State of Arizona
Government Information Technology Agency

Arizona Broadband Assessment Project
White Paper

Submission 3 - April 1, 2011

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As is widely noted, the ubiquitous availability of Broadband has become as essential to quality of life as are the availability of other essential infrastructures of power, water, and transportation. There is no longer any doubt regarding the necessity of broadband capacity as a critical component for a region's economic well-being, job creation, and future prosperity for its citizens. Indeed, our increasing reliance on broadband communication for everything from commerce and public safety to education and healthcare, and to the efficient operation of government has marked this first decade of the 21st Century as the "Information Age." Accurately knowing the conditions of broadband availability, its capacity, and deficits in all parts of our State, especially underserved rural areas, is critical information for decision-making and informed policy.

Because the GITA Broadband Team has now spent its first full year developing the Arizona Broadband GIS Survey and Assessment data, tools, and deliverables under our National Telecommunications and Information Administration (NTIA) Broadband Mapping grants, we can now begin to identify the actual availability and deficits in the State, on behalf of Arizona's broadband stakeholders, with a reasonable degree of accuracy. There is still much to do to make the data yet more accurate and useful to stakeholders as the data currently provided by service providers currently may overstate actual availability in two dimensions.

First, for wireline services, availability is frequently shown as availability throughout an entire service territory and does not show in which streets, census blocks, and neighborhoods where physical plant is not actually available to connect users.

Second, as agreed with service providers, download and upload speeds for all types of services are reported as maximum advertised speeds. These numbers vary considerably when compared to actual speeds experienced by users in most instances. To address these issues, so as to provide more accurate data to our stakeholders, we have begun a verification program using licensed databases and crowd-source data and speed-test data captured by independent third parties. As the amount of this data is accumulated to a statistically significant level, we will begin to incorporate it in our broadband maps. We will also continue working with our service providers to obtain more granular and accurate service availability data wherever possible.

Finally, as we begin using the Broadband Survey and Assessment data and begin moving into our Capacity Building phase supported by a second NTIA grant, as a basis for accelerating the build-out of broadband capacity in Arizona, our service provider stakeholders tell us that non-uniform, inconsistent permitting and rights-of-way reuse policies at all levels of government are

the major source of delays and economic disincentives to building-out more capacity, especially in underserved rural areas. We are committed to helping remove or reduce such barriers.

Many State and Federal agencies that control land and right-of-way do not yet appear to be committed to the national agenda for accelerating broadband capacity by expediting and simplifying their processes and working in a coordinated and uniform way with each other, the states, municipalities and the private sector. For example, we have determined that the cost of laying fiber-optic conduit along a highway right-of way that is under repair or construction is roughly equivalent to the cost of putting the paint stripes on the highway. If such conduit could be installed in these circumstances (especially along rural highways), it would yield "Two Highways for the Price of One. Quite a bargain! However, because the Federal Government provides the bulk of highway funding it would require rule and policy changes by the USDOT to make such a program a reality. Such a program (even if limited to just rural areas) would transform the ROI equations for serving rural areas and create profitable new broadband last-mile markets that now often go un-addressed by both small and major providers.

Other possibilities for accelerating rural build-out and increased broadband speeds are reflected in the recent FCC Notice of Inquiry (NOI) regarding broadband rights-of-way policy recommendations for economically reusing existing pole, duct, conduit, canal, pipeline, and rail rights-of-way for broadband deployments especially for increasing middle-mile capacity. Therefore GITA is very supportive of the types of ideas contained in the FCC NOI.

As we expand from just surveying and accessing to creating policy and programs for actually accelerating broadband availability, available speeds, performance, and utilization, working with other states and the Federal Government to mitigate and resolve these impediments to broadband growth (and therefore economic growth and opportunity) will become a major focus for our work. This white paper documents in significant detail the methods we have used to create the current version of the Arizona Broadband Map, and how the Broadband Survey and Assessment data that underlies it was obtained and processed. We would like to thank our core team of GITA personnel, as well as the Arizona State Land Department (ASLD) and our contractor Data Site Consortium, Inc. (DSCI) for their vision, commitment, and good work.

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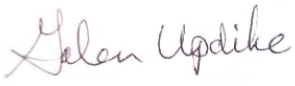

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Arizona Broadband Assessment Project Overview

The purpose of the Arizona Broadband Assessment Project (AZ BAP) is to identify both the availability and speed of broadband services, and the location of broadband infrastructure throughout Arizona. This project is provided through the American Recovery and Reinvestment Act of 2009 (ARRA) and the Broadband Data Improvement Act (BDIA), and in conjunction with the National Telecommunications and Information Administration (NTIA).

The information collected has been processed, verified, and shared with the Federal Communications Commission (FCC) and NTIA to develop a national broadband availability map, as well as to be used in Arizona to inform policy makers; identify opportunities to install new, or improve existing, broadband infrastructure; and to develop a state-level broadband availability map.

This white paper describes the data integration and verification processes employed by the State of Arizona in preparation of the broadband availability data set submitted to NTIA April 1, 2011. This data collection, processing, and submittal are to be conducted on a semi-annual basis over a five-year period. Spring 2011 was the third of ten semi-annual submissions by the State of Arizona and attempts to capture and reflect broadband availability and conditions in the field as of December 31, 2010.

AZ BAP White Paper Recommendations

The AZ BAP White Paper identifies many issues encountered as the project team developed broadband data for submission to NTIA, the FCC, and the state broadband availability map. The purpose of this section is to bring attention to several issues and proposed recommendations, contained within this white paper, that we believe are important.

Reverse Mapping: What Is It and Why We Use It

- The reverse mapping process for a given provider involves first determining a provider's outside plant infrastructure, technologies, and locations from which we deduce its likely service types and potential speeds. Then, we use engineering tools, such as ESRI's Network Analyst and Wireless Application Corporation's eCoverage, to create one or more coverage maps based on well-known propagation physics. These steps are followed by reviewing the probable coverage maps/speeds with the provider when possible, transforming the maps into ESRI shapefiles and publishing the results.

- We typically deploy the reverse mapping process where a provider 1) does not initially provide data, or 2) provider provides sparse data—back of the envelope sketches, etc. Most providers respond positively to our request for joint review of the reverse-mapped data. Some request rights to use the data on their websites—we always say yes. A few do not embrace the data, providing no real feedback as to its validity. See Reverse Mapping Role & Processes Section on Page 17.

Native American Mapping Efforts Going Forward

- Arizona is home to 21 federally recognized Tribes and over 250,000 Native Americans (http://edrp.arid.arizona.edu/tribes.html). In many cases, mapping of these Tribal Lands is covered when we map the underlying carriers that serve those areas. Hopi Telecommunications Inc. (HTI), Gila River Telecom Inc. (GRTI), San Carlos Apache Telecommunications Utility, Inc. (SCATUI), and Saddleback Communications (Salt River Pima-Maricopa Indian Community) have not been initial-providers of data. We have reverse mapped these four providers, have not obtained meaningful feedback from three of these four providers, and have leveraged public-data sources for purposes of confirming our reverse mappings. See Native American Mapping Efforts Going Forward Section on Page 17 and Appendix C - Arizona Broadband Provider Case Studies.

Metrics for Distinguishing Served, Underserved, and Un-Served Areas.

- The Arizona mapping team has concluded that it will utilize the number of broadband providers, within defined speed ranges, as its primary basis for categorizing Arizona regions as either, served, underserved or un-served. It is possible that other characteristics of broadband may be considered as we understand which of those characteristics relate to enabling substantial groups of users, such as telemedicine and e-learning. See Definition of Unserved and Underserved Communities Section on Page 18.

Data Processing Issues

- We are working to improve the geocoding reference sources we use to process Provider data by accessing local version of street networks and parcel databases where available. TIGER road segments are either not present or missing address attributes in many areas of Arizona, especially rural areas. Commercial data sources do not allow use to their geometry in our submittals to the NTIA. See Data Processing Issues - Improving Address, Census and Road Segment Section on Page 19.

- We are buffering commercially geocoded points to identify nearby TIGER road segments, even those without address attributes. This is a reasonable approach as there is likely to be service available within a few hundred feet of a current subscriber and it is a more realistic representation as we do not miss road segments due to lack of address attributes. See Data Processing Issues - Improving Road Segment Identification on Page 20.

- We are using buffered middle mile points to improve the definition of broadband footprints in rural areas where geocoding rates are very low. See Data Processing Issues - Improving Rural Area Broadband Areas Section on Page 20.

Community Anchor Institutions (CAIs) without Building Numbers

- Many western states may also face this issue and it would be useful for us to have an option which would allow us to include CAI features that have an accurate x, y coordinate and lack good address and building number data. A later section of this white paper recommends how x, y locations for CAIs that were developed through GPS or digitizing could be retained for inclusion for submission to FCC. See CAIs without Building Numbers Section on Page 25.

Broadband Data Description

For the State of Arizona broadband availability data set submitted to NTIA April 1, 2011, the summary of the data submission follows:

BB_Service_CensusBlock - 274,391 Census 2000 polygons less than or equal to two square miles in area representing the service area of 36 broadband providers. Multiple instances of a census block polygon exist where a provider has two or more technology types in a block or multiple providers have service in that block. Only the fastest upload and download speeds in a census block are reported for a given provider and technology type. Some providers supplied a list of census blocks they serve, while others reported their service as a list of addresses or as a service polygon (KML or shapefile). Addresses were geocoded and then aggregated to Census blocks. Footprint geography was used to select the underlying census blocks using a “centroid in” rule.

BB_Service_RoadSegment - 91,890 TIGER 2009 road segments that fall inside Census 2000 polygons greater than two square miles representing 26 broadband providers. Multiple instances of a road segment exist where a provider has two or more technology types on a segment or multiple providers have service on the segment. Only the fastest upload and download speeds on a segment are reported for a given provider and Technology type. The TIGER segments have all been clipped to fit entirely within a census block. The address ranges were not interpolated to accommodate any clipping. Some providers supplied a list of TIGER road segments they serve by TLID number, while others reported their service as a list of address ranges or as a service polygon (KML or shapefile). Address ranges were geocoded and then aggregated to Census blocks. Footprint geography was used to select the underlying road segments using a “centroid in” rule.

BB_Service_Wireless - 38 wireless service area polygons representing 31 broadband providers. Polygons fully or partially overlap where a single provider offers service over two or more technology types or spectrums or where multiple providers offer service in an area. Only the fastest upload and download speeds are reported for a given provider, spectrum and technology type. Some wireless broadband providers supplied a list of census blocks they serve, while others reported their service as a list of addresses or as a service polygon (KML or shapefile). Addresses were geocoded and then aggregated to Census blocks and census blocks were dissolved by technology and spectrum to create service area polygons.

Footprint geography was used to select the underlying census blocks using a “centroid in” rule. In some cases, the wireless service area was “reverse engineered” from publicly available data sources on tower locations, technology types and spectrum information.

BB_Service_MiddleMile - 517 middle mile points representing 19 broadband providers. Middle mile points were generated from provider data from Lat/Long (converted to decimal) and from Addresses (converted to decimal) both directly from providers. Elevation attributes were added by overlaying on a statewide 10-meter Digital Elevation Model.

Broadband Provider Participation

Broadband Providers Included

70 Total Providers (Some both Wireline and Wireless)

37 Unique Wireline Providers (TechID’s 10-50, Unique FRN’s)

31 Unique Wireless Providers (Tech ID’s 60-80, Unique FRN’s)

4 Unique Providers, Middle Mile Only (Excluding GovNET)

18 Total Middle Mile Providers (Excluding GovNET)

35 unique providers have a census block features in this submittal

They may have submitted just addresses and we converted

They may have submitted census blocks directly

We may have reversed engineered the service area where we selected census blocks

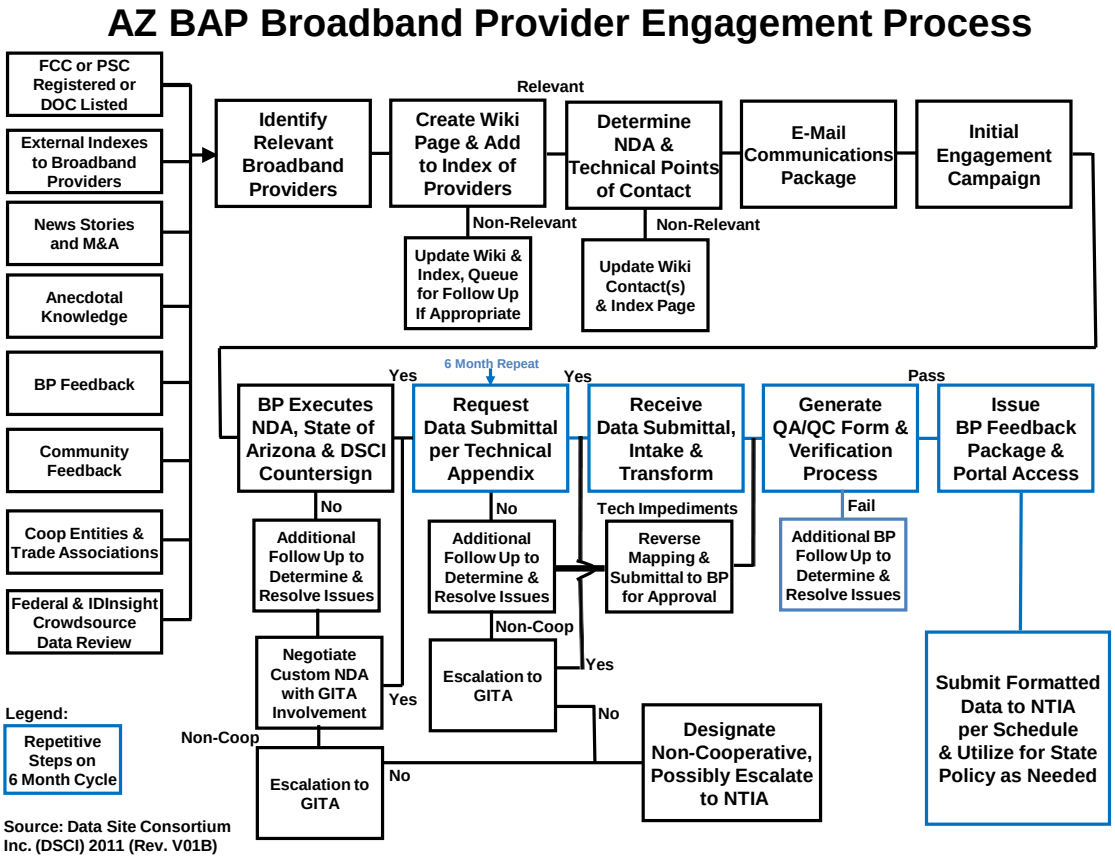
0 providers submitted at the County level

For the State of Arizona broadband availability data set submitted to NTIA on April 1, 2011, the summary of provider cooperation as contained in the datapackage.xls (including unique Broadband Providers, as well as those with multiple FRNs) was as follows:

	Provided Data	Will Provide Data	Will Not Provide Data	Non-Responsive
Provider	44	0	1	18
Reseller	5	0	0	0
Other	2	0	0	0
N/A	0	0	0	0
Total=70	51	0	1	18

Broadband Providers Identification Strategy

The whole nature of the Arizona Broadband Assessment Project (AZ BAP) revolves around data collection from relevant Broadband Providers (BPs), thus the comprehensive identification of relevant BPs active in the Arizona market and definition and determination of relevancy are the key initial steps in constructing the universe of target BPs for subsequent engagement. Additionally, the market will be dynamic over time as BPs go out of business, merge, startup or otherwise transition requiring an ongoing strategy and actions for adding to and updating the relevant BP universe.



The process began with reviewing and mining the Federal Communications Commission's (FCC) Universal Licensing System (ULS) for registered providers with FCC Registration Numbers (FRN), Arizona Corporation Commission (ACC) registered ILECs and CLECs, and Department of Commerce (DOC) listed telecom firms, as well as external indexes to broadband providers (e.g. - top Arizona ISP lists, web lists), extracting relevant details, contacts, and reference information. Additionally, membership in coop entities (carriers/providers that share infrastructure under a common name) and trade associations was reviewed to identify potential providers. The Contractor also acted as a collection point to mine team and external anecdotal knowledge of potential BPs, get references and intelligence from conversations with, and feedback from BPs, and continually monitor news, especially as it relates to merger and acquisition (M&A) activity. After these lists were assembled, the identified providers were analyzed to determine which are relevant BPs.

DSCI, along with GITA, has periodically reexamined the above sources. Additionally, DSCI has reviewed federal and IDInsight crowdsource data, converting and analyzing IP addresses as necessary, to identify previously unknown BPs.

DSCI has continued on with selected non-relevant resellers which are capable of providing data that can be utilized for verification purposes through their use of a relevant BP's infrastructure or otherwise have unique middle mile infrastructure or other telecom assets of interest to the State.

Over time, DSCI will retire (deem non-relevant) BPs who merge into other named entities or go out of business, tracking and documenting the non-relevant providers to provide a reference source as to who they are and how the non-relevancy determination was made, as well as document the consideration of the widest practical range of potential BPs for the project's purposes, providing a reference source for team knowledge capture and reference.

Broadband Providers Engagement Strategy

First for relevant Broadband Providers, the appropriate NDA engagement and follow on technical contacts need be identified. If a relevant BP has a FCC FRN listing, we extract the FRN listed contact and contact vectors as the starting point. If DSCI or GITA team members are already familiar with a BP's Arizona responsible personnel, we capture and document that contact information. Of course, the BP's website, business registrations, and other common sources are used as needed.

Then DSCI calls the identified contact person(s), provides a brief overview of the project, and determines if they would be the appropriate party to engage in NDA consideration, negotiation, and approval, or data transfer activities (it is recognized that many companies will want to address the NDA before identifying a data contact person). If so, DSCI will document the conversation and information obtained to the wiki and proceed to the next step providing an E-Mail Communications Package.

If not, the contractor will solicit name(s) and contact info of the appropriate NDA authorized parties. If the above process doesn't yield needed NDA authorized contact, the contractor will research the company website and other sources to identify other possible parties, follow the path/chain to determine and reach the appropriate NDA authorized contact, and escalate to GITA for assistance if appropriate contact cannot be determined.

During exchanges with a BP's appropriate NDA contact, the contractor will solicit name(s) and contact info of relevant Technical point of contact for data ask and submittal facilitation when appropriate. DSCI offers and describes cooperative technical assistance that could be provided in response to specific questions or expressions of concern as to the complexity or difficulty of complying with the request for data. DSCI then enters all gathered information and a brief log of activities, progress, and issues to the wiki.

The E-Mail Communications Package was developed as a collaborative effort between DSCI, GITA, and ASLD. It is organized into a cover letter under the signature of the GITA Director (State of Arizona CIO), followed by a more detailed and specific letter from DSCI, a copy of the standard project NDA, and an Arizona Broadband Provider Technical Appendix (See Appendix A). The two letters give the project explanation, value proposition, and call to action with the NDA and Technical Appendix yielding expanded and supporting documentation.

DSCI has developed a standard cover e-mail template which is adapted as needed (perhaps based on elements from previous conversations) to comprise the body of the cover e-mail for transmittal of the E-Mail Communications Package. DSCI then fields any initial e-mail, letter, phone, or in-person responses or questions from the provider and moves to the Initial Engagement Campaign.

DSCI then telephones the appropriate NDA contact to ensure receipt of the cover e-mail and Communications Package, as well as field any initial response or questions, inquire as to general receptiveness to NDA and anticipated internal process for review and execution, note on the provider's wiki page any suggested/committed timeframe(s) for anticipated BP response or requested follow up by them, e-mail and/or call periodically consistent with above item and project timeframes to keep on BPs "radar" and attempt to keep the process moving forward. Again, if the process stalls out at any level, DSCI notifies the Arizona project team members and asks for advice and/or assistance.

DSCI directly notifies Contractor project leaders if any specific objections or issues are noted by a BP and escalates if the response to those objections or issues requires specialized domain knowledge or decisions from a "higher authority." If there are questions on the NDA content or an expressed desire to modify or negotiate the NDA, DSCI escalates to DSCI's NDA negotiating parties. If the BP proves unresponsive or reluctant over a period of time, DSCI notifies the Arizona project team members and asks for advice and/or assistance to escalate and follow up.

If the BP indicates a willingness to execute the standard NDA, the data gatherer solicits its signature and forwards the signed document to the DSCI's legal advisor who in turn forwards it to GITA for counter signature. If the BP has questions on the NDA content or an expressed desire to modify or negotiate the NDA, the data gatherer escalates to the NDA negotiating parties on the DSCI team. The team's legal advisor determines the nature of BP questions, concerns, and/or issues and seeks to address them within the context of the standard NDA. If deemed necessary, the team's legal advisor works with the State and BP to reach a mutually agreeable modified NDA and proceeds to manage its execution.

Upon conclusion of review and/or negotiations for modification, the DSCI's legal advisor receives the BP executed standard or modified NDA, provides it to the State for counter signature, counter signs on behalf of DSCI, and provides the fully executed version back to the BP and GITA, posts a copy to the wiki (notated on the provider's wiki page), and updates the Index to Providers status page.

If the BP seems unable to meet the technical appendix requirements for data submittal, DSCI qualifies the apparent difficulties, as well as explores and negotiates cooperative technical assistance that could be provided by DSCI in response to issues in complying with the request for data. If the BP is only willing/able to submit FCC Form 477 data, lists of facilities, raw coverage maps, or other relevant but insufficient data for a full federal submittal, the contractor with knowledge and agreement of GITA will offer a reverse mapping option whereby available data sources will be mapped to estimated coverage by census blocks and delivery speed(s) consistent with the BP's technology, presented back to the BP for confirmation or feedback leading to iterative adjustments, and resulting in a "best guess" for their current delivery footprint.

Non-Disclosure Agreements (NDA)

NDA Overview

Some of the Arizona providers opted-out of the non-disclosure agreement ("NDA") process. However, the vast majority of the providers chose to participate, by negotiating and signing a NDA. Of the providers that chose to opt-out, they fall into two groupings. A first group consists of providers that were not sufficiently concerned with misuse of their data to be motivated to execute a NDA. All providers within this group provided data as required for the submittals to date. A second group consisted of providers that chose to largely boycott the mapping process. Members of the second group generally have not provided data. However, we have been successful in interfacing with the majority of these providers via our reverse mapping processes wherein we obtain relevant data from third parties and present the data to each provider for discussion and corrections (see other portions of this report for more details regarding reverse mapping).

Confidential Data

The Federal Program Definition of "Confidential Data," as pertains to Notice of Funds Availability (NOFA) NDAs with Broadband Providers, was originally sourced from the Mapping NOFA provided in the Federal Registry on July 8, 2009. This definition was subsequently clarified, as it pertains to NDA's between "service providers and awardees" in the BDIA. BDIA §§106(c)(3) and 106(h)(2), 122 Stat. at 4101-2 requirements apply only to information submitted by the FCC or a broadband provider to carry out the provisions of the BDIA and shall not otherwise limit or affect the rules governing public disclosure of information collected by any federal or state entity under any other federal or state law or regulation.

Further, the BDIA directed that "as a condition of grant funding under this Program, awardees may not agree to a more restrictive definition of Confidential Information than the definition adopted by this Program." Thus, the BDIA controlled conceptually all provider data that may

be considered confidential as between the service providers (“Providers”) and awardees (the “States” and their agents). However, the BDIA allowed for lesser scopes of confidential data.

General NDA Approach

Because Arizona determined that it would utilize a contractor for the purposes of collecting and processing provider mapping data, necessarily the contractor would see and have at least temporary custody of the mapping data. Therefore, to be effective, the NDA must bind not only the State but also its agent, the contractor. As a result, the State evaluated alternatives by which it could efficiently process NDAs that would bind the provider, the State, and its agent. The State considered a dual NDA approach, wherein it and the provider signed a first NDA, and it and its agent signed a second (mirror) NDA. Though effective in legally binding all three parties, this approach received push-back from the provider community and portions of the internal reviewing staff at the State. Thus, a second approach was coined in which a single 3-way NDA was devised. Under this approach all three signatories signed each NDA. The State used this approach as the Arizona Baseline NDA excepting incumbent local exchange carriers.

The Arizona Baseline NDA

The Arizona Baseline NDA was drafted for sharing Confidential Information in an advantageous manner for both the provider and the State. This Baseline NDA is an agreement wherein the provider (“discloser of the information”) achieves specified safeguards and the State (“receiver of the information”) is allowed specific uses of the information for a specified period of two years. Together the discloser and receiver are known as the parties. Both the safeguards and the specific uses are framed within a consistent set of duties and obligations to which the parties mutually agree as follows:

1. **Definition of the parties and their respective objectives (these are whereas statements)**. The Baseline NDA was construed between a disclosing party and a recipient party, wherein the disclosing party may be an owner of the Confidential Information or merely may have a present right-of-use of the information.
2. **Definition of the confidential information**. Herein, the parties negotiated what information is confidential-within the context of the NOFA/BDIA definition. This negotiation generally strikes a reasonable compromise between the information discloser wants for broad inclusive language and the recipient’s desired narrow and specific language. The definition was constructed as general categories of Confidential Information followed by specific instances within those categories.
3. **Exceptions to confidential information**. Exceptions, described both as general categories and specific instances, were negotiated in an effort to adequately characterize the confidential information.

4. **Ownership of the confidential information**. The Confidential Information provided by a disclosing party was not always owned by that party, but was rightfully possessed under an existing license or similar right-of-use of the information. Thus, provisions were included for this limitation, in which appropriate descriptions and indemnities were devised, and notice was provided to the underlying property owner associated with the confidential information.

5. **Definition of obligations of confidentiality**. Obligations of confidentiality focused to acceptable use and unacceptable misuse of the Confidential Information by the recipient. Such obligations also covered secondary disclosures by the agent of the recipient with appropriate need-to-know requirements and recordkeeping.

6. **Exceptions to the obligations of confidentiality**. Confidential Information by its nature must be confidential to someone or in some respect. Once the Confidential Information loses its confidential nature, it generally becomes freely available to all comers. Because information that is initially thought to be confidential may not be so, the NDA also delineated such exceptions. Thus, the NDA listed specific means under which disclosed information is not deemed confidential, such as the Confidential Information becoming publicly known by acts of others or discovered by the recipient by other means.

7. **Definition of what constitutes breach of the agreement**. Gravamen of breach of the NDA centers on intentional and unintentional disclosure of the information within the established term of the agreement. Related considerations included the materiality of a disclosure and whether it as volitional. It was important that the types of breach were identified in detail. Again, as with the definition of Confidential Information, it was helpful to also specify instances that do not constitute breach.

8. **Agreement of available remedies for each type of breach**. Generally, all breaches might require that the breaching party immediately notices the disclosing party of such breach. The NDA provided for such notice, should a breach occur, that provided sufficient time for the disclosing party to intervene for protecting its rights to the confidential information where possible. Further, it was appropriate that the recipient agree that certain breaches equate to irreparable harm to the disclosing party, giving the disclosing party injunctive rights.

9. **Term of the agreement**. A term generally entails defining a period required for the parties to effectively disclose and utilize the information. Here, the NDA term is 2-years. At the end of the term, and with a potential extension, the recipient must either return or destroy all confidential data and provide an affidavit to the disclosing party that it returned or destroyed the information. We anticipate that a second 3-year term will be negotiated during which the parties will agree to maintain confidentiality of the information.

10. **Miscellaneous issues**. These issues include agreed to law, integration, assignment rights, notice addresses, dispute resolution means, and the like.

Qwest and Arizona Local Exchange Carrier Association (ALECA) NDA Variants

When the Contractor initially interfaced with Qwest Communications, one of the Arizona local exchange carriers, the Qwest legal department had already formulated an NDA that was to their liking and which they desired to make the sole NDA under which they would provide mapping data to all states. The Qwest NDA was a two party NDA. In subsequent negotiations, each organization attempted to maintain its particular NDA format and content. However, as negotiations continued, it became obvious that give-and-take was required. The grand compromise largely involved Qwest relenting on its definition of what constituted Confidential Data to the NOFA/BDIA definition; and Arizona consented to Qwest's 2-party NDA framework. Also, in order to bind Arizona's agent (Contractor) a second mirror image NDA was signed by Qwest and the Contractor.

Once the Qwest NDA was fully executed, conversations with the other Arizona local exchange carriers which had been held in abeyance were accelerated. Ultimately, all the Arizona local exchange carriers followed through with the dual NDA approach, based on the Qwest language, wherein it and each of the other local exchange providers signed a first NDA with the State and then signed a second NDA with the State's agent, the Contractor.

Wireless Carrier NDA Variant

The wireless carriers, led by Sprint-Nextel, had also developed their standard NDA prior to the Arizona NDA team approaching them for securing a mutual NDA. Subsequent negotiations resulted in Arizona standardizing on a hybrid between its Baseline NDA and the wireless carriers' standard NDA. This NDA contained all the elements of the Arizona baseline NDA, but with modified wording. It also added specific language allowing the provider a right to enjoin wrongful disclosure of its Confidential Data.

Data Collection and Integration

Primary Data Collection

Overview

The State's contractor Data Site Consortium Inc. (DSCI) solicits and receives the BP data submittals, doing intake processing and usability crosschecks. DSCI's GIS subcontractor TerraSystems Southwest (TSSW) transforms the data to prepare it for federal submittal, documents the technical steps performed during that preparation for quality assurance and BP feedback, leads the team in collaborative data verification sessions, as well as supports further State use of the data in mapping and policy processes.

Reverse Mapping Role & Processes

The use of reverse mapping was key to depicting broadband coverage for: Broadband Providers unable to supply coverage area information; Broadband Providers with incomplete coverage area information; and Non-responsive Broadband Providers. Regardless of the scenario, DSCI and TSSW employed a number of logical methods to derive "where and which" broadband services a Broadband Provider likely had available.

Some of the key elements used to initiate reverse mapping included:

- FCC Form 477 data, though dissolving census blocks greater than 2 square miles into applicable road segments required special techniques and attention
- Central Office (CO)/Digital Subscriber Line Access Multiplexer (DSLAM) location (wireline) - used in conjunction with distance buffers to best determine "where" outside plant infrastructure would reside. We used multiple public information sources to discover CO and DSLAM locations.
- Tower location (wireless) - used propagation models to determine "coverage/reach" based on services provided (frequencies, lat/long, terrain). We used an "E-coverage" tool from Wireless Applications Corp as well as "Radio Mobile's" radio frequency coverage tools.
- Service Book/Offerings - usually determined through publicly available information (technology of transmission, speeds, etc.).
- Tribal boundary information (From FCC) - GIS shapefile used to determine Tribal boundaries and census blocks/road segments contained therein.
- Public Information Sources - from various sources including BPs' own websites to provide a "picture" of their network, services, and coverage.

Such reverse map estimations of the BP's coverage and technology were then presented back to the BP for confirmation or feedback leading to iterative adjustments, sometimes via collaborative online viewing sessions, and resulting in a "best guess" for their current delivery

footprint. BPs without current GIS capabilities were frequently impressed with our techniques and interested in internally and externally using the reverse mapping outputs.

Native American Mapping Efforts Going Forward

Arizona is home to 21 federally recognized Tribes and over 250,000 Native Americans (http://edrp.arid.arizona.edu/tribes.html). In many cases, mapping of these Tribal Lands is covered when we map the underlying Incumbent Local Exchange Carriers (ILECs), cable companies, and other broadband providers that serve those areas. Six providers are Native American owned and controlled, serving both on- and off-Indian Land areas. Of these providers, Hopi Telecommunications Inc. (HTI), the Tohono O'odham Nation, and Fort Mojave Nation have provided mapping data or directly supported reverse mapping efforts, are fully cooperative, and we anticipate will continue providing semiannual updates of their data. Gila River Telecom Inc. (GRTI), San Carlos Apache Telcom Utility, Inc. (SCATUI), and Saddleback Communications (Salt River Pima-Maricopa Indian Community) have not been initial-providers of data. Thus, we have reverse mapped these three providers. However, we have not obtained meaningful feedback of our mapped data directly from these three providers. But, we have leveraged Federal Communications Commission filings and crowdsourcing data, as well as like-kind public-data sources for purposes of confirming our reverse mappings. See Appendix C - Arizona Broadband Provider Case Studies.

Project WIKI Role

The AZ BAP wiki serves as a collaborative platform and shared workspace under PBWorks utilized by all project personnel to capture and track relevant knowledge and project deliverables through the entire project lifecycle. Its purpose is to capture knowledge on a near real-time basis, organize such knowledge in an accessible manner, inform participants as needed, and codify project deliverables, process, and incremental activities for documentation and tracking purposes.

Toward that end the wiki includes an Index to Providers page that lists all in-play Providers for a given submittal. The Index contains progress status information for each submittal. It includes links to (1) the associated Broadband Provider (BP) page that contains relatively persistent data and to (2) the more dynamic Quality Assurance/Quality Control (QA/QC) page for each BP. The QA/QC page summarizes the data submitted by a given BP for a given submittal cycle. The Index to Providers page is refreshed for each six-month period, and providers who are no longer in play (due to mergers, acquisitions et al.) are moved to a separate "holding" page, called the Not-in-play Providers page, from which they can be resurrected should they become active providers at a later date. Copies of the Index to Provider pages, the Not-in-play Providers page and the QA/QC pages are saved in the Historical Documents folder after each round of data submittals.

The BP page contains semi-persistent data including the DBA Name, the FRN, the contact person, a link to the signed NDA if one exists, and usually a link to the BP's website.

Comments are used with all wiki BP pages to record interactions between DSCI personnel and the BP. The Comments are saved as part of the monthly Backup/Export procedures.

Definition of Unserved and Underserved Communities

Following the Rural Telecommunications Congress (RTC) conference in Mesa in November 2010, we discussed the definitions of underserved and unserved areas (ignoring satellite coverage). Relying on input from former FCC Commissioner Rachelle Chong we tentatively agreed to the following definitions:

- Unserved is defined to be an area where there is no Broadband Provider offering a minimum of 3 Mbps down and 1 Mbps up.
- Underserved is defined to be an area where there is at least one Broadband Provider offering a minimum of 3 Mbps down but there is no Broadband Provider offering a minimum of 5 Mbps down and 1 Mbps up.

The FCC target for ubiquitous broadband coverage has been 4 Mbps down and 1 Mbps up. Arizona policy makers and stakeholders plan to use a working definition for underserved and unserved areas that will resemble the above specifications, but remains subject to change going forward.

Standardized BP Naming Conventions

We have developed a standardized BP naming convention for our use in Arizona. Since provider names vary considerably depending on the context (e.g., Holding Company names, DBA names, abbreviated names, truncated name portions, et al.) we decided to create a list of relatively short definitive names that would be familiar to the general public for each BP. In a few cases where two names are frequently used, such as T-Mobile and Deutsche Telekom, we have opted to use both, placing one name in parentheses. Wherever possible we have associated the standardized name with the FRN associated with the latest data set submittal from the given BP. We are using the standardized names in the Index to Providers page and in the interactive Arizona Broadband Map as ASLD has incorporated these names to the State map implementation.

Data Processing Approaches

Census Block: Sources of census block submittals have been either lists or shapefiles of addresses passed or served or lists of 2000 census blocks served.

Address lists are geocoded against an ESRI composite address locator using the latest available Navteq road centerline file as a primary reference data set with TIGER 2009 as the secondary source. Address points falling in census blocks less than or equal to two square miles are summarized by census block identifier. One summary table for each technology type is created with one record per census block containing only the fastest reported speeds in each of the four speed fields (maximum advertised or typical up and down speeds).

Road Segment: Sources of road segment submittals have been either lists or shapefiles of addresses passed or served, lists of census blocks, or lists of TIGER 2009 road segments (by TLID number).

For address lists or shapefiles, an Esri Near analysis is performed on the address points falling in census blocks greater than or equal to two square miles. This analysis provides a list of the TIGER 2009 segment ID's nearest to each address point within a maximum search radius of 225'. The list of TIGER segment ID's is summarized by each technology type, keeping only the fastest reported upload and download speeds for each segment. The TIGER segments are intersected with dissolved polygons representing census blocks greater than two square miles, thereby clipping the extent of these segments to the boundary of the census block areas.

For lists or shapefiles of census blocks, the blocks greater than or equal to two square miles are used to spatially select the underlying TIGER road segments using a "centroid in" selection rule. The road segments inherit the technology and speed attributes of the overlaying census blocks.

For lists of TIGER line ID's, these lists are summarized by technology type, keeping only the fastest upload and download speed for each segment and then joined to the TIGER line file to extract the geometry and attributes of those segments.

Wireless Polygons: Sources of wireless service area are either lists of addresses served, lists of census tract (477 data) or blocks served, or a shapefile or KML file of estimated service area boundaries. In some cases, the DSCI team generated these service areas by feeding tower locations and various technology and spectrum attributes into an RF propagation program.

Middle Mile: Wireline Middle Mile points were generated from provider data from Lat/Long and from addresses both directly from providers. Wireless Middle Mile points were derived from lat/long coordinates from the provider, through a commercial database from Wireless Applications Corp., or from public information. Ownership and backhaul type was derived from a combination of public sources and provider information. In either instance, information was converted to decimal latitude/longitude coordinates. Elevation attributes were added by overlaying on a statewide 10-meter Digital Elevation Model. Census block attributes (FULLFIPSID) were added through an overlay process.

Data Processing Issues

Improving Address, Census and Road Segment: TIGER roads are the source of geometry for our road segment submittal. TIGER files have a large number of records with no address element information, especially in rural areas. For the Spring 2011 delivery we added local streets in Cochise County to help improve low match rates from a particular provider in that area. In the future we will be transitioning to more local geocoding references (streets and

parcels) as they become available. From these local sources we can not only geocode but also pull geometry into the NTIA deliverables. We are also working on an application that will parse and fix address elements that have obvious errors prior to geocoding. We may also use commercial geocoding services where we cannot find a match through other means. We do not plan to manually match provider addresses.

Improving Road Segment Identification: For this delivery we have moved from identifying road segments strictly by geocoding to TIGER and instead are using geocoded points derived from both Navteq and TIGER reference data to find TIGER arcs within 225' of these points for inclusion in our deliverable. Using only TIGER, we often experience a very low geocoding rate and are therefore likely under-reporting broadband availability. Based on an analysis of our Fall 2010 technique against this new "buffer" approach, we determined we would get an average of about 85% of geocoded points involved in the road selection process vs. 40-60% in many cases using only TIGER. One downside to this approach is that we likely include roads that are not actually in the Providers' databases, but we assume that if a road is within 225' of one that is serviced, there is a good chance that new road can be serviced as well. A second drawback is that we may be selecting road segments that fall in census blocks <= 2 square miles. We handle this by intersecting our road networks with census block areas > 2 square miles, leaving only the portions or entire road segments that fall in the larger census blocks. When we have obtained local, highly accurate and maintained road networks and we can get geocoding rates up into the mid 80's or higher, we will likely return to a geocoding approach for identifying road segments in the larger census blocks.

Improving Rural Area Broadband Areas: For very rural areas where even the combined Navteq/TIGER geocoding rates are low, we have opted to use buffered middle mile points to identify census blocks in the service area. For example, we processed a list of DSLAM locations and service radii from the Frontier telecom group, buffered them by a provider-declared radii distance of 15,000 feet and then selected census blocks that intersected. In the Fall 2010 delivery we obtained only a 2% match rate on the Frontier - Navajo Telecomm groups submittal and therefore did not include their service in that delivery. For the Spring 2011 delivery, we used buffered DSLAM to identify census blocks and road segments which resulted in a significant increase in the census and road segment matches. In other Frontier areas, we kept Census Blocks that geocoded for the Fall 2010 delivery and added those census blocks that intersected a DSLAM buffer. We only kept road segments in Census Blocks greater than 2 square miles that intersected the DSLAM buffers, as review with local experts indicated this was a more reasonable depiction of where service actually was provided.

Reporting Multiple Speeds by Census Block or Road Segment: We use a summarize function with speed fields set to MAX so that only the fastest up and down speed for any given census block or road segment for any given Provider and Technology is reported. For

example, a census block for a given Provider with three reported speeds (3,2, 3,3, 4,2) would get a 4,3 reported.

Errata:

- Provider Name: we get rid of all commas but leave in periods assuming a CSV export would be less useful if commas were left in.
- For road segment data, we use a script that gives us the minimum and maximum address numbers across the four TIGER address number fields thereby meeting the NTIA requirement for these fields.

Data Processing Automation Project

For the September 2011 delivery, DSCI through GIS subcontractor TSSW is developing and testing a sophisticated data formatting and validation application that should improve the speed and accuracy of the numerous manual steps we now undertake to format and evaluate/fix anomalies in provider data submittals.

Community Anchor Institutions (CAI)

CAI Data Sources

Data for the Community Anchor Institutions (CAIs) reside in many different locations throughout Arizona and were collected from data custodians and/or data integrators throughout the State. This effort has two major components, the identification and geo-location of the CAI entities and the collection of data related to the status of their broadband usage. Both of these components have significant challenges for development and maintenance. The State does not currently have any centralized databases that could serve as a core basic backbone for CAI data development. Thus a sizeable data collection and standardization effort exists. The Arizona Broadband Mapping Project provides impetus for one of the first State efforts to consolidate CAI data into one database.

A considerable effort in basic data development working with local government websites and one to one contacts has been required to address some basic aspects of the CAI data collection. Numerous organizations in Arizona maintain locational information regarding some categories of CAI data but these are all of varying formats and currency. In many cases the project has had to assist CAI location data custodians in the update of some aspects of the basic locational data. The Project also is, in most cases, the first time that CAI managers have developed information regarding the level of broadband services for their institutions. This poses a host of challenges regarding a large number of existing processes in many organizations. Some aspects of these challenges are described in the CAI challenges part of this paper.

CAI locational and broadband data (for some broadband data items in some categories) was collected from the following sources listed below. Each incoming data set is completely unique and locational information, addresses and their formats and coordinate locations and their formats varied widely. Contributions from the Arizona State Land Department listed below constituted both original data creation and supplemental work on certain categories of data. Along with these data sources several additional data sources, not listed here, are starting to be incorporated into the data set to complete certain categories of data for their basic locational information.

Category 1: Public Schools (K - 12)

Arizona Department of Environmental Quality (ADEQ)
Victor Gass
Email: Gass.Victor@azdeq.gov
Phone: (602) 771-4517

State Cartographers Office (SCO)
Tim Colman
Email: Tcolman@land.az.gov
Phone: (602) 542-3249

Arizona Counter Terrorism Information Center (AcTIC)
Sharon Nicholson
Email: Snicholson@azdps.gov
Phone: (602) 644-5830

Arizona Department of Education (ADOE)
John Eickman
Email: John.Eickman@azed.gov

Category 2: Libraries

Arizona Counter Terrorism Information Center (AcTIC)
Sharon Nicholson
Email: Snicholson@azdps.gov
Phone: (602) 644-5830

Arizona State Land Department (ASLD)
Anthony Maslowicz
Email: amaslowicz@land.az.gov
Phone: (602) 542-2606

Libraries Consultant
Malavika Muralidharam
Email: mala@lib.az.us

Phone: (602) 926-3601

Category 3: Medical/Healthcare

Arizona Department of Health Services (ADHS)
Angela Wills
Email: WillsA@azdhs.gov
Phone: (602) 364-0462

Arizona Counter Terrorism Information Center (AcTIC)
Sharon Nicholson
Email: Snicholson@azdps.gov
Phone: (602) 644-5830

Category 4: Public Safety

Arizona State Land Department (ASLD)
Anthony Maslowicz
Email: amaslowicz@land.az.gov
Phone: (602) 542-2606

Arizona Counter Terrorism Information Center (AcTIC)
Sharon Nicholson
Email: Snicholson@azdps.gov
Phone: (602) 644-5830

Category 5: Universities, Colleges and Post-Secondary

Arizona Department of Environmental Quality (ADEQ)
Victor Gass
Email: Gass.Victor@azdeq.gov
Phone: (602) 771-4517

Category 6: Other Government Buildings

Arizona State Land Department (ASLD)
Anthony Maslowicz
Email: amaslowicz@land.az.gov
Phone: (602) 542-2606

Arizona Counter Terrorism Information Center (AcTIC)
Sharon Nicholson
Email: Snicholson@azdps.gov
Phone: (602) 644-5830

Arizona Department of Health Services (ADHS)
Angela Wills
Email: WillsA@azdhs.gov
Phone: (602) 364-0462

Category 7: Other Non-Government Buildings

Arizona State Land Department (ASLD)
Anthony Maslowicz
Email: amaslowicz@land.az.gov
Phone: (602) 542-2606

Arizona Department of Health Services (ADHS)
Angela Wills
Email: WillsA@azdhs.gov
Phone: (602) 364-0462

CAI Process Steps

After the data was collected from multiple sources listed above it was processed with the goal of populating the CAI Feature Class within a Geodatabase constructed for delivery to NTIA. The NTIA geodatabase specifications were utilized for the target geodatabase which was to receive the CAI data and to be transferred to NTIA. In our initial approach incoming data sets of various formats were processed into Esri shapefiles for the various CAI categories and then loaded in the CAI feature class of geodatabase. Data were received from sources as either Excel files or ASCII text files of address locations or as Esri shapefiles which already had the locations as X,Y points and usually also contained some form of street addressing as well. The formats of all of these incoming files were different.

In general a set of processing steps was applied to the data to eventually convert it into an Esri shapefile that was loaded into the final geodatabase. The steps listed below were utilized in the processing of Excel and ASCII text files. For incoming shapefiles step one does not apply and step four was not necessary. Some datum and projection transformations were also performed on the shapefiles to standardize those formats.

General CAI Data Processing Steps

1. Excel Tables or ASCII text files containing names and addresses of Community Anchors were obtained from various sources.
2. The data were then brought into Microsoft Access and the ADDRESS field(s) were parsed into BLDGNBR, PREDIR, STREETNAME, STREETTYPE, SUFFDIR, CITY and ZIP5. Data were then exported out as .dbf files for additional processing
3. The STATECODE field was added with the value set to AZ in ARCGIS as was subsequent processing.
4. The Esri Geocoding Software Tool was used to generate WGS84 Latitude/Longitude Coordinates in Decimal Degrees using the parsed Address Fields.
5. The resulting file, with (X, Y) data points was converted to a shapefile in Geographic Coordinates using Datum WGS84.
6. The resulting shapefile with Point Data was overlaid on the 2010 TIGER/Line Census Block shapefile in order to extract the FULLFIPSID information.
7. The CAICAT field was added to enable the data to be sorted based on the 7 Community Anchor Categories.
8. A unique CAIID value was assigned to each Community Anchor record.
9. The following Broadband attributes were added: BBSERVICE, PublicWiFi, TRANSTECH, MAXADDOWN, MAXADUP.
10. This resulted in a set of formatted shapefiles for the various CAI categories which were then loaded into the CAI feature class of the geodatabase.

CAI Issues

CAIs without Building Numbers: We had to drop a significant number of CAI data points for our April 2011 submission. These data points were located in Rural Areas where they did not have an address or Building Number. It is not unusual to have Rural Addresses that lack this information. In very rural areas of Arizona, which are often the areas which would most benefit from improved broadband services, locations are given by how many feet from an intersection or how close a building is to a known landmark (for instance, fire stations are notated as "…four hundred feet from the intersection next to the billboard sign." We often had a valid Lat/Long coordinate pair that was not derived from address geocoding. Many CAIs are located by heads up digitizing from digital orthophotos or locating by field GPS units. Based on the Lat/Long coordinates, rather than an accurate or valid address, we obtained a point on the map that was spatially accurate and valid. This data was often provided by state agencies that were required to locate offices for their programs. They did not have good address data

and sent out staff to GPS the location of required offices. Unfortunately, we had to drop these CAIs, which had accurate x, y coordinates, from our submission, because they failed the Python QA Script check. Currently, the QA Script flags all records that do not have a Building Number as "failed". Arizona is not just rural, but in some places, still frontier. Many western states may also face this issue and it would be useful for us to have an option which would allow us to include CAI features that have an accurate x, y coordinate and lack good address and building number data. One option may be to add a data field that identifies x, y locations that were developed through GPS or digitizing and should be retained. These data would then still be able to be submitted to FCC and appear on maps and be available for spatial analysis and planning for broadband development.

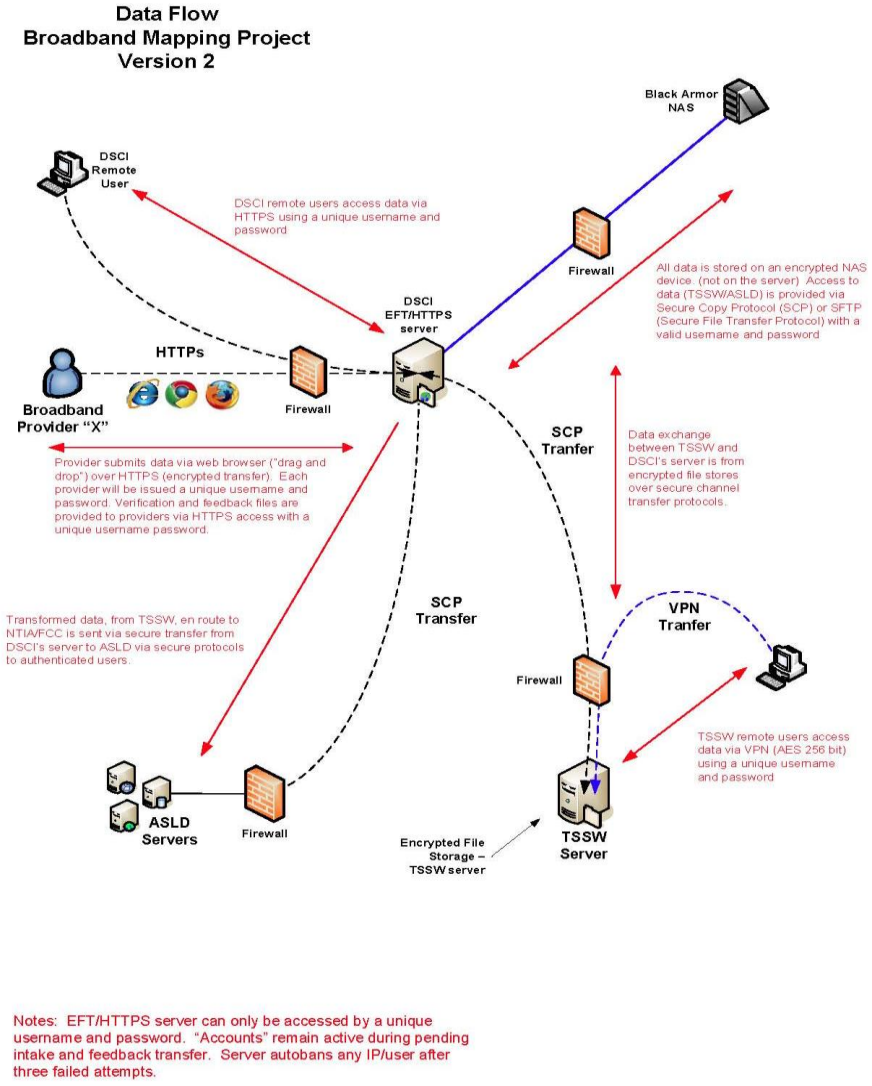
Broadband Provider Requests for CAI Information: All Broadband Providers on State contract for telecom services and others known or suspected to be providing broadband services to CAIs were sent a request letter and associated spreadsheet to enter data on the identified CAIs that they serve. None responded, however future plans include requiring those on State contract for telecom services to do so as part of their contract obligations and expectations.

Managing the Diversity of CAI Data: We are well on the way to having a good database of Arizona CAI locations, but need to deal with additional complexities related to developing data for the level of broadband service provided to the CAI locations in our database. We are putting together a State work group and are conducting outreach to those CAIs that have state agencies to act as data custodians for location and we can communicate and coordinate with those data custodians to develop methods for those institutions to self report their level of broadband services. In many cases, the databases and maps we are developing as part of the AZ Broadband Mapping Project provide incentive for agencies or data custodians to obtain information about their facilities. It is much harder to obtain broadband service levels from local government agencies due to the distributed nature of their managing agencies.

To that end, ASLD has done substantial outreach to local government agencies, throughout the state, and has created a comprehensive listing of local government facilities. ASLD has been developing a master database and data structure for these local government CAI facilities as well as for all other CAI categories. This will help us populate both location and broadband service levels, and more readily provide this data to NTIA, as the data becomes available to us from data custodians or integrators. A critical benefit of this approach is that feature level metadata can be added and fields for controlling data status currency and sources can be added. These will be critical in managing large amounts of incoming and diverse data and staging the data for update provision and updates of the Arizona Broadband Maps community anchor layer. Appendix B shows our initial data structure for the CAI management database. The structure is expected to change some as we gain more experience with its use and operations.

Project Data Flow and Security

Data Site Consortium Inc. (DSCI) provides a secure web browser-based portal supporting the Arizona Broadband Mapping Project for use by DSCI personnel, GIS subcontractor TerraSystems Southwest (TSSW), the Arizona State Land Department (ASLD), the Government Information Technology Agency (GITA), and participating Broadband Providers (BP). To submit data the BP user logs in to the portal on the server, which can only be accessed by a unique username and password. The BP may use any web browser (Internet Explorer, Firefox, Safari or Chrome) to access the portal. After a successful login, the BP can "drag and drop" files to the browser window for upload. The BP user account is deactivated after successful transfer. The data is stored on an encrypted device in a secure facility. After data transformation and data examination and correction, along with related processing, the data is made available for review and verification by the BP user. The BP user can access and review the transformed data (as formatted for federal submittal in GIS readable format) and derived data (such as maps in PDF and KML formats) prior to its delivery to NTIA as part of DSCI's BP feedback process and for verification tasks.



Notes: EFT/HTTPS server can only be accessed by a unique username and password. "Accounts" remain active during pending intake and feedback transfer. Server autobans any IP/user after three failed attempts.

Validation

Validation Overview

Receipt of Broadband Provider data sets by DSCI in response to an active submittal request or via the private portal as a preferred direct means triggers DSCI staff to perform a “first touch” analysis consisting of inspection of the data set(s), noting of specific technical characteristics, and determination of whether the data is sufficiently present and formatted for subsequent processing. If so, this is noted on the provider wiki page and the responsible DSCI staff member records meta information pertaining to the data submittal on the QA/QC wiki form for the data submittal. The data set then is processed as necessary to be compliant with federal data format requirements, and loaded into the data repository. The received data is then scheduled for review in a collaborative verification session with appropriate parties. The collaborative verification session identifies any data quality issues and assignments for additional verification activities and note anomalies, observations, and planned remedial actions to the wiki.

DSCI and TSSW staff reviews all BP data sets in a collaborative real-time shared view environment to verify and further qualify the submitted data. Collaborative verification sessions look specifically for spatial and technical logic issues present in provider submissions as detailed in Appendix D. Additional resources are employed such as community anchor institution data, licensed databases, lists of COs and DSLAMs, federal and state crowd-sourced data, field verification testing, etc. If the team identifies any significant perceived anomalies in coverage and speed, generates appropriate notes and documentation, then seeks to resolve by providing feedback to BPs to explain or correct the data submittal for the current round or in subsequent rounds.

DSCI staff then prepares a brief Provider Technical Feedback Form for each BP data submittal distilling the content of the QA/QC form into a brief and more readable format for inclusion in the BP Feedback Package to be issued by GITA. Identified anomalies and issues are highlighted and the BP is engaged to consider and help correct them.

Business Logic Rules

Data is submitted in collections called data sets, data files and records. A data file is one particular file submitted by a provider (e.g. address-specific data file, census block data file, middle-mile data file, etc.) Data files correspond directly to a feature class (GIS) or table (SQL). A data set consists of all files submitted by a provider. This corresponds to a feature data set (GIS) or database (SQL). The top-down hierarchy is: Data set contains data files contains records.

The attributes we validate immediately upon receipt of a data set are: currency of the data, evaluated by the date the BP specifies or the date received if the BP does not specify a date (the data is then assumed to be current); accuracy of the data, including both content

accuracy and spatial accuracy; cleanliness or edited quality of the data (e.g., misspellings, typos, transcription errors, missing field values); granularity of the data (e.g., street address, street or road segment, census block, census tract); data format (e.g., text file, shapefile, spreadsheet); and overall completeness (all BP customers are represented as opposed to a subset of customers).

Confidence/Reliability Index Development

As we collect broadband data from a variety of sources we need to assign some kind of indicator to the various data sets to indicate how reliable the data is. Such a reliability metric is sometimes referred to as our level of confidence in the data. Some other terms that are used to describe this metric are data quality and data validity. Another metric that is relevant refers to the value of the data. Data may be very reliable but still be of little value to us (e.g., it may be out of date). So we need to account for its value as well as its reliability.

The “Reliability” Index measures how reliable the data is (how well does it reflect the “real” situation). It is derived mainly from the accuracy, cleanliness, completeness and format of the data.

The “Value” Index measures how valuable the data is to the project. The data might be very reliable, but it may be old and not very specific. While subjectively assigned, the “Value” Index helps to prioritize processing and verification tasks. The “Value” Index is derived from the currency, granularity, completeness and format of the data.

Feedback Loop

If DSCI’s first touch data inspection detects submission issues (omissions, errors, structural inconsistencies) to an extent that would prevent subsequent processing and submittal, DSCI will designate the data as having a “Not Passed” status and enter information describing the deficiencies onto the appropriate wiki pages. DSCI will then work with the provider to address the issues for the current submission and/or in subsequent submissions.

In cases where technical issues present a barrier to a successful data submission by the BP, the DSCI team employs creative solutions that assist the BP in providing a data product that contains the minimum content necessary to transform the data to meet the minimum NTIA/FCC specifications. Such solutions include the provision of PDF or KML format maps of their service territory upon which providers can mark up their service area, speeds, and technologies, and spatial analysis of BP service areas based on the known operating characteristics and physical constraints of the technologies employed.

If the DSCI and TSSW team identifies any significant perceived anomalies in coverage and speed, it generates appropriate notes and documentation, then seeks to resolve the anomalies by providing feedback to BPs to explain or correct the data submittal for the current round or in subsequent rounds. When possible such issues will be incorporated into the Provider Technical Feedback Form included with the feedback packet. Otherwise, identified issues are brought directly, via email, to provider data contacts by the contractor

team. GITA relies on the Contractor for the provision of broadband-specific technical information and logic that should be incorporated into the data review sessions.

Statistical Models

No statistical models are currently applied to compile and analyze the data.

3rd Party Publicly Available Data

FCC Form 477 Data: The FCC requires all facilities-based providers to submit a Form 477 data which is then used to produce Local Telephone Competition and Broadband Data for analysis and reporting. The associated FCC Registration Number (FRN) is a key data identification and indexing element and the underlying data, though significantly limited in the desired broadband accuracy and granularity, has proved useful for identifying relevant Broadband Providers and as a starting point for some reverse mapping activities.

American Roamer: DSCI licenses American Roamer data for Arizona from Esri which provides a substantial view of wireless voice and advanced services coverage patterns. The data set has proven of substantial use in cross checking mobile Broadband Providers' declared coverage and gaps. With the dynamic nature of the mobile industry and advancing 3G and 4G deployments, American Roamer data will be licensed on an ongoing basis to support DSCI verification activities.

Cable Boundaries/Media Maps: DSCI licenses Cable Boundaries data from Esri for Arizona for use as a primary verification source for cable wireline providers. It is based on information from MediaPrints developed by Direct Group and Warren Communications and updated quarterly. Cable Boundaries data provides current information about cable services by area and has data variables including primary ownership, subscribers, miles of plant, and digital capability. The data are available in a variety of geographies. Though initially useful in verification for comparing declared cable broadband coverage, it generally has proved to grossly overestimate the BPs broadband service territory and is a coarse tool of limited utility.

TeleAtlas Central Offices & Wire Centers: DSCI licenses TeleAtlas Central Offices & Wire Centers from Esri for ILEC and CLEC base facilities identification. Such data is available from a variety of sources and tends to remain relatively constant over time. Also, since it doesn't capture Digital Subscriber Line Access Multiplexer (DSLAM) locations, it must be complemented by other means to be useful in verifying wireline LEC coverage and gaps.

Wireless Applications, Corp. SiteSync: PowerSearch manages queries to multiple databases including FCC, FAA, licensed microwave, and tower companies to look for structures or towers placed in designated areas and often reveals the specific broadband providers collocating on those towers. eCoverage projects signal propagation and terrain coverage using high-resolution terrain data and Longley-Rice frequency calculations through an easy to use downlink coverage and contour generator with easily adjustable parameters like antenna, azimuth height, frequency, and power.

Federal Crowdsourced Data: The FCC offers an online Consumer Broadband Test (http://www.broadband.gov/qualitytest/about/) to give consumers additional information about the quality of their broadband connections and to create awareness about the importance of broadband quality in accessing content and services over the internet. The FCC complements the data collected from the Consumer Broadband Test with the submitted street address and other data, aggregating it to several monthly files grouped by State and available for secured download. DSCI processes the wireline and wireless results files, converting IP addresses to named Broadband Providers, and otherwise prepares the data for use in collaborative verification procedures. These data sets have proved extremely useful in confirming declared and/or estimated BP coverage and speeds, leading to detection of core data anomalies and issues that have largely been corrected with BP participation, thus yielding much more accurate and reliable data submittals.

ID Insight Crowdsourced Data: DSCI licenses the BroadBand Scout database from ID Insight for all 15 Arizona counties. ID Insight uses proprietary analytic modeling, demographic data, and retail Internet order data that include physical and IP addresses, to detail consumer access types and transmission speeds keyed to geographic locations which contribute to our verification views of BP footprints and coverage gaps. To date, this data source has proved complementary to the FCC crowdsourced data and only contributed incremental knowledge and detection of data set anomalies in a limited number of cases. However, detailed review of IP addresses and BPs has led to the identification of several additional relevant BPs that have since been successfully engaged by DSCI.

Arizona Broadband Map

Arizona Broadband Map Overview

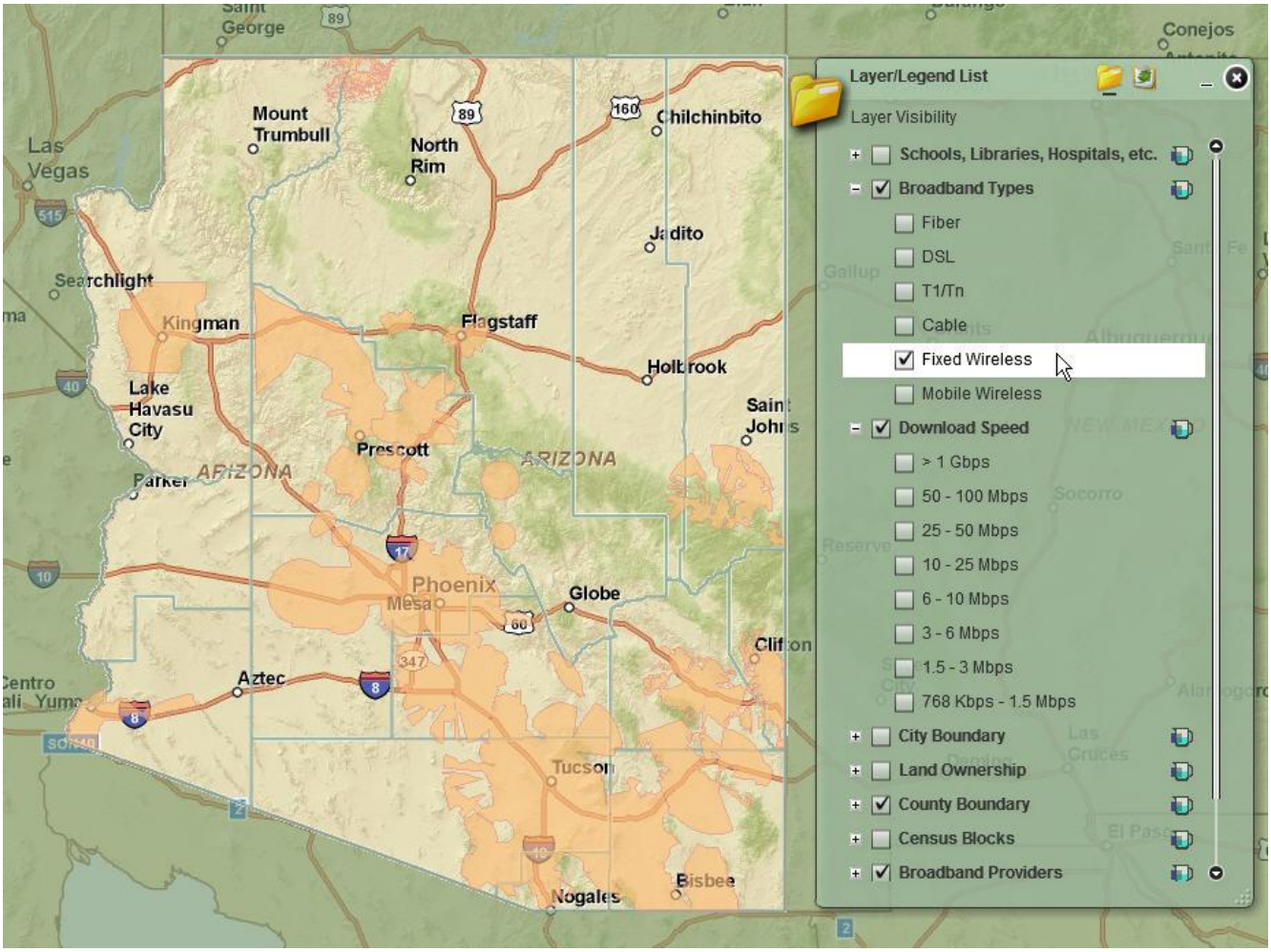
The Arizona Broadband Map (http://broadbandmap.az.gov/map) is an interactive mapping application designed for the end-user to find and list Broadband Service Providers at any location within Arizona.

The application allows the end-user to enter a street address to zoom to a location and identify the Broadband Service Providers in the immediate vicinity.


Arizona Broadband Map
Beta2 Version
HELP/About
Locate Providers
Locations found: 15
1616 W Adams St, Phoenix, AZ, 85007
Score: 100
1598 W Adams St, Phoenix, AZ, 85007
Score: 78
1700 W Adams St, Phoenix, AZ, 85007
Score: 78
Streets
Aerial
Topo
Layer/Legend List
Layer Visibility
Schools, Libraries, Hospitals, etc.
Broadband Types
Download Speed
City Boundary
Land Ownership
County Boundary
W Monroe St
W Adams St
W Washington St
W Jefferson St
W Madison St
N 19th Ave
N 18th Ave
N 17th Ave
N 15th Ave
N 13th Ave
N 12th Ave
S 14th Ave
S 18th Ave
S 13th Ave
S 12th Ave
State Capitol
Bolin Memorial Park
200 m
500 ft


Arizona Broadband Map
Beta2 Version
HELP/About
List Providers
Broadband Providers
Provider: Covad Communications
Type: DSL (Asymmetric)
Download: 3 - 6 Mbps
Upload: 200 - 768 Kbps
Broadband Providers
Provider: Qwest Communications
Type: DSL (Asymmetric)
Download: 25 - 50 Mbps
Upload: 10 - 25 Mbps
Broadband Providers
Provider: Covad Communications
Type: DSL (Symmetric)
Download: 3 - 6 Mbps
Upload: 3 - 6 Mbps
Broadband Providers
Provider: Covad Communications
Type: T1/Tn
Download: 3 - 6 Mbps
Upload: 3 - 6 Mbps
Broadband Providers
Provider: Integra Telecom
Type: T1/Tn
Download: 6 - 10 Mbps
Upload: 6 - 10 Mbps
Broadband Providers
Provider: Cox Communications
Type: Cable
Download: 50 - 100 Mbps
Upload: 3 - 6 Mbps
Broadband Providers
Provider: Airband
Type: Fixed Wireless
Download: 6 - 10 Mbps
Upload: 1.5 - 3 Mbps
Broadband Providers
Provider: Wydebeam
Type: Fixed Wireless
Download: 1.5 - 3 Mbps
Streets
Aerial
Topo
Layer/Legend List
Layer Visibility
Schools, Libraries, Hospitals, etc.
Broadband Types
Download Speed
City Boundary
Land Ownership
County Boundary
Broadband Providers
Provider: Covad Communications
Type: DSL (Asymmetric)
Download: 3 - 6 Mbps
Upload: 200 - 768 Kbps
W Monroe St
W Washington St
W Madison St
N 17th Ave
N 15th Ave
N 13th Ave
N 12th Ave
S 14th Ave
S 13th Ave
S 12th Ave
Bolin Memorial Park
200 m
500 ft

Several data layers are available for the user to turn on to obtain visual displays of the locations of various types of Broadband Services (Fiber, DSL, T1/Tn, Cable, Fixed Wireless, and Mobile Wireless). Maximum advertised Broadband download speeds can also be shown on the map by various Speed Tiers of download speed.



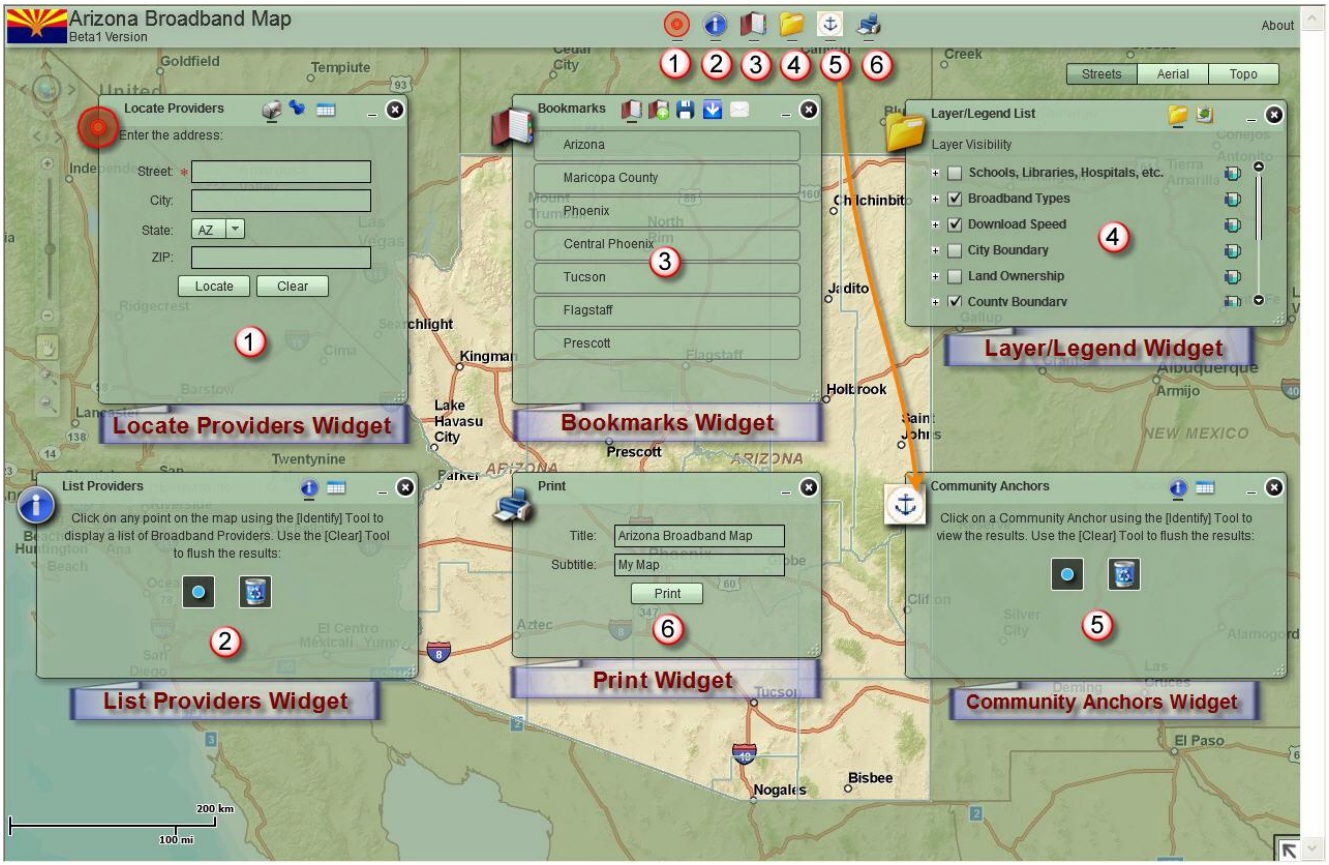
The application also allows the end-user to display related map layers like Community Anchor Institutions, City Boundaries, Land Ownership and Census Blocks less than 2 square miles that have some kind of Broadband Service.

Arizona Broadband Map Details

The Arizona Broadband Mapping Application is built upon Esri's ArcGIS Server 10.1 Technology.

A light-weight Adobe Flash based browser application is used on the Client Side to view the Broadband Map Services served by the ArcGIS Application Server running on the Server Side. The Client Side Adobe Flash based browser is based on the Esri Flex Viewer Template 2.2 that utilizes the ArcGIS API Library for Flex, designed and coded by Esri.

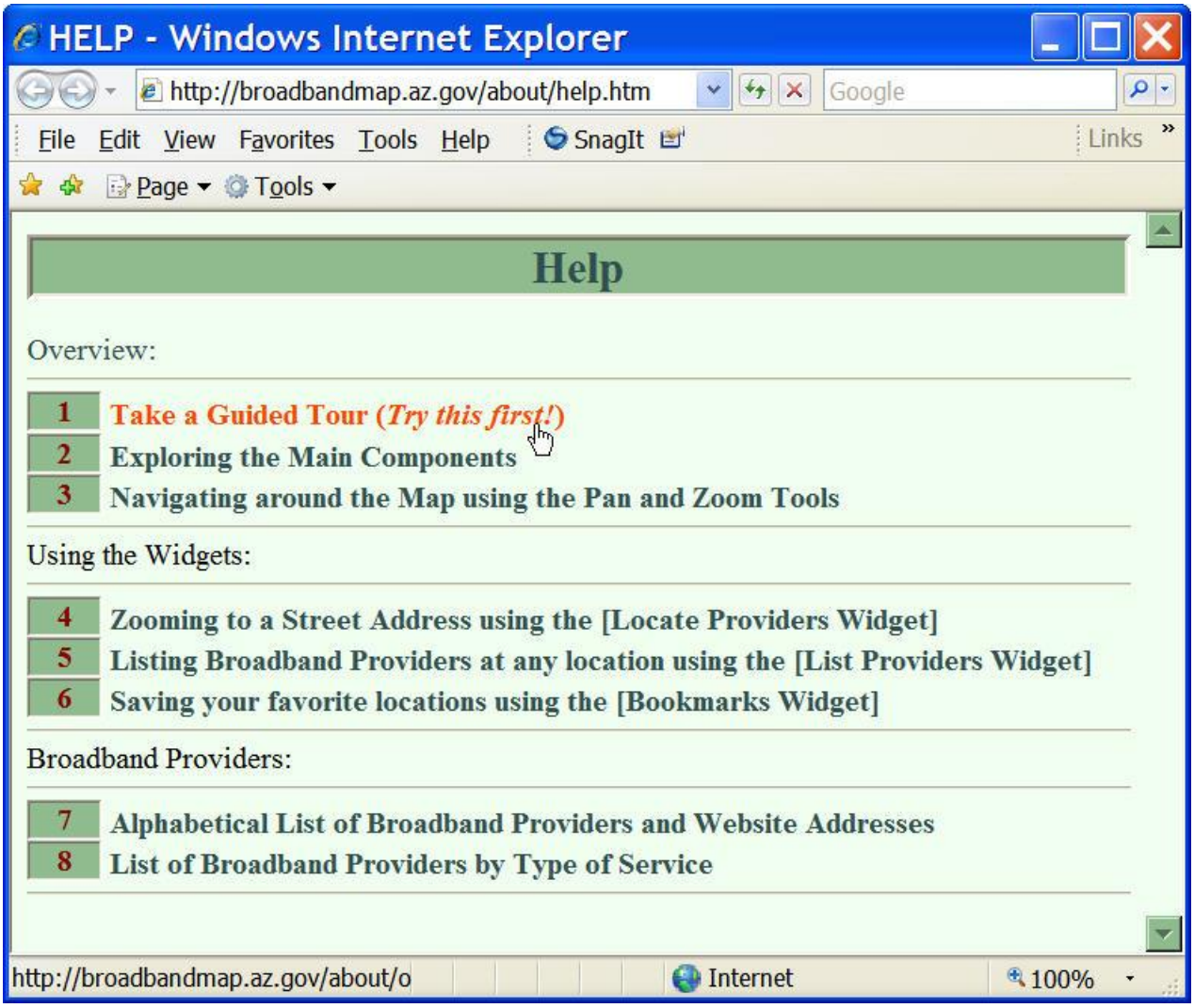
The application contains 6 widgets to help the end-user locate an address, list the Broadband Providers, create Bookmarks, view and manage the map layers, identify the Community Anchors and print a hard copy.



A Help/About section is provided to include the Disclaimers, Privacy Policies, Information on the Map, Contact information and links to take a Speed Test.

The Help/About section also includes an extensive Help component with a comprehensive Guided Tour to show the end-user how to use the application.

http://broadbandmap.az.gov/about/help.htm



The initial version of the map as described above has been developed. Additional customization will be added to future versions of the map to contain additional broadband status and planning information and greater user capabilities. The Arizona Broadband Map will have its main access point from the Arizona State Broadband Portal described in the next section.

Arizona Broadband Portal Plans

GITA is developing an Arizona Broadband Information Portal as a government website. The initial release of this portal will be available to the public by June, 2011 at http://www.azbroadband.gov/. This website will provide the public with general information about Arizona's Broadband Planning and Mapping Initiatives funded under our NTIA grants. The site will provide links to the sites for the State of Arizona Broadband Map (http://broadbandmap.az.gov/map), as well as the NTIA National Broadband Map (http://www.broadband.gov/maps/), and will provide a mechanism for users to do speed tests on their current broadband services and report the results to us for use speed verification efforts. This data will be incorporated into our broadband database and made available on our Arizona Broadband map. The site will also provide information about our community - outreach efforts as well as links to other state and local resources interested in or providing support for broadband and economic development in Arizona. Additionally, the site will provide information about the sources of data behind the map and how the mapping data is processed, the potential residential and commercial uses for the map.

The Arizona Broadband Information portal will also be integrated with social media capabilities such as RSS feeds, Twitter, and Facebook supported by experts within our State Health Department who have successfully developed outreach programs based on these new media capabilities.

Additionally, on pages requiring a secure log-in, the GITA portal will support the reporting of Community Anchor Institution connectivity, speeds, costs, and miscellaneous contact information, and help us establish their rural broadband deficits in response to a comprehensive out-reach campaign GITA will initiate in mid-2011.

Appendix A - Arizona Broadband Provider Technical Appendix

OVERVIEW

This document provides data specifications and delivery options for the Arizona Broadband Mapping Project, which is part of the nationwide NTIA Broadband Data and Development Program.

Under the NTIA program, each **Broadband Provider (BP)** is requested to provide information regarding the availability and delivery of broadband services if their company or organization:

- Offers broadband services to end users in Arizona, or could do so within a typical service interval without extraordinary effort, or
- Owns facilities in Arizona that make possible the delivery of broadband services by other companies meeting the description above.

Throughout this document, we address how data may be formatted, submitted and securely transferred to the State of Arizona. The availability and validity of the data is critical to portray each BP accurately.

While we ask every BP to submit as much data as required in the NTIA formats described below, we recognize the effort this may require. Ultimately, we seek the data in a format easiest for the BP and we're glad to provide support in the preparation and submittal of the data.

Provider data may be uploaded to the State of Arizona through a simple, safe and secure channel at https://www.azbbmp.com. Each provider will be given a unique username and password that will be active only during the submittal process. (Refer to page 9 of this document for additional details)

DEFINITIONS

"Broadband service" is the provision, on either a commercial or noncommercial basis, of data transmission technology that provides data transmission to and from the Internet with advertised speeds of at least 768 kilobits per second (kbps) downstream, and greater than 200 kbps upstream, to end users.

A "facilities-based" broadband provider offers service connections to end user locations if the company or organization:

1. Owns the portion of the physical facility that terminates at the end user location
2. Obtains unbundled network elements (UNEs), special access lines or other leased facilities that terminate at the end user location and supplies or equips them as broadband, or
3. Supplies or equips a broadband wireless channel to the end user location over licensed or unlicensed wireless spectrums including satellite transmission.

An "end user" of broadband service is a residential or business party, institution, or state or local government entity that may use broadband Internet service for its own purposes, and that does not resell such service to other entities or incorporate such service into retail Internet-access services that it provides. (For this purpose, Internet Service Providers "ISPs" are not "end users.")

REQUESTED DATA

The State of Arizona asks that each BP contribute detailed data for both wireline and/or wireless coverage areas. In addition to coverage areas, information regarding transmission technology, upstream and downstream speed is also requested.

All data submittals should include "common" information, including,

1. Technology of Transmission
2. Speed (Upstream/Downstream)
3. FRN (FCC Registration Number)

Technology of Transmission

The technology of transmission refers to the methodology or platform(s) by which a BP services their customer. The NTIA has developed a "model" where specific codes depict different technologies:

Code	Description
10	Asymmetric DSL
20	Symmetric DSL
30	Other Copper Wireline - T1, NxT1, EOC
40	Cable Modem - DOCSIS 3.0
41	Cable Modem - Other
50	Optical Fiber/Fiber to the End User
60	Satellite
70	Terrestrial Fixed Wireless - Unlicensed
71	Terrestrial Fixed Wireless - Licensed
80	Terrestrial Mobile Wireless
90	Electric Power Line
0	All Other

Speed Tables

Speed of Broadband service(s) should be specified as both maximum advertised upstream and downstream speeds as well as "typical" speeds achieved by end users. The NTIA has established a set of codes for Upstream and Downstream bandwidth speeds:

Speed Tier Codes Table		
Upload Speed Tier	Download Speed Tier	Description
2	n/a	Greater than 200 Kbps and less than 768 Kbps
3	3	Greater than or equal to 768 Kbps and less than 1.5 Mbps
4	4	Greater than or equal to 1.5 Mbps and less than 3 Mbps
5	5	Greater than or equal to 3 Mbps and less than 6 Mbps
6	6	Greater than or equal to 6 Mbps and less than 10 Mbps

7	7	Greater than or equal to 10 Mbps and less than 25 Mbps
8	8	Greater than or equal to 25 Mbps and less than 50 Mbps
9	9	Greater than or equal to 50 Mbps and less than 100 Mbps
10	10	Greater than or equal to 100 Mbps and less than 1 Gbps
11	11	Greater than or equal to 1 Gbps

Please note that, for a particular transmission technology, not all speeds are applicable, and submitted data will be checked against the NTIA established applicable speeds.

FCC Registration Number (FRN)

We ask that each BP provide their FCC Registration Number(s) (FRN). If any BP has more than one FRN, we ask that each data set submitted be tied to one and only one FRN. If in doubt concerning your FRN, please visit https://fjallfoss.fcc.gov/coresWeb/simpleSearch.do for verification.

Wireline Broadband Coverage

Wireline coverage area may be reported by any of the following:

1. Individual street address* where broadband service is available to end users.
2. Road Segments, *allowable only for areas where census blocks are greater than 2.0 square miles in area, using:*
    a. Arizona road centerline data - shapefile format road segments from current local sources are preferred, including all NTIA required fields for address ranges (minimum and maximum address on the segment), street prefix direction, street names, street type, street suffix direction, city, ZIP5 and ZIP4 (if available), with each element in a separate field. Alternatively, each segment can be identified in a table (non-GIS format) with a beginning and ending address range, street prefix direction, street name, street type, street suffix direction, city and ZIP codes in separate fields. Please note that a segment identifier (ID) field to your street network segments will not help us as we do not have access to that network.

    b. US Census TIGER/Line Road Files - shapefile format road segments from the latest Census TIGER files (2009 or 2010) including all NTIA required fields for address ranges, street prefix direction, street names, street types, street suffix direction, city, etc. Alternatively, each segment can be identified in a table (non-GIS format) with a TIGER Line ID (TLID) for the 2009 or 2010 version of Census TIGER files. BPs should indicate which Census version (2009 or 2010) was used in preparing the submittal.

3. Census block, *allowable only for areas where census blocks are less than or equal to 2.0 square miles in area.*

* *Please note that in all cases, wireline broadband availability will be aggregated to Census Block (for blocks <= 2 sq mi) or Street Segment (for blocks > 2 sq mi) as per the NTIA specifications,* ***and in no case will specific addresses be included in the Arizona or federal broadband maps.***

For those providers who wish to submit FCC Form 477 data, it is imperative that we have information that is more granular than census tract data. Any provider offering service boundary/areas, please make available in GIS (Geographical Information System/Esri shapefile) or Google Earth (KML) format

Data Format

By Address - Defined as broadband service available, including service type and advertised speed, to a specific "end user" by physical address. Typical submittal formats include excel spreadsheets, flat text files (.csv or .txt), and database tables (Access or SQL). Data should represent the following fields:

FRN	Address	City	State	ZIP4	Technology of Transmission	Maximum Downstream Speed	Maximum Upstream Speed	Typical Downstream Speed	Typical Upstream Speed
19567460	123 Main St	Here	AZ	88888	10	6	2	5	2
19567460	222 1st Ave	There	AZ	88800	41	5	2	4	1
19567460	445 Elm St	Every	AZ	87654	50	10	7	9	7

Where possible, include the category of end user by the following:

Code	Description
1	Residential user
2	Governmental user
3	Small Business user
4	Medium or Large Business user
5	Other

By Census Block - In lieu of reporting address-specific data, BPs may provide list of all census blocks, **two square miles or less in area,** in which broadband service is available to end users, along with the same service characteristics address points contain (technology of transmission and maximum and typical speeds).

If this option is employed, BPs are encouraged to use geographic information system (GIS) compatible software to select a subset of census blocks. Please include the full 15 digit FIPS (Federal Information Processing Standards) Census Block ID. These can be identifiers for Census 2000, 2009 or 2010 Census Blocks; please specify which version was used. GIS formats for these resources can be found at the US Census Bureau download site (Census 2000 is included with either 2009 or 2010 downloads)

- US Census Bureau's 2009 TIGER/line files at http://www.census.gov/geo/www/tiger/tgrshp2009/tgrshp2009.html
- US Census Bureau's 2010 TIGER/line files at http://www.census.gov/geo/www/tiger/tgrshp2010/tgrshp2010.html

Data should represent the following fields:

FRN	Census Block 15-digit FIPS	Technology of Transmission	Maximum Downstream Speed	Maximum Upstream Speed	Typical Downstream Speed	Typical Upstream Speed
19567460	40059412001036	10	6	2	5	2
19567460	40159501003174	41	5	2	4	1
19567460	40139410001010	50	10	7	9	7

By Road Segment - in lieu of reporting address-specific data, BPs may report a list of street segments with address ranges in which broadband service is available to end users along with the same service characteristics address points (technology of transmission and speed).

If this option is employed, BPs are encouraged to use geographic information system (GIS) compatible software to select a subset of road segments (from either of the GIS data sets listed below). The basic service information fields (Technology of Transmission, Maximum Advertised Downstream/Upstream speed and Typical Downstream/Upstream speed) should then be attached to each road segment to characterize the broadband service along each road.

US Census Bureau TIGER/line shapefiles can be accessed at the previously listed sites. Again, please report which data set was used in preparing your data.

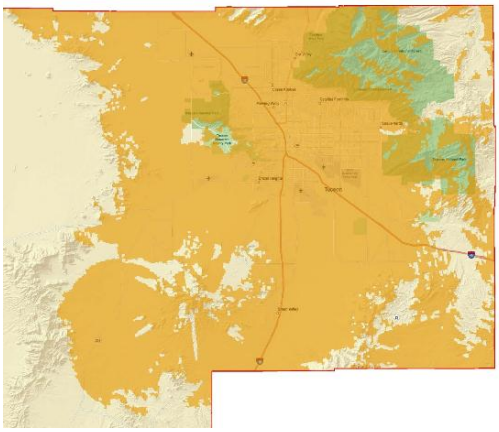
FRN	Min Address	Max Address	Prefix Dir	Street name	Street type	City	State	ZIP
19567460	1	100	E	Easy	Ln	Here	AZ	88888
19567460	101	250	E	Easy	Ln	Here	AZ	88888
19567460	301	399	W	First	St	There	AZ	87654

Wireless Broadband Cover - Fixed, Mobile & Satellite

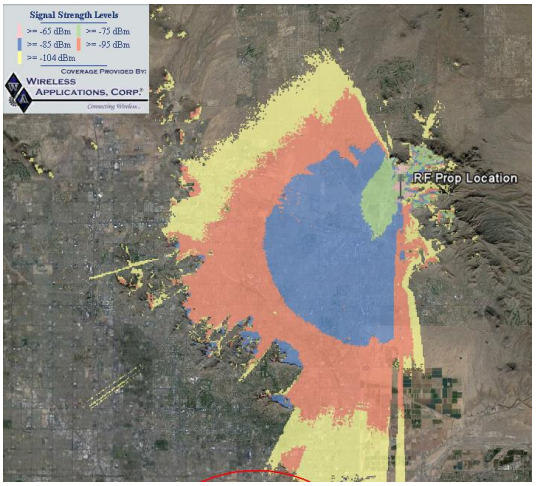
We would prefer that all information submitted for this requirement is in a **geographic data format with polygons depicting wireless service areas** and associated service characteristics (technology of transmission, speed), but may be reported by any of the following:

1. Geographical data format with polygons depicting wireless service areas (Esri shapefile)
2. Google Earth as either .kml or .kmz
3. Tower location, including
   a) Latitude and Longitude
   b) Tower height and/or Equipment height
   c) Spectrum Used
   d) Antenna specifications (omnidirectional, sectorized, etc) - if using sectorized, provide direction and beam width (60 degrees, 90 degrees, 180 degrees)

Esri Shapefile - include metadata depicting technology of transmission, lat/long, tower height and maximum upstream/downstream speeds.



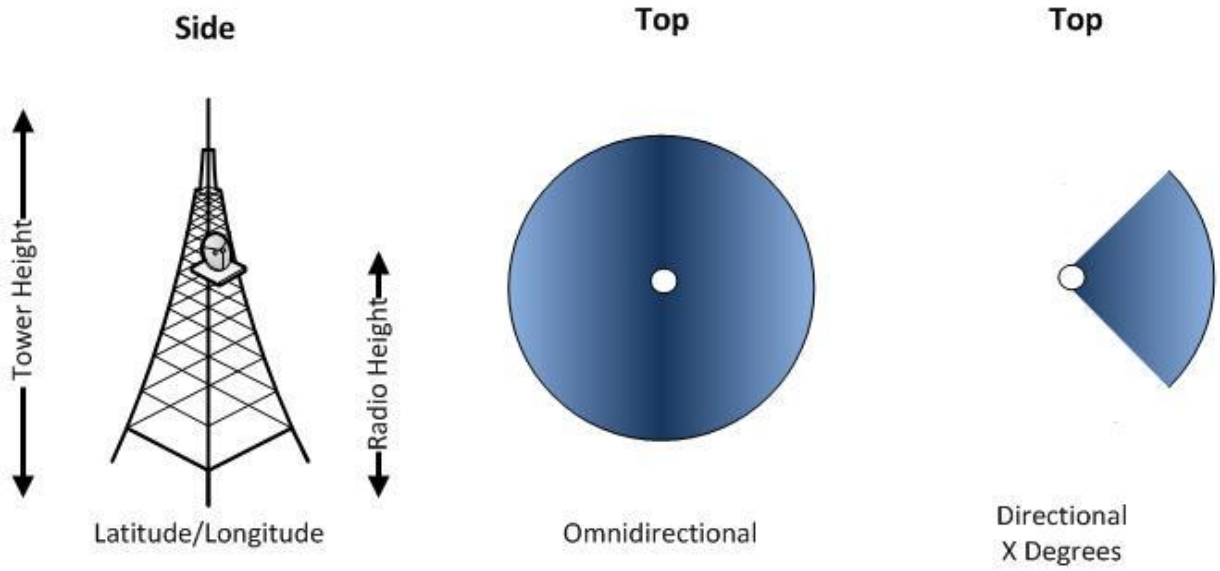
Google Earth - include metadata depicting technology of transmission, lat/long, tower height and maximum upstream/downstream speeds.



Tower Location - for BP that do not have coverage data in a geographical/polygon format, a description of tower location with lat/long, height, spectrum, speed as follows:

Tower Height/Equipment (ft)	FRN	Latitude	Longitude	Technology of Transmission	Maximum Downstream Speed	Maximum Upstream Speed
100/60	0019567460	33.419028	-112.142889	70	5	3
70/60	0019567460	32.995917	-111.745806	70	5	3
50/50	0019567460	35.241944	-111.610722	71	6	4

*include typical upstream/downstream where possible



Wireless Spectrum

The NTIA has developed specific codes for wireless spectrum use, as follows:

Code	Description
1	is Cellular spectrum (824-849MHz; 869-894) used to provide service
2	is 700 MHz spectrum (698-758 MHz; 775-788 MHz; 775-788 MHz) used to provide service
3	is Broadband Personal Communications Services spectrum (1850-1915 MHz; 1930-1995) used to provide service
4	is Advanced Wireless Services spectrum (1710-1755 MHz; 2100-2155) used to provide service
5	is Broadband Radio Service/Educational Broadband Service spectrum (2496-2690 MHz) used to provide service
6	is Unlicensed (including broadcast television "white spaces") spectrum Used to provide service
7	is Specialized Mobile Radio Service (SMR) (817-824 MHz; 862-869 MHz; 896-901 MHz; 935-940 MHz)
8	is Wireless Communications Service (WCS) spectrum (2305-2320 MHz; 2345-2360 MHz), 3650-3700 MHz
9	Satellite (L-band, Big LEO, Little LEO, 2 GHz)
10	is other licensed spectrum

Speed Tiers

Wireless speed tiers differ slightly from the aforementioned wireline speed tiers and fixed wireless differs from mobile wireless, as follows:

Speed Tier Codes Table Fixed Wireless		
Upload Speed Tier	**Download Speed Tier**	**Description**
3	3	Greater than or equal to 768 Kbps and less than 1.5 Mbps
4	4	Greater than or equal to 1.5 Mbps and less than 3 Mbps
5	5	Greater than or equal to 3 Mbps and less than 6 Mbps
6	6	Greater than or equal to 6 Mbps and less than 10 Mbps
7	7	Greater than or equal to 10 Mbps and less than 25 Mbps
8	8	Greater than or equal to 25 Mbps and less than 100 Mbps

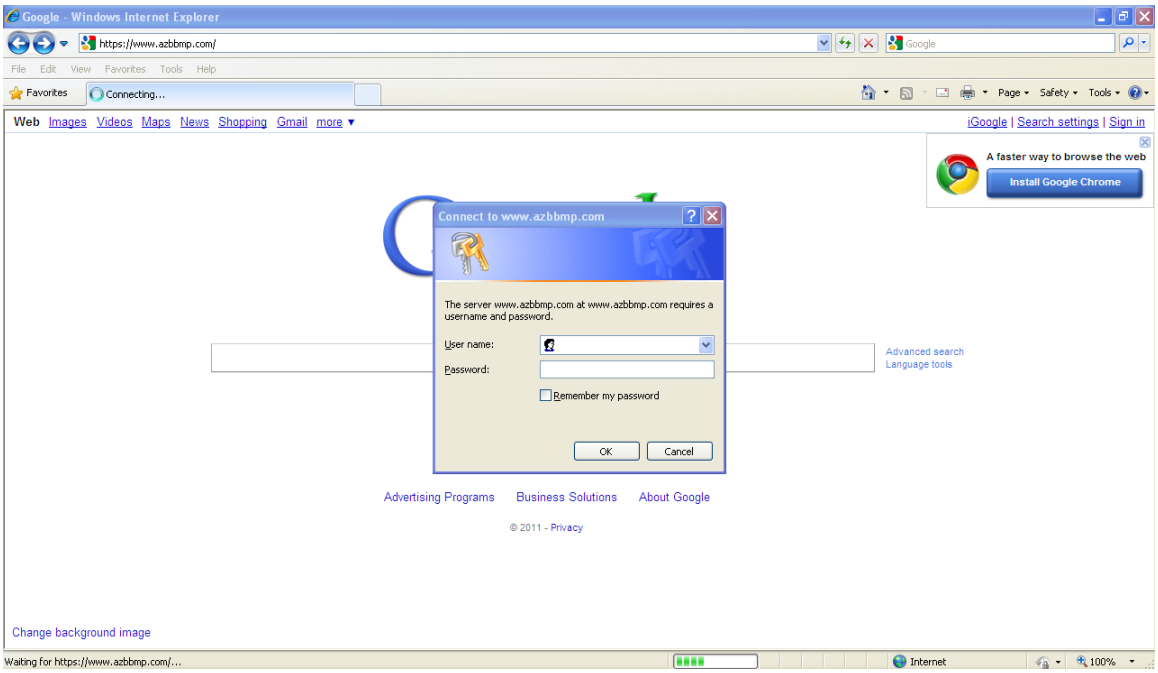
Speed Tier Codes Table Mobile Wireless		
Upload Speed Tier	**Download Speed Tier**	**Description**
2	n/a	Greater than 200 Kbps and less than 768 Kbps
3	3	Greater than or equal to 768 Kbps and less than 1.5 Mbps
4	4	Greater than or equal to 1.5 Mbps and less than 3 Mbps
5	5	Greater than or equal to 3 Mbps and less than 6 Mbps
6	6	Greater than or equal to 6 Mbps and less than 10 Mbps
7	7	Greater than or equal to 10 Mbps and less than 25 Mbps

Arizona Broadband Mapping Portal
www.azbbmp.com

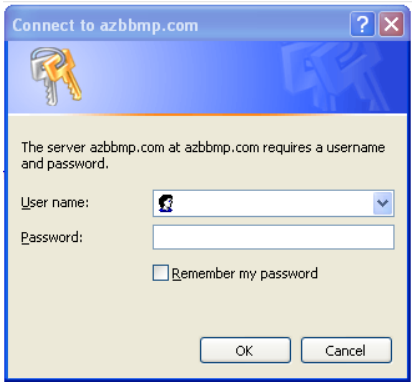
The Arizona Broadband Mapping Portal was exclusively designed for Arizona Broadband Providers so that they may securely transmit and receive data throughout the life cycle of NTIA/FCC project.

To establish a secure and simple platform, an HTTPS web interface is coupled with unique credentials (username/password) for each broadband provider. There is no need to download any software to use the platform. It will work on any Internet browser, including; Internet Explorer, Safari, Firefox and Chrome.

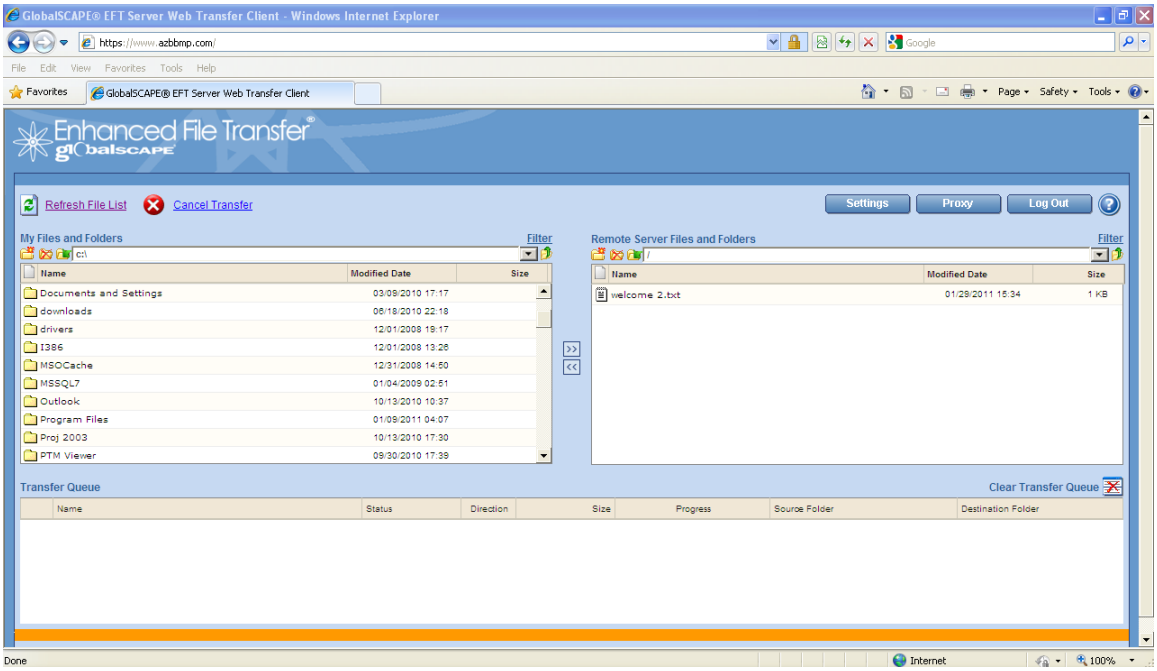
Once a provider has received their username and password, they can reach the portal via www.azbbmp.com. (https://www.azbbmp.com)



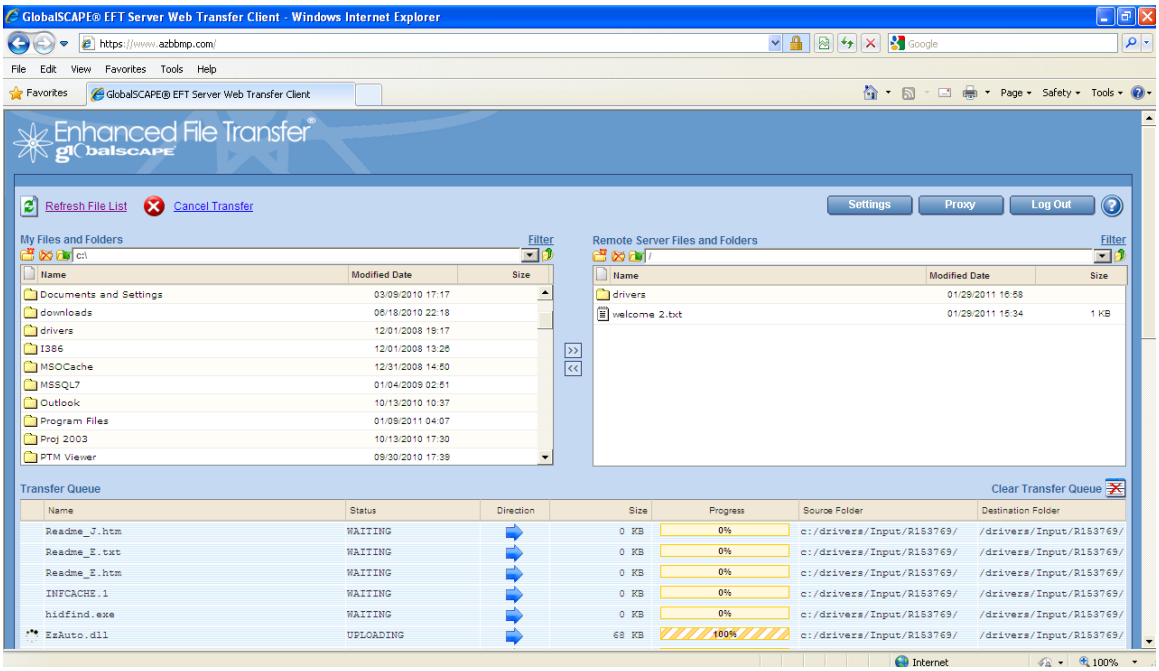
The user will be prompted for their unique credentials to enter the portal. Credentials will only be active during upload and verification timeframes and will be changed for each submittal cycle.



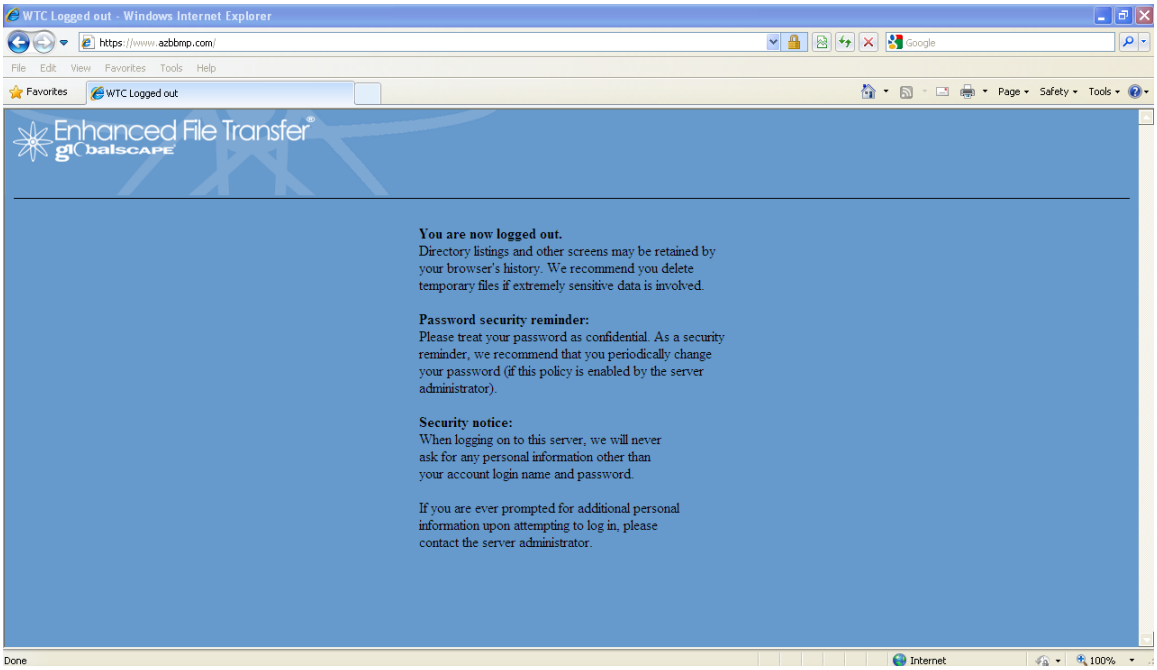
The portal interface enables the end-user to drag and drop files from their PC to the server. (right pane - user, left pane - server)



File transfer progress can be monitored from the bottom pane of the portal interface.



Once all the files have been transferred to the server, click the “logout” button to complete the session.



After the files have been successfully uploaded, the user credentials will be deactivated and the files will be transferred to an off-net, secure and encrypted Network Attached Storage device.

Additional portal information can be found at:
http://help.globalscape.com/help/eft6-2/HTTP_S_Transfer_Client.htm

Support

Please direct any questions regarding this document, in its entirety, to:

Nolan Straabe
Data Site Consortium Inc.
E-mail: nolan@straabe.com,
Mobile: 602-999-0143

Appendix B - Community Anchor Institution Master Database

Initial Data Structure

This data structure is being used to load in Community Anchor Institution (CAI) records for use as a base for developing and enacting improvements in the CAI update process. This database will be used as a source of data to update the CAI feature class data within the NTIA geodatabase.

The Community Anchor Master Database is currently an EXCEL Spreadsheet, although it is likely to be converted to other file format in the future. It is an evolving structure that will used to house CAI data for NTIA transfer and mapping purposes. The current spreadsheet is divided into 4 column categories: “Anchor Name”, “ID Code”, “Location” and “Broadband”. These categories represent types of data fields relevant to identifying and categorizing the CAI locations, providing locational information and information on sources of data. The “Broadband” category provides fields to hold the NTIA required information on the Broadband status at the CAI location.

These major data categories are divided into a total of 43 subcategories (43 unique columns of data) which represent the current fields in the CAI database. In order to facilitate navigation around the spreadsheet, each category has been color-coded. Subcategories that are required by the NTIA are asterisked.

Category: Anchor Name

This category provides basic address and function information about each Community Anchor Institution (CAI) including physical address & phone number, facility function & type, and source data information. It also has a field for notes that may apply to a particular circumstance surrounding a CAI record. The Anchor Name category is divided into 18 sub-categories and is Color-Coded Green on the spreadsheet.

Subcategories

***ANCHORNAME:** The name of the CAI currently in occupation of the building or facility - e.g. Pima County.

***ADDRESS:** The complete physical address of the CAI, down to the 5-digit zip code, where possible - e.g. 1631 South 10th Avenue Tucson AZ 85713

***BLDGNBR:** The parsed building number from the ADDRESS field - e.g. 1631

***PREDIR:** The pre-direction of the street - North, East, South, or West

***STREETNAME:** The street name as it appears in the ADDRESS field - e.g. 10th Avenue

***STREETTYPE:** The type of street as it appears in the ADDRESS field - Street, Road, etc.

***SUFFDIR:** The suffix direction of the street, if applicable - North, East, South, or West

***CITY:** The name of the city, town or community where the CAI is located.

COUNTY: The name of the county where the CAI is located.

***STATECODE:** The 2-digit state code of the CAI.

***ZIP5:** The 5-digit zip code of the CAI.

***ZIP4:** The 4-digit zip code extension of the CAI.

ADD_SRC: The source of the address information. The various data sources being used to compile the ANCHOR NAME categories have been coded as follows:

ADOA - Data provided by ***ADOA***

ADOT = Data provided directly by ***ADOT***

ASFM = Data provided by ***Arizona State Fire Marshal's*** Office

AWS = Data obtained directly from the ***Community Anchor's*** website

CAI = Original ***Community Anchor Institute*** data (data that we received at the beginning of the project)

COGIS = Data provided by a ***County GIS*** department in a GIS format (shape or geodatabase)

CWS = Data acquired from ***County*** website

DC = Data provided through ***Direct Contact*** with the CAI (either through E-mail or by telephone)

GM = Google Maps used to locate facility when all other attempts to locate do not work

NR= Not recorded - data that was obtained from an unknown source at the beginning of the broadband project (typically from Google and other web searches used when more traditional sources of data were not available).

ADD_DATE: Month & year that the Address Source information was created, credited to, or, in cases where records were acquired from the internet, the date that these records were acquired. If the date field is blank this means that the address data has not been verified or that the information was never recorded by ASLD/SCO.

DESCRIP: Descriptive text field explaining the CAI function performed at a specific address e.g. "*Wilcox Animal Control".*

PHONE: The telephone number of the CAI, including area code. When multiple phone numbers are listed for a CAI, an attempt has been made to use the main switchboard telephone number. In the case of emergency services (fire, police), the non-emergency number has been listed.

TYPE: The general category of CAI, useful for sorting records e.g. "*Fire", "Government Office", "Detention Facility".*

NOTES: A field used to provide additional information with regards to a particular CAI record. e.g. *"Closed for 2010 Season"* or "*2 miles west of I-10 on East Pinal Airpark Road."*

Category: ID CODE

The purpose of the ID CODE category is to assign a unique Identification code to each CAI for internal use and in order to satisfy NTIA submission requirements. For reference purposes, and with future updates in mind, an additional field has been included in order to log any unique ID numbers or codes used by external data sources. The ID CODE category is divided into 6 sub-categories and is Color-Coded Yellow on the spreadsheet.

Subcategories

***CAICAT:** A contraction of *"Community Anchor Institute Category".* The NTIA have requested that the following category code numbers be used:

1= Schools -Public/Tribal

2= Libraries

3= Medical-Health Care

4= Public Safety

5= University/College

6= Other Government

7= Other Non-Government

PRE_CAICAT: A single-letter code that identifies the level of government of the CAI. Non-government entities are coded 'N'.

C= County

I= City or Town (Incorporated)

F= Federal

M= Military

N= Non-Government

O=Other

R=Regional

S= State

T= Tribal

Z= Nothing, No value - used as a temporary place holder

SUB_CAICAT: A 3-letter code used to identify the general type of CAI facility. Letters only are used, no numbers or symbols.

APO= Airport

ANM= Animal Care, Animal Control or Animal Shelter

CRT= Court, Municipal, Juvenile, County, etc.

CTH= City, or Town Hall, County Seat or main County Government Complex.

CUL= Cultural Facilities: Cultural Centers, Civic Centers, Museums, Visitors Centers, Nature Centers, etc.

ENV= Environmental Facilities: Landfills, Recycling Centers, Waste Tire Yards, Water Treatment Plants, etc.

FIR= Fire Stations and related facilities, including: Administrative Offices, Training Centers, Equipment Storage Yards, etc.

HEL: Health related facilities: Clinics, etc.

LAW= Law Enforcement: Police, Sheriff, Constables, Detention Facilities, etc.

LIB= Libraries, including Public Libraries, Law Libraries, County Libraries

MTN: Maintenance Yards & Facilities, including Storage Yards & Warehouses

MSC= Miscellaneous - facilities that did not fit neatly into any other category. Includes: Rest Areas, Ports of Entry, Laboratories, etc.

OFC= General government office facilities, not including City/Town Halls or County Seats/main County Government Complex's.

REC= Recreation Facilities: Community Centers, Pools & Aquatic Centers, Senior Centers, Youth Centers, Sports Complex's, etc.

WTR= Water/Wastewater related infrastructure: Water Reclamation Plants, Water Treatment Plants, Water Quality Facilities, etc.

CAI_KEY: A 5-digit unique ID number developed internally for tracking purposes. Numbers only are used, no symbols or letters.

***CAIID:** The CAIID subcategory is created by merging (in sequence as listed) the following subcategories to create a 10-digit ID Code: CAICAT, PRE_CAICAT, SUB_CAICAT, CAI_KEY. For example, if we examine the CAIID number 6IREC00475 we can see that it is a recreation facility that belongs to a city or town.

CAICAT,	PRE_CAICAT,	SUB_CAICAT,	CAI_KEY
6	**I**	**REC**	**00475**
↗	↑	↑	↖
Other Government	City or Town	Recreation Facility	Unique ID #

EXT_ID: This field is to be populated by any unique ID numbers/codes which are provided by outside data sources, in order to easier share and maintain future versions of the database.

Category: Location

This category contains locational information about each CAI, including latitude & longitude coordinates in decimal degrees (Datum: WGS 84) and the date & acquisition method of these coordinates. If the lat/longs are derived from geocoding then the type of geocoded output is recorded. Any apparent geocoding errors (and fixes for these errors) are also noted. A Full FIPS ID Code is also included in this category. The Location category is divided into 8 sub-categories and is Color Coded Orange on the spreadsheet.

Subcategories

***LAT:** The latitude of the CAI, in decimal degrees, to six decimal places.

***LONG:** The longitude of the CAI, in decimal degrees, to six decimal places.

LL_MET: The method used to derive the latitude and longitude of a CAI (geocoding, GPS, field measurements, etc). The following code has been adapted from the ADEQ Geocoding Check Method.

DIG= Digitally verified against raster data or other data set

NON= Non-specific, multiple methods of verification (digital, geocoding, etc.)

GPS= Global Positioning System - Field Collected

GEO= Originally geocoded - address matched (location verified by other methods)

LL_DATE: The date that the lat/long coordinates were collected or generated.

GC_TYPE: The type of result returned from geocoding software if the lat/long coordinates were derived by this method.

STREET_ADD= The software geocoded to the street address level

ZIPCODE= The software geocoded to the centroid of the zip-code

NONE= The CAI address information was not run through the geocoding software

GC_ERROR: If the geocoding software generates spatially inaccurate point data then the specific error is noted here.

GC_FIX: Any geocoding errors that are corrected are logged in this field, along with the method of correction.

***FULLFIPSID:** The Full 16 digit Census Block ID that contains the State Code, County Code, Census Tract, Census Blocks, Census Block Groups and Group ID.

Category: Broadband

This category provides information on each Community Anchor Institution's broadband capabilities including whether, or not, they receive a broadband service, broadband upload and download speeds, and the kind of transmission technology being used at the location. Contact information about the broadband data source is also listed. The Broadband category is divided into 11 sub-categories and is Color-Coded Blue on the spreadsheet.

Subcategories

***BBSERVICE:** A Yes/No field asking whether a CAI has broadband service or not.

***BB_SRC:** The Source of the broadband information for the CAI.

BB_DATE: The date that the broadband information was provided to the project.

BB_TITLE: The title of the person providing the CAI broadband information.

BB_LNAME: The surname of the person providing the CAI broadband information.

BB_FNAME: The first name of the person providing the CAI broadband information.

BB_EMAIL: The e-mail address of the person providing the CAI broadband information.

BB_PHO: The phone number of the person providing the CAI broadband information.

***TRANSTECH:** Type of Technology of Transmission: Cable, T1, DSL, etc. Each type of broadband service has a 2 digit code.

Code	Technology of Transmission
10	Asymmetric xDSL- DSL (Asymmetric)
20	Symmetric xDSL- DSL (Symmetric)
30	Other Copper Wireline- T1/Tn
40	Cable Modem- DOCSIS 3.0 Down Cable
41	Cable Modem- Other Cable
50	Optical Carrier/Fiber to the End User Fiber
60	Satellite- Satellite
70	Terrestrial Fixed Wireless-Unlicensed Fixed Wireless
71	Terrestrial Fixed Wireless- Licensed Fixed Wireless
80	Terrestrial Mobile Wireless- Mobile Wireless
90	Electric Power Line

0 All Other

***MAXADDOWN:** Maximum Advertised Download Speed. These are the codes for the Download speeds:

Code	Speed Tier
3	768 Kbps - 1.5 Mbps
4	1.5 - 3 Mbps
5	3 - 6 Mbps
6	6 - 10 Mbps
7	10 - 25 Mbps
8	25 - 50 Mbps
9	50 - 100 Mbps
10	100Mbps - 1 Gbps
11	> 1 Gbps

***MAXADUP:** Maximum Advertised Upload Speed. These are the codes for the Upload speeds:

Code	Speed Tier
2	200 - 768 Kbps
3	768 Kbps - 1.5 Mbps
4	1.5 - 3 Mbps
5	3- 6 Mbps
6	6- 10 Mbps
7	10- 25 Mbps
8	25- 50 Mbps
9	50- 100 Mbps
10	100Mbps - 1Gbps
11	> 1 Gbps

Appendix C - Arizona Broadband Provider Case Studies

Hopi Telecommunications Inc. (HTI)

Hopi Telecommunications Inc. (HTI) is the ILEC for the Hopi Tribe's reservation in Northeastern Arizona, having forced out the previous incumbent, funding their purchase with RUS loans. HTI is owned by the Hopi Tribe, but has its own Board and profit center goals. They have invested heavily in fiber backhaul and DSL upgrades over the past decade and can serve much of the reservation, though several villages (Old Oraibi, Moenkopi) remain resistant to infrastructure deployment and thus unserved.

HTI proved reluctant to sign a NDA and generally to cooperate with requests for broadband data submittal. The DSCI team reverse mapped estimated coverage from FCC 477 data and knowledge of the reservations demography, topography, and infrastructure. When we presented the reverse mapping estimates and indicated our intent to submit them as part of our Spring 2011 submittal as having been derived from public sources and anecdotal knowledge, HTI agreed to cooperate in reviewing and improving the data. An hour long collaborative viewing session with HTI personnel led to the addition of multiple census blocks under 2 square miles deemed to be covered and significant fine tuning of the road segments deemed covered in census blocks over 2 square miles. As HTI does not yet have in-house GIS capabilities, they developed a keen interest in receiving full GIS output of the adjusted coverage estimates for future internal use and are expected to be generally cooperative in reviewing and adjusting coverage in subsequent biannual data collection and submittal cycles.

Gila River Telecom Inc. (GRTI)

Gila River Telecommunications, Inc. (GRTI) was established in 1988 for the purpose of providing the Gila River Indian Community with affordable telephone services. GRTI has grown with the vast growth of the community and providing a variety of telecommunication services. GRTI has more than 3,600 access lines which includes business and residential with service offerings including phone lines, Internet, High Speed (DSL) Internet and data lines. GRTI has significant fiber assets as well as an improvement plan with more than 66 miles of new fiber optic cable.

However, GRTI felt that it was beyond their ability both technically and in terms of required staff resources to comply with our requests for broadband coverage data. They do not have a customer billing database, as that function is performed by a third party and are otherwise limited in technical support areas. The State interceded and brokered several conversations that in the end proved fruitless. DSCI proceeded to reverse map their estimated coverage based on known Central Office locations, knowledge of some of their fiber placements, and other community service indications.

The estimated coverage was provided to GRTI prior to the Fall 2010 submittal and again prior to the Spring 2011 submittal with significant improvements in our coverage estimation modeling as we refined our base information and processes. We operated under the concept of prior notification and having told the BP that our data was developed from public sources and would be submitted, we carried through and did so. We continue to provide BP feedback packages with various versions of the underlying coverage data, encouraging GRTI to engage and cooperate more fully on future data collection and submittal cycles.

Valley Telecom Group (VTG)

Valley Telephone Cooperative, Inc. was established in 1962 and provides telecommunications services to over 27,000 rural and remote customers in southeastern Arizona and southwestern New Mexico. Copper Valley Exchange was purchased from US West in 1995 and has approximately 4,500 access lines in rural Arizona. Valley Connections, LLC is another operating entity serving customers in non-contiguous rural Arizona areas. They have been maintained as three separate Broadband Providers with unique FRNs and have a mix of delivery technologies (DSL, wireless, fiber) across the three operating entities.

Though VTG was generally cooperative and their data was included in the Fall 2010 submittal, there were substantial technical issues both in their submittal and our processing of it which led to significant gaps in their reported coverage versus their actual deployments. When the national broadband map launched they quickly realized the gaps in the coverage and were quite upset at the perceived oversights and wanted to withdraw from future cooperation. They strongly believed that accurate data would be good marketing leading potential customers to be able to “find” them and that accurate coverage would factor into preventing inappropriate grants to competitive providers where their coverage and existing competition were sufficient to preclude. In short, they “got it,” but didn’t have confidence in our approach and commitment.

We worked closely with them to turn the situation around, investigating and sharing the findings of where the problems had lain in the Fall 2010 submittal and offering various approaches to fixing the technical issues on both sides. After several conference calls, the kinks were worked out and new data submitted for the three operating entities delivering over the three technology types in a variety of data formats (customer lists, census blocks, wireless polygons). Several collaborative viewing sessions were hosted by DSCI with the VTG team participating where detailed review of operating entities, technology of delivery, and declared coverage areas lead to fine tuning the coverage to VTG’s satisfaction in time for inclusion in the Spring 2011 submittal.

Casa Grande Internet (CGI)

During our first quarter 2011 efforts, the Arizona mapping team encountered a single provider, Casa Grande Internet (CGI), which refused to participate in the broadband mapping process. CGI's website (http://www.casagrandeinternet.com/) indicates it has been providing Internet services in in the Phoenix metropolitan area for over 10 years, during which it has acquired several smaller Internet Service Providers (ISPs). Additionally, CGI provides computer repair and end-user networking services.

Our mapping status is that we have determined that CGI provides both point-to-point and point-multipoint wireless Internet service, but we do not know its current coverage area for these services. CGI did not answer our initial inquiries. However, third parties have informed us that CGI resells DSL services in limited areas, as well as being a wireless provider. Based on multiple inputs the DSCI team received, we constructed a possible mapping of CGI's offerings and presented a map of estimated coverage to CGI as a starting point for subsequent discovery. A co-owner of CGI responded that he did not have available time for the query and requested that we not submit any findings in the April 1, 2011 submittal. Thus CGI became the only BP of the 71 identified relevant Arizona BPs not included in our Spring 2011 submittal.

In summary, we know CGI uses multiple technologies that are capable of providing broadband services in excess of 1-Mbps and that its coverage areas likely vary with each of its deployment technologies. However their specific admonition not to submit the estimated coverage data without further interaction and correction to it led us to withhold it from the Spring 2011 submittal. We will continue working with the CGI principals for further discovery of their broadband offerings with the intent of being able to obtain their cooperation so as to be able to include their approved broadband coverage data in the October 1, 2011 submittal.

Appendix D - Broadband Provider Data Verification Table

	Wireline	Cable	Mobile Wireless	Fixed Wireless	Fiber	Satellite
Verification Sources	• ACC ILEC boundaries • Tele Atlas licensed database & otherwise known COs, Wire Centers, DSLAMs & POPs • Coverage modeling • Federal & ID Insight Crowdsource Data • Community Anchor Institutions • Market Knowledge • Primary survey data (not currently being used for data verification)	• Municipal Cable license information • Cable Boundaries/ Media Maps licensed database • Federal & ID Insight Crowdsource Data • Community Anchor Institutions • Market Knowledge • Primary survey data (not currently being used for data verification)	• American Roamer licensed database • BP published public coverage maps • Known tower & transmission locations • Federal & ID Insight Crowdsource Data • Community Anchor Institutions (technology being used by few CAIs) • Market Knowledge • Primary survey data (not currently being used for data verification) • FCC cellular & PCS licensed areas (not currently being used for data verification) • Wireless coverage modeling from propagation models (not currently being used for data verification) • Wireless field verification testing (not currently being used for data verification)	• BP published public coverage maps • Known tower & transmission locations • Federal grants & loans for WISP projects • Federal & ID Insight Crowdsource Data • Community Anchor Institutions (technology being used by few CAIs) • Market Knowledge • Primary survey data (not currently being used for data verification) • FCC spectrum licensed areas (not currently being used for data verification) • Wireless coverage modeling from propagation models (not currently being used for data verification) • Wireless field verification testing (not currently being used for data verification)	• BP public fiber maps & on net building lists • Federal Crowdsource Data (expect such data in few if any instances) • Community Anchor Institutions • Market Knowledge including known FTTx projects in specific areas • Primary survey data (not currently being used for data verification)	• Federal & ID Insight Crowdsource Data • Community Anchor Institutions (expect such data in limited instances) • Market Knowledge • Geographic & topographic shadow modeling (not currently being used for data verification) • Primary survey data (not currently being used for data verification)

Coverage Anomalies	• Inconsistencies with ACC ILEC boundaries • Map overlays indicate significant over or under coverage from known T-1/T-3 & DSL delivery points as modeled • Map overlays show significant crowdsource &/or CAI data voids or outside data points from declared coverage	• Map overlays indicate significant over or under coverage from Cable Boundaries/ Media Maps data • Map overlays show significant crowdsource &/or CAI data voids or outside data points from declared coverage	• Map overlays indicate significant over or under coverage from American Roamer data &/or coverage estimates from known transmission locations • Map overlays show significant crowdsource &/or CAI data voids or outside data points from declared coverage	• Map overlays indicate significant over or under coverage from coverage estimates from known transmission locations • Map overlays show significant crowdsource &/or CAI data voids or outside data points from declared coverage	• Map overlays indicate significant over or under coverage from BP fiber maps & on net building lists • Map overlays show significant crowdsource &/or CAI data voids or outside data points from declared coverage	• With BP statewide shapefile use without geographic shadow modeling, limited coverage considerations
Speed Anomalies	• Use CAI and crowdsource data to confirm typical and maximum speeds in expected ranges	• Use CAI and crowdsource data to confirm typical and maximum speeds in expected ranges • Monitor expansion from DOCSIS 2 to 3	• Use CAI and crowdsource data to confirm typical and maximum speeds in expected ranges	• Use CAI and crowdsource data to confirm typical and maximum speeds in expected ranges	• Use CAI and crowdsource data to confirm typical and maximum speeds in expected ranges • Fiber speeds readily provisioned upward by DWDM over time	• Use CAI and crowdsource data to confirm typical and maximum speeds in expected ranges
Technology Anomalies	• Most likely to be “confused” with fiber delivery overlays	• Possible to be “confused” with fiber delivery overlays claimed to be direct customer connected	• Claimed upgrades &/or delivery protocols planned but not yet in place	• TBD	• Possibly to be “confused” with Wireline or Cable delivery overlays	• Not anticipated
Threshold of Concern/Action	• TBD	• TBD	• TBD	• TBD	• TBD	• TBD
Verification Schedule	• Annually if expansion of coverage areas or increases in speeds claimed	• Annually if expansion of coverage areas or increases in speeds claimed	• Biannually with expected dynamic expansion of coverage areas &/or increases in speeds claimed	• Annually if expansion of coverage areas or increases in speeds claimed	• Annually if expansion of coverage areas or increases in speeds claimed	• Review crowdsource and CAI data annually for general trends & confirming any speed increases