Methodologies Used to Create and Validate Broadband Datasets For the April 2014 SBDD Submission

EXECUTIVE SUMMARY

Broadband data for Massachusetts was collected, integrated and verified by the Massachusetts Broadband Institute (MBI), a division of the Massachusetts Technology Collaborative (MTC). This data was prepared for the National Telecommunications and Information Administration (NTIA) as part of the State Broadband Data and Development (SBDD) grant program and will be displayed on the National Broadband Map. This data is current as of December 31, 2013 and will continue to be verified and updated to improve the quality and accuracy of the information to support MBI activities including adoption studies and last mile deployment planning.

About the MBI

The MBI is the central broadband entity for the Commonwealth of Massachusetts, created on August 4, 2008 when Governor Deval Patrick signed Chapter 231 of the Acts of 2008, *An Act Establishing and Funding the Massachusetts Broadband Institute* (the "Broadband Act"). The mission of the MBI is to extend affordable, robust high-speed Internet access to all homes, businesses, schools, libraries, medical facilities, government offices and other public places across our state.

The Broadband Act gave the MBI the authority to invest up to $40 million of state bond funds into broadband infrastructure. This bonding authority is structured as an "incentive fund" intended to stimulate private industry investments that will complement the MBI's public investments. The MBI is investing its funds in long-lived infrastructure assets, such as conduit, fiber-optic cable and wireless towers, which will lower the cost of entry for broadband providers and make it economically feasible for such firms to provide broadband access service to currently unserved residential, business and institutional customers. For more information about the MBI and its programs and activities, visit the web site at broadband.masstech.org.

Data Summary

The MBI has collected data for 30 of 38 companies that meet the SBDD program definition of "broadband service provider" in Massachusetts. Due to mergers, this is 2 less than the previous submission. The complete list of potential providers also includes resellers and other providers that do not meet the SBDD definition as well as companies that filed FCC Form 477 but do not actually provide broadband service in MA. This list may be found in the "Broadband Providers in Massachusetts" section starting on page 13.

Provider Lists	# Providers
Potential providers in MA (from FCC Form 477 and other sources)	142
Verified as a provider in MA (including resellers and other providers that don't fit the NOFA definition of "provider")	89
Data obtained for or from the provider (included in April 2014 data)	33

Data was acquired from 32 providers of residential and business broadband access in Massachusetts and created from the web site of 1 additional provider. Data transmission technologies in the datasets include asymmetric and symmetric DSL, other copper wireline, DOCSIS 3.0 and other cable, fiber optic, unlicensed fixed wireless, 3G and 4G mobile wireless and satellite technologies. This information was integrated and submitted to the NTIA in the following four datasets.

Dataset	# Providers	# Records
BB_Service_CensusBlock	17	407,159
BB_Service_RoadSegment	12	9,534
BB_Service_Wireless	15	37
BB_ConnectionPoint_MiddleMile	16	107

Information on broadband services at Community Anchor Institutions (CAIs) were collected by phone, email, web surveys, community meetings and from state agencies, parent organizations or regional associations. Public schools and libraries contain unique CAI IDs, from the National Center for Education Statistics (NCES) and Institute of Museum and Library Services (IMLS) respectively, that may be used link the information with other regional or national datasets. Approximately 22% of the CAIs contain broadband subscription information, of which 93% subscribe to broadband services.

Dataset	# Institutions	# Records
BB_Service_CAInstitution	6,628	7,274

DATA DEVELOPMENT – GENERAL

Data development was performed using Esri ArcGIS 10.2.1 software.

Data Integration

Data were received from broadband service providers in varying formats and levels of detail. No two datasets were alike, which required a significant amount of manual review and editing to integrate the information into a common format. Although Excel and Shapefile templates were made available, very few datasets were received in the template formats and attributes were not always provided using the standardized coded values requested. In addition, attribute field names were inconsistent between datasets, contained spaces and special characters or were missing altogether. These differences prevented the use of automated data integration models to format and import data into standardized feature class templates.

All attributes were standardized so that the provider name, doing-business-as name and FCC registration numbers were consistent throughout the datasets (unless noted in the Data Package spreadsheet) and that attributes complied with valid value lists (e.g., for technology of transmission, spectrums used, maximum advertised and typical speeds, end user category, etc.).

Geocoding
Unless otherwise specified, address data was geocoded using street addresses and zip codes from NAVTEQ streets data, which was developed though a partnership between NAVTEQ and the Massachusetts Office of Geographic Information (MassGIS) for increased geocoding accuracy and success rates for the State E911 data.

Data transfer model loading
The final datasets for each provider were loaded into the SBDD transfer schema. Geometry and topology checks were performed a final time and the data were checked for conformance with SBDD database and business rules.

DATA DEVELOPMENT – WIRELINE AVAILABILITY

This section describes the methods used to create the following datasets representing wireline broadband availability (e.g., cable, xDSL, other copper wireline, fiber optic and other unclassified wireline services) by census block and/or road segment:

- BB_Service_CensusBlock and
- BB_Service_RoadSegment

The various wireline broadband availability data formats received include:

1. Non-geographically referenced CAD files containing cable or fiber strands;
2. Geographically referenced Shapefiles containing census block polygons or road segments;
3. Excel spreadsheets or delimited text files containing census block IDs
4. Excel spreadsheets or delimited text files containing individual street addresses;
5. Excel spreadsheets or delimited text files containing street address ranges
6. Written or verbal narratives of service areas; and
7. Excel spreadsheets containing maximum advertised speeds by US Census Bureau core based statistical area (CBSA) and rural statistical area (RSA).

For areas where census blocks are less than or equal to 2 square miles in area, a template containing 2010 census block polygon geography was used. Otherwise, a template was used containing line geography from 2010 TIGER/Line roads that intersect 2010 census blocks greater than 2 square miles in area. Associated attribute information included provider identification, technology of transmission and upload and download speeds.

Data Integration
The integration methods used, and described below, varied according to the source data format.

1. Integrating CAD strands: Cable strands submitted in CAD format were georeferenced to street centerlines and a 200 foot buffer was created from the strands. 2009 census blocks and 2009 TIGER/Line road segments (in census blocks greater than 2 square miles in area) that intersected the 200 foot buffer were classified as served and associated attribute information

from tabular datasets or narratives were populated accordingly. These were later converted to 2010 census blocks and roads, as defined in method 4.

2. Integrating census block and road segment polygons: Data provided in Shapefile format required minor formatting of attribute field names and values to match the common schema.

   (a) The census block vintage (2000 or 2010) was determined by reviewing ID values and attributes were imported into the census block template.

   (b) If vector data was provided from a source other than TIGER/Line roads, a spatial intersection with a 200 foot buffer was performed to transfer attributes to the corresponding TIGER/Line road segments.

3. Integrating tabular data containing census block IDs: Tabular information relating to census blocks referenced either 2009 or 2010 census block data and was joined to the corresponding polygon geometry using the 15 or 16 character FIPS IDs. 2009 census block data were summarized and joined to the 2000 census block polygons using the first 15 characters of the FIPS ID while retaining the maximum advertised and typical speeds and other associated validation and data processing attributes. These were then converted to 2010 census blocks, as defined in method 4.

4. Converting to 2010 census blocks: Census blocks and associated attribute information were converted from 2000 to 2010 census blocks by performing a spatial overlay of the adjusted 2000 census blocks and the new 2010 census blocks. Attribute information was summarized by the 15 character GEO ID (i.e., FIPS ID) and statistics were calculated to carry over the appropriate attribute information (e.g. maximum advertised speeds), which were loaded back into a template containing the 2010 census block geometry.

5. Integrating tabular data containing individual street addresses: Tabular data containing individual street addresses, generally representing subscriber addresses, were geocoded using NAVTEQ streets data to generate point locations. 2010 census blocks and 2010 TIGER/Line road segments (in census blocks greater than 2 square miles in area) that intersect a 200 foot buffer of the points were classified as served. Associated attributes were also imported.

6. Integrating tabular data containing street address ranges: (a) If tabular data was based on 2010 TIGER/Line roads and included a TIGER line ID (TLID), the attributes were loaded into a template containing the TIGER/Line geometry by joining the TLIDs.

   (b) If tabular data was not based on TIGER/Line roads or did not have a means for creating a unique ID to link to the TIGER/Line data, the minimum, mean and maximum left and right street addresses were geocoded using NAVTEQ streets data to generate point locations. As with the individual street address methodology above, 2010 census blocks and 2010 TIGER/Line road segments (in census blocks greater than 2 square miles in area) that intersect a 200 foot buffer of the points were classified as served. Associated attributes were also imported.

7. Integrating narrative data: (a) Location information provided in narrative form, such as the names of streets served or unserved, were incorporated by classifying the qualifying road segments as served. A spatial intersection was then performed to classify any census blocks with area less than 2 square miles as served.

   (b) Attribute information provided in narrative form generally applied to all records or an easily identifiable subset of records in a dataset and the standardized values were assigned to the appropriate field in batch.

8. Integrating spreadsheets containing speed by CBSA/RSA: The tabular data was joined to corresponding CBSA/RSA polygon geometry using the CBSA/RSA ID. Maximum advertised download and upload speed values were transferred to census block and road segment availability records from the CBSA/RSA polygon they are located within.

Data standardization
All information was imported into to 2010 census blocks and road segments. Records with download speeds below 768 kbps (i.e., that don't qualify as broadband service) were removed from the final dataset.

DATA DEVELOPMENT – WIRELESS AVAILABILITY

This section describes the methods used to create the following dataset representing wireless broadband availability (e.g., fixed and mobile wireless and satellite services) by service area:

- BB_Service_Wireless

The various wireless broadband availability data formats received include:

1. Geographically referenced Shapefiles or MapInfo files containing service area polygons;
2. Geographically referenced KML vector and raster files depicting service areas;
3. Non-geographically referenced PDF and JPG files depicting service area polygons;
4. Hard copy maps with hand-drawn service areas;
5. Excel spreadsheets containing street addresses; and
6. Emails and technical documents containing tower and signal specifications.

Associated attribute information included provider identification, technology of transmission, wireless spectrums used and upload and download speeds. In some cases, attributes were provided in a separate tabular or narrative form or had to be acquired from the provider's web site. If providers offered more than one spectrum, a separate feature was created for each unique provider and spectrum combination.

Data Integration
Data integration methods used, and described below, varied according to the source data format.

1. Integrating service area polygons: Data provided in vector format required minor processing to fix geometry errors and create separate polygons for unique provider and spectrum combinations. Polygons less than 0.125 square miles, except for the islands along the Massachusetts coastline, were removed and the remaining polygons were dissolved to create a single feature for each unique provider and spectrum combination. Attribute field names and values were created, formatted and/or populated from tabular or narrative form to match the standardized template format.

2. Integrating service area raster images: Propagation model outputs provided as KML raster images were imported into the GIS system; however, the geographic reference information was not able to be preserved. The imported raster images were georeferenced in the GIS by matching the intersections of propagation area boundaries and roads in Google Earth. Once georeferenced, the raster images were converted to polygons, then tagged with and aggregated by the associated tower ID and spectrum information to create service areas polygons for each propagation model. Additional associated attribute values were populated from information provided in narrative form.

3. Integrating static maps: The PDF and JPG maps containing wireless access points and service area buffers were georeferenced using known locations, such as road intersections. Service areas were digitized or recreated from buffered points on the georeferenced maps. Individual service areas were tagged with spectrum information and aggregated into a single service area for the provider and spectrum combination. Additional associated attribute values were populated from information provided in narrative form or from providers' web sites and the resulting service area boundaries received confidence score of 1.

4. Integrating hard copy maps: Hard copy maps containing shaded service areas were reproduced by digitizing boundaries based on known map locations, such as road intersections. Associated attribute values were populated from information provided in narrative form and the resulting service area boundaries received confidence score of 1.

5. Using tabular data containing street addresses: Tabular data containing individual street addresses, representing subscriber addresses or addresses where service was determine not to be available, were geocoded using NAVTEQ streets data to generate point locations. These locations were compared to service areas and propagation models to verify boundaries.

6. Modeling with tower and signal specifications: Wireless tower and signal specifications (e.g., latitude, longitude, cell site height, cell site frequency and effective radiated power) were used as input parameters in SPLAT! radio frequency signal propagation, loss, and terrain analysis software. Service area boundaries were derived from the received power contours in the resulting propagation models. Additional associated attribute values were populated from information provided in narrative form.

7. Integrating online service maps: Wireless service coverage maps downloaded as images from some providers' web sites, georeferenced using roads and other map features and classified by colors into 2 categories (broadband service and all other). The resulting raster

representations were converted to polygons representing the providers' wireless service areas.

Data standardization
Service area datasets for each provider were clipped to the state boundary and self-intersecting lines were fixed prior to loading into the SBDD transfer schema.

DATA VERIFICATION – WIRELINE AND WIRELESS AVAILABILITY

This section describes the methods used to verify the following datasets representing wireline broadband availability (e.g., cable, xDSL, other copper wireline, fiber optic and other unclassified wireline services) by census block and/or road segment and wireless broadband availability (e.g., fixed and mobile wireless and satellite services) by service area:

- BB_Service_CensusBlock,
- BB_Service_RoadSegment and
- BB_Service_Wireless

Verification of availability data received from providers is essential to determining the accuracy and completeness of the resulting broadband availability maps and is an ongoing process. Methodologies continue to be developed and implemented for data verification and are incorporated into a confidence ranking process. The data verification and confidence ranking methods are described below.

The data verification process employs the following methods (including ground truthing, modeling, community reviews, crowd sourcing, drive testing and Web research), which supply input for the confidence ranking methodology.

1. Cable service area modeling: Cable strand data for incumbent cable providers were acquired as georeferenced MapInfo files from the MA Department of Telecommunications and Cable (DTC) in 93% of the 305 cable-served towns. The strands were imported and a 200 foot buffer was created to approximate the distance from the cable that a structure can receive service without excessive cost or delay. The 200 foot distance was selected based on observed distances between poles and the acceptable distances of structures from cable as defined in cable license agreements. Census blocks and road segments acquired from providers that intersected the resulting service area buffers for that provider were given an increased confidence score.

2. DSL service area modeling: DSL service areas were modeled from known DSL-equipped central office locations, which were geocoded using NAVTEQ streets data and refined using aerial photography, street views and bird's-eye views from Google Maps and Bing Maps. A linear network was developed, using a comprehensive roads dataset maintained by the MA Department of Transportation (MassDOT), that encompassed all roadways within 17,800 linear feet of the central office location. A 200 foot buffer of the network was created to

define a maximum service distance of 18,000 feet from the central office to the service location, based on input from industry experts, with the same 200 foot distance from pole to structure that was used in the cable model. The resulting service area buffers were cropped at town boundaries except where central offices were known to serve neighboring towns. Census blocks and road segments acquired from providers that intersected the estimated service areas for that provider were given an increased confidence score.

3. Infrastructure field surveys: Targeted field work has been performed to locate broadband infrastructure, such as DSL-equipped remote terminals (RTs). As with the central offices, locations were mapped using address and landmark information acquired in the field by geocoding with NAVTEQ streets data and refining with aerial photography, street views and bird's-eye views from Google Maps and Bing Maps. Although many DSL-equipped RTs have been located in the field, they have not yet been incorporated into the DSL service area model yet due to the difficulty of predicting the directional nature of services provided from those locations. However, the locations are valuable for visual review of DSL coverage areas claimed by providers that fall outside of modeled service areas to evaluate the likelihood of service from a given RT location. These visual reviews are performed by a team consisting of a GIS expert and a DSL technology expert. Confidence scores are modified accordingly.

4. Public surveys: Broadband subscription information is collected through web-based broadband surveys from the public and from community anchor institutions (see http://broadband.masstech.org/broadband-availability/community-involvement). The surveys are publicized through targeted events and publications and MBI email notifications. Information collected includes location, provider name, transmission technology, price, and speed for homes, businesses, and institutions throughout the state. At this time, the survey data is only used to verify availability by provider name and transmission technology. Census blocks and road segments acquired from providers that are within 200 feet of survey locations are given an increased confidence score. As with the service area models, the 200 foot distance represents the distance at which service can be provided without excessive cost or delay. In the future, speed test results will be summarized by census block to verify typical speed information received from providers as well.

   Responses to the public survey are geocoded through Google Maps and visually refined by the user if desired. Responses to the community anchor institution surveys are linked to existing point locations maintained by the Massachusetts Office of Geographic Information (MassGIS) or affiliated agency. Community anchor institutions that have changed addresses or are not already in the MassGIS datasets are geocoded using NAVTEQ streets data and refined using a combination of institution web sites and aerial photography, street views and bird's-eye views from Google Maps and Bing Maps.

   At this time, responses from the FCC's consumer broadband test are not used for data verification, but will be evaluated for inclusion in future data verification phases.

5. Provider web site information: If information acquired by providers – including availability and speed – appeared to be questionable, a search was performed on the provider's web site

to confirm it. This type of verification was only performed when uncertainties arose during visual review of the data. In the future, this type of review may be incorporated into a more structured approach to validate locations that are geographically dispersed throughout a provider's service area.

6. Community cable and DSL feedback: In collaboration with some Regional Planning Agencies (RPAs), availability maps were generated and distributed to carefully selected community representatives, such as local broadband committee members or town officials, with local knowledge of cable and/or DSL services in their town. The community representatives reviewed and marked up hard copy maps to identify services areas that extended too far or not far enough and, in some cases, provided the last known service location or address along a road. This was implemented in low confidence areas, which includes western Massachusetts and part of central Massachusetts. Confidence scores are modified based on feedback from the community representatives, and DSL service area boundaries are modified in the areas with the most knowledgeable representatives.

7. Wireless drive studies: In coordination with local colleges, teams of student volunteers were trained to perform wireless drive studies. The students drove pre-defined routes with intermittent stops to collect wireless signal location and quality information using Android phones operating QoS Solutions' QMapper and QPerf software (see www.qos-solutions.com). The drive studies were performed in the same 5 RPA regions in central and western Massachusetts as the community cable and DSL feedback projects. The drive study results will be overlaid on the wireless providers' service areas and submitted for review by the providers. Further verification or service area boundary modifications may be discussed with providers in areas with anomalous results.

Confidence Ranking

As availability data is verified, the verification status is documented in each individual census block or road segment record or subdivision of a wireless service area. The records are also assigned numeric values from 1 to 5 that represent the level of confidence in the likelihood that service is available at that location. When service availability for a given provider and technology is verified by an alternate source, the confidence value for that location is increased by one, up to a maximum score of 5. A value of 1 represents the lowest confidence in provider data and no corroborating information from alternate sources. A value of 5 represents 3 or more corroborating sources or confirmation through field work. Data of all confidence levels are included in the availability datasets; however, locations that are deemed to be inaccurate as a result of the data verification process may have their confidence value reduced and may be tagged as not part of the service area.

General guidelines of the confidence ranking process are as follows:

- Initial rankings: Data records submitted by providers are given an initial confidence ranking of "1" or "2" depending on the level of ambiguity in the submission method. For example, availability information provided by census block ID, street address or spatial object is given

a confidence ranking of 2. Whereas, availability information provided as hand-drawn or narrative estimates may be given a confidence ranking of 1.

- Verification from alternate sources: If availability at a given location is corroborated by an alternate dataset (such as the cable or DSL models, broadband survey responses, cable or DSL service area feedback from community representatives, or wireless drive study data interpolation), the verified location receives a 1 point increase in the confidence score for each corroborating dataset, with a minimum score of 3 and a maximum score of 5.

- Field confirmation: If availability at a given location is confirmed by known service locations identified through field work, it is given a confidence score of 5. Confirmed field locations include known infrastructure, such as DSL-equipped remote terminals, or known service availability acquired in wireless drive studies.

Provider Feedback Loop
All providers that submitted data received a written data submission report that described the format and completeness of the datasets they provided. This report included requests for additional information or alternate formats in the next submission and other data clarifications or corrections needed. Additional feedback was provided by phone or email conversations as needed. In addition, PDF maps of estimated services, based on the census blocks and roads or wireless area boundaries, are provided for verification and/or modification as needed. Information on conflicting alternate data sources may also be provided for comment or challenge. The final service areas and attribute information are also available to the providers for review using a secure web-based data portal.

DATA DEVELOPMENT – MIDDLE MILE INTERCONNECTION FACILITIES

This section describes the methods used to create the following dataset representing the location, technology and capacity of facilities that connect a service provider's network to another provider's network or the Internet:

- BB_ConnectionPoint_MiddleMile

Tabular data – including provider identification and facility ownership, capacity and type – were received from providers by street address or latitude and longitude. Latitude and longitude values were used to create point geometry when possible. Otherwise, street address data was geocoded using NAVTEQ streets data.

The MBI does not have alternate data sources for the verification of these datasets.

Data standardization
Facility ownership, capacity and type values were standardized to comply with valid value lists. Due to the field type of double used to store latitude and longitude, values with trailing 0's did not meet the 6-digit business rule. However, to preserve the accuracy of the data, these values

were not modified to contain 6 decimal places. Latitude and longitude values received from providers with less than 6 decimal places were also not modified to prevent misrepresenting the data as more accurate than it really was.

DATA DEVELOPMENT – COMMUNITY ANCHOR INSTITUTION SERVICE SUBSCRIPTIONS

This section describes the methods used to create the following dataset representing the location and broadband service subscription of community anchor institutions throughout the state:

- BB_Service_CAInstitutions

The community anchor institution datasets deemed most relevant to broadband issues in Massachusetts are listed below. New categories added this round are marked with *.

- K-12 schools
- Colleges and universities
- Public libraries
- Hospitals
- Community health centers
- Other healthcare facilities*
- Police stations
- Sheriffs' offices
- Fire stations
- Public safety answering point
- Ambulance service
- Career centers
- Town halls and municipal offices
- State offices*
- Boards of health
- Councils on aging
- Senior center
- Public Housing

Existing spatial datasets containing community anchor institution names and locations were acquired from state and regional agencies. The attributes were standardized and imported into a template dataset. Missing attributes (e.g., zip codes) were acquired through web searches (e.g., on institution web sites or from the US Postal Service). Many of the locations in the western and north central part of the state have been corrected in conjunction with the ***MassBroadband 123*** fiber-optic build out, a Broadband Technology Opportunities Plan (BTOP) grant program.

Initial data requests were made to state and regional agencies and/or associations to acquire any existing compilations of information on broadband service information at affiliated anchor institutions. Complete or almost complete datasets for career centers, state police and county sheriffs were acquired from the MA Executive Office of Labor and Workforce Development (EOLWD) and MA Executive Office of Public Safety and Security (EOPSS). Partially complete datasets for K-12 schools and public libraries were acquired from the MA Department of Elementary and Secondary Education (ESE) and the MA Board of Library Commissioners (MBLC).

For the remainder of the anchor institutions, a campaign was implemented to acquire information through phone, email and web-based surveys from individuals associated with individual anchor institutions who were knowledgeable about the institution's broadband services. Requests were also made through targeted outreach at events and in publications targeted at anchor institutions

to increase awareness of broadband issues and participation in the broadband survey. Agencies and organizations that assisted in this effort included the MA Department of Secondary and Elementary Education (ESE), MA Board of Library Commissioners (MBLC), MA Chiefs of Police Association (MCOPA), Massachusetts Municipal Association (MMA), MA Department of Revenue (DOR), Mass League of Community Health Centers (MLCHC) and a CIO group for public and community colleges.

Data standardization

Survey questions were developed to request information that were easily understood and acquired by anchor institution staff. As a result, survey results required additional formatting to standardize the information in accordance with SBDD valid values. This information included broadband subscription status, transmission technology and maximum advertised speeds were collected and standardized to comply with valid value lists. In addition, street addresses for new anchor institutions that were not in the original GIS datasets were geocoded using NAVTEQ streets data and refined using visual references such as Google satellite photography and street view imagery.

In some cases, standardized transmission technology attribute values were used by the MBI to track uncertain technology categories. These were converted in the final datasets, as shown below, to comply with SBDD valid values.

MBI Technology Values	SBDD Technology Values
1: Unknown	0: Other
42: Cable - DOCSIS Unknown	40 or 41: Cable - DOCSIS 3.0 or Other (depending on provider)
72: Fixed Wireless - Unknown	70: Fixed Wireless - Unlicensed

In some cases, transmission technology was corrected to reflect the service known to be offered by the specified provider. For anchor institutions that have more than one broadband connection, only records with the maximum speeds for each transmission technology type were included. For anchor institutions that did not provide broadband information, the broadband service field was set to unknown (BBSERVICE = U).

BROADBAND CHALLENGES IN MASSACHUSETTS

Broadband access differs significantly between the eastern, central and western parts of the state as well as the cape and islands. The majority of “unserved” and “underserved” communities are in western Massachusetts, which represents approximately 1/3 of the land mass in the state. Barriers to broadband access and deployment in this region are primarily due to topography, vegetation and population density. Western Massachusetts, as well as Cape Cod and the islands, currently lacks the middle mile infrastructure needed to encourage private sector development of last mile service or to achieve downstream speeds of 4 Mbps. In early 2014, the final construction of over 1,550 miles of open access fiber-optic middle mile networks in the state was completed. ***MassBroadband 123*** is a 1,200 plus network in over 120 communities in western

and north central Massachusetts that connects and provides over 1,200 community anchor institutions with access to competitive services. OpenCape is a 350 plus mile network in 37 towns in southeastern MA, Cape Cod and the Islands that connects over 90 community anchor institutions. The MBI is also working on last mile strategies to make broadband available to residents and businesses in underserved communities.

For ***MassBroadband 123*** info: broadband.masstech.org/building-network/massbroadband123
For OpenCape info: www.opencape.com

Wireline broadband availability in Massachusetts, particularly in western Massachusetts, is overstated in the current broadband datasets. This is due, in part, to generalizations resulting from census block size and population distribution in rural areas. DSL service is not available to new customers in many western Massachusetts towns because the equipment is at maximum capacity. The MBI continues working with communities to incorporate local knowledge of service availability in our feedback to broadband service providers by flagging census blocks and road segments requiring additional verification and in some cases modifying service area boundaries.

Wireless broadband availability in Massachusetts is also overstated. The reliability of propagation modeling has been identified as a concern in establishing wireless broadband availability. Although topography is factored into propagation models, vegetation is also a significant barrier to wireless in Massachusetts and makes it difficult to determine if service is really available at a location. Responses to the MBI survey also indicate that typical mobile wireless speeds do not always qualify as broadband.

Information provided by the community anchor institutions also requires additional review and modification. Respondents had difficulty selecting the correct transmission technology (e.g., the provider name frequently did not correspond to the technology) and often did not know the advertised speed of their service.

BROADBAND PROVIDERS IN MASSACHUSETTS

The MBI performed web research and/or attempted to contact all of these companies to verify if they were a broadband service provider in Massachusetts. Potential providers were asked the following questions to determine how to classify them on the list and if they should be included on the state and national broadband maps.

1. Do you provide broadband services in MA?
2. What part(s) of MA do you serve?
3. What type of broadband services do you offer?
   - What type of technologies?
   - Do you offer residential services, business services or both?
4. Do you own the infrastructure or are you a reseller?

5. Do you offer separate services under different names or do you have multiple names related to the same service?
6. Can you provide service within 10 days?

Below is the full list of providers potentially offering broadband services in Massachusetts, including companies that filed FCC Form 477 and additional providers identified by the MBI through other sources. Alternate provider names, resulting in duplicate provider entries, were removed from the list.

The list is broken down into three sections.

1. Verified providers with data included in the data submission.
2. Verified providers in Massachusetts that were not included in the data submission. (Note: This category is made up primarily of resellers and other providers that do not fit the SBDD definition of a broadband service provider, generally because they can't provide service within 10 days.)
3. Other companies that do not offer broadband service in Massachusetts.

A. Verified providers included in the April 2014 data submission

Number	Filing Company DBA	Provider Type
1	AT&T Corp, Inc.	Meets NOFA Definition
2	AT&T Mobility LLC	Meets NOFA Definition
3	BELD Broadband	Meets NOFA Definition
4	Charter Communications Inc.	Meets NOFA Definition
5	Chappy WISP	Meets NOFA Definition
6	Comcast	Meets NOFA Definition
7	Country Roads Networks, Inc.	Meets NOFA Definition
8	Covad Communications Company	Meets NOFA Definition
9	Cox Communications	Meets NOFA Definition
10	FairPoint Communications	Meets NOFA Definition
11	Fibertech	Other
12	GAW High-Speed Internet Inc	Meets NOFA Definition
13	HGE.net Fiber Optic Internet	Other
14	HughesNet	Meets NOFA Definition
15	Level 3 Communications, LLC	Other
16	MetroPCS	Meets NOFA Definition
17	Norwood Light Broadband	Meets NOFA Definition
18	OTT Communications	Meets NOFA Definition
19	PMLDnet.com	Meets NOFA Definition
20	RCN	Meets NOFA Definition
21	Richmond Telephone Company	Meets NOFA Definition
22	Russell Municipal Cable T.V.	Meets NOFA Definition
23	Shrewsbury Electric and Cable Operations (SELCO)	Meets NOFA Definition
24	Sprint	Meets NOFA Definition
25	StarBand Communications Inc.	Meets NOFA Definition
26	Time Warner Cable	Meets NOFA Definition
27	T-Mobile	Meets NOFA Definition
28	USAi.net	Meets NOFA Definition
29	Verizon	Meets NOFA Definition
30	Verizon Wireless	Meets NOFA Definition
31	Warwick Broadband Service	Meets NOFA Definition
32	WildBlue Communications, Inc.	Meets NOFA Definition
33	WiSpring	Meets NOFA Definition

B. Verified providers not included in the April 2014 data submission

Number	Filing Company DBA	Provider Type
34	DSCI Corporation	Meets SBDD Definition
35	Mega Broadband Inc.	Meets SBDD Definition
36	segTel, Inc.	Meets SBDD Definition
37	Sentinel Tree Telephone Company	Meets SBDD Definition
38	Towerstream	Meets SBDD Definition
39	tw telecom inc.	Meets SBDD Definition
40	Wave2Wave Communications Inc.	Meets SBDD Definition
41	XO Communications Inc.	Meets SBDD Definition
42	Ace Innovative Networks, Inc.	Reseller
43	ACN, Inc.	Reseller
44	ACN, Inc.	Reseller
45	Airespring, Inc.	Reseller
46	American Telephone Company LLC	Reseller
47	Bandwidth.com, Inc.	Reseller
48	Barry Communications, Inc.	Reseller
49	BCN Telecom, Inc.	Reseller
50	Broadcore, Inc.	Reseller
51	Broadview Networks Holdings, Inc.	Reseller
52	BullsEye Telecom, Inc.	Reseller
53	Communication Solutions Partners, Inc.	Reseller
54	Cordia Corporation	Reseller
55	Evolve IP, LLC	Reseller
56	Fidelity Voice Services LLC	Reseller
57	Granite Telecommunications, LLC	Reseller
58	iCore Networks, Inc.	Reseller
59	Internet & Telephone, LLC	Reseller
60	LY Holdings, LLC	Reseller
61	McGraw Communications, Inc.	Reseller
62	Metropolitan Telecommunications Holding Company	Reseller
63	Midwest Marketing Group, Inc.	Reseller
64	Network Billing Systems LLC	Reseller
65	New Edge Holding Company	Reseller
66	nexVortex, Inc.	Reseller
67	One Communications	Reseller
68	Qwest Communications International, Inc.	Reseller
69	Smart Choice Communications, LLC	Reseller
70	Stage 2 Networks, LLC	Reseller

Number	Filing Company DBA	Provider Type
71	TReseller Technologies	Reseller
72	Utel, Inc.	Reseller
73	Velocity Networks Inc.	Reseller
74	Broadvox Go!, LLC	Other
75	Cbeyond Communications, Inc.	Other
76	Cogent Communications Group	Other
77	Cypress Communications, Inc.	Other
78	EarthLink	Other
79	Ernest Communications, Inc.	Other
80	FiberTower Network Services Corp.	Other
81	Global Crossing	Other
82	Lightower Fiber Networks	Other
83	M5 Networks, Inc.	Other
84	PaeTec Corporation	Other
85	South Hadley Electric Light Department	Other
86	Telesphere Networks Ltd.	Other
87	Transbeam Inc.	Other
88	Vocal IP Networx Ltd.	Other
89	Westfield Gas and Electric	Other

C. Other companies that do not offer broadband service in Massachusetts

Number	Filing Company DBA	Provider Type
90	5LINX Enterprises, Inc.	No service in MA
91	8x8, Inc.	No service in MA
92	Access One, Inc.	No service in MA
93	Access Point, Inc.	No service in MA
94	Accessline Holdings, Inc.	No service in MA
95	Apptix, Inc.	No service in MA
96	Aptela, Inc.	No service in MA
97	Birch Communications Inc.	No service in MA
98	C3IP Communications LLC	Dissolved/Liquidated
99	Call Catchers, Inc.	No service in MA
100	Cause Based Commerce Inc.	No service in MA
101	Cincinnati Bell Inc.	No service in MA
102	CommPartners Holding Corporation	No service in MA
103	ConnectMe, L.L.C.	No service in MA
104	Cordia Corporation	No service in MA
105	DataNet Communications Group, Inc.	Needs further research

Number	Filing Company DBA	Provider Type
106	Equinox, Inc.	No service in MA
107	First Communications, LLC	No service in MA
108	GlobalPhone Corp.	No service in MA
109	GreatCall, Inc.	No service in MA
110	IDT Corporation	No service in MA
111	InPhonex.com, LLC	No service in MA
112	IP Communications, LLC	No service in MA
113	Jivetel Communications	No service in MA
114	Kosmaz Technologies, LLC	No service in MA
115	LightSquared LP	No service in MA
116	Matrix Telecom, inc.	No service in MA
117	Millicorp	No service in MA
118	Mitel Netsolutions Inc.	No service in MA
119	Mix Networks, Inc.	No service in MA
120	N.W.ComTech, Inc	No service in MA
121	Navigator Telecommunications, LLC	No service in MA
122	NextWave Wireless Inc.	No service in MA
123	NOS Communications, Inc.	No service in MA
124	OnWav, Inc.	No service in MA
125	Openairboston.net	No service in MA
126	Phone.com, LLC	No service in MA
127	PNG Telecommunications, Inc.	No service in MA
128	Proximiti Technologies, Inc.	No service in MA
129	Quality Telephone Inc.	No service in MA
130	Razorline LLC	No service in MA
131	Reign Integrated Network Solutions LLC	No service in MA
132	Semperon Corporation	No service in MA
133	Spectrotel, Inc.	No service in MA
134	Telekenex, Inc.	No service in MA
135	TelLan Network Technologies, Inc.	No service in MA
136	Thinking Phone Networks, LLC	No service in MA
137	Tidal Communications, LLC	No service in MA
138	Trans National Communications International, Inc., TNCII	No service in MA
139	vCom Solutions	No service in MA
140	VoIPStreet, Inc.	No service in MA
141	Vonage Holdings Corp.	No service in MA
142	Zayo Group, LLC	No service in MA