South Dakota Broadband Mapping Project: Product Release White Paper

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Product Specification:	Spring 2013 NTIA Data Model
Product/Process:	NTIA—April 1, 2013 Data Deliverable
Dataset Submission QC:	NTIA—SBDD_CheckSubmission.py

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OVERVIEW

This white paper highlights the **Submission Summary** for this deliverable, as well as describes the **Data Gathering**, **Data Integration**, **Data Validation and Verification** and **Quality Control** processes used to create the Broadband Mapping Project's April 1st, 2013 data submission. To support varying levels of technical and program knowledge, both a **high-level summary** and a **detailed process review** are supplied.

SUBMISSION SUMMARY

PROVIDER DETAILS

PROVIDER PARTICIPATION

- Provider Participation Statistics Summary

Summary	Count
Total Providers Researched/Contacted	101
Total Valid Broadband Providers	54
Non-Responsive Providers	4
Non-Cooperative Providers	1
Number of Providers - Supplied Updates for this Submission	36
Number of Providers - Confirmed No Updates	5

- New Providers Since Last Data Submission
  - Native American Telecom
  - Additional new providers have been identified, which we're currently working with for future representation on the broadband map. They are as follows:
    - Evertek
    - Sandhills Wireless
    - Timber Lake Broadband

- Existing Providers – Confirmed No Updates
  - Mediacom Communications Corporation
  - Northern Valley Communications
  - Skycasters
  - StarBand Communications Inc.
  - ViaSat, Inc.

- Non-Responsive Providers/Non-Cooperative Providers
  - KeyOn Communications Inc.
  - New Edge Network, Inc.
  - Western Communications
  - Wirefree USA
  - Nate's Net

- Providers researched and identified as non-broadband providers can be viewed within the table at the end of this document.

COMMUNITY ANCHOR INSTITUTION (CAI) DETAILS

OVERALL STATISTICS

Community Anchor Institution - Categories	Overall Count	CAIID Counts	Broadband Subscriber (Yes)	Trans Tech	Advertised Speed Down	Advertised Speed Up
Category 1 - School K through 12	548	229	474	323	238	238
Category 2 - Library	121	99	35	29	24	24
Category 3 - Medical/Healthcare	210	0	123	39	33	33
Category 4 - Public Safety	473	0	86	61	24	24
Category 5 - Universities/Colleges	58	29	56	40	12	12
Category 6 - Other: Government	599	1	598	598	165	165
Category 7 - Other: Non-Government	26	0	13	12	9	9
Total	**2035**	**358**	**1385**	**1102**	**505**	**505**

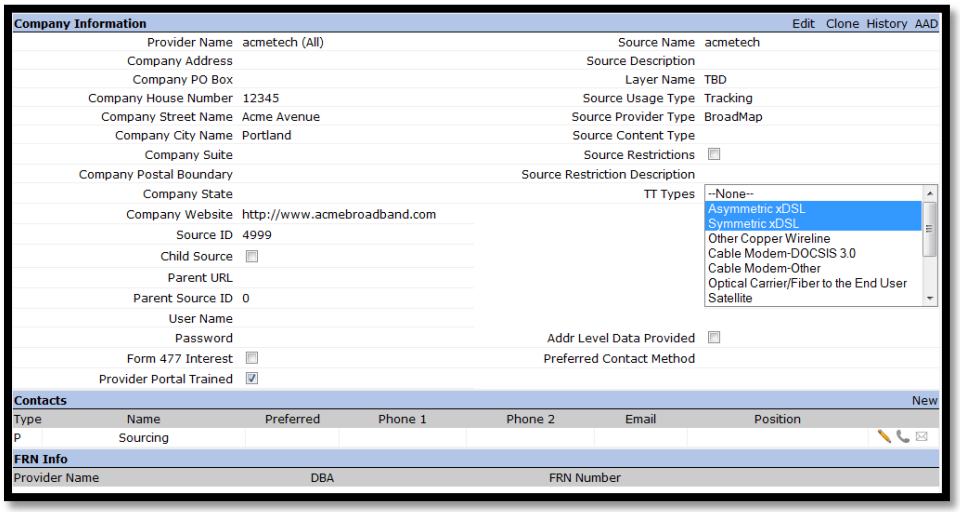
HIGH-LEVEL SUMMARY

DATA GATHERING

BROADBAND SERVICE AREAS, MIDDLE MILE AGGREGATION POINTS AND BROADBAND SERVICE OVERVIEW

The collection of Broadband Service Areas, Middle Mile Aggregation Points and Broadband Service Overview information is handled through the following Provider Outreach Process:

- Build and maintain an inventory of Broadband providers through currently known providers and research.
- The inventory and everyday interaction with providers is tracked using the Provider Catalog (PCat). Below are some examples of the web application, which has a shared access between our team and mapping partner (BroadMap).



Company Information — Edit Clone History AAD

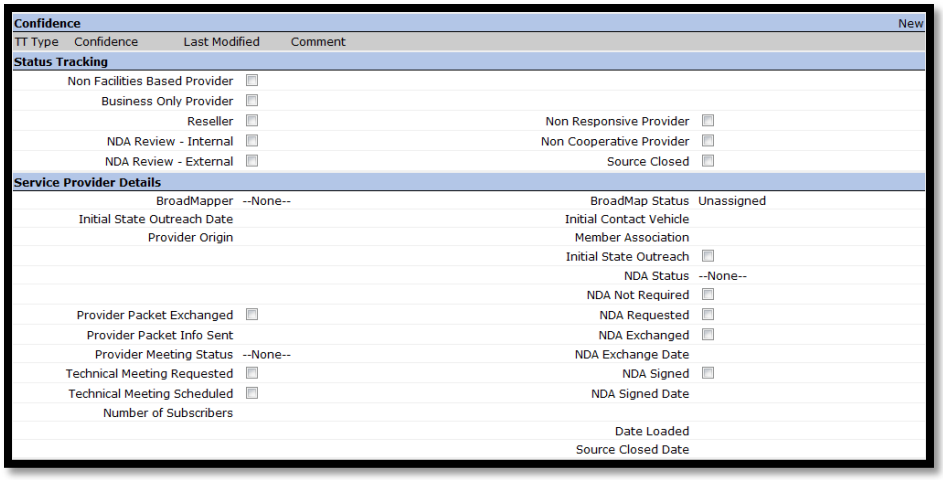
Provider Name	acmetech (All)	Source Name	acmetech
Company Address		Source Description	
Company PO Box		Layer Name	TBD
Company House Number	12345	Source Usage Type	Tracking
Company Street Name	Acme Avenue	Source Provider Type	BroadMap
Company City Name	Portland	Source Content Type	
Company Suite		Source Restrictions	☐
Company Postal Boundary		Source Restriction Description	
Company State		TT Types	--None--
Company Website	http://www.acmebroadband.com		Asymmetric xDSL
Source ID	4999		Symmetric xDSL
Child Source	☐		Other Copper Wireline
Parent URL			Cable Modem-DOCSIS 3.0
Parent Source ID	0		Cable Modem-Other
User Name			Optical Carrier/Fiber to the End User
Password			Satellite
Form 477 Interest	☐	Addr Level Data Provided	☐
Provider Portal Trained	☑	Preferred Contact Method	

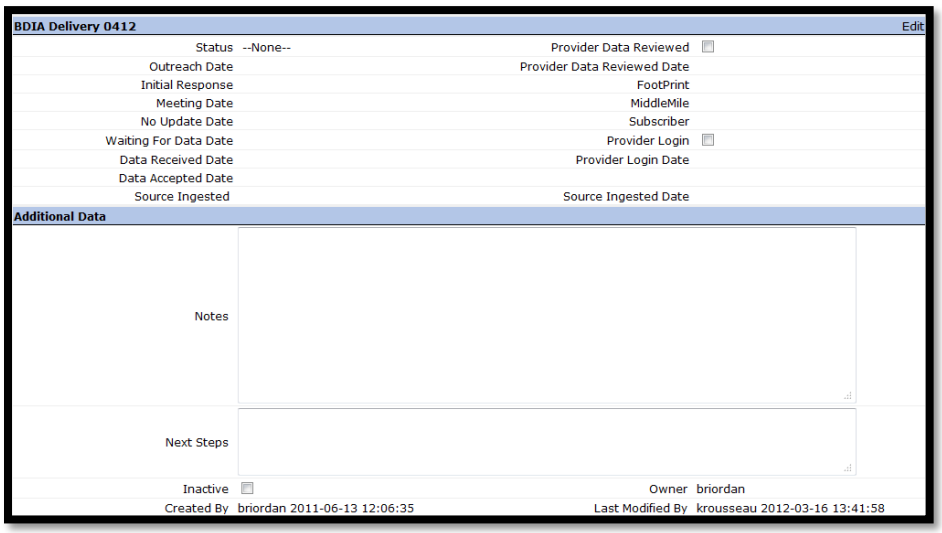
Contacts — New

Type	Name	Preferred	Phone 1	Phone 2	Email	Position
P	Sourcing					

FRN Info

Provider Name	DBA	FRN Number





- Update provider material that describes the data requirements and logistics for data transfer.
- Update Non-Disclosure Agreement (NDA) for use in the project, where applicable.
- Maintain multiple protocols for the provider to submit data, including Secure File Transfer Protocol (SFTP) technology when desired.
- Conduct one-on-one informational discussions with each provider to communicate the following:
    - Requirements of this project;
    - Broadband data required to support the product data model;
    - Submission protocols available;
    - Capability to validate how the supplied data is aggregated.
- Download/receive provider data.
- Establish a repeatable process with provider. Maintain provider communication, transaction and data handling records throughout the project (dates contacted, data received, etc.).

COMMUNITY ANCHOR INSTITUTION (CAI)

The collection of CAI information is handled through the following CAI Collection Process:

- Collect and maintain inventory of CAIs through currently known CAIs, data mining, and research.
- Maintain web-based CAI portal for institutions to add or confirm attribution, location and enter broadband-specific information.
- Upload web-based data to Core Database for standardization.
- Perform internal cleansing, such as removing duplicate records, identifying gaps in broadband attribution and verifying category.
- Geocode CAI locations.
- Translate Core Database data to deliverable-ready format.
- Continue engagement with non-responsive institutions.

DATA INTEGRATION PROCESS

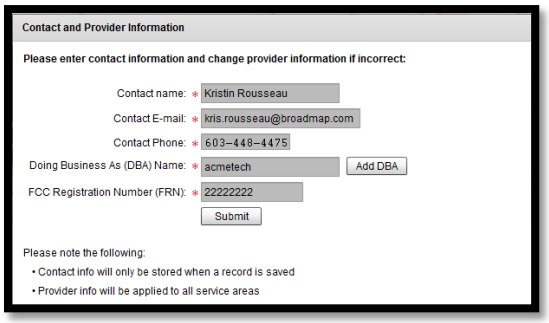
The data integration and processing mechanisms currently used allows for multiple types of inputs and result in a standardized output that meets the NTIA deliverable requirements. This flexible process supports data model changes and project-requested enhancements.

- Receive inputs from providers via submission protocols; upload into Sourcing Database and catalog with provider information.
- Review provider-supplied data for completeness and for potential discrepancies that require resolution prior to processing and flag as necessary.
- Categorize input into data-type category (addresses, block lists, paper maps, etc.).
- Standardize input based on data type within Staging Database.
- Create Compact Polygons (CP)—(internal methodology for generating area-based feature for coverage in Staging Database).
- Apply broadband attribution to CP; apply metadata to CP.
- Perform quality analysis of the CP against the source supplied to identify any completeness or accuracy issues.
- Request additional information from the provider if elements of coverage are missing or contain discrepancies. This is a second manual quality check to ensure data is complete.
    - Process coverage area to build the required NTIA data model layers.

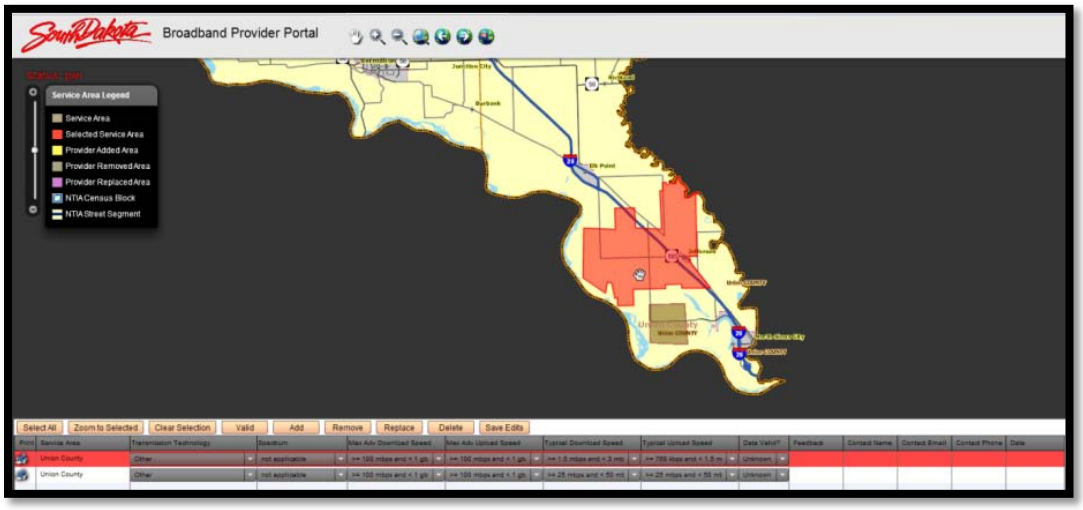
With the deployment of the Provider Portal this round, the data collection and later validation process was streamlined allowing both activities to occur within a secure web application. The majority of the providers used this methodology as it supplies them with more visibility into how their data is being represented and gives them knowledge and ownership of their coverage representation. Below are some bullet points and supporting screen shots on how the portal is used.

- Each provider is assigned credentials with a strong password to ensure security measures are taken into consideration

- Collection and confirmation our contact, as well as the company's DBA Name and FRN accuracy

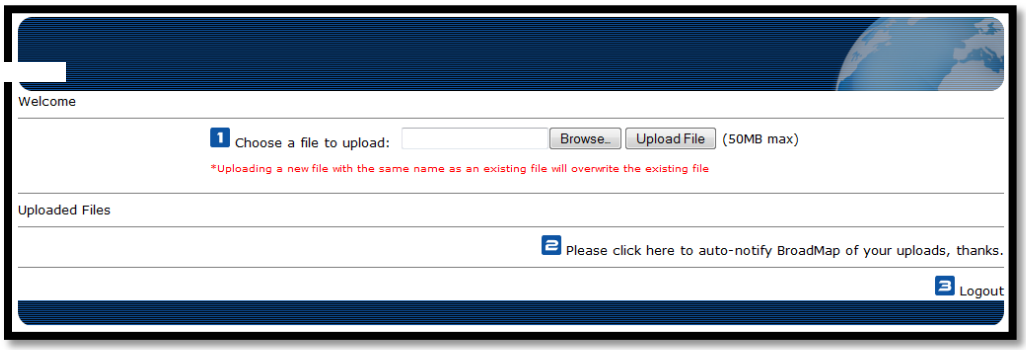


- Capability to review and request changes to the coverage footprint



- The provider can Add/Remove portions, or all, of the footprint requesting that their footprint be increased or refined.

- File upload functionality to support providers that would prefer a shapefile, spreadsheet, PDF, KMZ/KML file be used to reflect changes for the data round



- Once the provider has reviewed completed changes to their coverage, they can then validate them by signing off that everything is accurate.

DATA VALIDATION AND VERIFICATION

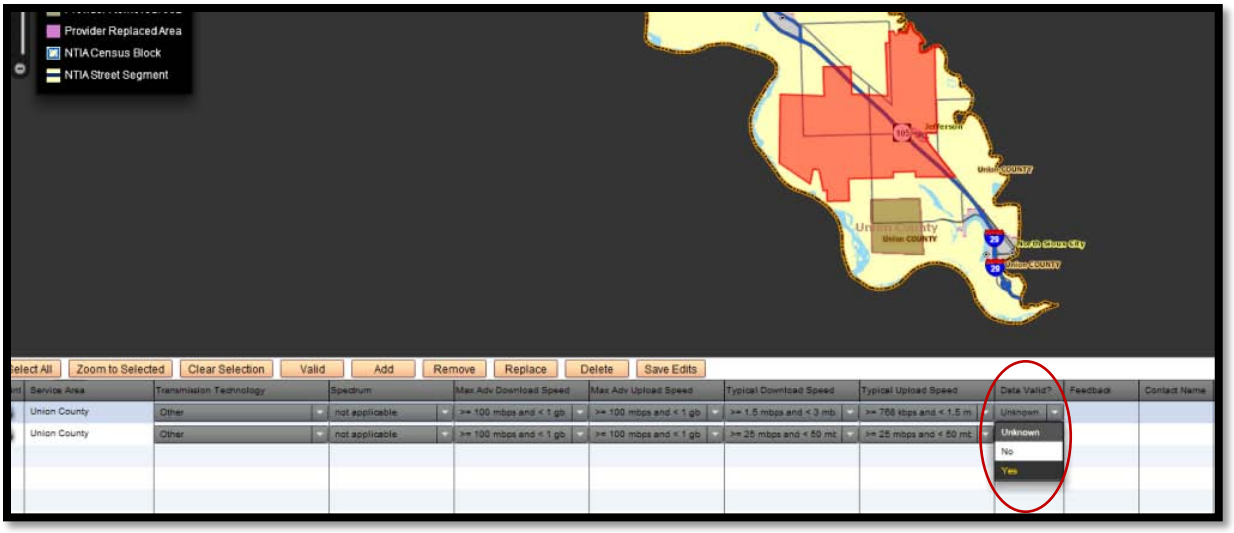
To ensure the data collected and processed is as accurate and as comprehensive as possible, South Dakota broadband verification encompasses many efforts. The methodologies employed are documented below:

BROADBAND PROVIDER VALIDATION—PROVIDER PORTAL APPLICATION

First and foremost, all providers are given access to, and are trained in the use of, a web application we call the "provider portal". After each data collection and ingestion of provider data, representatives from the provider are able to review the polygons, segments, speeds, technologies, and other attribution that our GIS teams have developed based on the submitted data. Providers are given the opportunity to make changes to the data's attributes (speeds, technology, spectrum, etc…) as well as add/change/move/delete coverage areas. The requested changes are delivered to the GIS teams for full ingestion in our broadband database. This process is repeated until the provider representatives confirm that all aspects of the coverage areas are accurate and complete.

This portal is available 24/7/365 for providers to utilize, allowing those companies without GIS or mapping staff access to those technologies and benefits for review, presentations, and other business opportunities. This process has proven both successful and popular in the provider community.

- Coverage validation can be done on one record/footprint at a time or by selecting footprints and selecting the 'Valid' button. The provider could also print off or download their coverage for their own tracking purposes.



All validation results are tracked internally through our Validation Table, which also improves the overall **Confidence Value** as mentioned below.

FURTHER BROADBAND PROVIDER VALIDATION

Following the completion of each data submission, maps are supplied to each provider in PDF format for them to perform further validation and review with their staff. These maps are also utilized as marketing material for their websites, internal communications, etc., which further fosters participation.

Any feedback or changes received following the delivery of these maps are incorporated into the overall broadband map and reviewed again with the provider.

RF PROPAGATION – PREDICTIVE MODELING

For this data submission, we have used EDX to perform RF propagation analysis and create predictive modeling of wireless coverage based on available tower data. The analysis performed thus far has not required us to make significant adjustments to the provider submitted shapefiles; however we are working with providers to collect further tower information, as well as potential extra signal strength that may be gained from repeaters.

We are also offering these maps created to providers as a service, so they can use it to further validate the coverage area and use it for marketing material. This will help ensure continuous participation in the program.

INDUSTRY KNOWLEDGE – SUBJECT MATTER EXPERTS

South Dakota's technology and telecommunications businesses are highly consolidated, with the State of South Dakota often being the largest consumer of services in the state. Given that, relationships and partnerships often already exist between the State of South Dakota and the broadband providers, giving a first-hand look at the services offered and where they are offered. In addition, the South Dakota broadband team has ready access to industry experts within the SD Public Utilities Commission, telecommunications association's boards, and technology industry experts in the fields of telecommunications and data networking.

Our office has met and consulted with these experts regarding provider data as issues were found. Examples of these consultations are the review of provider coverage areas against telecommunications exchange areas with the Public Utilities Commission and against known technological capabilities. Any anomalies or questioned material is relayed to the providers for review.

FIELD VERIFICATION

A number of field verification efforts have taken place during the last six months.

- For newly discovered fixed wireless providers, we send remote office staff out to document and photograph the tower infrastructure reported by the provider.

- For mobile wireless providers, broadband staff and other team members have completed over 40,000 miles of drive testing utilizing mobile wireless phones collecting information on coverage and broadband performance. This drive testing has collected over 1.86 million data points across the state that confirm the availability of wireless broadband signal at a geographic location by coordinates, with the data collected every 10 seconds during the drive testing. Tower location information and wireless speed test results were also collected during this drive testing, with over 25,000 test results collected. This gives us a total of 270,000 speed test results with the information collected during our field verification efforts and the Ookla mobile data.

- One verification effort that has picked up steam recently has been crowdsourced reporting of unserved areas. Our website has always maintained a feature for the public to report unserved areas, but participation hasn't been as strong as previously hoped. Our office has recently seen an increase in the usage of this reporting tool. We compare these reports to our data, with follow-ups as necessary to both the provider and the reporting citizen.

An important point to note is that with the development of an automated toolset that allows team members to start data collection upon entering the vehicle and not need any further intervention, a number of staff members have been volunteering time to drive untested roads and territories of the state during vacations, other state business, or leisure time at no cost to the program.

Due to the nature of our organization being a centralized IT group for government and education, we are uniquely positioned to request field verification by our remote office staff. As technicians travel the state, they have performed speed tests at businesses, homes, and government offices, as well as surveyed remote office staff on availability of coverage areas at their homes.

THIRD-PARTY DATA VERIFICATION

The South Dakota broadband team has collected data from the FCC CBT and Mobile tests, the FCC dead zone reporting tool, FCC ASR datasets, our own hosted speed test application, provider speed test results, census data, provider exchange boundaries and commercially available datasets from Ookla to confirm the availability of broadband service. Of particular interest to our program were datasets that tied a specific address to the broadband data, as we have found other location-based services (IP geolocation) to be woefully inaccurate in our state.

Collected third-party data is overlaid against provider coverage areas for comparison. Most valuable has been our hosted speed test server (speedtest.sd.gov). This test collects specific address location information and provider details, while providing consumers the ability to directly provide more accurate location information via a clickable map in the event that their address is not geocoded correctly. This provides benefits to our verification effort as well as our Improved Address Files grant program.

Recently added to our verification efforts have been more accurate provider exchange boundaries and 2010 Census information on population density. Provider coverage areas are compared against known exchange boundaries, and census population density information is used to explain any possibly gaps in coverage.

CROWD SOURCING

In addition to our Crowd sourced speed test system, our state broadband website offers consumers the ability to report broadband dead zones, take surveys on available broadband and related topics, report inaccuracies in our online static/interactive maps, as well as any other relevant feedback about the broadband environment of South Dakota. This feedback is compared against provider coverage areas, with relevant information reported to the providers for comments and/or correction.

Website Hyperlink: **http://broadband.sd.gov/**

CONFIDENCE VALUES

All verification, validation and manual quality review results are tracked by provider/technology type and stored and maintained within a **Validation table**. A confidence value is assigned, based on internal assessments of the collected information, to highlight the provider coverage areas and/or attributions that would benefit from further investigation and/or enhancements.

With the continued efforts on provider validation, 3rd party verification and the release of the public interactive map with feedback collection functionality, the confidence values will be utilized further to identify specific areas in need of attention.

QUALITY CONTROL

Following collection, processing and analysis of the provider and CAI data, the product is checked manually and algorithmically against the NTIA data model. Some of the items included within these checks are:

- Format correctness;
- Table and field structure;
- Valid values, including default values, where applicable;
- Geographic extent and topology errors.

Prior to data submission, another quality control script supplied by NTIA is run. This script, SBDD_CheckSubmission.py, creates an output in text form that is required to be submitted along with the final deliverable. All errors must come up clean, unless otherwise specified by NTIA.

DETAILED PROCESS REVIEW

To review the detailed process, please review the attached object:

BMap_ProcessDetails_2013_04_01.docx

PROVIDERS RESEARCHED

Below is a list of providers that were researched and contacted, but identified as non-broadband providers and didn't require inclusion within the data submission. Some may be due to different naming conventions or inaccurate FRN/DBA names and were therefore considered a closed source.

5LINX Enterprises, Inc.
Airespring, Inc.
Apptix, Inc.
Aptela, Inc.
Bandwidth.com, Inc.
Birch Communications Inc.
Broadvox Go!, LLC
BullsEye Telecom, Inc.
Cause Based Commerce Inc.
CommPartners Holding Corporation
Dickey Rural Telephone Cooperative
DigitalBridge Communications Corp.
Evertek, Inc.
Farmers Mutual Telephone Company (MN & SD)

Matrix Telecom, inc.
Megapath, Inc.
Metropolitan Telecommunications Holding Company
Millicorp
Minnesota Valley Television Improvement Corporation
Mitel Netsolutions Inc.
MobilePro Corp.
Nates Net
Native American Telecom
NextWave Wireless Inc.
nexVortex, Inc.
Northeast Nebraska Telephone Company
NOS Communications, Inc.
OrbitCom, Inc

Fionda VoIP, LLC	PaeTec Corporation
Granite Telecommunications, LLC	Phone.com, LLC
Great Plains Communications, Inc.	Proximiti Technologies, Inc.
GreatCall, Inc.	Siouxland WISP
Hickory Tech Corporation	Timber Lake Broadband
iCore Networks, Inc.	Trans National Communications International, Inc.
InPhonex.com, LLC	tw telecom inc.
Kosmaz Technologies, LLC	VoIP360, Inc.
Level 3 Communications, LLC	VoIPStreet, Inc.
Local Link	Vonage Holdings Corp.
LY Holdings, LLC	Wave2Wave Communications, Inc.