

OFFICIAL OCTOBER 2013 UPDATE SUBMISSION TO  
THE NATIONAL TELECOMMUNICATIONS AND INFORMATION  
ADMINISTRATION UNDER THE  
STATE BROADBAND INITIATIVE GRANT PROGRAM FOR THE  
STATE OF SOUTH CAROLINA

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October 1, 2013

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October 1, 2013

Ms. Anne W. Neville  
SBI Grant Program Director  
National Telecommunications and Information Administration  
U.S. Department of Commerce  
Room 4716  
1401 Constitution Avenue, NW  
Washington, DC 20230

Dear Ms. Neville:

Connected Nation, in cooperation with South Carolina's broadband provider community, our state-based partners, and the Office of the Governor and the Division of State Information Technology, is pleased to present this submittal of the state of South Carolina's State Broadband Initiative (SBI) Grant Program, known as Connect South Carolina.

Truly, now more than ever, the significance of complete and validated data through this effort is impacting lives in communities all across our great country. The Connect South Carolina program and its collective stakeholder community continue to be faithful and energized contributors, and we are proud to play such a part in forging the innovation economy of the twenty-first century.

The artifacts that comprise this submission should be found to be compliant with the October 1, 2013, deadline for the semi-annual data update and in accordance with the terms of the July 1, 2009, Notice of Funds Availability (NOFA) and all subsequent clarifications pertaining to delivery of state-level mapping of broadband service availability. This packet includes:

***Inventory of Deliverables, Connect South Carolina: October 1, 2013***

<u>NOFA Requirement</u>	<u>Data Transfer Model</u>	<u>Data Description</u>
Appendix A: 1(a)(i)	BB_Service_CensusBlock	Broadband Service Availability of Facilities-Based Providers in Census Blocks of No Greater Than Two Square Miles in Area
Appendix A: 1(a)(ii)	BB_Service_RoadSegment	Broadband Service Availability of Facilities-Based Providers by Road Segment in Census Blocks Larger in Area Than Two Square Miles
Appendix A: 1(b)	BB_Service_Wireless	Broadband Service Availability of Wireless Services Not Provided to a Specific Address

Appendix A: 3(b)	BB_ConnectionPoint_MiddleMile	Broadband Service Infrastructure Middle-Mile and Backbone Interconnection Points
Appendix A: 4	BB_Service_CAInstitutions	Community Anchor Institutions- Listing
Appendix A: 4	n/a	Community Anchor Institutions- Narratives
VII.A.1(a) n/a	n/a DataPackage.xlsx	Accuracy and Verification Report Worksheets of Contact Information, Record Count, and Provider Summary Table
n/a	n/a	List of Changes and Corrections to the Dataset
n/a	n/a	Broadband Provider Roster and Participation Status

In addition, this data update submission should be found to be compliant with the additional program requirements instituted by the National Telecommunications and Information Administration since the time of the April 2013 SBI data submission for the Connect South Carolina program. Specifically, these new requirements are:

### **SBI Data Transfer Model**

The submission of the broadband dataset for October 1, 2013, is contained within the SBI Data Transfer Model as provided to SBI Grantees on June 26, 2013. All efforts have been made to comply with formatting, domain, and metadata requirements to include as much information on each provider as possible.

### **Additional Submission Guidance**

On July 8, 2013, the program office released an “unknown broadband speeds” report on school and library Community Anchor Institutions (CAI), identifying the percentage of those CAI types that are missing subscribed download speed data or the federal ID code (CAI ID). The distributed list generated much excitement and support from staff as well as state leaders committed to improving CAI numbers universally. This October 2013 submission has seen an increase in the number of federal ID codes reported.

In collecting broadband service area datasets for inclusion on the National Broadband Map, this October 2013 submission includes business/commercial broadband service areas in addition to the residential datasets that have been collected for the SBI program. Following guidance from the program office, the end user category appropriately delineates the differences in residential service area, business service areas, and combination residential/business service areas. Further, all contacted providers were asked if they provide broadband services to business customer within their existing coverage areas and, if so, this information was noted.

This October 2013 semi-annual data update under the SBI Grant Program continues to demonstrate our dedication to implementing the joint purposes of the Recovery Act and the Broadband Data Improvement Act (BDIA) by gathering comprehensive and accurate state-level broadband mapping data, developing state-level broadband maps, aiding in the development and maintenance of the National Broadband Map, and undertaking statewide initiatives for broadband planning.

### ***Broadband Service Availability — Provider Outreach and Verification***

This data update submission under the SBI program includes datasets for 97.83 percent of the South Carolina provider community, or 45 of 46 total providers. Of the 45 participating providers, 23 supplied an update to their network or coverage area(s), while 18 have reported no change. The remaining 4 represent providers who previously supplied data but were non-responsive in the October 2013 update effort; therefore, their previous dataset is being put forward as part of this compilation. A complete roster by provider depicting participation status and contact history is contained herein. The 1 provider that is not represented in the attached datasets was non-responsive to multiple contact attempts.

New to this October 2013 submission is reporting on the number of business/commercial providers included in the broadband datasets. Of the 45 residential providers represented in the above section, 13 are providers that do not distinguish between serving primarily residential or primarily non-residential users (end user category 5). Two business-only providers (end user category 2) are also included in this submission.

As the aforementioned roster and attached methodology documentation will attest, it is the collective opinion of the Connect South Carolina principals that all commercially reasonable efforts were made to account for 100 percent of the known South Carolina broadband provider community, pursuant to this semi-annual data update submission.

Connect South Carolina has also continued to perform broadband verification activities through several means. In addition to confirmation of service area(s) by each provider, Connect South Carolina conducts field validation efforts. To date, 44 (95.65 percent) providers have been validated through field verification activities. Additional details on verification activities are contained within the Field Validation Methodology.

The Connect South Carolina website ([www.connectsc.org](http://www.connectsc.org)) continues to serve a prominent role in the outreach and data collection effort. This program asset provides a way for the general public to participate in the process by offering interactive tools for users to test their connection speed, submit broadband inquiries, or contact a program representative.

As an indicator of stakeholder penetration, the Connect South Carolina website encountered 4,517 unique visits during this reporting period (23,865 total to date for the life of the grant awarded on December 20, 2009). Additionally, this pronounced Web activity netted 7 broadband inquiries over this same reporting period (151 grant inception to date). The website also provides access to the My ConnectView™ interactive mapping application, which allows consumers and broadband providers

to confirm or dispute the coverage represented on the broadband inventory map. These consumer-initiated actions are facilitated through the Connect South Carolina website and the Connect South Carolina interactive mapping tool (My ConnectView™) that offer the stakeholders the vehicles to provide information regarding availability in their respective service area, either in affirmation or contest of the reported data represented in the Connect South Carolina mapping artifacts. Since the initial data collection and release of corresponding maps, feedback in the form of broadband inquiries has allowed Connect South Carolina to identify additional areas that are in need of field validation, which is scheduled as soon as possible.

### ***Community Anchor Institutions***

Connect South Carolina remains committed to gathering data regarding the location and broadband connectivity of Community Anchor Institutions in accordance with the data requirements of the SBI NOFA Technical Appendix. The increased CAI data collection can be directly attributed to the “unknown broadband speeds” report received from the NTIA earlier this year. Multiple agencies and leaders have taken the opportunity to recommit to CAI data collection, reiterating the importance of a relationship-oriented approach with state-level agencies and organizations that generates more responses than local outreach.

Outreach was conducted during this data update reporting period by Connect South Carolina to continue identification of existing, centralized sources for CAI connectivity data. Additionally, outreach was coordinated to distribute the CAI survey to institutions throughout the state through multiple methods including a customized online survey available on the Connect South Carolina website. Building on the success of past campaigns to generate excitement about CAI outreach, research, and mapping, there have been two campaigns conducted since the previous NTIA data submission: Digital Learning (May 2013) and Education (August 2013). Connect South Carolina has strengthened existing relationships with statewide associations to promote the importance of broadband connectivity at anchor institutions and participation in this data collection process. The value of these relationships continues to impact the entire success of the Grant Program, and the CAI engagement is a logical extension of new and existing relationships. Connect South Carolina will continue to expand on these relationships over the coming months and utilize its contacts throughout the state to collect data and raise awareness of this project.

From our work in South Carolina, as well as other states, we recognize the great value of this data to future collaboration efforts within the state as well as its value to the National Broadband Map. We plan to continue to bring best practices to the Connect South Carolina efforts, along with an investment of both human and technical resources required to reach our goal of increasing the data that is secured and reported as part of this process.

The Connect South Carolina program exists to improve data on the deployment and adoption of broadband services and to assist in the extension of broadband technology across all regions of the great state of South Carolina, as well as the United States and its territories through contribution to the National Broadband Map. We look forward to the continuing work ahead and improving upon our data collection methods.

Respectfully submitted,

A handwritten signature in blue ink, appearing to read "Tom Ferree".

Thomas W. Ferree  
President and Chief Operating Officer  
Connected Nation, Inc.

## **SOUTH CAROLINA COMMUNITY ANCHOR INSTITUTIONS METHODOLOGY**

Connect South Carolina remains committed to working with South Carolina to gather data on the location and broadband connectivity of Community Anchor Institutions (CAI), in accordance with the data requirements of the SBI NOFA Technical Appendix. This commitment was further strengthened by the encouragement of NTIA to improve data numbers specifically in the K-12 school and library sectors. This encouragement translated very well with the state client as well as K-12 school and library points of contact. The impact will be seen in this submission as well as the upcoming April 2014 submission.

In addition to the encouragement from NTIA, Connect South Carolina continues to promote sector-specific campaigns every quarter. Information received from these campaign outreaches is processed and compiled with all currently collected CAI data. Physical address information continues to be augmented through manual sourcing and geocoded by Connect South Carolina through Esri ArcGIS software.

Connect South Carolina continues to utilize a customized online survey hosted through SurveyMonkey, with a landing page on the Connect South Carolina website that was developed during the first reporting period. This survey, in combination with a customized data-gathering spreadsheet, was distributed on a regular basis to a targeted list of CAI throughout the state as well as organizations and agencies that work closely with the CAI. The distributions were completed with the support of the state client. Connect South Carolina will continue to use these data-gathering tools for future targeted outreach efforts throughout the coming months leading up to the next reporting period. These materials are customized to fit the CAI categories as defined in the SBI NOFA.

The survey can be accessed at this link: <http://www.surveymonkey.com/s/RJH5DMW>.

Connect South Carolina realizes the value of key relationships, new and old, to promote the importance of broadband connectivity at Community Anchor Institutions and participation in this data collection process. It is apparent that these relationships are beneficial to the entire success of the grant program, and the CAI engagement is a logical extension of new and existing relationships. Connect South Carolina will continue to build upon these relationships over the coming months and utilize its contacts throughout the state to collect data and raise awareness of this project.

In addition to fostering and building relationships with state agencies, associations, and organizations, Connect South Carolina has also developed a sector-specific calendar that supports CAI outreach as well as research and communications efforts. This focused approach allows a corporate commitment to capturing CAI data in addition to developing meaningful sector-specific content. Since the April 2013 submission, the sector-specific approach included two month-long campaigns: Digital Literacy (May 2013) and Education (September 2013). During these campaigns, Connect South Carolina committed to engage key stakeholders to educate them about the importance of our CAI data gathering efforts, distribute survey requests to sector representatives to gather CAI information, and provide campaign-specific education through communications and webinar resources. Continued outreach to and survey of schools, libraries, hospitals, local law

enforcement, and fire stations helps build awareness and establishes a centralized database of key connectivity data for planning.

Connect South Carolina conducts significant research as part of an ongoing process to identify existing, centralized sources for CAI connectivity data. In tandem with these efforts to identify existing data, Connect South Carolina continues to identify key CAI contacts in an effort to distribute and promote the online survey and raise awareness of the importance of CAI broadband connectivity. Also, when possible, Connect South Carolina works to identify existing relationships that can support CAI outreach.

Connect South Carolina has an ongoing mission to educate CAI throughout the state on the importance of participating in the project. Participation by these institutions will raise awareness about the importance of broadband connectivity and the need to report the requested data for inclusion on the National Broadband Map.

The greatest challenge with collecting CAI data continues to be educating the CAI about the Connect South Carolina project as well as self-awareness of their own broadband connectivity (specifically upload and download speeds). Connect South Carolina will continue to research key CAI organizations and agency contacts in an effort to raise awareness of this project among CAI.

A CAI summary of all processed and submitted data is provided below:

CAI Type	Total	Physical Address	Lat/Long	Technology of Transmission	Download Speed	Upload Speed
<b>K-12 Schools</b>	1,759	1,759	1,759	1,099	1,098	1,098
<b>Libraries</b>	278	278	278	182	181	181
<b>Healthcare</b>	296	296	296	199	200	200
<b>Public Safety</b>	793	793	792	336	310	309
<b>Higher Ed Institutions</b>	232	232	232	139	137	137
<b>Other Government</b>	944	944	943	865	864	864
<b>Other Non-Government</b>	98	98	98	86	86	85
<b>Total</b>	4,400	4,400	4,398	2,906	2,876	2,874

Additionally, efforts were made to increase the number of CAI IDs, or federal ID codes, submitted for K-12 school and library records. The K-12 schools now have 87.61% of the CAI IDs accounted for in the records, an increase of 492 since the April 2013 submission. Library records now have 82.01% of the CAI IDs accounted for in the records, an increase of 65 since the April 2013 submission; additional work will be completed prior to the April 2014 submission to further increase the number of CAI IDs submitted.

During the coming months, CAI data collection will be supported by regular reporting to the Connect South Carolina team. The CAI data is proving an invaluable resource to all components of the Connect South Carolina effort. The data identifies potential local champions, sector trends, and

opportunities for improvement as well as opportunities to educate CAI not familiar with their current connectivity.

## SBI DATA SUBMISSION METHODOLOGY

The submission of the broadband dataset for October 1, 2013, is contained within the SBI Data Transfer Model and additional components as provided to SBI Grantees on June 26, 2013.

Connected Nation (CN) has reviewed all literature that relates to the release and use of this data transfer model and recognizes that it does not replace or dictate how data is stored, processed, or displayed for the state, as it is meant primarily as a means to transfer the broadband data from all states and territories and populate the National Broadband Map in a seamless fashion.

Connected Nation has complied with the following guidance documents published by NTIA:

- Technical Mapping Guide, as released on the Grantee Workspace on March 24, 2011, was followed to ensure the completeness and validity of the submission through completion steps and checklists, completing the DataPackage spreadsheet, uploading broadband datasets into the Data Transfer Model, and checking the dataset using the SBDD\_CheckSubmission receipt process.
- Naming Conventions and Category of End User, as released on the Grantee Workspace on March 26, 2012, was followed to ensure the consistency of individual file and zip package naming.
- Wireless Data Processing Guidance, as sent to SBI grantees on February 8, 2013, was followed to ensure that all fixed and mobile wireless provider coverage records are submitted to NTIA as separate, closed polygons whenever there is a variation in any of the required fields.

In addition to the methodologies contained herein, the Changes and Corrections documentation, as well as the DataPackage.xls containing contact information, the data dictionary, and a provider summary table, the following feature classes are submitted within the SBI Data Transfer Model for the state of South Carolina.

### *Inventory of Deliverables, Connect South Carolina: October 1, 2013*

<u>NOFA Requirement</u>	<u>Data Transfer Model</u>	<u>Data Description</u>
Appendix A: 1(a)(i)	BB_Service_CensusBlock	Broadband Service Availability of Facilities-Based Providers in Census Blocks of No Greater Than Two Square Miles in Area.
Appendix A: 1(a)(ii)	BB_Service_RoadSegment	Broadband Service Availability of Facilities-Based Providers by Road Segment in Census Blocks Larger in Area Than Two Square Miles.
Appendix A: 1(b)	BB_Service_Wireless	Broadband Service Availability of Wireless Services Not Provided to a Specific Address.

Appendix A: 3(b)	BB_ConnectionPoint_MiddleMile	Broadband Service Infrastructure Middle-Mile and Backbone Interconnection Points.
Appendix A: 4	BB_Service_CAIstitutions	Community Anchor Institutions-Listing.

The provider data collected by CN on behalf of the state of South Carolina have been formatted per the given specifications and uploaded into the appropriate feature classes of the SBI Data Transfer Model. Wireline availability is contained within census blocks and road segments, wireless availability is contained as polygons of coverage areas, and middle-mile connections and Community Anchor Institutions are contained as point data. All speed data is contained at the census block, road segment, or wireless polygon level of availability. All efforts have been made to comply with formatting, domain, and metadata requirements to include as much information as possible.

In collecting broadband service area datasets for inclusion on the National Broadband Map, this October 2013 submission includes business/commercial broadband service areas in addition to the residential datasets that have been collected for the SBI program. Following guidance from the program office, the end user category appropriately delineates the differences in residential service area, business service areas, and combination residential/business service areas.

Connected Nation has continued outreach to satellite providers on their availability, technology, and speed information, but granular coverage is not yet available. Submitted within the wireless feature class are the satellite companies providing service to South Carolina as a polygon of the state boundary. Efforts will continue to collect, process, or otherwise create more granular satellite data based on availability analyses and guidance received from NTIA. Process development continues as well to be able to create more granular satellite coverage based on satellite equipment positioning and geographic inputs; more granular satellite service areas should appear in the April 2014 submission.

## DATASETS FOR IN-KIND MATCH

Connect South Carolina received in-kind match contributions to assist with SBI mapping goals which have been beneficial to the program in the following ways:

Connect South Carolina received a Community Anchor Institution (CAI) connectivity information dataset for a variety of institution types including higher education, state and local governments, public safety, and more from the South Carolina Budget and Control Board - Department of State Information Technology as part of an in-kind match contribution to Connect South Carolina - \$107,548.

Connect South Carolina received a CAI dataset for schools and libraries from the South Carolina Budget and Control Board - Department of State Information Technology as part of an in-kind match contribution to Connect South Carolina - \$71,232.

## SOUTH CAROLINA FIELD VALIDATION METHODOLOGY

CN focused a portion of its time on specific validation processes such as:

- conducting random spectrum analysis studies throughout the state using an Avcom PSA-37-XP spectrum analyzer;
- conducting mobile speed tests throughout the state using an iPhone, Android (or other smart phone) as well as provider-specific aircards (Sprint 3G/4G, Clearwire et al);
- identifying pre-selected, provider-submitted wireless transmit tower sites and cross-referencing data about that tower against the Federal Communications Commission (FCC) databases such as Antenna Structure Registration and/or the Universal Licensing System;
- cross-referencing Federal Registration Number data against available FCC Form 477 data as well as the FCC **CO**mmission **RE**gistration **S**ystem (CORES);
- validating provider submitted data (for example: latitude/longitude) using a handheld Garmin eTrex Summit GPS unit or GPS enabled software such as Microsoft *Streets & Trips*;
- locating physical wire-line attributes (such as Central Offices, Remote Terminals, CATV plant, etc.) and comparing them against provider submitted data; and
- conducting on-net and off-net speed tests using the FCC portal at <http://www.broadband.gov/qualitytest/about/> or using the Ookla Net Metrics enabled speed test utility located on each of CN's program specific websites.

Additionally, CN cross-referenced numerous public documents in order to ensure that all known broadband providers were located and contacted. This included searching membership logs from trade associations (WISPA, WCAI, PCIA, etc.), the Cable Television Fact Book, Public Utility Commission records, Public Service Commission records, Chamber of Commerce, etc.

To date, Connected Nation's staff conducted on-site validation tests in South Carolina on the following providers: AT&T; Atlantic Broadband; CenturyLink; Charter Communications; Chesnee Telephone Company; Chester Telephone Company (d.b.a. Fairfield Communications); Clearwire Corporation; Comcast; Countrywide Wireless; Electronics Service Company of Hamlet LLC; Family View Cable; Farmers Telephone Cooperative Inc. (d.b.a. FTC Communications); Frontier Communications of the Carolinas; Hargray Communications Group; Harron Communications (d.b.a. MetroCast); Home Telephone Company Inc.; Horry Telephone Cooperative Inc.; Hughes Network; Northland Communications Corporation; NtInet Inc.; Palmetto Rural Telephone (d.b.a. Low Country); Pee Dee Online; PRT Communications; Rock Hill Telephone Company (d.b.a. Comporium Communications), PBT Communications, and Fort Mill Telephone Company); Sandhill Telephone Cooperative; SkyRunner; Southern Coastal Cable; Sprint; TDS Telecom; Time Warner Cable Inc.; T-Mobile; tw telecom; US Cellular; Verizon South Inc.; ViaSat; West Carolina Telephone; Wide Open West (formerly d.b.a. Knology); and Windstream;

From program initiation through this reporting period, CN has completed in-the-field validation testing against 44 companies (out of a universe of 46 viable providers) totaling 95.65 percent within the state of South Carolina.

CN has also continued to review provider datasets for accurate speed information, platform listings, and other intricacies that may fall outside of the standard SBI Data Transfer Model parameters, as included with the submission materials provided to grantees on June 26, 2013. Any providers whose submitted coverage and attributes are anticipated to come into question have been further reviewed and confirmed; details on a case-by-case basis are presented below.

#### **Comcast Cable Communications, LLC**

Issue: Technology of transmission code 40 with maximum advertised download speed in tier 8, lower than expected value range for the technology; also technology of transmission code 41 with maximum advertised download speed in tier 8, higher than expected value range for the technology.  
Resolution: Confirmed use of DOCSIS 3.0 with speed tier 8; speeds are kept lower to be backwards compatible. Other areas using less than DOCSIS 3.0 were upgraded from speed tier 7 to 8.

#### **Home Telephone Company (Berkley Cable Television and Home Telephone Company)**

Issue: Technology of transmission code 41 with maximum advertised download speed in tier 10, higher than expected value range for the technology.  
Resolution: Provider website advertises up to 110 Mbps service; screenshot below.



#### **Horry Telephone Cooperative, Inc.**

Issue: Technology of transmission code 41 with maximum advertised download speed in tier 9, higher than expected value range for the technology.  
Resolution: Provider website advertises 50 Mbps service; screenshot below.

**Northland Communications Corp.**

Issue: Technology of transmission code 40 with maximum advertised download speed in tier 7, lower than expected value range for the technology.

Resolution: Provider website advertises up to 24 Mbps service; screenshot below.

	Downward Speed	Up to Upload Speed	Single Product Price	Multiple Product Price	Promotional Price
Promo Price 1st 6 months Available ONLY to Multiple Product Customers*					
LITE	1 Mbps	1 Mbps	\$32.95	\$24.95	\$16.95
STANDARD	10 Mbps	1 Mbps	\$49.95	\$44.95	\$28.95
PREMIUM	20 Mbps	2 Mbps	\$59.95	\$54.95	\$38.95
ULTRA	30 Mbps	5 Mbps	\$79.95	\$69.95	\$48.95
ELITE	50 Mbps	5 Mbps	\$99.95	\$89.95	\$68.95
HTC Bluewave - Standard**	10 Mbps	10 Mbps	\$49.95	\$44.95	\$28.95
HTC Bluewave - Premium**	20 Mbps	10 Mbps	\$59.95	\$54.95	\$38.95
HTC Bluewave - Ultra**	30 Mbps	10 Mbps	\$79.95	\$69.95	\$48.95
HTC Bluewave - Elite**	50 Mbps	10 Mbps	\$99.95	\$89.95	\$68.95

\*\*Selected areas only.

# Northland Internet Service

**It's Turbo fast with speeds up to 24 Mbps!**

We are proud to announce that we have made significant upgrades to our advanced fiber optic infrastructure, allowing us to provide even faster Internet service! We'd like to invite you to experience the Internet in a whole new way with Northland's Internet Service!

## CONNECTED NATION SATELLITE BROADBAND FIELD TESTING REPORT

Connected Nation's Engineering and Technical Services (ETS) team has two main objectives in validating a provider's broadband service: 1) confirm the provider's presence in the target testing area, and 2) confirm that the provider's Internet service meets or exceeds the required minimum broadband speed.

Over the past three years, attempts to use any of our tailored validation techniques for satellite validation proved futile as the basic tools for validating other platforms do not exist for satellite. For example, residential satellite equipment for broadband is difficult to distinguish from satellite video gear as viewed from the street. Further, a satellite installer can serve several counties, and may not have a retail presence. As a result, confirming the presence of a specific satellite provider in any targeted community has been challenging. In trying to confirm broadband speeds, historically slow speeds and high latency on the satellite services have also prevented this level of validation.

The ETS team recently devised an approach to confirm both presence and speed by deepening the desk-top research in advance of field validation and leveraging CN's rich database of broadband inquiries. Connected Nation has received thousands of inquiries from consumers seeking broadband service alternatives. Scores of those inquiries come from consumers currently accessing the Internet at home with satellite service. By enlisting the help of those consumers to test their satellite service through the CN state websites, the ETS team created a process to both verify the presence of specific providers at specific locations (the consumers' addresses), and obtain speed test results for validating broadband speeds.

ETS team members identified all broadband inquiries received in the state of South Carolina in which the consumer identified himself or herself as a satellite customer. An e-mail was sent to all relevant consumers requesting that they visit the Connect South Carolina website and perform a speed test using their home satellite service. By placing a deadline of 24 hours in which to perform the test, CN was able to obtain the test results for the website during that test period, cross-check the noted names and addresses on the tests against the inquiry list, and filter out all other tests unrelated to satellite service. See Appendix B for the complete report and test results on this validation methodology.

## **PROVIDER VALIDATION METHODOLOGY**

Broadband providers maintain their service area data in many different formats, all in varying levels of complexity and granularity. In order to ensure that the data required by the NTIA is standardized across all providers and that it is as accurate as possible, CN translates and formats the data that providers are able to supply into a GIS shapefile and produces maps for the provider to review. The resulting map(s) and review process allow for providers to see their service area in a geographic format – for some providers, this is the first time they have seen maps of their broadband service area. Having the mapped service area allows providers to quickly identify any issues that appear in the data representation, whether the issue is in the data translation into a GIS format or from the original data collection and submission. Often data is provided from various sources and through the review and revision process, local engineers who operate the networks and work in the field are able to ensure that the tabular data that has been submitted is accurate and represents the real-world network extent. Any issues in how the service area is represented on the map(s) are remedied by CN, whether they are additions, removal of service, or any other revisions. Revised maps of service area representations are sent to the provider for review and approval; CN will revise data and return maps as many times as necessary until the provider is in agreement that the map represents their service area as accurately as possible. Once the review process has been completed and final approval of the data is provided, the data is deemed ready for NTIA submission. However, if approval is not received from a provider in time for the submission, but CN believes the new/updated service area to be accurate, then the coverage will be submitted to NTIA without final provider approval with a note regarding the situation made in the provider log.

Once the data collection has been aggregated at a statewide level, static maps of statewide and county-level availability are produced and made publicly available. In addition, consumers can visit the interactive online tool, My ConnectView, to create customized views of broadband service areas

and analyze corresponding demographic information. Leveraging broadband service data on various platforms allows for public users, providers, and other stakeholders to review, scrutinize, and provide feedback on the represented data. This feedback becomes a validation method in itself, as consumers submit inquiries to CN either affirming where service is not available or identifying areas where broadband service is shown on the map, but in actuality is not available. This allows for a follow-up to providers regarding revisions to the data as it is represented; it also allows for CN to identify locations where on-site visits may be necessary to complete field validation of available services. Public feedback on all forms of mapping products serves as a localized validation method for provider-supplied information and allows CN to resolve inaccuracies as they are identified to ensure that only the highest quality information is provided to stakeholders.

Estimates derived from provider-validated data indicate that approximately 3.04 percent of South Carolina households do not have terrestrial fixed broadband service available, and approximately 0.08 percent of South Carolina households have neither mobile nor fixed broadband service available.

Within rural areas of the state, results derived from provider-validated data indicate that approximately 3.95 percent of rural South Carolina households do not have terrestrial fixed broadband service available, and approximately 0.10 percent of rural South Carolina households have neither mobile nor fixed broadband service available. Please note that the availability estimates presented are based on Census 2010 household information.

The estimates above, in accordance with NTIA's definition of available broadband service as specified in the SBI NOFA, include broadband service with download speeds of at least 768 Kbps and upload speeds greater than 200 Kbps.

In addition, due to the nature of the SBI data collection methodology as defined by the NTIA and based on both census block geographic units and street segment data, the estimates of broadband availability derived from provider-validated data may include an overstatement of the actual number of households with broadband availability. Under the census block-based data collection method, a provider will typically report broadband availability for an entire census block whether its network is present across the whole or only a subset of that census block. This potential overestimation at the census block level can be amplified as the data is aggregated across the entire state.

## WIRELESS METHODOLOGY

### Broadband Service Availability in Provider's Service Area Wireless Services Not Provided to a Specific Address

Data solicited from a fixed wireless provider to create propagation models include, but are not limited to:

1. The name of the structure.
2. Whether the transmitting device is operational or proposed.
3. The maximum advertised downstream speed, the maximum advertised upstream speed.
4. The typical downstream speed, the typical upstream speed (peak periods for both).
5. The frequency range of spectrum being used (as prescribed by NTIA). This may include (but is not limited to) spectrum authorizations identified within the Federal Communications Commission (FCC) Universal Licensing System (ULS) database or located on the FCC's Spectrum Dashboard.
6. The primary population center(s) being served (for geopolitical boundary reference).
7. The physical address of the transmit site (in the event latitude/longitude is unavailable from the provider this allows a quick reference point for geocoding).
8. Latitude in either Degrees, Minutes, and Seconds and/or in Decimal Degrees (typically received as NAD 27 or NAD 83).
9. Longitude in either Degrees, Minutes and Seconds and/or in Decimal Degrees (typically received as NAD 27 or NAD 83).
10. Antenna pattern (e.g. omnidirectional, 180°, 120°, 90°, etc.).
11. Azimuth of antenna (e.g. 360° with magnetic declination if known).
12. Approximate transmit radius (in feet, miles, or kilometers).
13. Polarity of transmit antenna (Vertical or Horizontal).
14. Transmit antenna gain (in dBi).
15. Line loss (applicable only to providers using coax, heliax, waveguide or other forms of cabling – excludes power-over-Ethernet devices).
16. Mechanical and/or Electrical beam tilt (if applicable).
17. Equipment Manufacturer (allows easy cross-reference against manufacturer's specification sheet).
18. Power output of the transmitting device (if unknown, FCC standards or manufacturer specifications are applied).
19. AMSL at base of tower site.
20. Antenna centerline AGL (height of antenna above ground level measured at the centerline of the actual antenna).
21. Foliage factors (Evergreens/Deciduous and percent of ground cover).
22. Ground Clutter (primarily used in rural areas to account for foliage and in metropolitan areas to account for types and heights of buildings if known).
23. Average gain of receive antenna.

24. Receive antenna is estimated at height above average terrain (HAAT) of 6.2 meters/20 feet.
25. Federal Registration Numbers (if applicable) which may allow opportunities to cross-reference and/or obtain additional data from the FCC's ULS and the **CO**mmission **RE**gistration System.

Propagation modeling combines scientific data and empirical mathematical formulation for the characterization of radio wave propagation as a function of frequency, distance, and other conditions. Propagation software(s) typically use the Irregular Terrain Model (also known as Longley-Rice) of radio propagation for frequencies between 20 MHz and 20 GHz. This model is based on electromagnetic theory and statistical analyses of the combination of terrain features and radio measurements, then predicting the median attenuation of a radio signal as a function of distance and the variability of the signal in time and in space. For metropolitan areas, the software can typically be adjusted to use the Okumura-Hata model, which accounts for predicting the behavior of cellular transmissions in areas where buildings are the primary obstructions. The resulting product from either model depicts a graphical illustration of the theoretical propagation characteristics of a selected frequency range based on defined variables (receiver sensitivity of the home/mobile device, foliage factor, and digital elevation terrain input).

After converting propagation models into a geospatial format, additional processing is completed to remove the small pixels representing service present in the resulting dataset. These areas are initially created based on the parameters entered in the software from the provider equipment information, the underlying data parameters of elevation, hill shade, etc., and the limitations of the software itself to display a broadband service area as accurately as possible. Generally, these random pixel striations appear as a result of signal levels reaching the highest elevated points within the prescribed radius. Typically, while this pixilation anomaly shows legitimate areas where signals can be received, these highly elevated points may have exceedingly sparse populations or are entirely void of population. As a result, and congruent to the *Wireless Technology Methodologies and Business Logic* white paper submitted to NTIA on January 20, 2011, all independent pixels representing service that are less than 0.125 square miles in area have been removed from the geospatial representation of each wireless provider.

## BROADBAND INQUIRIES METHODOLOGY

CN collects consumer feedback in the form of broadband inquiries (BBIs). These inquiries represent any type of communication received from the public regarding broadband service. Once BBIs are received across the state, this information is overlaid with the broadband availability information which was collected through the SBI program. This allows for a real-world comparison of the broadband landscape to the information received from broadband inquiries. Consumers submitting these inbound comments and/or inquiries are able to provide information regarding five categories: 1) residents who do not have broadband but want it; 2) residents who have broadband but want a different provider; 3) residents who do not have broadband, but the broadband inventory maps

indicate that they do; 4) residents who have broadband but want a faster connection speed; and 5) residents who have broadband but want a less expensive service option.

BBIs are submitted frequently by consumers via the Connect South Carolina website. Inquiries often seek help to identify local broadband provider options, or to learn when a specific provider may be able to provide service to that consumer. Consumer comments also provide information which may help modify maps with actual service area information. The primary objectives of CN regarding these inquiries are 1) to improve the accuracy of the state maps with submitted consumer information and follow-up field research; 2) to provide broadband options to consumers through cooperation with mapped providers and by facilitating new broadband service options; and 3) to map and analyze information from consumers about areas of unmet broadband demand and alternatives to currently mapped services. A prime example of the second option is the utilization of the Rural Utility Service satellite eligibility tool. By simply entering the consumer's address, the CN engineer can quickly determine if the consumer meets the initial qualification status for BIP satellite subsidies.

New BBIs are assigned to either the GIS department or the Engineering & Technical Services (ETS) team depending on the category entered by the consumer on the website submission form. The GIS or ETS team members respond to each inquiry according to the information entered by the consumer. Many BBIs can be resolved through desktop research; however, if a BBI requires research in the field, the assigned ETS team member conducts such research when performing field validations in the area of the inquiry, or at another such time as is practical and appropriate. GIS and ETS team members respond to and conclude BBIs via telephone contact and/or e-mail communication.

The broadband inquiry process has been implemented in each of the CN state programs with successful results. Altogether CN has received over 18,996 broadband inquiries since 2007, allowing the state programs to evaluate each inquiry for broadband demand and data verification. These inquiries are continuously examined against current broadband availability, updated every six months, to determine if previously unserved households have been expanded to and can now receive broadband at their residence. This database of broadband inquiries has also allowed the CN state programs to aggregate demand in concentrated areas to show providers the exact locations where the population has made it clear that they would purchase broadband if it was made available to them. Providers in the states have responded to this process and have expanded to areas knowing that their investment will be worthwhile. Data verification methods have also proven successful, as the state programs have been able to show those inquiries that indicate the broadband service areas are misrepresented on the map to providers, who then verify where service cannot reach in regard to that residence(s). The broadband coverage in these states has been altered to create a more accurate map based on the inquiries submitted by the public.

During this reporting period, the Connect South Carolina project has received a total of 7 inquiries (151 grant inception to date). As more inquiries are submitted to Connect South Carolina, a more thorough validation of the broadband landscape can be performed, while also allowing providers to see which areas have a high demand for broadband adoption.

## **MY CONNECTVIEW METHODOLOGY**

My ConnectView is an interactive online mapping tool for viewing, analyzing, and validating broadband data. Developed using Esri's ArcGIS for Server and Adobe's Flex Framework and hosted and maintained by Connected Nation, My ConnectView is a multi-functional, user-friendly way for local leaders, policymakers, consumers, and technology providers to devise a plan for the expansion and adoption of broadband.

First and foremost, My ConnectView allows consumers to locate their residence and identify providers that offer broadband Internet service to that location. The interactive platform allows for users to build and evaluate broadband expansion scenarios using a wealth of data, including several coverage analysis layers, speed analyses, Community Anchor Institutions, and tools to search and export household demographic information, as well as extract data in GIS, spreadsheet, and/or PDF formats.

My ConnectView also features more interactive data layers and additional tools than ever before to allow the consumer to explore the broadband data. My ConnectView provides consumers with the ability to print, e-mail, and provide feedback on the broadband data displayed on the interactive map. Through the collection of this feedback, a visual demand for broadband is presented. This visualization allows the CN state programs the ability to validate the broadband availability for accuracy. If residents within a region state they are without broadband, but the interactive map shows otherwise, this allows CN to approach the providers within that area in an effort to trim down their coverage to more accurately represent real-world availability on the ground.

The Connect South Carolina project launched My ConnectView on April 2, 2012, and has received 321 visits this reporting period; to date the interactive mapping application has received 8,011 visits.

## **SPEED TEST METHODOLOGY**

The 176 speed tests that are represented in the Connect South Carolina Speed Test Report during this reporting period (790 grant inception to date) are the result of a partnership between CN and Ookla Net Metrics. Utilizing this relationship increases the level of confidence in the data being collected and provides for a far greater sample size than could be collected by a single testing site.

Ookla owns and operates Speedtest.net, as well as develops and deploys speed tests, such as the Connect South Carolina speed test website, for partners around the world. This network of sites that is developed and run on its testing technology provides Ookla with a vast dataset that, due to the variability of geographic information collected across the varying speed test sites, is geocoded utilizing Geo-IP technology. This technology allows for tests to be geocoded to points of aggregation, typically larger nodes across provider networks. While there are hundreds of thousands of tests that have been conducted, the level of aggregation is only sufficient for county-level detail

due to the test results being located at these larger nodes and not at an absolute location for each speed test.

In an effort to validate broadband data from the Connect South Carolina project, speed test information is collected throughout the state. Speed tests provide speed information on the path taken through all networks (a provider’s network as well as additional networks) a local machine must connect to in order to reach the host test. The benefit of this collection of speed information is two-tiered. First, it allows for a comprehensive dataset of speeds, while also providing Connect South Carolina with the information on where broadband services are available. Second, unlike theoretical speed information which may be received through the data collection process, the use of speed tests provide real-world information on the speeds that currently exist within the state of South Carolina.

**PROVIDERS DEEMED NON-VIABLE**

The following list of companies represents the remainder of the broadband provider universe that was originally identified as complete for outreach to begin for the State Broadband Initiative. These providers are not included in the Data Package for the October 2013 submission because they have been deemed non-eligible under the parameters and guidance of the SBI grant program. This list of companies includes, but is not limited to: providers offering service but below the current definition of broadband, those that have gone out of business, technology consulting firms, infrastructure or network construction companies, non-facilities based general resellers that have not provided sufficient mapping information, etc.

	Company Name	URL	Comments
1	ACSinc.net	<a href="http://www.acsinc.net">www.acsinc.net</a>	This company does not provide residential Internet service.
2	Aero Networks	<a href="http://www.aeronetworks.net">www.aeronetworks.net</a>	This company does not provide Internet services in the state.
3	Aerolina Wireless Networks	<a href="http://www.aerolina.com">www.aerolina.com</a>	This company provides commercial services only.
4	Airespring, Inc.	<a href="http://www.airespring.com">www.airespring.com</a>	This company is a non-facilities-based reseller.
5	Airimba	n/a	This provider offers service to select MDUs.

6	Beyond Communications	<a href="http://www.discoverbeyond.com">www.discoverbeyond.com</a>	This provider offers service to select MDUs and HOAs, but not to public communities; non-responsive to multiple attempts.
7	Birch Communications	<a href="http://www.birch.com">www.birch.com</a>	This company does not provide residential Internet service.
8	Broadstar	<a href="http://www.broadstar.com">www.broadstar.com</a>	This provider offers service to select MDUs.
9	Broadview Networks Holdings, Inc.	<a href="http://www.broadviewnet.com">www.broadviewnet.com</a>	Non-facilities-based reseller to businesses.
10	Community Connect	<a href="http://www.vybrent.com">www.vybrent.com</a>	This company does not provide residential Internet services.
11	Contractdata.net	n/a	This company is out of business.
12	County of Oconee	<a href="http://www.oconeefocus.com">www.oconeefocus.com</a>	BIP recipient promotes the construction of a fiber optic broadband network in the county.
13	Digital Bridge	<a href="http://www.bridgemaxx.com">www.bridgemaxx.com</a>	This company does not provide Internet services in the state.
14	Genesis Telecommunications	<a href="http://www.genesistelcom.com">www.genesistelcom.com</a>	Dial-up services in Greenwood only.
15	Global Crossing Telecommunications, Inc.	<a href="http://www.globalcrossing.com">http://www.globalcrossing.com</a>	Acquired by another company.
16	Grand Strand Communications	n/a	This company is out of business.
17	Hickory Tech Corporation	<a href="http://www.enventis.com">www.enventis.com</a>	B2B services.
18	Hotwire Communications	<a href="http://www.gethotwired.com">www.gethotwired.com</a>	Offers residential service to one multi-dwelling unit.
19	LightEdge Solutions, Inc.	<a href="http://www.lightedge.com">www.lightedge.com</a>	Illinois provider; no service in SC.
20	Lightyear Network Solutions, LLC	<a href="http://www.lightyear.net">www.lightyear.net</a>	Non-facilities-based reseller.

21	Main Street Wireless	<a href="http://www.mainstreetsc.com">http://www.mainstreetsc.com</a>	Provider may no longer be in business.
22	MegaPath Inc.	<a href="http://www.megapath.com">www.megapath.com</a>	This company does not provide Internet services in the state.
23	Metropolitan Telecommunications Holding Company	<a href="http://www.mettel.net">www.mettel.net</a>	Non-facilities-based reseller of business services.
	Navacore Communications	<a href="http://www.navacore.net">www.navacore.net</a>	This company does not provide high-speed Internet; dial-up only.
24	Net Doctors	<a href="http://www.netmds.com">www.netmds.com</a>	This company does not offer high-speed Internet; dial-up only.
25	New Edge Network, Inc.	<a href="http://www.newedgenetworks.com">www.newedgenetworks.com</a>	Acquired by Earthlink. Company does not offer residential service; resells backhaul.
26	NuVox, Inc.	n/a	Acquired by another company.
27	Open Range Communications, Inc.	<a href="http://www.openrangecomm.com">http://www.openrangecomm.com</a>	No longer in business.
28	PAETEC Communications, Inc.	<a href="http://www.paetec.com/">http://www.paetec.com/</a>	Acquired by another company.
29	Pee Dee Net	n/a	This company does not provide residential Internet services.
30	Personally Complete	<a href="http://www.personallycomplete.com">www.personallycomplete.com</a>	This company does not provide Internet access.
31	Pine Tree Cablevision	<a href="http://www.ptc-me.net">www.ptc-me.net</a>	This company is out of business.
32	PM Broadband	<a href="http://www.pmcoll.com">www.pmcoll.com</a>	This company is out of business.
33	Qwest Communications Company, LLC	<a href="http://www.qwest.net">www.qwest.net</a>	Provider acquired by CenturyLink.
34	Shentel Converged Services, Inc.	<a href="http://www.shentel.com">www.shentel.com</a>	This company is a private cable provider serving a few campuses and related MDUs, but not public residences.

35	Techcore Consultants II	<a href="http://www.almega.com">www.almega.com</a>	This company is no longer in business in South Carolina.
36	TeleSouth Wireless	<a href="http://www.telesouth1.com">www.telesouth1.com</a>	The company appears to be out of business.
37	Telovations, Inc.	<a href="http://www.telovations.com">www.telovations.com</a>	This company does not provide residential Internet services.
38	Tri-County Electric	<a href="http://www.tri-countyelectric.net">www.tri-countyelectric.net</a>	This company does not provide residential Internet services.
39	University Corporation for Advanced Internet Development	<a href="http://www.internet2.edu">www.internet2.edu</a>	This consortium is a BIP/BTOP recipient with no Internet network.
40	WilTel Communications, LLC.	n/a	Acquired by Level 3.
41	WP Media	<a href="http://www.wpmedia.com">www.wpmedia.com</a>	This company is a consulting firm.
42	Zayo	<a href="http://www.zayo.com">www.zayo.com</a>	Not a broadband provider in this state.

**APPENDIX A: BROADBAND PROVIDER LOG**

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## Broadband Provider Log

Complete	102
Non-Responsive/Refused	1
In Progress	1
Reseller Providing Data	0
Count of Datasets by Status	104
Total Unique Providers Represented	46

Provider Name	Platform	Status	NDA Execution Date	Notes
AT&T Inc.	DSL	Data Added to Statewide Inventory	12/16/2009	[AUG-30-13 Matthew Brunt] Changes and/or Corrections: Possible service expansion or corrections to previous dataset; entirely new dataset provided for October 2013 submission.
AT&T Inc.	Mobile Wireless	Data Added to Statewide Inventory	12/16/2009	[AUG-30-13 Matthew Brunt] Changes and/or Corrections: Possible service expansion or corrections to previous dataset; entirely new dataset provided for October 2013 submission.
CenturyLink	DSL	Data Added to Statewide Inventory	12/4/2009	[AUG-16-13 Matthew Brunt] Changes and/or Corrections: Possible service expansion or corrections to previous dataset; entirely new dataset provided for October 2013 submission.
Charter Communications, Inc.	Cable	Data Added to Statewide Inventory	12/15/2009	[AUG-09-13 Matthew Brunt] Changes and/or Corrections: Possible service expansion or corrections to previous dataset; entirely new dataset provided for October 2013 submission.
Chester Telephone Company	Cable	Data Added to Statewide Inventory	1/25/2010	[AUG-29-13 Matthew Brunt] Change and Correction: Provider upgraded upload speeds to tier 3 and refined their coverage area.
Chester Telephone Company	DSL	Data Added to Statewide Inventory	1/25/2010	[AUG-29-13 Matthew Brunt] Change: Provider expanded coverage area and increased upload speeds to tier 3.
Chester Telephone Company	Fiber	Data Added to Statewide Inventory	1/25/2010	[AUG-29-13 Matthew Brunt] Change and Correction: Provider upgraded upload speeds to tier 3 and refined their coverage area.
Clearwire Corporation	Mobile Wireless	Data Added to Statewide Inventory	3/17/2011	[JUL-30-13 Matthew Brunt] Change: Provider added a small area to their mobile coverage.
Comcast Cable Communications, LLC	Cable	Data Added to Statewide Inventory	12/7/2009	[AUG-20-13 Matthew Brunt] Changes and/or Corrections: Possible service expansion or corrections to previous dataset; entirely new dataset provided for October 2013 submission.
Electronics Service Company of Hamlet, LLC	Fixed Wireless	Data Added to Statewide Inventory	3/24/2010	[AUG-29-13 Matthew Brunt] Change: Provider added one additional tower.
Farmers Telephone Cooperative, Inc.	Fiber	Data Added to Statewide Inventory	1/22/2010	[AUG-26-13 Matthew Brunt] Change: Provider expanded fiber coverage area.
Frontier Communications Corporation	DSL	Data Added to Statewide Inventory	1/22/2010	[AUG-20-13 Matthew Brunt] Change: Provider sent updated DSLAM information.
Home Telephone Company, Inc.	Cable	Data Added to Statewide Inventory	1/22/2010	[JUL-29-13 Matthew Brunt] Change and Correction: Provider increased download speeds to tier 10 and removed a small portion of their coverage area.
Home Telephone Company, Inc.	Cable	Data Added to Statewide Inventory	1/22/2010	[JUL-29-13 Matthew Brunt] Change and Correction: Provider increased download speeds to tier 10 and expanded their cable coverage area.
Home Telephone Company, Inc.	DSL	Data Added to Statewide Inventory	1/22/2010	[JUL-29-13 Matthew Brunt] Correction: Provider removed a small portion of their coverage area.
Home Telephone Company, Inc.	Fiber	Data Added to Statewide Inventory	1/22/2010	[JUL-29-13 Matthew Brunt] Change and Correction: Provider increased download speeds to tier 10 and expanded their fiber coverage area.
Home Telephone Company, Inc.	Fiber	Data Added to Statewide Inventory	1/22/2010	[JUL-29-13 Matthew Brunt] Change and Correction: Provider increased download speeds to tier 10 and expanded their fiber coverage area.
Horry Telephone Cooperative, Inc.	Cable	Data Added to Statewide Inventory	1/22/2010	[AUG-26-13 Matthew Brunt] Changes and/or Corrections: Possible service expansion or corrections to previous dataset; entirely new dataset provided for October 2013 submission.

Horry Telephone Cooperative, Inc.	DSL	Data Added to Statewide Inventory	1/22/2010	[AUG-26-13 Matthew Brunt] Changes and/or Corrections: Possible service expansion or corrections to previous dataset; entirely new dataset provided for October 2013 submission.
Horry Telephone Cooperative, Inc.	Fiber	Data Added to Statewide Inventory	1/22/2010	[AUG-26-13 Matthew Brunt] Changes and/or Corrections: Possible service expansion or corrections to previous dataset; entirely new dataset provided for October 2013 submission.
Horry Telephone Cooperative, Inc.	Mobile Wireless	Data Added to Statewide Inventory	1/22/2010	[AUG-26-13 Matthew Brunt] Changes and/or Corrections: Possible service expansion or corrections to previous dataset; entirely new dataset provided for October 2013 submission.
Leap Wireless International, Inc.	Mobile Wireless	Data Added to Statewide Inventory	4/6/2010	[AUG-16-13 Matthew Brunt] Changes and/or Corrections: Possible service expansion or corrections to previous dataset; entirely new dataset provided for October 2013 submission.
Northland Communications Corp.	Cable	Data Added to Statewide Inventory		[AUG-23-13 Matthew Brunt] Change: Provider removed coverage from a small portion of their coverage area.
Palmetto Rural Telephone Cooperative, Inc.	DSL	Data Added to Statewide Inventory	1/22/2010	[AUG-07-13 Matthew Brunt] Change: Provider converted a portion of their DSL coverage area over to fiber. Provider sent updated Name and DBA information.
Palmetto Rural Telephone Cooperative, Inc.	Fiber	Data Added to Statewide Inventory	1/22/2010	[AUG-07-13 Matthew Brunt] Change: Provider converted a portion of their DSL coverage area over to fiber.
Piedmont Rural Telephone Cooperative, Inc.	Mobile Wireless	Data Added to Statewide Inventory	1/28/2010	[AUG-23-13 Matthew Brunt] Change: Provider added one additional mobile tower.
Sprint Nextel Corporation	Mobile Wireless	Data Added to Statewide Inventory	1/14/2010	[AUG-02-13 Matthew Brunt] Changes and/or Corrections: Possible service expansion or corrections to previous dataset; entirely new dataset provided for October 2013 submission.
T-Mobile USA, Inc.	Mobile Wireless	Data Added to Statewide Inventory	1/8/2010	[AUG-19-13 Matthew Brunt] Changes and/or Corrections: Possible service expansion or corrections to previous dataset; entirely new dataset provided for October 2013 submission.
TDS Telecommunications Corporation	DSL	Data Added to Statewide Inventory	1/27/2010	[AUG-21-13 Matthew Brunt] Changes and/or Corrections: Possible service expansion or corrections to previous dataset; entirely new dataset provided for October 2013 submission.
Time Warner Cable Inc.	Cable	Data Added to Statewide Inventory	12/21/2009	[AUG-26-13 Matthew Brunt] Changes and/or Corrections: Possible service expansion or corrections to previous dataset; entirely new dataset provided for October 2013 submission.
Verizon South Inc.	Mobile Wireless	Data Added to Statewide Inventory	12/14/2009	[AUG-01-13 Matthew Brunt] Changes and/or Corrections: Possible service expansion or corrections to previous dataset; entirely new dataset provided for October 2013 submission.
Conterra Ultra Broadband Holdings	Backhaul	Backhaul Provider Only Processing Complete	11/8/2011	
Level 3 Communications, LLC	Backhaul	Backhaul Provider Only Processing Complete	12/14/2009	
TDS Telecommunications Corporation	Backhaul	Backhaul Provider Only Processing Complete	1/27/2010	
West Carolina Rural Telephone Cooperative, Inc.	Backhaul	Backhaul Provider Only Processing Complete	1/22/2010	
West Carolina Rural Telephone Cooperative, Inc.	Fiber	Speed Only Update; Data Processing Complete	1/22/2010	[AUG-08-13 Matthew Brunt] Change: Provider upgraded speeds to tier 10 download and tier 7 upload.
AT&T Inc.	Backhaul	No Update to Provide	12/16/2009	
ATG Communications, LLC	Backhaul	No Update to Provide	1/14/2010	
Atlantic Broadband, LLC	Cable	No Update to Provide	2/3/2010	
CenturyLink	Backhaul	No Update to Provide	12/4/2009	
Charter Communications, Inc.	Backhaul	No Update to Provide	12/15/2009	
Chesnee Telephone Company, Inc.	Cable	No Update to Provide	1/25/2010	
Chesnee Telephone Company, Inc.	DSL	No Update to Provide	1/25/2010	
Chester Telephone Company	Backhaul	No Update to Provide	1/25/2010	
Countrywide Wireless	Fixed Wireless	No Update to Provide		
Family View CableVision	Cable	No Update to Provide		
Farmers Telephone Cooperative, Inc.	Backhaul	No Update to Provide	1/22/2010	
Farmers Telephone Cooperative, Inc.	Backhaul	No Update to Provide	1/22/2010	
Farmers Telephone Cooperative, Inc.	DSL	No Update to Provide	1/22/2010	
Farmers Telephone Cooperative, Inc.	DSL	No Update to Provide	1/22/2010	
Farmers Telephone Cooperative, Inc.	Fiber	No Update to Provide	1/22/2010	
Farmers Telephone Cooperative, Inc.	Mobile Wireless	No Update to Provide	1/22/2010	
Frontier Communications Corporation	Fiber	No Update to Provide	1/22/2010	
Hargray Communications Group, Inc.	Backhaul	No Update to Provide	1/25/2010	
Hargray Communications Group, Inc.	Backhaul	No Update to Provide	1/25/2010	
Hargray Communications Group, Inc.	Backhaul	No Update to Provide	1/25/2010	
Hargray Communications Group, Inc.	Backhaul	No Update to Provide	1/25/2010	
Hargray Communications Group, Inc.	Cable	No Update to Provide	1/25/2010	
Hargray Communications Group, Inc.	Cable	No Update to Provide	1/25/2010	
Hargray Communications Group, Inc.	DSL	No Update to Provide	1/25/2010	
Hargray Communications Group, Inc.	DSL	No Update to Provide	1/25/2010	

Hargray Communications Group, Inc.	Fiber	No Update to Provide	1/25/2010	
Harron Communications LP	Cable	No Update to Provide		
Home Telephone Company, Inc.	Backhaul	No Update to Provide	1/22/2010	
Home Telephone Company, Inc.	Backhaul	No Update to Provide	1/22/2010	
Horry Telephone Cooperative, Inc.	Backhaul	No Update to Provide	1/22/2010	
Hughes Network Systems, LLC	Satellite	No Update to Provide	2/5/2010	
NTInet, Inc	Fixed Wireless	No Update to Provide	2/9/2010	
Palmetto Rural Telephone Cooperative, Inc.	DSL	No Update to Provide	1/22/2010	
Piedmont Rural Telephone Cooperative, Inc.	DSL	No Update to Provide	1/28/2010	
Rock Hill Telephone Company	Backhaul	No Update to Provide	1/25/2010	
Rock Hill Telephone Company	Backhaul	No Update to Provide	1/25/2010	
Rock Hill Telephone Company	Backhaul	No Update to Provide	1/25/2010	
Rock Hill Telephone Company	Cable	No Update to Provide	1/25/2010	
Rock Hill Telephone Company	Cable	No Update to Provide	1/25/2010	
Rock Hill Telephone Company	Cable	No Update to Provide	1/25/2010	
Rock Hill Telephone Company	Cable	No Update to Provide	1/25/2010	
Rock Hill Telephone Company	DSL	No Update to Provide	1/25/2010	
Rock Hill Telephone Company	DSL	No Update to Provide	1/25/2010	
Rock Hill Telephone Company	DSL	No Update to Provide	1/25/2010	
Rock Hill Telephone Company	DSL	No Update to Provide	1/25/2010	
Rock Hill Telephone Company	Fiber	No Update to Provide	1/25/2010	
Rock Hill Telephone Company	Fiber	No Update to Provide	1/25/2010	
Rock Hill Telephone Company	Fiber	No Update to Provide	1/25/2010	
Rock Hill Telephone Company	Fiber	No Update to Provide	1/25/2010	
Rock Hill Telephone Company	Fixed Wireless	No Update to Provide	1/25/2010	
Rock Hill Telephone Company	Mobile Wireless	No Update to Provide	1/25/2010	
Sandhill Telephone Coop., Inc.	Backhaul	No Update to Provide	1/25/2010	
Sandhill Telephone Coop., Inc.	DSL	No Update to Provide	1/25/2010	
Skycasters	Satellite	No Update to Provide	10/16/2012	
Skyrunner, Inc.	Fixed Wireless	No Update to Provide		
Southern Coastal Cable, LLC	Cable	No Update to Provide	6/30/2010	
Spacenet, Inc.	Satellite	No Update to Provide		
Sprint Nextel Corporation	Backhaul	No Update to Provide	1/14/2010	
tw telecom of south carolina, llc	Backhaul	No Update to Provide	4/26/2010	
United States Cellular Corporation	Mobile Wireless	No Update to Provide	2/15/2011	
ViaSat, Inc.	Satellite	No Update to Provide	1/8/2010	
West Carolina Rural Telephone Cooperative, Inc.	DSL	No Update to Provide	1/22/2010	
DeltaCom, Inc.	Backhaul	No Update Provided – Use Last Submission Data	2/16/2010	
Pee Dee Online Consulting	Fixed Wireless	No Update Provided – Use Last Submission Data	2/24/2010	
WideOpenWest Finance, LLC	Cable	No Update Provided – Use Last Submission Data		
Windstream Communications	Backhaul	No Update Provided – Use Last Submission Data	1/20/2010	
Windstream Communications	DSL	No Update Provided – Use Last Submission Data	1/20/2010	
Windstream Communications	Backhaul	Solicited Initial Data	1/20/2010	
Atlantic Tele-Network, Inc.	Mobile Wireless	Non-Responsive to Multiple Attempts		In addition to multiple contact attempts made during previous mapping submission periods, 4 contact attempts were made this period.

**APPENDIX B: CONNECTED NATION SATELLITE BROADBAND  
FIELD TESTING REPORT**

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## **CONNECTED NATION SATELLITE BROADBAND FIELD TESTING REPORT SEPTEMBER 2013**

With equipment spinning thousands of miles above the surface of the earth and covering vast physical land masses, satellite broadband validations have been a bit of a challenge for Connected Nation’s Engineering and Technical Services (ETS) team...until now. This white paper discusses some of the challenges of satellite as a broadband platform, a new process developed by the ETS team to validate satellite broadband providers in the field, and results from a validation methodology derived from leveraging CN’s broadband inquiry database.

### **Residential Satellite Broadband Today**

Satellite direct-to-home broadband services have experienced numerous improvements in technology and capabilities in recent months. Residential satellite broadband can now deliver multi-megabit speeds and vastly improved performance compared to earlier versions at an affordable price. Satellite broadband is available to virtually every consumer location within the continental United States, as long as a clear view of the southern sky is available.

While WiFi networks utilize certain frequencies to operate at very short distances, satellite broadband uses spectrum licensed by the Federal Communications Commission to transmit at much higher frequencies, able to reach 22,500 miles from the earth’s surface. The view of the continental United States is excellent from that distance, and the customer equipment back on Earth is extremely efficient in communicating in a two-way broadband Internet mode with the satellite systems deployed in geo-synchronous orbit in space.

When satellite delivered broadcast *television* services are in use, one is joining in on a broadcast sent to thousands of consumers in a one-way, receive-only mode. With any Internet broadband connection, however, each connection is typically delivered individually to the person making the request, thus requiring *two-way* communication, and sufficient bandwidth to accommodate all of the simultaneous requests. Even though the radio signals are traveling at the speed of light, there is a slight time delay from the moment a person makes a request at home to the time a response is received back from the satellite. This delay is called “latency” and is typically caused by signal processing that occurs within all routers, switches, servers, and transmission equipment.

Latency is present in all broadband services to varying degrees, based upon several factors, but is usually very short – typically 50 milliseconds with terrestrial broadband services such as DSL and cable modem. As a comparison, a human blinks at a speed of about 300-400 milliseconds (ms), so a person would normally not notice terrestrial broadband latency. In satellite broadband systems, however, latency is longer due to the great distance in sending the signals

to and from the earth – in addition to the normal terrestrial latency. A satellite broadband system located 22,500 miles away – nearly the entire distance around Earth’s equator – has a typical latency of at least 700 ms, or more than ten times the latency found with terrestrial broadband systems.

In addition to the challenge of high latency, additional problems have historically plagued satellite broadband technology from a marketing perspective. Such problems include expensive equipment costs and service plans, complex installations, and slow broadband service in comparison to other land-based cable, DSL, fixed wireless, and fiber broadband services. This report steers away from the economics and marketing of the service and focuses instead on the validation of the delivery system and its achieving broadband speeds.

## **How is Satellite Broadband Deployed?**

Connected Nation recognizes five satellite providers offering residential broadband service in the nine states and one U.S. territory in which CN currently collects and submits broadband datasets. Although each provider determines its own satellite configuration, this paper will focus on one satellite broadband provider, ViaSat, who operates the Exede satellite delivery system. ViaSat also owns the WildBlue satellite broadband system.

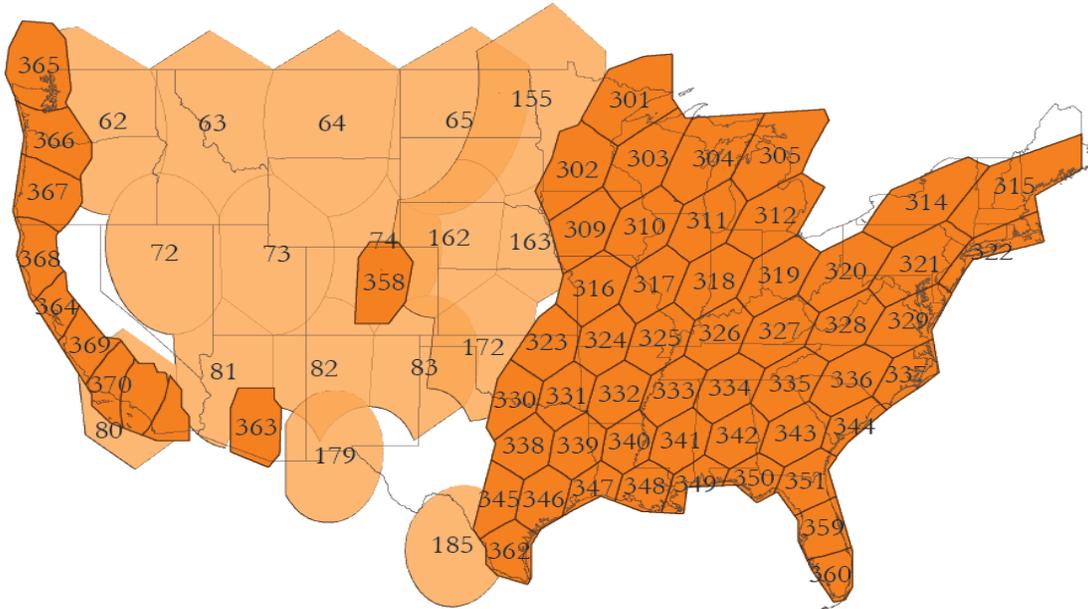
WildBlue service was an early entrant in satellite broadband and was sold across the country to accommodate the demand for rural broadband where other traditional broadband service providers did not, or could not, provide service. As the WildBlue customer base increased, and as Internet applications and bandwidth needs also increased to support a multitude of new “apps,” the system became overloaded – just as land-based systems also became overloaded. Early adopters who had purchased their satellite systems with significant individual investment became frustrated with slow and unreliable services, especially as additional new satellite customers came onto the system and compounded the problem.

To resolve the congestion and overload problem created by serving the entire continental United States with a small number of Internet broadband satellite transponders, ViaSat created the Exede delivery system. The deployment of this system required a highly technical and extremely aggressive investment plan based on spot beams covering small geographic areas on Earth – typically 200-300 miles across. Spot beams re-use frequencies in consecutive areas stacked together like a honeycomb. This deployment structure essentially multiplies the available capacity over and over with each additional spot beam deployed. The end result is that the satellite broadband service bandwidth and capacity are greatly improved. ViaSat now claims that the Exede system has enough newly installed spot beam capacity to accommodate an additional 1 million residential users.

Exede’s spot beams shadow, rather than replace, WildBlue satellite broadband signals. ViaSat’s strategy for the rollout of the Exede spot beams was to first overlay coverage of earlier satellite broadband deployments where the highest density of satellite broadband subscribers already existed. By doing so, the company can minimize overloading the older systems as new

customers come on board. As a result, ViaSat operates WildBlue and Exede services simultaneously with separate speeds and technical platforms. For example, the WildBlue service offers download speeds as high as 5 Mbps, whereas, Exede advertises a 12 Mbps service.

### ViaSat's WildBlue Footprint and Exede Spot Beams



White areas have no ViaSat satellite coverage.

### Exede's Advertised Broadband Speed

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Obtaining residential satellite broadband service is relatively easy and affordable, although early adopters are often chagrined at a second equipment investment required to make use of improved services. For Exede's satellite service, each system is installed and activated by a local, professionally trained dealer within the Exede network. Satellite *television* installers may not be qualified to install satellite broadband due to the more rigorous requirements related to the two-way connection needed for broadband Internet.

## Validating Satellite Broadband

Connected Nation's ETS team has two main objectives in validating a provider's broadband service: 1) confirm the provider's presence in the target testing area, and 2) confirm that the provider's Internet service meets or exceeds the required minimum broadband speed. To confirm a provider's presence, a CN technician would visit, inspect, and document (often with pictures) provider office locations, broadband equipment in the field, billboards, and other local advertising, and detected WiFi networks. For mobile and fixed wireless networks, a technician can often perform signal tests for known frequencies licensed to and/or used only by that provider. If an Internet connection is found and accessed in the field, the detected provider's service could also be tested using a speed-test utility.

Over the past three years, attempts to use any of these techniques for satellite validation proved futile as the basic tools for validating other platforms do not exist for satellite. For example, residential satellite equipment for broadband is difficult to distinguish from satellite video gear as viewed from the street. Further, a satellite installer can serve several counties, and may not have a retail presence. As a result, confirming the presence of a specific satellite provider in any targeted community has been challenging. In trying to confirm broadband speeds, historically slow speeds and high latency on the satellite services have also prevented this level of validation.

The CN ETS team recently devised an approach to confirm both presence and speed by deepening the desktop research in advance of field validation, accessing controlled use of satellite testing equipment, and leveraging CN's rich database of broadband inquiries. Using Exede as a participating test subject and model for satellite broadband validation, an ETS technical engineer fine-tuned the process in Iowa and Minnesota as described below.

The first objective was to confirm that Exede service was available throughout a targeted service area. In addition to using the Exede coverage map above, the engineer used Exede's website to look at each individual county within Iowa to find all Exede dealers, installation companies, and storefronts. Using this tool, he located 28 authorized dealers serving 98 of Iowa's 99 counties. Many dealers are actually electric or telephone cooperatives such as the rural Exede dealer and electric co-op in Jackson, Minnesota, shown below. In identifying these dealers, CN confirmed the provider's presence virtually throughout the state.

## Exede Authorized Dealer – Federated Rural Electric Association in Jackson, MN



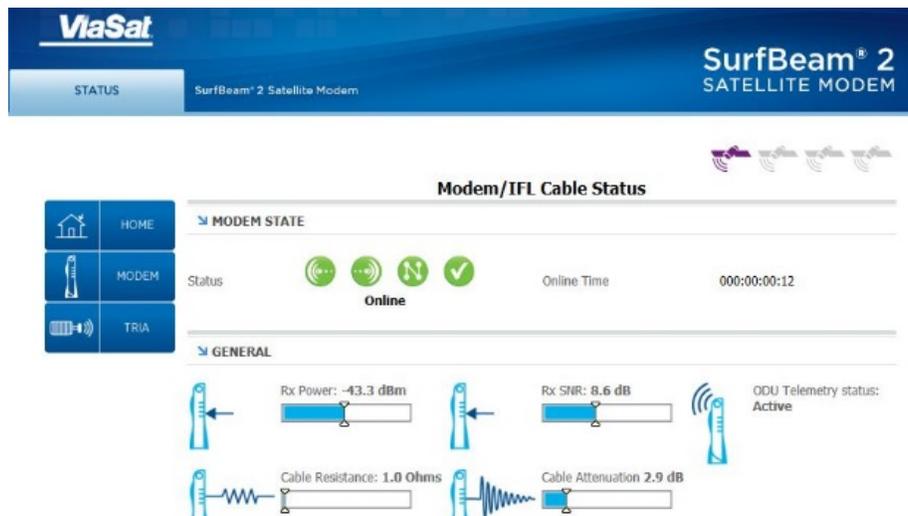
The next step was to identify specific provider equipment at various locations. Since satellite broadband equipment is difficult to distinguish from satellite television equipment, CN teamed with an Iowa Exede representative to obtain the use of Exede equipment for 30 days. The testing began at a *fixed* location chosen by CN – the Worthington Bio-Technology Advancement Center in Worthington, Minnesota. The center’s manager agreed to allow CN to use the Worthington facility to test the satellite service to help promote satellite broadband technology for rural residential and educational purposes.

## Exede Installation and Test Site in Worthington, MN



The Exede system was installed and demonstrated by Sean Clarke, of Tri-Lakes Consulting. The broadband equipment was set up on a temporary ground-mount in front of the center with a cable extending to the building and then inside to a modem and computer. The equipment assembly was straightforward, and only one RG-6 cable was necessary for the installation (previous versions required two cables, making installation and troubleshooting more difficult). The azimuth and elevation presets arrive with the system for the specific zip code where the system is to be installed, which shortens the field installation time for the trained technician. The satellite dish was coarse-tuned, and the modem equipment was connected. After the dish was fine-tuned, the installer established an Internet connection, and performed an automatic firmware and software download with the latest versions of Exede's operating requirements. Once the download was complete (a few minutes), the system was engaged and ready for use.

### Exede's Internet Connection GUI



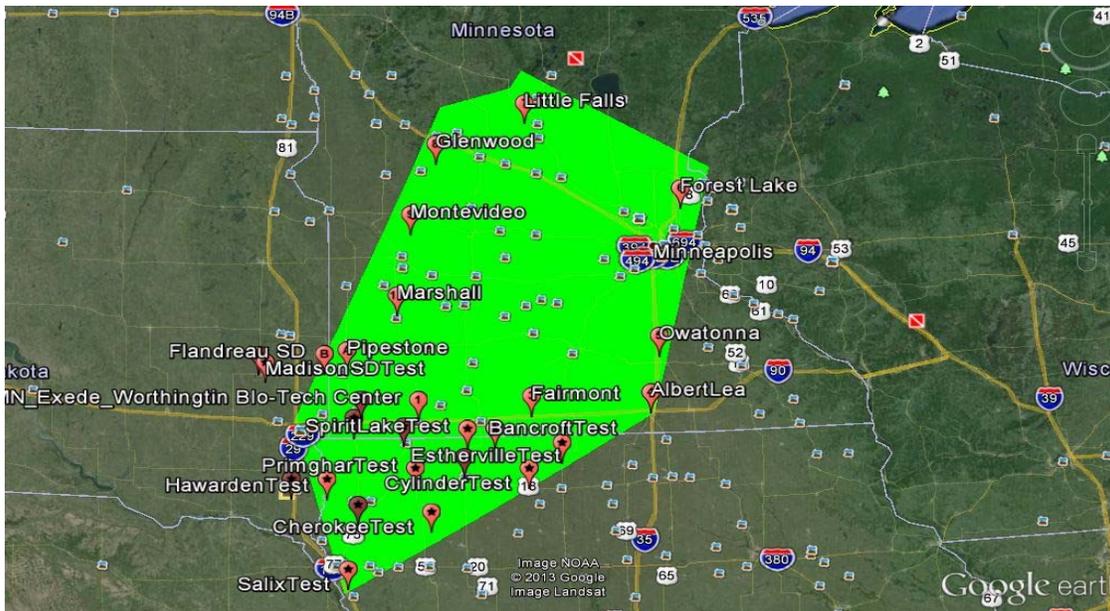
Exede's satellite broadband service consistently delivered the advertised speed of 12 Mbps, and many tests performed well beyond the advertised speed. Internet applications worked well, and download tests consistently delivered multi-megabit packages. Streaming video worked well with no buffering, and upstream speed tests were smooth and consistent. **As a result of this supervised testing, CN was able to confirm both the presence of the satellite provider in a targeted area, and that the provider delivered broadband-defined speeds within the area.**

### Field Validation Testing

For testing Exede's satellite broadband service in multiple residential areas, the engineer selected Exede's Spot Beam 302 and tested in a variety of locations. The targeted spot beam coverage includes a large portion of southwestern Minnesota, as well as a portion of northwestern Iowa. He was able to secure the Exede receiver system on a hitch mount on the

back of a vehicle, and connected the system to a portable power inverter and laptop. To test the system at numerous locations within the boundary of the advertised spot beam, the system was re-tuned at each testing location using the Worthington set-up parameters as a reference. Numerous tests were conducted at the edge of the spot beam to determine if the signal degraded at the spot beam's defined boundaries. In fact, once the system was locked in place as described below, the system performed equally well at the edge of, or even slightly out of, the beam as it did in the center of the beam.

### Satellite Broadband Speed Test Locations within Exede's Spot Beam 302



Testing began in the Minnesota portion of the spot beam as shown with the location markers in the map above. A week later, beam testing and performance testing took place in a similar format within Iowa utilizing the same Exede equipment. Although there were no extreme or heavy weather conditions during the testing process, temperatures were typically hot and humid, with some days of overcast conditions. Testing was performed at various times of day (**Exhibit 1**).

Testing the Exede system required a clear view of the southern sky. After stopping at a suitable location, the engineer would level the satellite receiver equipment and coarse-tune the low-noise block (LNB) transverter arm of the satellite dish; the LNB collects the radio waves sent to the dish from the satellite, and prepares it for transmission through the cabling to the modem and computer. The equipment would then be oriented south, and elevated to a reasonable inclination for set-up. Orientation would be fine-tuned and completed using a PC-aided installation set-up procedure, and the settings would be locked for use.

## Installation and Testing Parameters

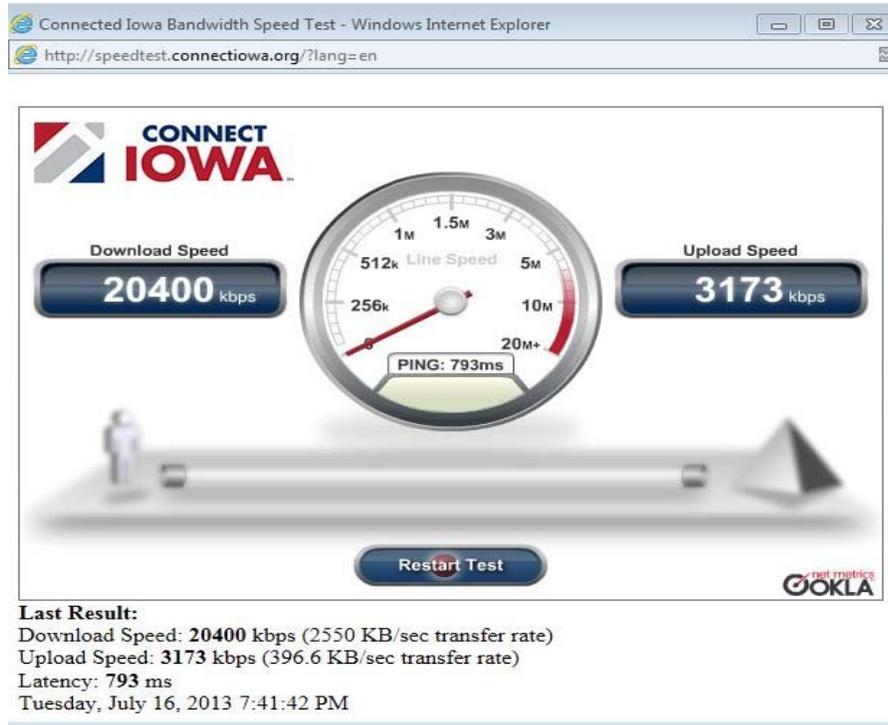


Installer ID	
Provisioned Beam	302
Provisioned Satellite	ViaSat-1
Desired Satellite	ViaSat-1
Azimuth	204.3°
Elevation	36.0°
Skew	70.8°
Boom Arm Angle	16.6°
APA/Modem Key	NW XF-P5PR-5DJF-KRC5
Equipment	SB2
Polarization	Right
Latitude	43.6401°
Longitude	-95.5915°



Using the modem and laptop configuration, signal strengths were recorded and speed tests were performed and documented (**Exhibit 2**) using both Connect Minnesota and Connect Iowa websites. As a secondary reference, speed tests were also recorded and documented using the SpeakEasy.net speed test using Chicago, Illinois as the common speed test gateway location. Exede speed test results typically exceeded the advertised 12 Mbps download speed.

## Sample Speed Test Results from Exede Test in Bancroft, IA



Just as the presence and speed of the Exede satellite broadband system was confirmed at the fixed location in Worthington, Minnesota and similar to processes followed for other broadband providers and platforms, this new testing process developed by the ETS team successfully validated the Exede broadband service throughout the targeted test areas in Minnesota and Iowa.

In Minnesota and Iowa, the technical engineer successfully utilized satellite equipment to perform speed tests in the field and confirmed ViaSat as a viable broadband provider through its Exede satellite service. Fortunately for this single service provider in these two states, the engineer was able to secure the temporary use of broadband equipment. For those states in which satellite equipment may *not* be available for portable testing, however, the ETS team devised an alternate approach to testing and validating satellite broadband service.

### Broadband Inquiries

Connected Nation has received thousands of inquiries from consumers seeking broadband service alternatives. Scores of those inquiries come from consumers currently accessing the Internet at home with satellite service. By enlisting the help of those consumers to test their satellite service through the CN state websites, the ETS team created a process to both verify the presence of specific providers at specific locations (the consumers' addresses), and obtain speed test results for validating broadband speeds.

To test the process, a second CN technical engineer identified all broadband inquiries received in the state of South Carolina in which the consumer identified himself or herself as a satellite customer. An e-mail was sent to all relevant consumers requesting that they visit the Connect South Carolina website and perform a speed test using their home satellite service. By placing a deadline of 24 hours in which to perform the test, he was able to obtain the test results for the website during that test period, cross-check the noted names and addresses on the tests against the inquiry list, and filter out all other tests unrelated to satellite service.

In South Carolina, the results were both substantial and informative. On a selected Thursday, this second engineer sent speed test requests to 20 e-mail addresses. Within the noted 24 hours, information was received from 9 of those addresses (45%). Of those 9, 5 performed speed tests (20% test rate). Both HughesNet and ViaSat were able to be validated in South Carolina as a result of the tests (below).

### South Carolina Speed Tests Performed by Satellite Internet Consumers

Provider		Test Site Info						Speed Test Data					
Provider	Test City	Test State	Test County	Physical Address	Latitude	Longitude	Presence Confirmed	Utility	Time	Ping Time (ms)	Download Speed (kbps)	Upload Speed (kbps)	Min Speed Met?
Hughes Network Systems, LLC	Pauline	SC	Spartanburg	Old Hills Bridge Rd	34.74	-81.88	Yes	connectsc.org	5:16 PM	861	4870	308	Yes
Hughes Network Systems, LLC	Westminster	SC	Oconee	Tallulah Dr	34.57	-83.09	Yes	connectsc.org	9:00 PM	1146	571	133	No
Hughes Network Systems, LLC	Ridgeville	SC	Dorchester	Myers Mayo Rd	33.10	-80.27	Yes	connectsc.org	10:37 PM	836	1248	190	Yes
ViaSat Communications, Inc.	Edgefield	SC	Edgefield	Abel Drive	33.70	-82.08	Yes	connectsc.org	9:14 PM	867	7039	1470	Yes
Hughes Network Systems, LLC	Prosperity	SC	Saluda	Denny Highway	34.13	-84.54	Yes	connectsc.org	10:39 PM	645	9142	615	Yes

The original technical engineer also performed a similar process in Iowa. Within 24 hours of his request, he received information from 13 of 32 addressed consumers. Ten e-mails were returned indicating that the consumers switched away from satellite service. Of the remaining 3, 2 responded stating that they were no longer satellite users in the state, and the last actually performed a speed test.

Although the response rate from South Carolina satellite users was higher than in Iowa, **in both states, CN can count at least one satellite validation with confirmation of the provider’s location and speed.**

### Conclusion

For many rural consumers, satellite service is the only platform available for accessing the Internet, other than dial-up telephone. Historically, satellite broadband has been expensive and slow, and much of the blame has been placed on the simple physics of transmitting wireless data traffic nearly the distance of Earth’s circumference – twice for each mouse click. This extreme distance, relative to other broadband alternatives, results in noticeable delay – or latency – in broadband performance that can be more than 10 times greater than that experienced using other terrestrial broadband platforms.

For Connected Nation’s ETS team, the challenges of both distance and latency had been significant obstacles to validating satellite broadband providers. Two new processes, however,

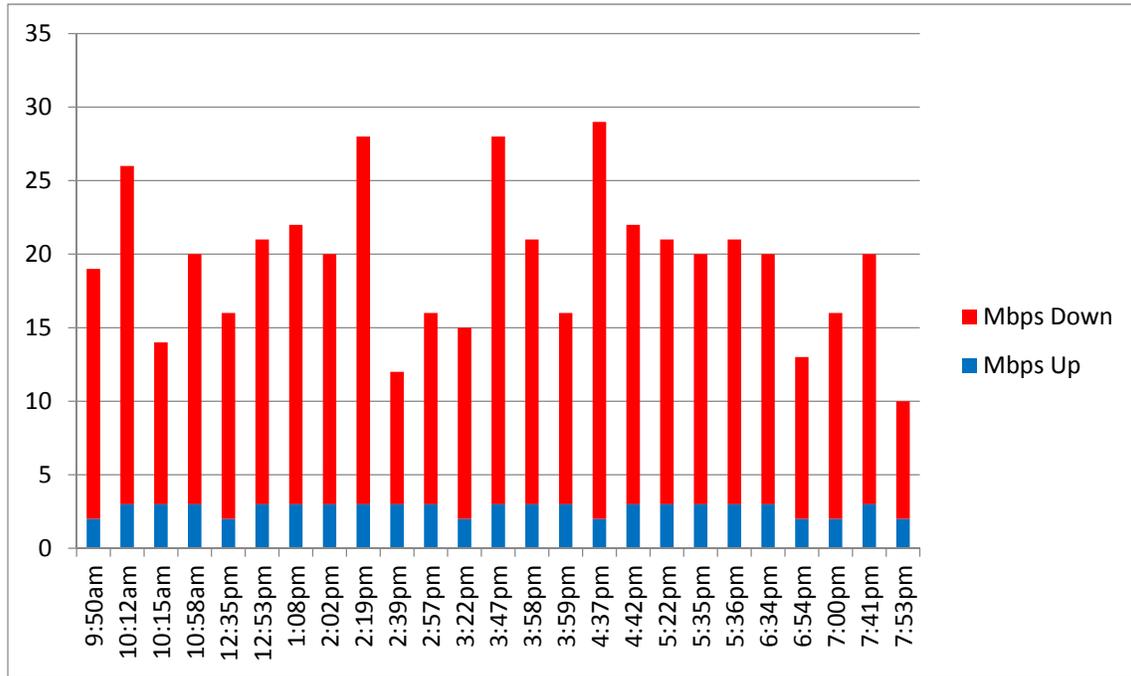
have been developed and tested to meet that challenge. One process uses standard satellite equipment rigged to a portable carrier to test speeds throughout targeted areas, and the second process leverages CN's broadband inquiry database to enlist consumers to perform speed tests that can be analyzed.

Using ViaSat's Exede satellite network as a test subject, the CN technical engineer performed speed tests at a fixed location as a base case, and then devised a method to carry the satellite equipment to various remote locations, fine-tune the equipment to lock in the two-way satellite signal at each location, perform speed tests over Exede's satellite service, and capture the results of those tests. In CN's field testing, consistent downstream and upstream speeds were experienced at the locations tested – even at the edges of the spot-beam.

For those states in which satellite equipment may *not* be available for portable testing, the ETS team successfully tested a validation process by requesting, capturing, and filtering test results using CN's database of broadband inquiries, many of which originated from satellite broadband users who responded to our email requests for assistance.

With these two new processes, and with the help of both satellite providers and satellite users, Connected Nation's ETS team now can perform reliable testing for satellite validations.

## Exhibit 1 Speed Test Results by Time of Day



## Exhibit 2 Exede Field Test Speed and Latency Results from Iowa/Minnesota Beam 302

Location	Date	Time	Zip Code	Exede Advertized Speeds DS/US	Connect IA/MN.org Speedtest Actual Tested DS/US	Speakeasy.net Speedtest Actual Tested DS/US	Exede Advertized Latency	Connect IA/MN.org Actual Tested Latency	Speakeasy.net Actual Tested Latency	Jitter
Worthington, MN	07-08-13	3:22pm	56187	12Mbps/3Mbps	15.048Mbps/2.361Mbps	11.72Mbps/2.50Mbps	700 milliseconds	901 ms	N/A	N/A
Luverne, MN	07-10-13	10:12am	56165	12Mbps/3Mbps	26.40Mbps/2.98Mbps	11.64Mbps/2.58Mbps	700 milliseconds	853 ms	691 ms	12 ms
Fairmont, MN	07-10-13	12:35pm	56031	12Mbps/3Mbps	15.80Mbps/2.47Mbps	9.2Mbps/2.01Mbps	700 milliseconds	857 ms	677 ms	14 ms
Albert Lea, MN	07-10-13	2:19pm	56007	12Mbps/3Mbps	28.14Mbps/3.04Mbps	9.19Mbps/2.23Mbps	700 milliseconds	858 ms	691 ms	15 ms
Owatonna, MN	07-10-13	3:59pm	55060	12Mbps/3Mbps	16.39Mbps/2.62Mbps	22.63Mbps/2.81Mbps	700 milliseconds	911 ms	715 ms	25 ms
Forest Lake, MN	07-10-13	6:54pm	55013	12Mbps/3Mbps	12.75Mbps/2.11Mbps	11.47Mbps/2.54Mbps	700 milliseconds	860 ms	683 ms	17 ms
Little Falls, MN	07-11-13	9:50am	56345	12Mbps/3Mbps	19.13Mbps/2.09Mbps	10.52Mbps/2.02Mbps	700 milliseconds	936 ms	705 ms	19 ms
Montevideo, MN	07-11-13	3:58pm	56265	12Mbps/3Mbps	21.032Mbps/2.661Mbps	22.46Mbps/3.52Mbps	700 milliseconds	901 ms	667 ms	10 ms
Marshall, MN	07-11-13	5:36pm	56258	12Mbps/3Mbps	20.506Mbps/2.777Mbps	11.95Mbps/2.11Mbps	700 milliseconds	842 ms	666 ms	09 ms
Pipestone, MN	07-11-13	7:00pm	56164	12Mbps/3Mbps	15.665Mbps/2.367Mbps	11.27Mbps/2.53Mbps	700 milliseconds	889 ms	679 ms	10 ms
Flandreau, SD	07-11-13	7:53pm	57028	12Mbps/3Mbps	10.361Mbps/1.881Mbps	9.21Mbps/2.2Mbps	700 milliseconds	921 ms	679 ms	12 ms
Steen, MN	07-16-13	10:58am	56173	12Mbps/3Mbps	20.249Mbps/3.081Mbps	12.41Mbps/2.48Mbps	700 milliseconds	786 ms	672 ms	11 ms
Sibley, IA	07-16-13	12:53pm	51249	12Mbps/3Mbps	21.205Mbps/3.183Mbps	11.21Mbps/2.66Mbps	700 milliseconds	798 ms	679 ms	18 ms
Primghar, IA	07-16-13	2:02pm	51245	12Mbps/3Mbps	19.722Mbps/3.122Mbps	11.00Mbps/2.44Mbps	700 milliseconds	792 ms	695 ms	16 ms
Spencer, IA	07-16-13	2:57pm	51301	12Mbps/3Mbps	16.045Mbps/2.982Mbps	10.17Mbps/2.43Mbps	700 milliseconds	751 ms	653 ms	14ms
Spirit Lake, IA	07-16-13	3:47pm	51360	12Mbps/3Mbps	27.951Mbps/3.017Mbps	09.42Mbps/1.95Mbps	700 milliseconds	799 ms	688 ms	16 ms
Estherville, IA	07-16-13	5:22pm	51334	12Mbps/3Mbps	20.940Mbps/3.111Mbps	10.49Mbps/2.16Mbps	700 milliseconds	789 ms	691 ms	20 ms
Cylinder, IA	07-16-13	6:34pm	50528	12Mbps/3Mbps	20.496Mbps/3.259Mbps	12.3Mbps/2.64Mbps	700 milliseconds	769 ms	663 ms	13 ms
Bancroft, IA	07-16-13	7:41pm	50517	12Mbps/3Mbps	20.400Mbps/3.173Mbps	11.28Mbps/2.5Mbps	700 milliseconds	793 ms	687 ms	16 ms
Cherokee, IA	07-17-13	10:15am	51012	12Mbps/3Mbps	15.492Mbps/2.881Mbps	10.92Mbps/2.44Mbps	700 milliseconds	790 ms	678 ms	09 ms
Salix, IA	07-17-13	1:08pm	51052	12Mbps/3Mbps	22.036Mbps/3.142Mbps	11.77Mbps/2.71Mbps	700 milliseconds	762 ms	657 ms	20 ms
LeMars, IA	07-17-13	2:39pm	51031	12Mbps/3Mbps	12.433Mbps/2.565Mbps	11.27Mbps/2.48Mbps	700 milliseconds	739 ms	679 ms	05 ms
Hawarden, IA	07-17-13	4:37pm	51023	12Mbps/3Mbps	28.594Mbps/2.081Mbps	10.05Mbps/1.95Mbps	700 milliseconds	789 ms	680 ms	05 ms
Beresford, SD	07-17-13	5:35pm	57004	12Mbps/3Mbps	20.139Mbps/3.058Mbps	12.03Mbps/2.63Mbps	700 milliseconds	781 ms	692 ms	16 ms
Madison, SD	07-19-13	4:42pm	57042	12Mbps/3Mbps	22.003Mbps/3.197Mbps	8.17 Mbps/2.08Mbps	700 milliseconds	775 ms	671 ms	07 ms

Note: Connect Iowa and Connect Minnesota speed tests utilize OOKLA Speed Test Services.