey asks a scripted set of questions and records the responses in a database. For example, our team produces a survey to develop and monitor access and use trends at a regional level.	The purpose of a telephone survey is to gather in depth information from a targeted respondent. We would likely use telephone survey for targeted purposes--either clarifying anchor institution data or randomly polling consumers to better understand attitudes.	The primary benefits are to develop in depth information as well as surveying a large number of respondents regarding opinions or behavior. Phone surveys tend to be more helpful to survey attitudes or to find out location specific information. Telephone sampling is used in our consumer surveys.

Purchased Datasets	See external data consistency checks.			Also note that not all external data checks must be purchased. For example Census data could be used for an external consistency check but it is freely available for download.
Web-based surveys	Web based surveys can involve three dimensions. First a web survey (a form available to be filled out on the Internet) can be used to supplement and better understand consumers. A web survey could be a compliment or a substitute for a telephone survey to target a specific demographic (a web survey can also be part of a social media campaign). Further web surveys can be used to verify provider information.	In the case where a web survey is a compliment to phone or in person, a survey,instrument is developed and then respondents are invited to complete the form. In the case where a survey is a mechanism to gather additional information from provider web sites, this could take the form of manual queries (looking for address listed in a Census block) or automated scraping where information is pulled from a website via a specific web application. We currently use both approaches depending on our goal.	The purpose in all cases is to gather additional information via the Web.	The benefits of web survey are its relatively low cost as well as the ability to gather specific information into a form that can be easily used by downstream work processes.

Field Surveys	A field survey is sending a team of skilled participants into the field to verify submitted data or sample some aspect of the environment in a given area.	Field survey methods involve assigning a field team, equipping them with data acquisition hardware, ensuring they have a consistent skill basis and recording observations. To date most of our field survey work has been in engaging CAIs into the process. We have performed limited wireless testing and infrastructure verification.	Although expensive, field surveys are sometimes the best way to verify information such as provider equipment presence or the strength of a wireless broadband signal.	The benefits to field work are significant. They can help us better understand the exact phenomenon in a particular area.

Verification Standard

Verification is a broad term, but in our definition it boils down to determining if broadband coverage is in the right place. For a given provider, the question is whether the coverage is assigned to appropriate Census Blocks, road segments or area features. Coverage verification can be further broken out into two distinct classes:

- Technology verification, which is determining if the provider is listed with a technology consistent with their marketing information.
- Speed verification, which is determining if the speed supplied for that block, road segment, point area file or market area is consistent with the technology and the marketing information received.

The final verification dimension is consumer feedback and crowd-source verification. This is a dynamic set of steps we are beginning to implement. One side of this is responding to consumer concerns. The second is using the crowd sourced data to validate provider claims and, if appropriate, update the map and the underlying data.

At this stage, our working hypothesis (confirmed by our experience) is that there will not be a single measure to indicate broadband coverage availability in a Census block or along a segment. From prior work, and examining our current provider submissions, we believe that there is too much variation below the submitted record to make a single binary yes/no indication. Rather, there will be a series of measures that combine to provide qualitative confidence (a classification scheme) in our indication of Broadband availability at the block, segment, or wireless polygon level. We believe such a qualitative classification scheme is both relevant to and supportive of NTIA interests, as well as the interests of our end-user community – that is, the states and citizens we serve through this program.

The intent of this section is to illustrate why our team is moving toward a particular verification methodology. Our team is learning as we go along, and will adjust and improve this thinking. But given our experience to date, this is our path. As stated above:

- First, coverage verification is at the level of data submitted to NTIA.
- Second, coverage verification is enhanced when there is a secondary measure of availability (such as infrastructure presence or serving area boundaries)
- Third, given the limited resources of this effort, the most important coverage verification process to implement is the erroneous dispersion of coverage. These are the "islands" of coverage isolated by significant distance from other covered areas. In other words, Broadband Internet likely doesn't exist far away from other areas with Broadband Internet access supplied by the same provider.
- Next we present several examples which illustrate the complexity of coverage verification.

The first example is taken from a gentleman who requested a map change in Alabama. His home is near the yellow dot. The darker grey Blocks are covered Census Blocks. The black lines are covered road segments. He cannot receive DSL from his incumbent provider, although his neighbors can. The incumbent carrier does have at least one structure in that block from which Broadband services can be provided; unfortunately his home is not served.

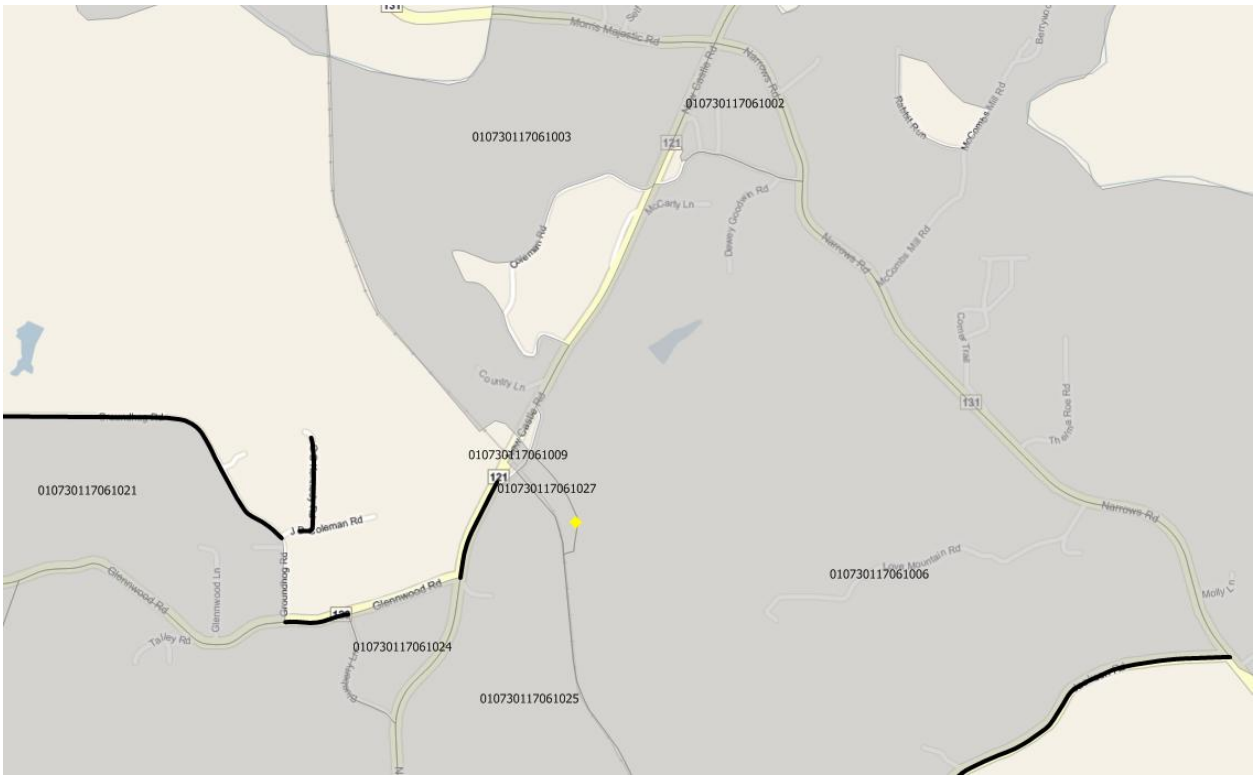


Figure 15--Sub block variation

Because the SBI program requires the depiction of coverage at the block level, the above map has been correctly generated. However, from the customer's point of view, the map is inaccurate. This requires us to explain that the maps are not intended to be a structure-level qualification, at which point some consumers question the value of the maps when seeking service information.

Beyond this type of one-off structure-level qualification, sometimes, as shown below, we have even larger gaps in provided coverage. The image here shows an "outlier" block that could be an error, or it could indicate missing Blocks along a major road that should have been filled in. In this figure, the outlier block is highlighted in turquoise.

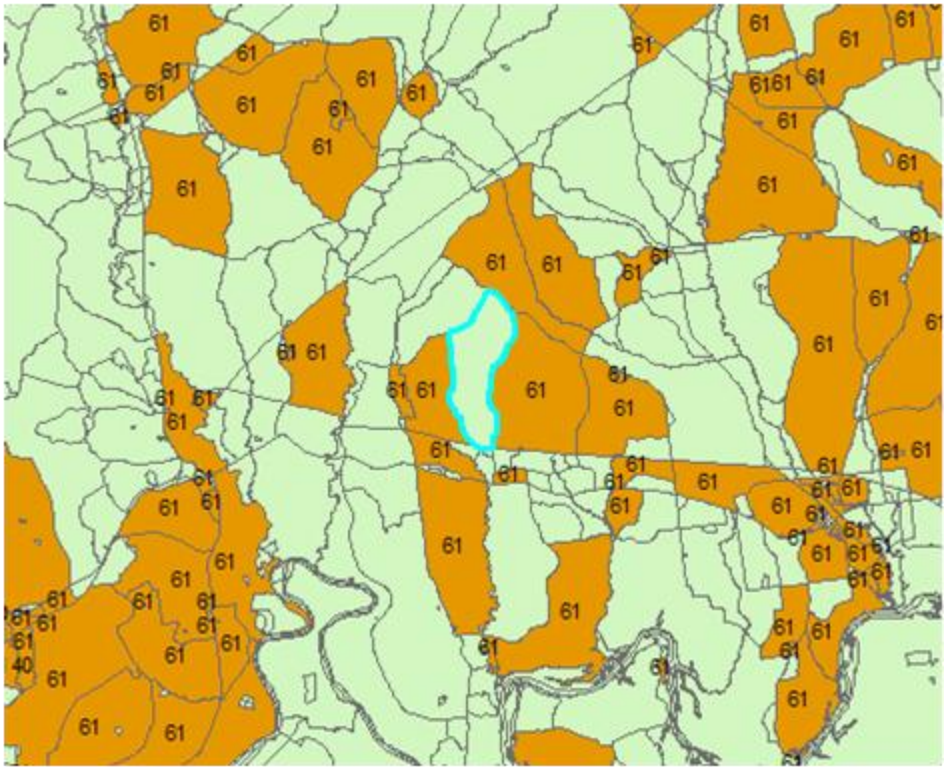


Figure 16--Dispersion in Submitted Data

In this particular case, we are faced with a different verification question. Based upon the properties of the neighbors, we believe this block should likely be covered (coverage interpolation,) but supplied data from the incumbent says otherwise. Although we don't have information to know how much of the data submitted to us is generated, our sense is that geocoded customers or plant are used. In this case the block dispersion could be the result of a side of the street assignment rather than an availability assignment. In other words the data may speak to where is working plant rather than where could service be provided in 7 to 10 days.

The next example shows where an interpolation process could require some adjustment. The figure below shows a town level view. There are some smaller Blocks that are likely covered by interpolation logic, but we also do not want to extend coverage beyond a franchise boundary as in the areas shown in a box on the bottom of the map.

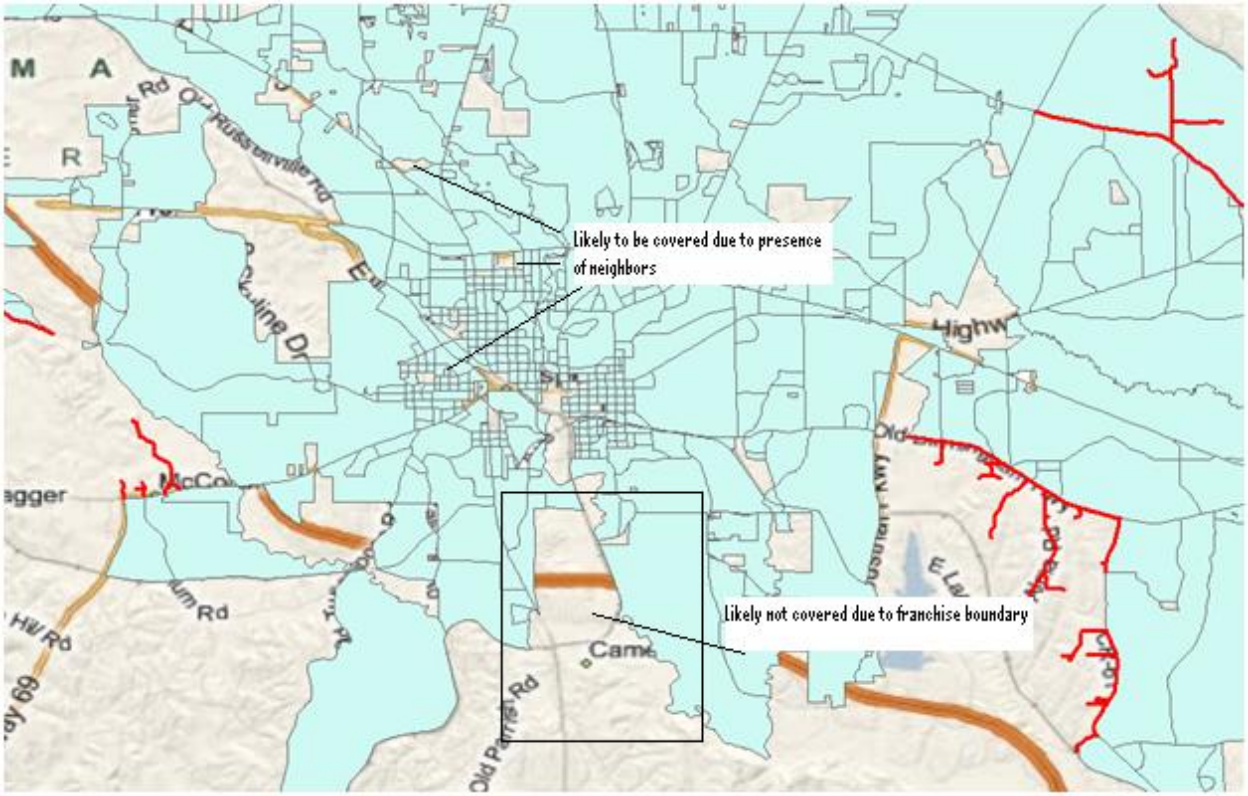


Figure 17-Where do you stop interpolating?

From what we can gather from some providers, the submitted data—data with consistently high degrees of dispersion or coverage holes—tends to come from geocoded billing records. In this paradigm, this means where there are no billing address points; service is not identified on a map. The interpolation verification question then takes on three dimensions.

First, if a provider has no customers in an area, how can we know if they would be able to provide service in a 7-10 day interval?

Second, if we use the properties of neighboring Blocks to interpolate coverage, when should we stop (e.g., at a franchise boundary, at a certain distance, etc.)?

Third, if we are comparing to a data source that examines coverage at a higher level (such as 477 Tract) do we use the Tract information to assign information block level coverage or do we use the tract coverage to filter out dispersions in coverage.

We continue to work with providers to get additional information to help us better understand and contend with this type of circumstance. However, we have not been entirely successful at getting franchise/service area boundaries that would address much of the issue.

The final map shows this dispersion problem, but to an even larger degree. This solitary large block is likely the result of a bad geocode, but we don't know, given the data that has been submitted by the provider and the "single customer in a block standard" set by the NOFA clarification.

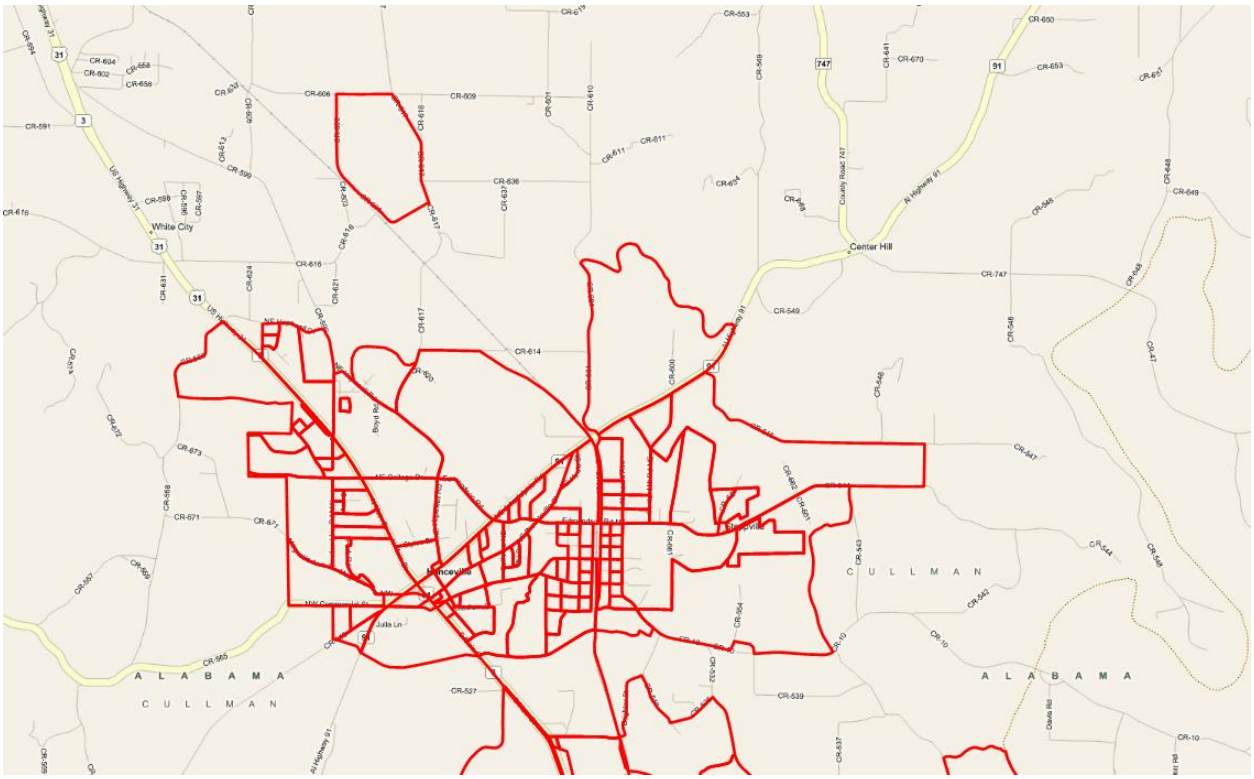


Figure 18-Dispersion in covered Blocks

Due to the fact that this situation is quite obvious in display, this type of problem is one that we are more aggressively trying to resolve. Where a single block has no neighbor offering comparable coverage and is a specified distance beyond an exchange boundary, our approach has been to filter these Blocks out. As of now, this filter is limited to incumbent xDSL providers because we have a good source of exchange boundaries.

The exchange boundary dispersion verification method breaks down when examining providers who are more likely to CLEC into neighboring territory. In the figure below, the black line represents the exchange boundary, while the continuity in the DSLAMs likely points to coverage extending along a road into another provider's territory.

Figure 19--DSL Coverage outside of exchange boundary

In sum, the variability in our source data continues to suggest that our dynamic verification process is relevant, appropriate and evolving in a manner consistent with the overall program. And, as noted above, we believe the more meaningful outcome of our verification processes will likely be a series of qualitative indicators or expressed confidence levels. Our concern, as with the development of any sort of classification process, is how rigid we should make this classification given the variation in our input data and the varied perceptions of service providers, map viewers and down-stream data consumers.

Verification Work Process

To support our dynamic multi-factor verification process, we have implemented the following steps.

Between submissions our provider relations team works to analyze our current broadband provider ecosystem and capture any changes such as acquisitions, mergers or cessation of operations. They also remain in touch with providers who have indicated when follow-up is necessary. The team confirms that the providers who submit data are NOFA compliant. Given these steps they begin a survey and awareness campaign to get data submitted for the program.

When data is received, an analyst reviews the submission and any immediate questions or concerns are sent back to the provider as quickly as possible. We have found this gatekeeping step very helpful in making sure we understand the intent of the submission.

For all providers who submitted data to us in the prior round, the provider received both a tabular data summary and mapped output[28]. Prior to releasing the "check maps" to providers, we inspected each provider's coverage area. After this in-house review, we solicited a second level of feedback from providers and received a number of requested changes and corrections used in the development of the current dataset.

For those providers who submit only block or segment level coverage (i.e., in those cases where we have no infrastructure to test with) we test for coverage containment within known service boundaries. The intent of this validation step is to remove Blocks that are obviously erroneous.

We have also begun to perform a mechanical test against wireline providers. This is an examination to ensure that each feature submitted has some neighbor within 1 mile. We are testing this process to try to understand what the neighbor distance should be. This has proven to be a difficult process.

We also verify the submitted speeds against the typical speed ranges in the NTIA frequency tables. If we note a value outside of typical range, we ask the provider for clarification. These responses are recorded.

As mentioned in the sections above, we have implemented a check on dispersed Blocks, but we have implemented less with respect to coverage interpolation (holes in coverage). We continue to work on a

[28] For the verification of round 3 data, we submitted both PDF and KMZ (Google Earth) format check maps. Some providers prefer to work with the Google format as it supports easier modification. Others continue to submit marked up PDFs.

series of mechanical tools to assist with the inspection process but have run into challenges related to geographic basemap and timing.

As our submissions have moved online, we have also begun to benefit from crowd source feedback. In some cases this has helped us identify and fix errors in our underlying data. In other cases, as we have shared with NTIA, we have encountered some perceptual issues rooted in how the data are developed and modeled to comply with the NOFA. Depiction of uniform coverage in small Census Blocks continues to be a challenge. Despite our best efforts to explain the full block coverage requirement, we continue to receive complaints that the coverage shown on the map is not accurate for a particular location within that block.

Consumer and Provider Responses to Deliverables

Here, we segue from internal verification to external verification. We view responses to our work product as a form of validation and verification. On the one hand, this gives us the opportunity to fix mistakes and then generate QA steps to make sure that the problem does not reoccur. We also learn how to improve what we are doing or better explain what we are doing to a community not always familiar with the NOFA and program office framework. On the other hand, listening and learning from this feedback helps us better target our mapping deliverable to meet the needs of our external customers. In this second case, external feedback not only provides feedback on perceived qualities (or lack of quality) in the data, it helps us to learn if we are developing data that is truly helpful to downstream users across a wide range of usage and intent.

At this point, our external deliverables take three forms: State Broadband Maps, data transfer to NTIA used for the National Broadband Map, and text format data requested by outside parties.

Online Map Experiences

With our State maps online, we continue to harvest viewer feedback and comments. Because an online map allows someone to zoom in far below the scale of the data, a large number of comments reflect sub-Census block concerns. While important to the citizens reporting these issues and to our Broadband planning teams, this level of data is outside the scope of our core validation process, which as noted above, is focused on the level of data submitted to NTIA.

There are several other themes that our team believes are important to share. These comments are actually quite helpful because they also improve our data processes to better meet the needs of map viewers. For example, we have invested significant time in harvesting more segments from provider data. Because the appearance of segments is so important, we are putting time into ensuring a visually appropriate edge match between the roads we harvest and the Blocks/roads we will show online. On a technical level, we also believe that a good segment process will help us understand more about dispersion in the data, and what is valid versus what is not valid.

Online Display of Consumer Feedback

We have completed development of a consumer feedback layer for our online maps.

The intent of the new layer is to show viewers the feedback of other map viewers. This layer went live after the Round 4 data was posted.

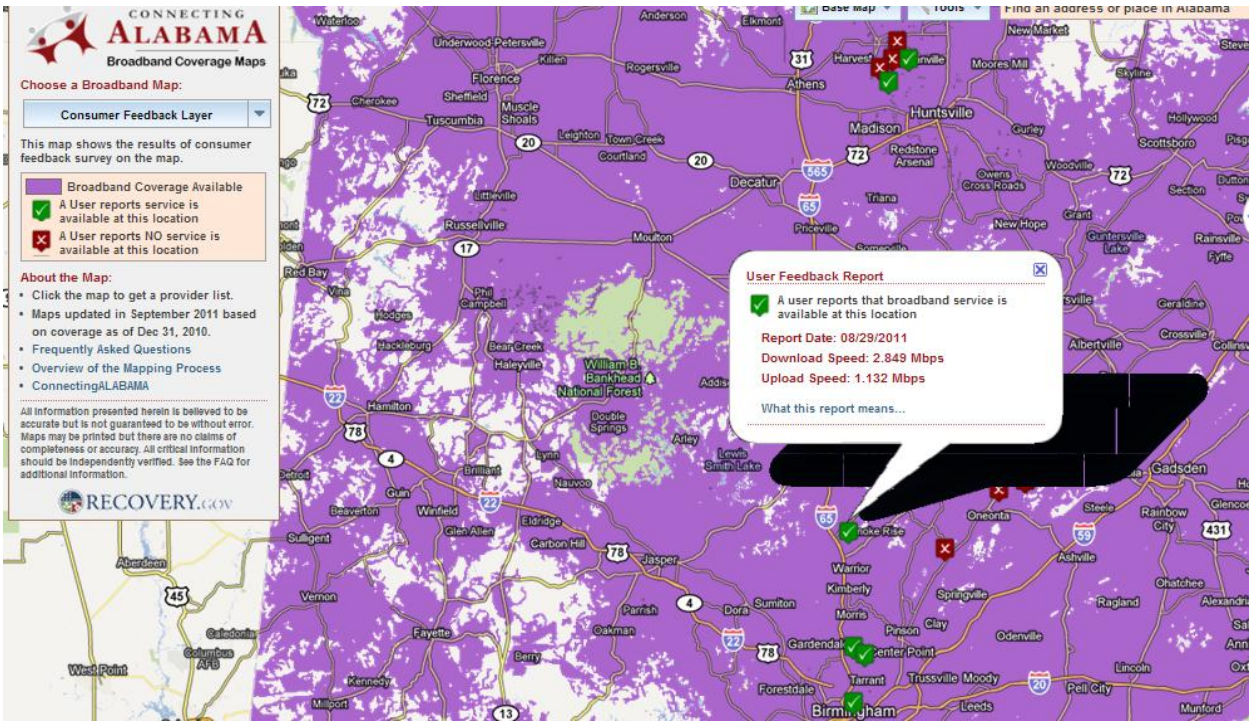
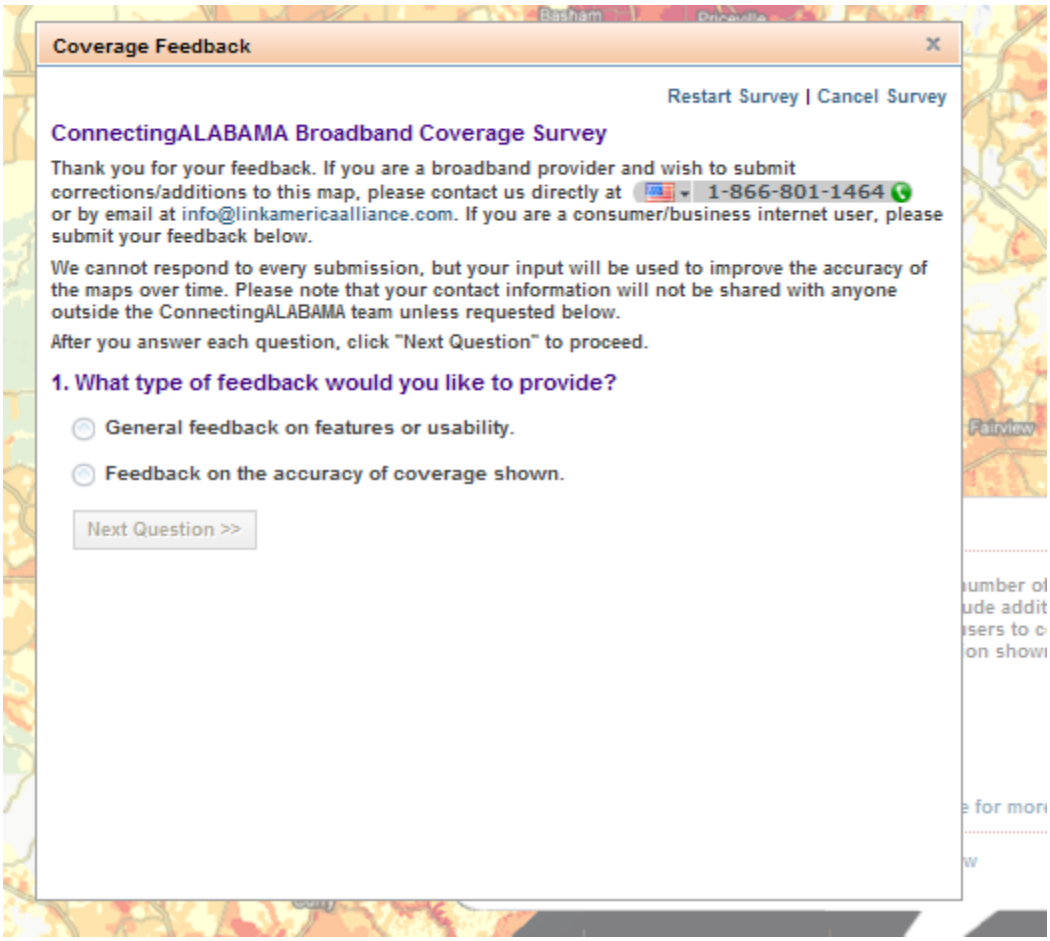


Figure 20--Consumer Feedback Layer

To gather feedback, we use a survey wizard which asks the end users to categorize their concerns. The survey went through several iterations of design and usability testing. Our experience has been unless we get a way to constrain the user feedback into manageable categories, it becomes very difficult to act upon.



As mentioned by other Grantees we struggle with how to use all of the feedback we receive. The qualified data points seem to fall below a volume in which we can infer significant modifications to the map data. Nevertheless, we believe it is important to gather structure and display the feedback to support project transparency.

Perception of Unfair Treatment Across Technologies

Several Broadband service providers have expressed strong concerns regarding how wireline services are displayed, as contrasted to how wireless coverage is displayed. This is an artifact of the SBI data model. As an example, consider the figure below.

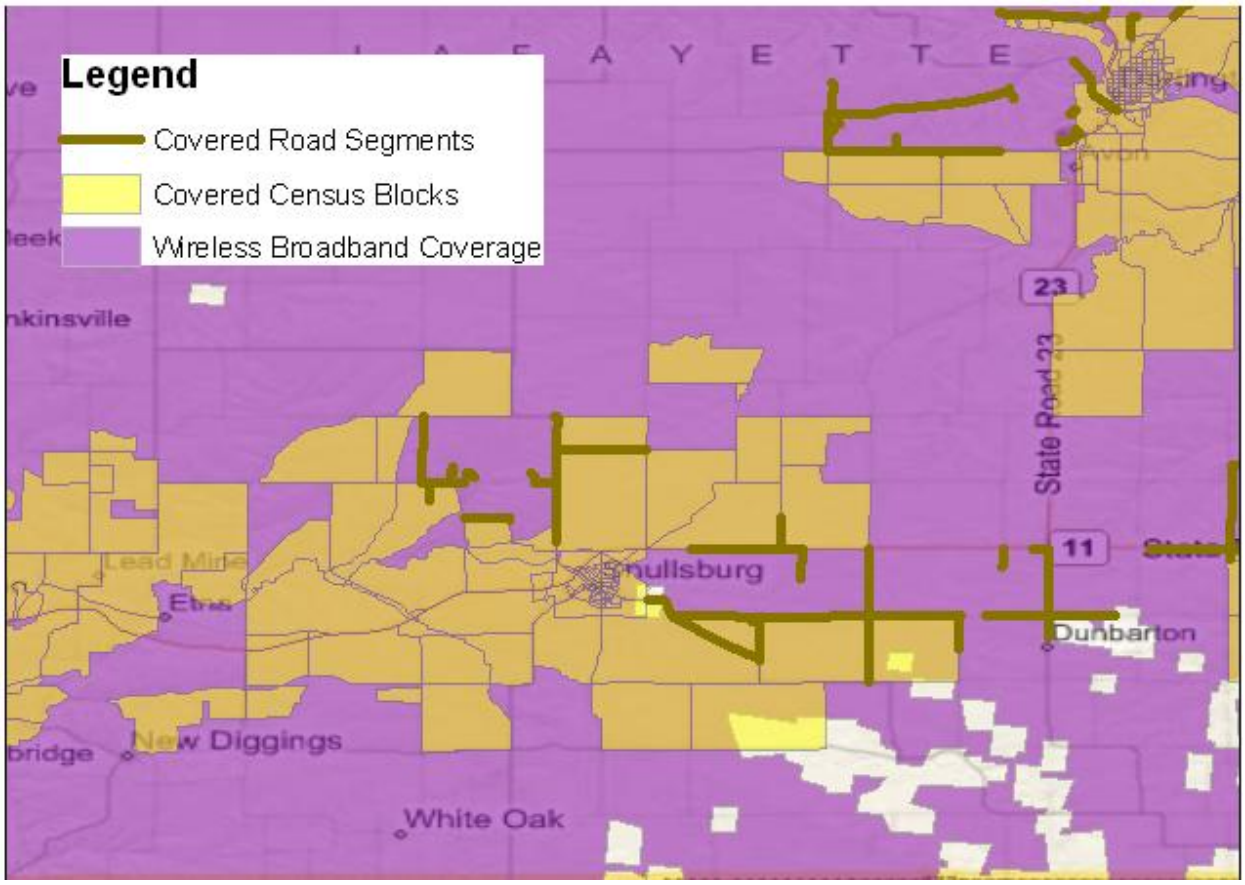


Figure 21--Multi Network Coverage portrayal

In this image, covered Census Blocks are light gold. Covered road segments are a darker gold and wireless coverage is purple. The concern seems to come down to how a wireline provider's coverage is shown in the large Census Blocks (greater than 2.0 sq mi). Some wireline providers have expressed dissatisfaction because their coverage is only tied to road geography, which leads to a visual "hole" in their coverage map. At the same time, they feel that it is unfair that the wireless provider's coverage is shown to be uniform in the same area. Put another way, if our maps show wireline in terms of Blocks and segments, why don't our maps show wireless the same way?

Loss of Geographic Granularity

Some providers particularly those who submitted facility level information are disappointed when we have to roll the derived data up to Census blocks or road segments as this changes the appearance of their service areas. This is especially important in rural areas where the larger blocks represent more of the service territory.

Perceptions of Carrier of Last Resort (COLR) Obligations

Some wireline providers have also expressed dissatisfaction because online maps limit the distance of coverage from a road segment. In our current online maps we buffer a wireline carrier's service 300' from road centerline. A number of providers have expressed that they are mandated to provide voice coverage (which Broadband will accompany) anywhere in the Exchange. There seems to be many

dimensions to this argument, but the basic concern comes down to not being able to accurately reflect the scope of their COLR obligation within the mixed block/segment view. Their ability (or lack thereof) to actually provision such services for new users within a 7-10 day period adds yet another level of complexity when attempting to fairly portray their coverage capabilities.

Intentions of Coverage Mapping

When a viewer of an online map clicks on the map (or zooms to an address), they are provided with a pop-up of service provider coverage in the area. The critical question is this: what is the area to which that pop-up window responds to? In the past, we reported back to the specific Census block, or buffered road segment intersected by the user click. As far as the map was concerned, once we move off of that road, or out of that segment, we have a new area to examine.

Our sense, given feedback received, is that our provider view should be a bit more tilted toward finding providers in a general area, rather than finding providers at a single-click location. If the goal of the map is to get someone to call a provider for service, our bias should be to include all of the potential providers in the general area, rather than giving potential customers a method to self-disqualify. That is, we want to cast a wider coverage net, rather than one too narrow. The problem with this approach is that it will create a number of false positive Broadband reports. As of this date we cannot determine if the claims of inaccurate coverage in online maps are due to the looser provider view standard or not. We keep this looser standard in place to minimize the likelihood of self-disqualifications.

Appendix One-Idaho

Community Anchor Institutions

Understanding the role that Community Anchor Institutions (CAIs) play in Idaho has demonstrated to be a complex process. In a state characterized by such a diverse geography and spread out rural communities it is challenging to identify a clear pattern that encompasses the workflows of each CAI in its community. The mapping team continues to focus on collecting CAIs' broadband access information with a targeted, flexible and creative approach that attempts to address the particular situations of CAIs. The team expects that this approach will lead to the establishment of sound communications with CAIs, improved responses and therefore higher quality data collections which will help inform policy makers and support the SBI planning process.

The work performed in the previous 5 submissions has yielded a comprehensive dataset of CAIs in Idaho. For Round 6 our efforts focused on a thorough review of the institutions on the list, including verification of address and correct contact person. The ongoing online survey continues to offer an efficient means for CAIs to provide broadband connectivity data. More specifically, as of the date of this report a little over a third of the data collected has been through survey responses. To build on this effort in the current submission our objectives were:

Verify the physical address and the currentness of CAIs against data sets provided by authoritative sources such as emergency management departments at counties across the state and regional resource centers.
Raise awareness of the broadband mapping initiative to relevant local and state government agencies and organizations associated with the CAI categories such as emergency management departments, Idaho Sheriff's Association, State Fire Marshal and Idaho Geospatial Council.
Collaborate with state and federal efforts to advance the development of authoritative statewide datasets representing parcels and structures. These datasets will support the broadband mapping initiative by providing an accurate and up-to-database to map broadband availability.

CAI Philosophy

The work performed for this submission was guided by three principles:

First, CAIs are important stakeholders within the planning process. CAIs are traditionally active participants of the community planning processes. The challenge of the team is to encourage CAIs to include broadband accessibility in their discussions as an instrumental tool to improve their services to the community. It also allows broadband planning to tie into existing organizational and planning networks.

Second, we believe that CAIs will likely be one of the primary beneficiaries of targeted broadband funding. Some CAIs categories are especially positioned to perform the dual functionality of 1) availing on the extended applications offered by broadband to improve the efficiency of the services they provide to the community (e.g., improved emergency planning, management and response, better medical services, etc.); and, 2) providing a portal for people to access the increasing number of applications available through broadband (e.g., online training; job postings, goods and services, etc).

Third, we continue to use a rational and targeted approach to derive information. This means we will utilize our planning teams for as much ground work as possible. This also means that a goal of our CAI process is not an exhaustive Census of anything that could be a CAI; rather, it is the discovery, inventory and integration of Broadband planning activities into those CAIs that stand to produce the greatest synergies with the SBI planning process.

Based on these principles, the team directs its efforts to integrate broadband mapping in the ongoing fabric of the communities. We want to reach out to CAIs and help them realize viable ways to harness the potential of broadband access. We want to support CAIs to be able to become active voices in their communities to continuously encourage the inclusion of broadband in the community planning processes.

Anchor Institution Outreach

As explained above, in Round 6 we mapped broadband availability at CAIs using an adaptative approach that consisted of a variety of methods. We focused our efforts in two fronts: 1) Clean up the ID CAI database by ensuring that the institutions listed are currently working and are accurately located; and 2) Maximize the results of our outreach by identifying and partnering with CAIs associations leaders.

The process of validating the CAI database is instrumental to achieve the goals of the program. However, this process has proven to be very intense and time consuming. We verified the existence and physical address of 745 public schools against the 2011 -2012 Public Schools Directory of Idaho. This document and the accompanying spreadsheet are maintained and were provided by the Idaho State Department of Education. If a school listed in the Community Anchor Verification System (CAVs) did not have a match in the Directory it was placed in a list for further research, which included looking online for the school website or information about the school in the respective school district website. Finally, the existence of the school was verified on the phone by calling the school district office. This method allowed us to identify 75 schools in our dataset that were closed or that have been consolidated and were accordingly flagged to be deleted. Additionally, this comparison allowed us to update the physical address of 62 schools. Although the Directory included information about private schools, it was stated that this list was not comprehensive. Therefore, verifying the currentness and physical addresses of private schools listed in our dataset required additional research including web searches, phone calls, and physical visits when appropriate. During this round we also worked closely with the Idaho Education Network (IEN). Their collaboration was instrumental to achieve the goals of SBI in several fronts: 1) IEN provided up-to-date broadband connectivity data for the collection points of all school districts; 2) IEN provided access to of the internal network of all school districts, which included detailed and accurate broadband connectivity information of each school in the district; 3) IEN provided a list of

IT personnel for each district including phone numbers and email addresses, this list was used to update the CAVs database contact information; 4) IEN provided a list of all school district offices which included physical addresses and superintendent contact information. The collaboration provided by IEN allowed us to add 105 records of school district offices to the CAVs database and complete or update connectivity information for 560 public schools.

In order to verify the physical addresses of public safety institutions such as fire stations and police departments we contacted the emergency management and/or GIS coordinators at 12 counties and the Eastern Idaho Regional Resource Center. We sent them a list of the institutions found in the CAI database that belonged to each of their jurisdictions and we asked them to check if these lists were accurate and current. We also reached out to the Idaho Bureau of Homeland Security hoping to find the most authoritative information regarding public safety institutions but unfortunately this type of information has federal use only restrictions and prohibits redistribution.

In addition to the physical address it was necessary to develop a comprehensive list of valid email addresses to invite CAIs to participate in the SBI. Although only few of the counties' emergency managers provided contact information of the people in charge of broadband in public safety institutions, most of them could not offer this information. Therefore we opted to do research online and we added 130 emails of potential contacts. Further work will be needed to assess the validity of these email addresses. However, for this round we used a third party email-marketing service to invite 60 previously verified contacts to fill out the on-line survey regarding broadband connectivity;

Another method used was the verification of the physical address of several public safety institutions against the list of state owned/leased buildings. This dataset is maintained by the Risk Assessment Unit within the Department of Administration and it includes the current physical address of all buildings that the state owns or leases. We mapped out this list based on geocoding their physical address and compared the location of the public safety institutions currently in CAVs. Additionally, this list can be used to verify addresses of other government agencies (CAI category 7) in the next data collection rounds.

We tested a new method to invite private schools to contribute their broadband connectivity information. We created groups of private schools based on their religious denomination and/or mission. For instance, we created groups of Catholic, Lutheran, Seventh Day Adventist, Methodists, and Montessori schools and contacted the organizations' head offices. We explained to them the objectives of SBI and asked them to reach out to their schools by using a communication that we drafted for them. Some groups were more receptive to this outreach than others.

We reached out to national organizations such as the National Association of State Technology Directors (NASTD) and the United States Unified Community Anchor Network (US UCAN) with the objective of defining a frame of reference that allows us to assess our outreach efforts to CAIs against similar endeavors in the nation. We presented an overview of SBI at the NASTD Conference in North Dakota in May and invited the Special Interest Group on Broadband to share their experiences and ideas as to how to improve the data collection process. We reviewed documentation that NASTD maintains in a virtual

library relevant to SBI. On the other hand, through our conversations with US UCAN we have learned that most of the methods this organization uses to compile a dataset of Community Anchor Institutions at the national level are fairly similar to ours.

Additionally, we continue to use some of the methods from previous data collection rounds. That is, we contact CAIs directly (emails and follow up phone calls) which helped us to get to know individual CAIs briefly, explain the objectives of the program and answer questions and invite them to participate in the on-line survey. It also provides an opportunity for the individual institutions to become engaged in the broadband planning process. The on-line survey remains open between collection periods to provide opportunity for the Regional Planning Teams to update information as they engage with the community and to allow responding institutions to update their data as necessary.

We also continue to extend our network to a number of working groups at local, regional and state levels. We presented information about the SBI program at a variety of meetings such as public safety workgroups, Idaho Geospatial Council and GIS state agencies meetings. The attendants were encouraged to pass on this information to relevant contacts within their own groups. With this method we sought to efficiently raise awareness about SBI on different networks. For instance, by posting information about the program on the Geotech list, which is accessed by several public safety authorities, the program is introduced to a wide audience with the intent of making future outreach to these organizations easier. Our hope is that having knowledge about the program will make them more willing to participate in the survey.

Anchor Institution Trends

To date we have focused our efforts on identifying community anchor institutions, verifying physical address information for the institutions, assigning appropriate NTIA tracking codes to the institutions when appropriate and seeking connectivity data from the institutions. We have placed a priority on reaching out to schools (K-12), libraries, and hospitals. Moving forward we will continue to reach out to the above groups but will increase our efforts to collect better data for the remaining CAI groups with specific emphasis on higher education and public safety institutions.

We continue to foster partnerships with groups doing similar work for other agencies. In Round 5 an important relationship was established with Idaho Department of Water Resources. They house an effort -- in cooperation with the Federal Emergency Management Agency (FEMA) -- to model damage caused by natural disasters using GIS, and have developed a dataset of essential facilities in Idaho. Coordination of activities with IDWR continued throughout Round 6 with the objective of minimizing duplication of efforts.

Another avenue being pursued for CAI data is the “Parcels Project”. This ambitious effort seeks to compile a statewide dataset based on the contributions of authoritative parcels datasets from local governments. Led by Tax Commission and the Department of Administration this project will provide a base to further SBI objectives.

As a final verification step, the team is continuously striving to improve the CAIs positional accuracy. We continued to use GIS methods to plot CAIs as points in a map based on the listed longitude and latitude

fields. The location of each point was then compared to the essential facilities dataset and CAI points were repositioned when necessary.

We are hopeful that pursuing these many avenues for data collection will prove to be useful over time for the overall program goals.

Appendix Two

Data Collection Challenges

This section summarizes some of the challenges we have experienced with data collection and processing. The team believes it is important to categorize these challenges as they help inform the geoprocessing and verification methods used. It is also our hope that some of the more global issues can be discussed and decided within the Grantee community.

We begin with several global issues and then continue toward more granular challenges.

Global Data Collection Issues

Maximum Advertised Speed is Not Reported Consistently

As has been discussed in webinars and also within the context of NTIA data assessments, much reported speed information continues to be reported at the market level (MSA/RSA) and then uniformly pushed down to the Census blocks. This has a tendency to create a problem with NTIA speed tripwires since the technology is reported by block but the maximum advertised speed is reported at a regional level.

This challenge gets further amplified at a block level when comparing to a third party data provider. It can create a mismatch between third party data generated at an area larger than block level versus block level generated speed and vice versa. To minimize the potential confusion, it might be helpful to be able to provide a flag at the submitted record level which indicates the geographic basis by which the Maximum Advertised Speed is reported.

Census Block and Road Standards are not clear

There seem to be several methods by which providers are calculating the Census block area. So the distinction at 2.00 square miles can be uniform, it would be ideal to articulate an operational area calculation definition.

Providers Not Wishing for Block Level Aggregation of Their Data

For providers who submit address point data, we do minimal additional processing. Our main test is to ensure that points are contained within 1 mile of exchange boundaries; the only other processing was normalization into NTIA formats.

Broadband providers not Meeting the NOFA "provider" Definition

Comments on PBWorks appear to reflect a concern among a number of grantees about what a Broadband provider is--and how that definition impacts mapping.

If the 7-10 day provisioning rule is to be strictly enforced, it could seem to eliminate a number of prominent Broadband providers[31]. Further, the need for clarification around a facilities-based provider,

[31] By email ***REDACT*** informed us they could not provision in 7-10 days, but they also supply information on qualified locations to the address point level. Therefore, we draw a distinction between an incumbent provider owning the facility--which terminates at a customer premise--who cannot turn up service at a qualified location, versus a provider not reporting any specific qualified locations in which they cannot turnup service in the 7-10 day

versus the reseller, has injected even more uncertainty. Right now we are unclear on how strictly to interpret either of these important distinctions, but we are concerned that we are beginning to create an NTIA exclusion criterion that is going to confuse downstream consumers of the data.

Given mergers and acquisitions in the CLEC space we are noticing a drop off in participation in this program by several national CLECs. We hope this is an artifact of the mergers and resource constraints rather than a long term trend.

Again, we do not want to exclude a service provider, but we believe there needs to be further clarification around the "7-10 day rule," the definition of a "reseller," and better interpretation of facility-based providers, versus equipping UNEs, SpA or leased lines.

We have used the provider Type of "Other" to classify a number of providers who offer Broadband services, but we do not offer them in a manner consistent with Technical Appendix A definitions.

To What Extent Should We Begin "Classifying" the Data and Maps?

The question immediately preceding gets to the intent of a Broadband provider. This question gets to the intent of the Data and Maps.

Earlier in this document we discussed the question of what type of bias we should introduce to our online map messaging. In an online environment, do we want to more likely create an overstatement of coverage for a provider than an understatement? In other words, is the larger problem allowing a consumer to self-disqualify, versus calling a number of neighboring providers? There is a related issue to this. Clearly in our maps there is a lot of scatter in data that we believe should be more continuous. These are the islands of coverage from an incumbent provider[32]. There are a number of processes that could be put in place to deal with this type of scatter, but without more information from the service provider-- essentially the last mile facilities-- it will be difficult to perform this clean up in an informed manner. On the one hand, we can aesthetically clean the maps up and reduce the scatter, but we have little sub-block engineering information upon which to make this decision. Right now our preference is to put out a somewhat aesthetically messier deliverable and work with providers to get better information to clarify their submission. If that isn't forthcoming, we are limited in what can be done given the lack of facility level information. In summary this yields two questions

In our online maps should we error on overstating coverage to prevent consumer self-disqualification?
In our online maps should we work to clean up a lot of the scatter that we see without having facility-based evidence from which to remove it?

---

window. In the first case we have a sense of where service can be offered and verified. In the second, we have no evidence that a service could exist there until a specific location becomes a customer.

[32] For a provider who sells opportunistically (not within a franchise area) it becomes even more problematic to classify their coverage because the points are more related to the type of consumer purchasing the service than a bounded offering. In a matter of speaking, the ProviderType is more determined by the technology and/or location than a type of business. The core intent of the NOFA and our grant application was centered around the 7-10 day providers but we believe maintaining information on provider Type "Other" and "Reseller" is important to assist in validation and market segment analysis as resources are available.

As we examine results from third party data assessments, it appears that this scatter is something that is also problematic with the assessment results. It also appears to be evident that different third party data sources treat water areas differently. When we are developing data based upon Wireline facilities, we exclude water blocks. We do not filter out water blocks from provider submitted data. We are unsure if there is or should be a standard in how water covered blocks are treated for Wireline broadband providers.

Community Anchor Institution Surveys

Over time the base of participation in CAI surveys has broadened. Our teams are interacting with more organizations interested in broadband planning. This is a benefit because it helps integrate the importance of Broadband mapping, planning and capacity building within their organizational framework. But it also begins to create challenges in data collection. There are two noticeable trends in this area.

First, CAIs are organizationally diverse. For a school, you expect to have a centralized entity that can answer and support questions about Broadband services. For a rural, volunteer fire department answering questions about broadband may go to the Chief. The way that he/she answers about Broadband is probably specific to her experience and context. The implication is two-fold. First saying that some percentage of CAIs in a state have access to broadband can be misleading because the formality of a school or government building is much different than the formality of a volunteer fire department. Second, that volunteer fire department may get broadband via a 3G mobile hotpsot when they need it…but the presence of *this* type of broadband is a very different thing than the presence of a responder who has mobile LTE broadband.

Second, technical knowledge of the survey respondent differs within each organization. This complicates our data collection. It is not uncommon for someone to say yes we have Broadband, I just don't know how we get it or how fast this is. So in response we report they are broadband served but unknown speed or technology. This doesn't mean they haven't been surveyed, it just means the response was unknown. As there are now a large number of people collecting this data, it would be helpful to have some consistent national business rules from which we can answer questions about the meaning of any particular data element. As an example, when should "no" be used versus when should "unknown "be used. In other words, what is the standard for the difference between never made contact with the CAI versus a respondent didn't know/couldn't answer. We have guidelines internally but are unsure if this is consistent across states.

Granular Data Collection Issues

Non-Uniform Submission Standards

It is clear among providers that there isn't a consistent method used to derive Broadband coverage. Some providers appear to be use a geocoding approach and then point in polygon or point on segment process. Others may be using GPS locations. In some cases, it is difficult to infer what reference data was used to georeference plant (is it the carrier's roadbase?). This leads to uncertainty regarding the input data scale or accuracy relative to other base layers. Although we may be trading off absolute

accuracy, our standard has been to conflate submitted data to TIGER 2010 Blocks and TIGER 2010 roads. We perform our verification against this conflated data product.

Temporal

We are unsure of how well the data are temporally consistent. Some providers gave us their best effort to control to June 30, 2012. We note that some providers were clear that the submission was as of extract date without any way to move back in time. They have no means to control for time and cannot provide any audit support beyond when the data are released to us. Some data-especially loop qualification data-may change from day to day. It will be very difficult to clarify why something was changed from a given point in time.

Perceived Inaccuracy with Respect to Internal Standards

The NOFA is clear on submitting a list of Blocks in which a provider delivers Broadband service. This is a different objective than perfectly reflecting service territories. If a firm's accuracy standard is a reflection of their service area, then the data created under the NOFA will not meet their perception of accuracy. This leads to two other issues: First, using Census Blocks rather than serving area may overstate or understate a particular provider's Broadband serving area. This was a significant concern of ***REDACT*** who specifically required us to submit only address-level qualification data. The second issue this brings up is how or if, there should be some standard on how much of a Census Block needs to be covered to call it covered.

Confidentiality

Several providers have noted concerns with CPNI-related issues and have stated this as a reason for non-participation. We have also heard expressions of comparable concern regarding identifiable responses to Anchor Institution information.

Unclear on Definitions

As discussed earlier, several providers claimed confusion on several key terms involved in Middle Mile. We note a consistent stream of questions around the interpretation of Maximum Advertised Speed. Some providers understand this to be the most common speed package bought within the mass market, while others view this as a speed that can be purchased for an additional cost above a mass market offering (e.g. a Turbo option for an additional fee per month). Others interpret this as the fastest speed that is available for that particular location--in terms of xDSL, a structure qualified speed, for example.

Perception of Data Use

There seems to be some hesitancy releasing speed information because no one is sure of how the information will be used, or what the speed is intended to reflect. A number of providers have verbally indicated that typical speed will be about (on average) 80% of purchased speed due to overhead. But there are many other factors (such as a user's home network) that influence speeds measures. Providers are concerned about introducing statistics without a clear understanding of how those statistics are derived and will then be used. Also, as advertised speed is pushed down to a block level, we sense more trepidation to report speed values. This quickly begins to touch on parity across network types (why is wireline down at the block when wireless is half the state, etc.). Finally we note a

significant increase in speed values reported to us. This may be due to network upgrades or competitive concerns to match the theoretical network speed.

Location Uncertainty In Source Data

Within this document we have noted concerns about the impact of source data accuracy. Our geoprocessing methodology provided what we believe is a relatively conservative tolerance to account for the scale issue in the source data, but we are unsure of how this may impact downstream users. Clearly, it also impacts the verification process because we can't attempt to verify received data beyond a scale at which it was developed.

Covered Segment Process

Deriving Broadband covered segments in Census Blocks greater than 2 square miles has proved to be a challenge. Moving from a NOFA specified tabular deliverable to a requested geographic deliverable also increases the complexity of the effort.

Record Level Metadata

It would be helpful to have one or two additional fields in each feature class transmitted to NTIA. One User Defined field could be helpful as an expression of record level confidence. The second field could be used as a Key between the transfer geodatabase and our systems. Ideally, both fields could be large text fields (50 char) so the Grantee can use them to express a variety of attributes.

Miscellaneous Data Collection Notes

We note the following important observations regarding our data submission:

There are Middle Mile plant records for providers who are not present in the Census block, segment or wireless area feature classes. This is due to classification as non-NOFA Broadband providers.
In some cases, we have trimmed wireless coverage estimates to honor state boundaries.
We believe some providers are trimming their coverage to honor license area boundaries.
Where a provider submitted Middle Mile points out of state, we are no longer passing those points to NTIA as they fail the validation script.
In tables with mandatory Street and Zip5 attributes (Service Address), if the value is unavailable we fill the default value.
As before there remain some differences between the Data Model, Data Model Default Values and the Python Validation Script.
We have a significant amount of VDSL, ADSL 2 and ADSL 2+ coverage categorized into the xADSL category. This introduces large variance in speed availability as some providers are using VDSL, shortened loops and/or pair bonding to increase speed to levels nearly 30 Mbps.
We note a few providers who have speeds seemingly inconsistent with their technology of transmission. This is either very low speeds with optical fiber, or very high speeds with non DOCSIS 3.0 systems. We have verified on provider websites that the reported speeds are available in the area but these speeds will fall out of the NTIA frequency table analysis.
We have a small number of providers who serve an area with both a residential and business speed tier. In cases where we cannot distinguish which speed tier offering to use, we use the higher of the speed tiers.

Per NTIA request we have modified the manner in which we handle Wireless coverage polygons. If a Provider submits a single geometry but specifies multiple spectrum codes in use in that polygon, we duplicate the polygon for each spectrum code. In other words the geographic object is identical but the attribute data for the object is unique.

In point level data submissions (Service Address and CAI) we note points that are spatially coincident. With respect to Service Address points our thought is these represent multi-unit dwellings or businesses but we don't have enough address detail to determine if these are multi-unit structures or duplicated customers. Because we cannot determine the reason for the duplication we leave spatially coincident records in our submission. We also leave in our CAI submission points which may be the same physical structure but have slight variations in addressing.

In point level middle mile data, we are finding a variance in the quality of the geocoded longitude and latitude returned. Given the data received we are unsure if this is an issue where the plant address is difficult to geocode or if the longitude and latitude provided to us is different than what would be returned in geocoding.

For Block and Segment level data which we produce based upon provider facility or service area boundaries, we remove Census blocks which are entirely water covered. This results in a drop of Census block counts for a number of providers.

Appendix Three

This appendix contains the confidentiality clarification supplied in a series of emails between CostQuest and NTIA.

Feature Class	*Metadata*	*NOFA Confidential?*	*Online Map*	*Public Disclosure*	*Exemption*
Last Mile	Constraints on accessing and using the data	Yes	No	No	None
	Access constraints: None				
	Use constraints:				
	This data is confidential as defined in the NOFA.				
Middle Mile	Constraints on accessing and using the data	Yes	No	No	None
	Access constraints: None				
	Use constraints:				
	This data is confidential as defined in the NOFA.				
Service Address	Constraints on accessing and using the data	No	No	Yes	
	Access constraints: None				
	Use constraints:				
	There are no restrictions on distribution of the data by users.				
CAI	Constraints on accessing and using the data	No	Yes	Yes	NO attributes on any record in this feature class are considered confidential

	Access constraints: None				
	Use constraints:				
	There are no restrictions on distribution of the data by users.				
Census Block	Constraints on accessing and using the data	No	Yes	Yes	NO attributes on any record in this feature class are considered confidential
	Access constraints: None				
	Use constraints:				
	There are no restrictions on distribution of the data by users.				
Service Overview	Constraints on accessing and using the data	No	Yes	Yes	The only provider who may not show up on this table is a provider who has provided only confidential data (last mile, Middle Mile,

					address point with provider name)
	Access constraints: None				
	Use constraints:				
	There are no restrictions on distribution of the data by users.				
Road Segment	Constraints on accessing and using the data	No	Yes	Yes	NO attributes on any record in this feature class are considered confidential
	Access constraints: None.				
	Use constraints:				
	There are no restrictions on distribution of the data by users.				
Wireless	Constraints on accessing and using the data	No	Yes	Yes	NO attributes on any record in this feature class are considered confidential
	Access constraints: None				
	Use constraints:				

	There are no restrictions on distribution of the data by users

Appendix Four-Idaho

This appendix details our analysis of the potential and actual broadband provider market. We include both our internal tracking description document and then our categorization for each provider. As this extract was made prior to final submission, there may be differences between provider categorization and the attributes on the day of submission to NTIA.

Provider Categorization

Provider Type and Status Definitions

The Provider Type is based upon categories provided by NTIA, while the Provider Status is based upon categories developed internally for tracking purposes. It should be noted that the Provider Status discussed here relates to the provider's overall status within the program.

Provider Type Codes and Definitions:

NTIA code	Code	Name	Definition
1	P	Provider	This code applies to all confirmed providers of broadband service per the SBI program NOFA. A provider is given a "P" designation if we have determined that the company does indeed exist and appears to be providing broadband services.
2	R	Reseller	This code applies to all broadband entities that have been confirmed as pure resellers – meaning they do not own their own facility/equipment and simply resell services under their own brand name or the brand name of an actual Provider.

3	O	Other	The code applies to entities who were originally placed on the SBI provider list, but whose status is still in question or has been determined to be non-NOFA compliant.
4	N/A	Not applicable	This code applies to entities who appeared on the original state provider list or a third party list (such as the FCC 477, American Roamer, or Warren Media lists) but who have been confirmed as NOT providing broadband services.
	X	Inactive	This code applies to entities that may have appeared on an early provider list but whose identity and existence we subsequently have been unable to verify. This code may also apply to providers who have since been acquired or simple gone out of business and for which no FRN appears on the FCC list – These no longer need to be reported to NTIA. This is an INTERNAL category used to remove entities completely from the list of entities submitted to NTIA.

Once the proper Provider Type has been assigned to an entity, an overall Provider Status must be established. The Provider Status codes are specific to the Provider Types, and are not interchangeable. The following table lists the status codes associated with each Provider Type.

Provider Status Definitions

Provider Type Code	Provider Status Code	Name	Definition
P	D	Declined	A provider is given a Status of "D" if they have officially stated verbally or in writing that they will not participate in the SBI program.
	P	Participating	A provider is considered to be "Participating" if they have submitted USABLE data in at least one data submission round. The data does not need to be 100% complete for a provider to be assigned a "P" code – they simply have to have provided a level of data that is sufficient to submit to NTIA.
	NR	Non Responsive	A provider is considered "Non Responsive" if they have either failed to respond to any of our correspondence, or they have submitted insufficient data that makes inclusion of their data in the NTIA submission impossible.
	V	Submitted under other ID	A provider whose data is submitted under another Provider ID, but is operating under their own FRN.
	E	Estimated	A provider is marked as "Estimated" if they have not submitted usable data, and would otherwise be considered non-responsive, BUT for whom we are able to submit data by using estimation techniques and/or third party sources. This designation applies only to providers whose data is 100% estimated.
R	R	Reseller	"R" is the only status code for Resellers and it simply reconfirms their status as a reseller –data may not be submitted but name of provider is included in NTIA data package.
O	U	Unknown	The status of Unknown is assigned to an entity whose name has appeared on a list (or been submitted as a new possible provider) and is currently under investigation. It has not been determined yet if this entity is indeed offering broadband services or not.
	NC	Non-Compliant	This status is assigned to entities who appear to be in the broadband industry, but who do not meet the formal definition of a BB provider under NOFA requirements. Examples may be entities who cannot provision service within 7-10 days.

	P	Participating	These are providers who do not meet the formal definition of a BB provider under NOFA requirements, but are participating in the program and submitting data.
	NP	Not a Provider	This status applies to entities who may appear on a third partly list of valid providers, but who have been proven to either no longer exist, or simply no longer provides broadband services.
N/A			No status codes associated with this Provider Type
X			

Provider Disposition

Provider ID	Provider State	Provider Name	DBA	Alternative NTIA Name (if available)	Provider Type	Provider Status
679	ID	360 Networks	360 Networks	n/a	O	NC
148	ID	A & W Satellite	A & W Satellite	n/a	R	R
120033	ID	Access Spectrum	Access Spectrum	Access Spectrum	N/A	NP
120027	ID	Advanced Cable Technology	Advanced Cable Technology	n/a	N/A	NP
152	ID	Wired Or Wireless, Inc.	AIR-PIPE	Wired or Wireless, Inc.	P	P
115	ID	ATC Communications	Albion Telephone Company	Albion Telephone Company, Inc.	P	P

Provider ID	Provider State	Provider Name	DBA	Alternative NTIA Name (if available)	Provider Type	Provider Status
153	ID	All Idaho Internet	All Idaho Internet	n/a	R	R
802	ID	Atlantic Tele-Network	Allied Wireless Communications Corporation	Atlantic Tele-Network	P	NR
678	ID	American Fiber Systems, Inc.	American Fiber Systems	Zayo Group, LLC	O	P
661	ID	AT&T Mobility LLC	AT&T Mobility LLC	AT&T Mobility	P	P
120038	ID	Atlantic Wireless LP	Atlantic Wireless LP	Atlantic Wireless LP	O	U
154	ID	Big Sky Telecom	Big Sky Telecom	n/a	R	R
155	ID	BitSmart	BitSmart	n/a	P	P
120034	ID	Blackfoot Telephone Cooperative Inc	Blackfoot Telephone Cooperative Inc	Blackfoot Telephone Cooperative Inc	N/A	NP
135	ID	Bresnan Internet	Bresnan Internet	n/a	N/A	NP
686	ID	DigitalBridge Communications	Bridgemaxx	DigitalBridge Communications Corp.	N/A	NP

Provider ID	Provider State	Provider Name	DBA	Alternative NTIA Name (if available)	Provider Type	Provider Status
120010	ID	Level 3 Communications, LLC	Broadwing Communications, LLC	n/a	P	V
136	ID	Cable One	Cable One	Cable One, Inc.	P	P
120029	ID	Cache Broadband	Cache Broadband	n/a	N/A	NP
120049	ID	Cache Valley Wireless	Cache Valley Wireless	Cache Valley Wireless	N/A	NP
120002	ID	Cactus International, Inc.	Cactus Computer	n/a	P	D
638	ID	Cambridge Telephone Company, Inc.	Cambridge Telephone Company, Inc.	Cambridge Telephone Company, Inc.	P	P
120035	ID	Cavalier Wireless, LLC	Cavalier Wireless, LLC	Cavalier Wireless LLC	N/A	NP
131	ID	CenturyTel, Inc.	CenturyLink	CenturyTel, Inc.	P	P
129	ID	CenturyTel, Inc.	CenturyLink	Qwest Communications International, Inc.	P	V
829	ID	Chickadee Wireless	Chickadee Wireless	n/a	P	D

Provider ID	Provider State	Provider Name	DBA	Alternative NTIA Name (if available)	Provider Type	Provider Status
804	ID	GreenFly	Clearfly	Greenfly Networks, Inc.	R	R
120036	ID	Cleartalk	Cleartalk	Cleartalk	N/A	NP
189	ID	Clearwire	Clearwire	Clearwire Corporation	P	P
527	ID	Comcast of California Idaho, Inc.	Comcast	Comcast Corporation	P	P
120003	ID	CommWorld	CommWorld	n/a	P	NR
830	ID	Concept Cable TV	Concept Cable TV	n/a	P	P
120037	ID	Continuum 700 LLC	Continuum 700 LLC	Continuum 700 LLC	N/A	NP
156	ID	Convertec Internet Services	Convertec Internet Services	n/a	N/A	NP
754	ID	Country Cable	Country Cable	Country Cable	P	NR
137	ID	CoxCom, Inc.	Cox Communications	Cox Communications, Inc.	P	P

Provider ID	Provider State	Provider Name	DBA	Alternative NTIA Name (if available)	Provider Type	Provider Status
803	ID	Craner Technology Services	Craner Technology Services	Craner Technology Services	P	P
729	ID	Leap Wireless International, Inc.	Cricket Communications, Inc.	Leap Wireless International, Inc.	P	P
116	ID	CTC Telecom	CTC	CTC Telecom	P	P
671	ID	Custer Telephone Broadband Services LLC.	Custer Telephone Broadband Services	Custer Telephone	P	P
117	ID	Custer Telephone Cooperative, Inc.	Custer Telephone Cooperative, Inc.	Custer Telephone Cooperative Inc.	P	P
157	ID	Datawav-is	Datawav-is	n/a	X	
158	ID	Digi-Comm	Digi-Comm	n/a	X	
159	ID	Direct Communications - wireless	Direct Communication	n/a	P	V
138	ID	Direct Communications Cable	Direct Communications	Direct Communications Rockland, Inc.	P	P
118	ID	Direct Communications	Direct Communications	Direct Communications Rockland, Inc.	P	P

Provider ID	Provider State	Provider Name	DBA	Alternative NTIA Name (if available)	Provider Type	Provider Status
139	ID	Dish Network	Dish Network	Dish Network	R	R
645	ID	Megapath, Inc.	DSLNet Communications, LLC	n/a	N/A	NP
716	ID	Elk River TV Cable Company	Elk River TV Cable Company	Elk River Cable TV Inc.	N/A	NP
769	ID	Fretel	FairPoint Communications	FairPoint Communications, Inc.	P	P
119	ID	FairPoint Communications	FairPoint Communications	FairPoint Communications, Inc.	P	P
171	ID	LTLink	Family Friendly Internet Service	n/a	P	NR
120	ID	Farmers Mutual Telephone Company	Farmers Mutual Telephone Company	Farmers Mutual Telephone Company (ID)	P	P
121	ID	Filer Mutual Telephone Company	Filer Mutual Telephone Company	Filer Mutual Telephone Company	P	P
162	ID	First Step Internet, LLC	First Step Internet	First Step Internet, LLC	P	P
132	ID	Citizens Telecommunications Company of Idaho	Frontier Communications of Idaho	Frontier Communications Corporation	P	P

Provider ID	Provider State	Provider Name	DBA	Alternative NTIA Name (if available)	Provider Type	Provider Status
130	ID	Frontier Communications	Frontier Communications of Northwest Inc.	Frontier Communications Corporation	P	P
120005	ID	First Step Internet, LLC	GLOBAL CROSSING TELECOMMUNICATIONS, INC.	n/a	R	R
164	ID	Gem State Communications	GSC Wireless	n/a	P	P
805	ID	Hughes Communications, Inc.	HNS License Sub, LLC	Hughes Communications, Inc.	P	P
166	ID	Imbris, INc.	Imbris, Inc.	n/a	N/A	NP
832	ID	MediaG3, Inc.	Imperial Wireless	n/a	P	NR
167	ID	Inland Internet	Inland Internet	n/a	P	V
122	ID	Inland Telephone Company	Inland Telephone Company	Western Elite Incorporated Services	P	P
695	ID	Electic Lightwave, LLC	Integra Telecom	Integra Telecom Holdings, Inc.	P	P
168	ID	Intermax Networks	Intermax Networks	Newmax, LLC	P	P

Provider ID	Provider State	Provider Name	DBA	Alternative NTIA Name (if available)	Provider Type	Provider Status
740	ID	Idaho Regional Optical Network	IRON	n/a	O	P
169	ID	Ispeed Wireless	ISpeed Wireless	n/a	P	NR
687	ID	JAB Broadband - DIGIS	JAB Broadband - DIGIS	JAB Wireless, Inc.	P	P
165	ID	JAB Broadband - DIGIS	JAB Broadband - DIGIS	n/a	P	V
120023	ID	JAB Broadband	Jab-Skybeam	n/a	N/A	NP
120009	ID	KeyOn Communications Holdings, Inc.	KeyON Communications Holdings, Inc.	n/a	X	
120031	ID	Laser Image Inc	laser Image Inc	n/a	N/A	NP
170	ID	DIGIS	Last Mile Wireless	n/a	P	V
151	ID	Leader Communications Services (St. Maries Wireless)	Leader Communications Services (St. Maries Wireless)	n/a	P	NR
660	ID	Level 3 Communications, LLC	Level 3 Communications, LLC	Level 3 Communications, LLC	P	P

Provider ID	Provider State	Provider Name	DBA	Alternative NTIA Name (if available)	Provider Type	Provider Status
120039	ID	Manti Telephone Company	Manti Telephone Company	Manti Telephone Company	N/A	NP
737	ID	PAETEC Holding Corp	McLeodUSA Telecommunications Services, Inc.	PaeTec Corporation	N/A	NP
172	ID	Meadow Creek Computer Works	Meadow Creek Computer Works	n/a	R	R
120042	ID	Qualcomm	MediaFLO	Qualcomm	N/A	NP
120040	ID	Metro PCS	Metro PCS	Metro PCS	O	U
120011	ID	Metropolitan Telecommunications Holding Co	Metropolitan Telecommunications Holding Co	n/a	R	R
173	ID	Microserv	Microserv	n/a	P	NR
174	ID	MicroWave DSL (HIBEK.Net)	MicroWave DSL	n/a	P	D
123	ID	Midvale Telephone Exchange, Inc.	MTE Communications	Midvale Telephone Exchange	P	P
120041	ID	MTPCS LLC	MTPCS LLC	MTPCS LLC	O	U

Provider ID	Provider State	Provider Name	DBA	Alternative NTIA Name (if available)	Provider Type	Provider Status
124	ID	Mud Lake Telephone Cooperative Association, Inc.	Mud Lake Telephone Cooperative Association, Inc.	Mud Lake Telephone Cooperative Assn., Inc.	P	E
145	ID	Mullan Cable	Mullan Cable	Mullan Cable TV Inc.	P	P
120000	ID	AT&T Inc.	New Cingular Wireless Services, Inc.	n/a	P	V
674	ID	New Edge Holding Company - Earthlink	New Edge Network, Inc.	New Edge Holding Company	O	NC
768	ID	Nez Perce Tribe	Nez Perce Tribe	n/a	P	P
175	ID	NIDAHO.NET	North Idaho Connection	n/a	P	NR
146	ID	Northland Cable Television	Northland Cable Television	Northland Communications Corp.	P	P
690	ID	OneEighty Networks	OrbitCom, Inc.	OrbitCom, Inc	P	NR
125	ID	Oregon-Idaho Utilities, Inc.	Oregon-Idaho Utilities, Inc.	Robinson Communications Corporation	P	P
176	ID	Overarch Broadband	Overarch Broadband	n/a	P	NR

Provider ID	Provider State	Provider Name	DBA	Alternative NTIA Name (if available)	Provider Type	Provider Status
161	ID	Pass Word PKA - Fastlane-i.com	Pass Word, Inc.	n/a	N/A	NP
126	ID	Project Mutual Telephone Cooperative Association, Inc.	Project Mutual Telephone Cooperative Association, Inc.	Project Mutual Telephone	P	P
178	ID	Ptera Wireless Inc.	Ptera	n/a	P	P
179	ID	QROIdaho	QRO High-Speed Internet of Idaho	n/a	P	P
149	ID	Coeur d`Alene Tribe	Red Spectrum Communication	n/a	P	E
806	ID	Rural Network Services (Owned by Midvale Tel)	Rural Network Services	Rural Network Services	P	NR
120012	ID	Rural Network Services (Owned by Midvale Tel)	Rural Network Services	n/a	N/A	NP
127	ID	Martell Enterprises, Inc.	Rural Telephone Company	Martell Enterprises, Inc.	P	P
180	ID	SafeLink Internet	Safelink Internet	Safelink Internet	P	P
779	ID	Millennium Networks	Silver Star Broadband	Silver Star Telephone	P	P

Provider ID	Provider State	Provider Name	DBA	Alternative NTIA Name (if available)	Provider Type	Provider Status
141	ID	Silver Star Broadband	Silver Star Broadband	Silver Star Telephone	P	P
722	ID	Columbine Telephone Company, Inc.	Silver Star Communications	ATC Communications	P	P
128	ID	Silver Star Telephone Company, Inc.	Silver Star Communications	Silver Star Telephone	P	P
723	ID	Gold Star Communications LLC	Silver Star Wireless	Silver Star Telephone	P	P
181	ID	SISNA (dialup)	SISNA	n/a	N/A	NP
188	ID	Sky Blue	Sky Blue	n/a	O	S
838	ID	Skycasters, LLC	Skycasters, LLC	n/a	P	P
120048	ID	SpectrumCo	SpectrumCo	SpectrumCo	N/A	NP
836	ID	Speed Connect	Speed Connect	n/a	P	P
182	ID	SpeedyQuick Networks	SpeedyQuick Networks	n/a	P	NR

Provider ID	Provider State	Provider Name	DBA	Alternative NTIA Name (if available)	Provider Type	Provider Status
183	ID	Spokane Skynet	Spokane Skynet	n/a	O	S
651	ID	Sprint Nextel Corporation	Sprint	Sprint Nextel Corporation	P	P
191	ID	St. Maries Gazette Record	St. Maries Gazette Record	n/a	P	P
163	ID	St. Maries Gazette Wireless	St. Maries Gazette Record	n/a	P	V
807	ID	StarBand Communications Inc.	StarBand Communications Inc.	StarBand Communications Inc.	P	P
120014	ID	Stat Network Solutions	Stat Network Solutions	n/a	N/A	NP
120015	ID	Stratos Global Corporation	Stratos Offshore Services Company	n/a	O	S
142	ID	Suddenlink Communications	Suddenlink Communications	Cequel Communications, LLC	P	E
143	ID	Superior Satellite	Superior Satellite	n/a	R	R
184	ID	Surf1	Surf1	n/a	P	NR

Provider ID	Provider State	Provider Name	DBA	Alternative NTIA Name (if available)	Provider Type	Provider Status
696	ID	Syringa Networks, LLC	Syringa Networks, LLC	Syringa Networks, LLC	P	P
845	ID	Syringa Wireless	Syringa Wireless	n/a	P	NR
705	ID	Potlatch Telephone Company	TDS	Telephone and Data Systems, Inc.	P	P
704	ID	Asotin Telephone Company	TDS	n/a	N/A	NP
133	ID	Telephone and Data Systems, Inc.	TDS TELECOMMUNICATIONS CORPORATION	n/a	P	V
185	ID	Teton Wireless	Teton Wireless	n/a	N/A	NP
653	ID	Time Warner Cable LLC	Time Warner Cable	Time Warner Cable Inc.	P	P
134	ID	T-Mobile USA, Inc.	T-Mobile	Deutsche Telekom AG	P	P
120043	ID	Toba Inlet PCS, LLC	Toba Inlet PCS, LLC	Toba Inlet PCS, LLC	N/A	NP
144	ID	Troy Cable	Troy Cable	n/a	P	NR

Provider ID	Provider State	Provider Name	DBA	Alternative NTIA Name (if available)	Provider Type	Provider Status
759	ID	tw telecom of Idaho llc	tw telecom	tw telecom inc.	P	P
120045	ID	U. S. Cellular	U. S. Cellular	United States Cellular	N/A	NP
120044	ID	Union Telephone Company	Union Telephone Company	Union Telephone Company	N/A	NP
120017	ID	Verizon Business Global LLC	Verizon Business	n/a	O	NC
713	ID	Verizon Wireless	Verizon Wireless	Verizon Communications Inc.	P	P
666	ID	ViaSat, Inc.	ViaSat, Inc.	WildBlue Communications, Inc.	P	P
120008	ID	Inland Cellular Telephone Company	Washington RSA No 8 Limited Partnership	n/a	P	V
766	ID	Westcom LLC	Westel Fiber	WestCom LLC	P	P
120046	ID	Western Communications Inc.	Western Communications Inc.	Western Communications Inc.	N/A	NP
120047	ID	Whidbey Telephone Company	Whidbey Telephone Company	Whidbey Telephone Company	N/A	NP

Provider ID	Provider State	Provider Name	DBA	Alternative NTIA Name (if available)	Provider Type	Provider Status
186	ID	Wilderness Wireless	Wilderness Wireless	n/a	P	P
147	ID	Windjammer Cable	Windjammer Cable	Windjammer Communications LLC	P	P
808	ID	XO Holdings, Inc.	XO Communications, LLC	XO Holdings, Inc.	R	R
120020	ID	Zayo Bandwidth Northwest, Inc.	Zayo Group, LLC (FiberNet)	n/a	O	NC