



American Samoa

Broadband Mapping Project Product Release White Paper

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Product Specification: Spring 2011 NTIA Data Model
Product/Process: NTIA – April 1st, 2011 Data Deliverable
Dataset Submission QC: NTIA – SBDD_CheckSubmission.py

Document Control

Version	Primary Author(s)	Description	Date Completed
1.0	Kristin Rousseau	Original Draft Document	03/29/11





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1 Overview

The following describes the Data Gathering, Data Integration, Data Validation and Verification and Quality Control processes utilized to create the Broadband Mapping Project's April 1st, 2011 data submission.

To support various levels of technical and program knowledge, this white paper supplies both a high level summary and a detailed process review.

2 High Level Review

2.1 Data Gathering - Providers

Broadband Service Area, 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 research and State inputs.
- Update Provider Material that describes the data requirements and logistics for data transfer.
- Update NDA for use in project, where applicable
- Maintain multiple protocols for the provider to submit data, including 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.)





2.2 Data Gathering - Community Anchor Institution (CAI)

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

- Collect and maintain inventory of CAIs through Data Mining, research, and State inputs.
- 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.

2.3 Data Integration Process

The data integration and processing mechanisms currently utilized allow for multiple types of inputs and results in a standardized output that meets the NTIA deliverable requirements. This process is flexible to support 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. Following completion of CP creation, process steps within Data Validation & Verification occur
 - Process coverage area to build the required NTIA data model layers
- Process CAI data input into internal standardized format, as mentioned above under CAI Create Product Deliverable based on NTIA and State-level requirements.
- Following the creation of the product, process steps within Data Validation & Verification occur





2.4 Data Validation & Verification

To ensure the data collected and processed is as accurate and comprehensive and possible, provider validation and internal verification activities are utilized. Following the initial mapping of providers' coverage area and serviceability claims, additional reviews are performed using the following methods:

- **Third-Party Data Verification:** Visually and programmatically compare the coverage against third-party data.
Pitney Bowes and American Roamer data are used in cases where a coverage area is questionable. All anomalies identified during this analysis are reviewed with the providers.
- **Broadband Provider Validation – Provider Portal Application:** Providers are trained on and requested to use a secure interactive web application to review their current coverage area(s) and supporting broadband attribution and validate their data or submit change requests to update their data.

All provider change requests go through the Data Integration Process and a review with the provider to complete validation.

- **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.

2.5 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 as follows:

- Format Correctness
- Table & 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 from NTIA.





Exceptions to the script as noted by NTIA on the SBDD Workspace on 03/25/11 at the following link:

<https://sbdd-granteeworkspace.pbworks.com/w/page/38218329/CheckSubmissionExceptions>

- Longitude values for States outside the lower 48 (any table)
- CAI results for Transtech, MaxAdUp, MaxAdDown if BBService is 'No' or 'Unknown'
- Overview MaxAdDown, MaxAdUp if 100% of record level data has MaxAdDown or MaxAdUp populated

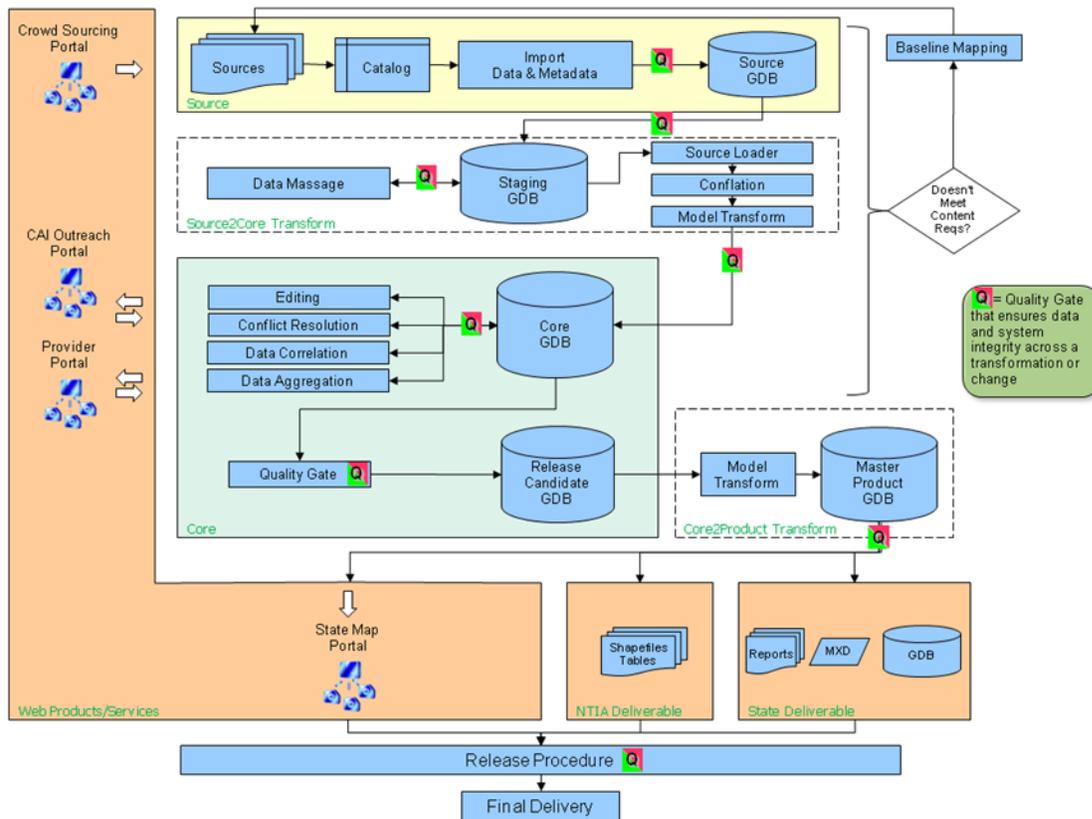




3 Detailed Process Review

Below is a detailed review of the data collection, integration and quality control points along the broadband data gathering and mapping process.

Diagram of overall process:



3.1 Provider Outreach

For the April 2011 data submission, an e-mail notification was sent to all providers with supporting deliverable dates. The Provider Portal web application was released and training webinars held so providers could use this application to submit changes to and/or validate their current coverage area(s).

Data was also collected from the providers via e-mail and SFTP, depending on their comfort level to submit data in time for the April 1st deadline.





In support the data collection effort, providers that did not timely respond to the outreach were contacted by phone.

3.2 Outreach Materials

The original provider packet sent via email to the providers included the following documents and files:

- 1) Letter from the State inviting them to participate in the program
- 2) Copy of the non-disclosure agreement (NDA)
- 3) Copy of the Mapping NOFA from the NTIA
- 4) Copy of the NOFA Clarification from the NTIA
- 5) Broadband service address example file in CSV format
- 6) Word document describing service address example file
- 7) Broadband service block example file in CSV format
- 8) Word document describing service block example file
- 9) Broadband service street example file in CSV format
- 10) Word document describing service street example file
- 11) Broadband subscriber example file in CSV format
- 12) Word document describing subscriber example file
- 13) Broadband wireless coverage area sample shapefile
- 14) Word document describing wireless coverage area sample shapefile
- 15) Instructions for downloading, installing, and using the WinSCP secure FTP application

3.3 Outreach Process

The provider outreach process is comprised of the following general steps:

- 1) Send the provider package and introduction letter to the main point of contact for the provider
- 2) Follow up with email and call to verify that the main point of contact is correct.
- 3) If necessary, discuss the NDA further and resolve any redlines.
- 4) Once the correct primary contact is established, set up a call, if necessary, to learn more about the provider's offerings and direct them to the appropriate outreach materials.
- 5) If providers are unable to be contacted (non-responsive) or indicate that they are not interested in participating (non-cooperative) mark them as such on the provider tracking sheet. These providers will be escalated to the state for further action.
- 6) As the providers are collecting the required data, provide instruction on downloading, installing, and using the WinSCP secure FTP application, if required.
- 7) Arrange with the providers to transfer the data in whatever way they are comfortable. Some providers will find regular email acceptable. Others will want to use the secure FTP application.
- 8) After data is received and reviewed, it may be necessary to contact a provider for clarification or to address incomplete data sets. In the interest of building and maintaining relationships, care is given not to push the provider but to work with it to obtain accurate data in the best possible format.





3.4 Data Collection

3.4.1 Data Transfer Procedures

There are three primary ways data is collected from providers. These are:

- 1) Secure FTP using the WinSCP application
- 2) Regular email
- 3) Mail

3.4.2 Initial Data Review and Quality Assurance

The initial data review and quality assurance process consists of the following general steps:

- 1) Access the data from the secure FTP site or email
 - a. If emailed, place copy of original data set in the appropriate provider folder on the secure FTP site
- 2) Place copy of raw data on local computer in a working directory.
- 3) Review data and determine course of action based on type of data received.
- 4) Ensure data is complete and contact provider to address any gaps.

Note: The goal is to get as many providers as possible to provide subscriber address data in the correct format. Obviously, this will not be possible with all providers so we will continue to have to process various types of provider-supplied data.





3.5 Data Ingestion

3.5.1 Data Ingestion Overview

The following outlines the process steps taken based on the type of input supplied by the data provider:

Point Data

- Subscriber location
- DSLAM location
- Central Office location
- Broadcast Tower location

Linear Information

- TIGER street segments

Polygonal Information

- Census Blocks
- Coverage Area

Overall, the process is geared toward taking the provider data supplied and creating polygon shapes to append to the bb_cov feature class. The bb_cov feature class is the interim data set that is then processed using the **makeDeliverable.py** Python scrip to create the MapConnect data layers that will be delivered to the state and, ultimately, to the NTIA. Following are the detailed instructions used in this process.

3.5.2 Point Data

3.5.2.1 Subscriber Location – Address Data

In the event that the data provider supplies subscriber address data the following actions occur:

- 1) First, convert the address data to a clean Excel spreadsheet in an appropriate address data format.
 - a) Usually, this has the following columns: street address (number, pre-directional, pre-modifier, street name, street type, post-directional, and post-modifier concatenated together), city, state, ZIP.
- 2) Configure the ArcGIS geocoding tool to use the TIGER 2009 streets dataset
 - a) In ArcCatalog, create a new Address Locator by right-clicking in the white space of the appropriate directory and selecting New>Address Locator from the dropdown menu.
 - b) Select “US Streets with Zone” and press OK.
 - i) Note: It is likely that multiple Address Locators will have to set up to handle the variety of provider address data received.
 - c) Navigate to the TIGER Streets 2009 file and press OK.
 - d) Fill in the dialog box as seen below:





New US Streets with Zone Address Locator

Name:

Description:

Primary table

Reference data:

Store relative path names

Fields

House From Left:

House To Left:

House From Right:

House To Right:

Prefix Direction:

Prefix Type:

Street Name:

Street Type:

Suffix Direction:

Left Zone:

Right Zone:

Input Address Fields

The field containing:	is recognized if it is named:
Street	Address
Zone	Addr
	Street

Buttons: Add..., Delete, Up, Down

Matching Options

Place Name Alias Table...:

Spelling sensitivity:

Minimum candidate score:

Minimum match score:

Intersections

Connectors: Separate connectors by a space, e.g. "& @ , /"

Output Options

Side offset: in

End offset: %

Match if candidates tie

Output Fields

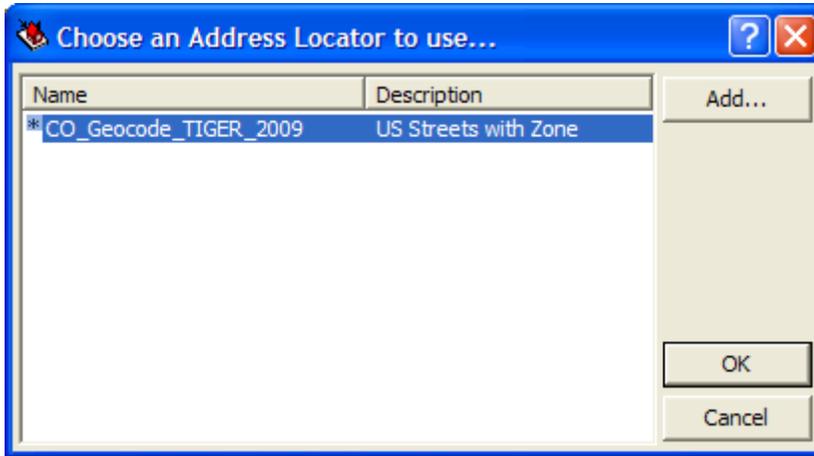
X and Y coordinates Standardized address

Reference data ID Percent along

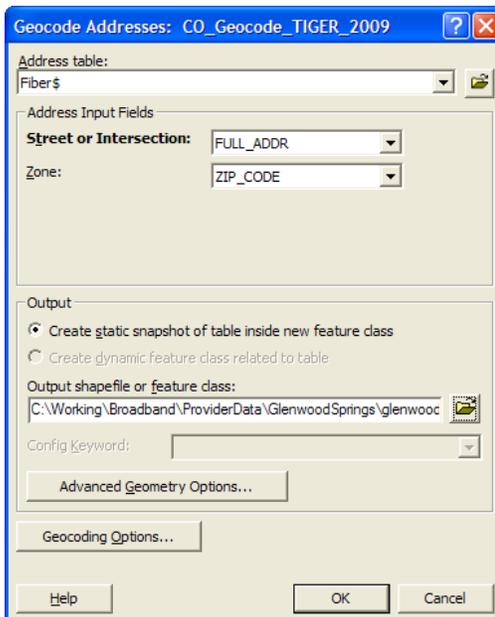
Buttons: Help, Advanced..., OK, Cancel

- e) Click OK.
- 3) Open up ArcMap, and add the Excel spreadsheet with the address information.
- 4) Right-click on the Excel spreadsheet and select Geocode Addresses from the dropdown menu.
- 5) Select the appropriate address locator by clicking Add.... then OK.





6) Fill out the Geocode Addresses dialog box as shown below:



- 7) Geocode the list in batch mode using the geocode service set up in Step 2 above, accepting all the default parameters.
- 8) Review results.





Interactive Rematch - glenwood_try1

Show results: All Addresses Manage result sets... Refresh Rematch Automatically

FID	Shape	Status	Score	Match_type	Side	
0	Point	M	81	A	L	201 CENTENNIAL DR, 81601
1	Point	M	81	A	L	201 CENTENNIAL DR, 81601
2	Point	M	81	A	L	201 CENTENNIAL DR, 81601
3	Point	M	100	A	L	210 CENTER DR, 81601
4	Point	M	81	A	L	15 MARKET DR, 81601
5	Point	M	81	A	R	40 MARKET DR, 81601
6	Point	U	0	A		
7	Point	T	51	A	L	58627 SOCCER FIELD RD, 81601
8	Point	M	100	A	L	125 STORM KING RD, 81601
9	Point	M	60	A	L	52800 TWO RIVERS PLAZA RD, 81601
10	Point	U	0	A		
11	Point	M	81	A	R	40 MARKET DR, 81601
12	Point	T	63	A	R	2698 GILSTRAP CT, 81601

Record: 1 Records (of 110)

Address: Street or Intersection: 201 CENTENNIA Zone: 81601

1 Candidate

Score	Side	Match_addr	LeftFrom	LeftTo	RightFrom	RightTo
81	L	201 CENTENNIAL DR, 81601	201	299	200	298

Candidate details:

From	201	200
To	299	298
PreDir		
PreType		
StreetName	CENTENNIAL	
StreetType	DR	
SufDir		
Zone	81601	81601
Score	81	
Side	L	
Match_addr	201 CENTENNIAL C	

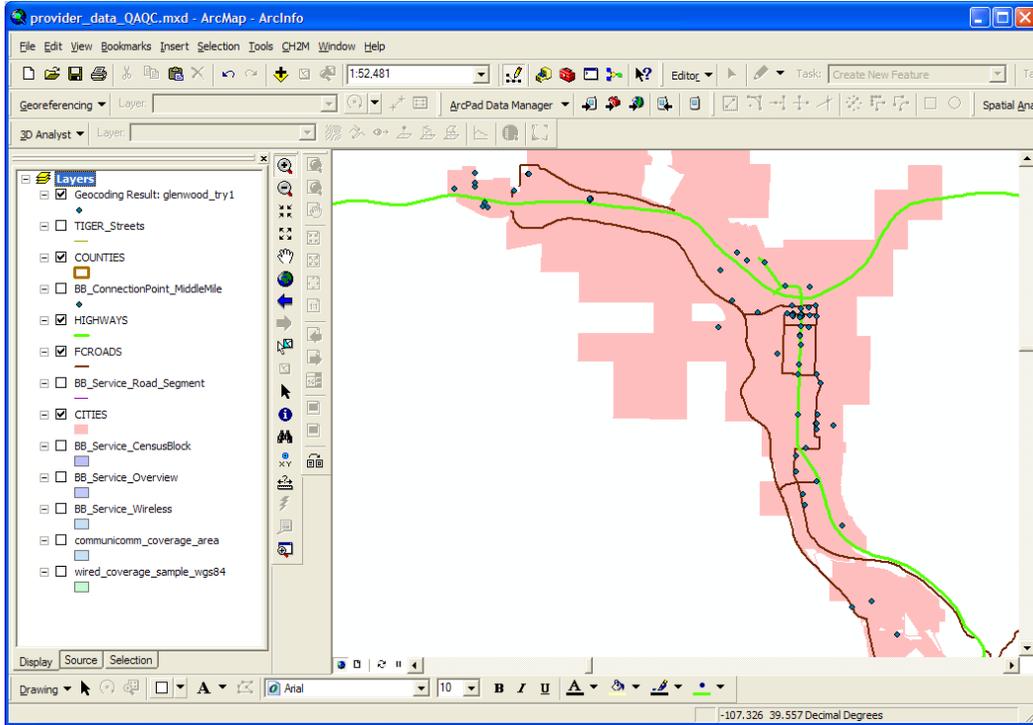
Standardized Address: 201 | CENTENNIAL | ST | 81601

Geocoding Options... Zoom to Candidates Pick Address from Map Search Match Unmatch Save Edits Close

Matched: 97 (88%)
Tied: 5 (5%)
Unmatched: 8 (7%)

- 9) Adjust geocoding parameters accordingly and repeat batch to resolve issues.
- 10) Manually geocode unmatched addresses until target hit rate achieved, generally 90%.
- 11) Visually inspect the data as seen below:





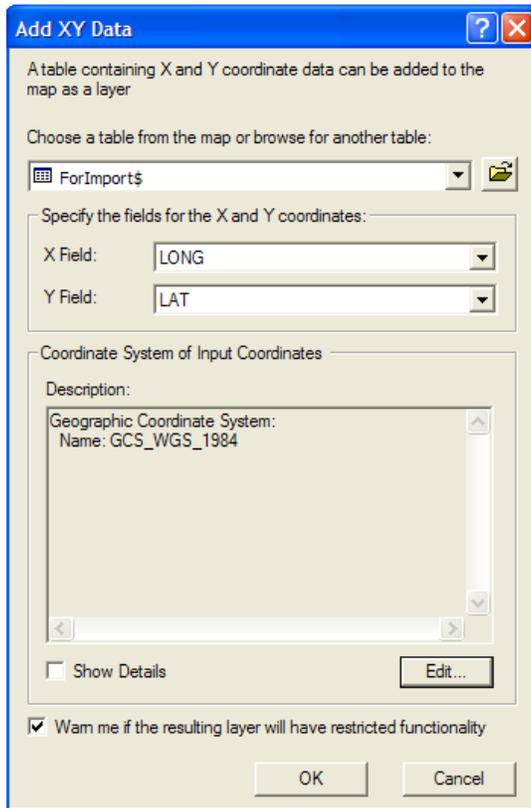
12) Follow the steps detailed in Subscriber Location – GIS Data below

3.5.2.2 Subscriber Location – XY Data

If the provider supplies a list of subscriber data with accompanying XY data such as latitude and longitude, the steps are as follows:

- 1) Refine the format in Excel so that the data can easily be opened using ArcMap.
 - a. Remove all font color, highlighting, cell colors and borders, clean up column headers and make sure there are no merged cells.
 - b. Make sure that XY locations are in decimal degrees.
 - i. To convert from degrees, minutes, seconds (39° 26' 45.67") to decimal degrees use the following formula: $DD + (MM/60) + (SS.SSS/3600)$.
 - ii. Note: if XY locations from some other coordinate system are provided, you can use those in the process below but you must know what the coordinate system is.
- 2) Open up the Excel worksheet in ArcMap.
- 3) From the menu bar, select Tools>Add XY Data...





- 4) Supply the appropriate fields for the X and Y coordinates, choose the appropriate coordinate system and press OK.
- 5) Results are an event layer, not a true spatial layer. Export the data by right-clicking the event layer and selecting Data>Export Data... from the dropdown menu.
- 6) Follow the steps detailed in Subscriber Location – GIS Data below.

3.5.2.3 Subscriber Location – GIS Data

If the provider supplies subscriber location in GIS format, the only process step is to load that data into the appropriate data schema and it will be ready for processing.

- 1) First, load the data into the Point Address database schema (please see Appendix D for an example of the Point Address database schema.) using an empty feature class in that schema.
- 2) In ArcCatalog, right-click on the empty feature class and select Load from the dropdown menu.
- 3) Navigate to the provider address GIS data set and then map the attribute fields accordingly, as seen in general below:





Simple Data Loader

For each target field, select the source field that should be loaded into it.

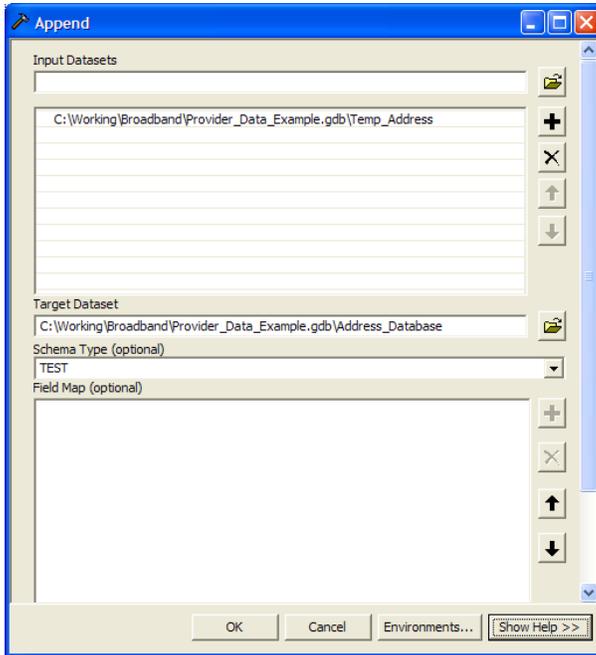
Target Field	Matching Source Field
street_id [int]	<None>
side [string]	<None>
feature_id [int]	<None>
point_type [short int]	<None>
add_house_num [string]	BLDG_NUM [string]
add_pre_dir [string]	PRE_DIR [string]
add_pre_type [string]	<None>
add_name_body [string]	STREET_NM [string]
add_suf_type [string]	SUF_TYPE [string]
add_suf_dir [string]	SUF_TYPE [string]

Reset

< Back Next > Cancel

- Once you have successfully loaded the provider address data into the temporary database with the correct schema, you will now append that data to the overall Point Address database.
- In ArcToolbox, use the Append command (*Data Management Tools>General>Append*) to add the features into the overall Point Address database, as seen in general below:



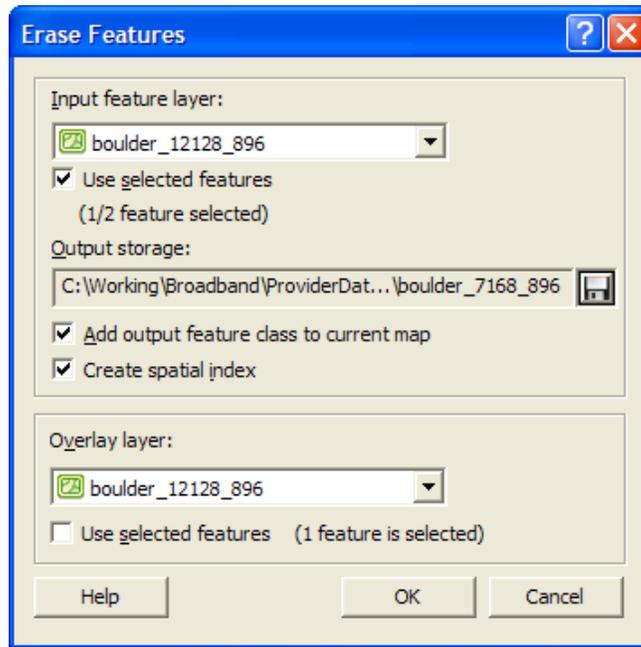


- 6) Since the data is already in the Point Address database schema, there is no need to alter the Field Map in the Append tool.
- 7) After appending, calculate metadata reflecting geometry source and representation values.
- 8) Break provider-specific points into separate county feature classes and perform the following steps per county feature class:
 - a. Within ArcGIS
 - i. Summarize download and upload speeds [first,last] to determine all speeds available for county.
 1. This will save as a DBF table. Keep track of location for future reference.
 - ii. Buffer county address point featureclass to 150'.
 1. During buffer command, dissolve on "ad_down"; "ad_up"; "provider"; "dba"; "frn"; "tt"; 'all metadata fields'; "stctyfips". Save as... county_fastestdown_fastestup.
 2. (Example using Qwest data: boulder_40128_20128, where boulder=county; 40128=ad_down; 20128=ad_up)
 3. Note: these attribute fields are specific to the Point Address database.
 - iii. Select the features that represent the lowest speeds
 - b. Using XtoolsPro (<http://www.xtoolspro.com/>)
 - i. In the XTools Pro toolbar, select XTools Pro>Layer Operations>Erase Features
 - ii. Use the same feature class for Input and Overlay
 - iii. Check Use selected features on the Input feature, as seen below.



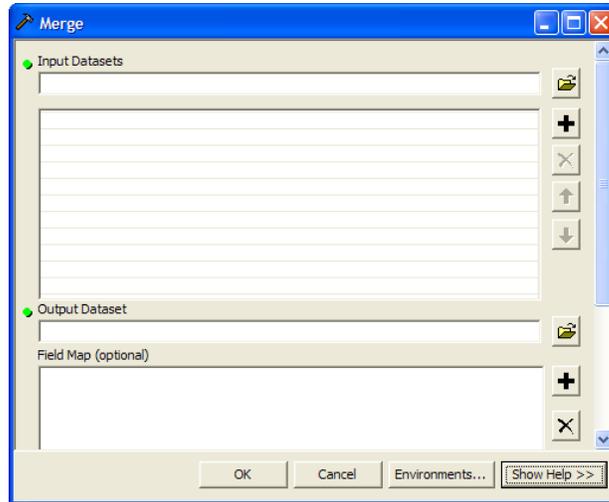


- iv. Repeat and erase slowest speeds one speed at a time. Saving each new feature class as the next slowest speed, using the same naming convention as above. A general example is seen below:



- c. Within ArcGIS
 - i. Edit/delete speeds from the attribution table of each feature class, so each remaining feature class has only one speed value.
 - ii. Merge individual speed feature classes together using the Merge command in ArcToolbox (Data Management Tools>General>Merge). The dialog box is seen below:





- iii. Merge individual county feature classes together using the Merge command in ArcToolbox (Data Management Tools>General>Merge).
- iv. Since the county files are all in the same schema, do NOT alter the Field Map portion of the command interface.
- v. When all the county files are merged together into one dataset, use the Append command in ArcToolbox (Data Management Tools>General>Append) to add the features to the bb_cov interim data set. Use the Field Map portion of the Append tool to map the appropriate field values to their corresponding fields in the bb_cov feature class.

3.5.2.4 DSLAM or Central Office Location – Address Data

In the event that the provider supplies DSLAM (digital subscriber line access multiplexer) or Central Office address data please follow the steps below:

- 1) Follow the process for geocoding points in Subscriber Location – Address Data, above.
- 2) Follow the steps detailed in DSLAM or Central Office Location – GIS Data below.

3.5.2.5 DSLAM or Central Office Location – XY Data

In the event that the provider supplies DSLAM (digital subscriber line access multiplexer) or Central Office XY data please follow the steps below:

- 1) Follow the process for creating points from XY data in Subscriber Location – XY Data, above.
- 2) Follow the steps detailed in DSLAM or Central Office Location – GIS Data below.

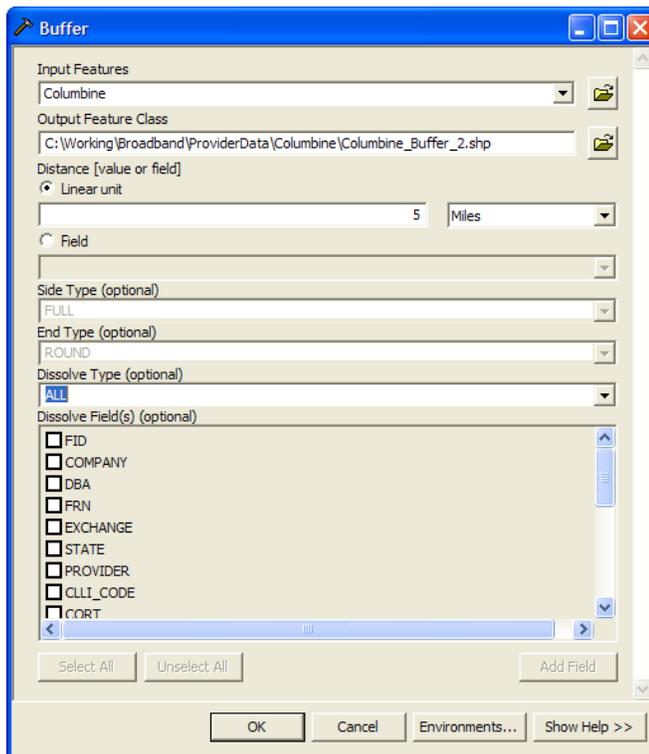




3.5.2.6 DSLAM or Central Office Location – GIS Data

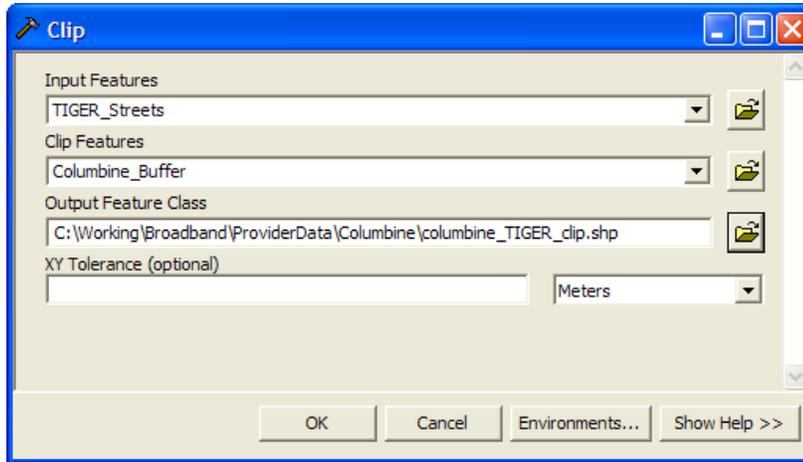
In the event that the provider supplies DSLAM (digital subscriber line access multiplexer) or Central Office GIS data please follow the steps below:

- 1) Buffer the DSLAM/Central Office points feature class
 - a) Add the point feature class to ArcMap
 - b) Open up ArcToolbox and go to Analysis Tools>Proximity>Buffer
 - c) Set the buffer distance to 5 miles
 - d) Set the dissolve type to ALL
 - e) Name the output feature class
 - f) Typical Buffer tool is seen below:



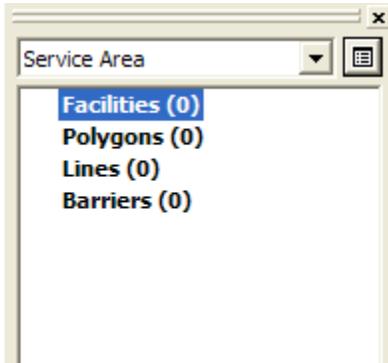
- g) Press OK
- 2) Use the resulting buffer feature class to clip the TIGER street layer (as described earlier):
 - a) Add TIGER street layer to ArcMap
 - b) Open up ArcToolbox and go to Analysis Tools>Extract>Clip
 - c) Complete the dialog box as seen below:



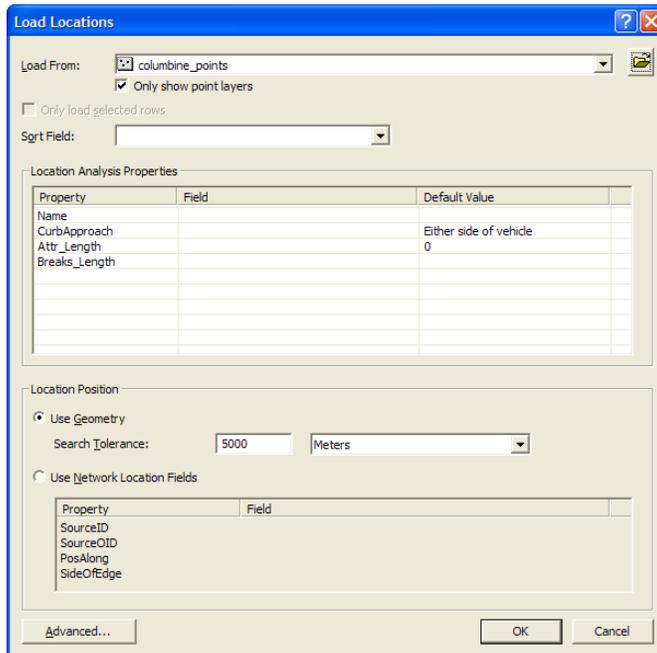


- d) Press OK.
- 3) Using ArcCatalog and within the file geodatabase:
 - a) Right Click and create a new Feature Dataset
 - i) For the Feature Dataset settings:
 - (1) Name the feature dataset accordingly
 - (2) Select horizontal coordinate system by importing the coordinate system associated with the clipped TIGER street layer by selecting Import and navigating to the location of that feature class
 - (3) No vertical coordinate system needed
 - (4) Leave all x,y,z,m values at default.
 - (5) Press Finish
 - 4) Import previously created street feature class into new Feature Dataset
 - 5) Right-click Feature Dataset and create new Network Dataset – accept all default setting for the Network Dataset
 - a) Note: the Network Analyst extension must be turned on
 - 6) In ArcMap Turn on the Network Analyst Toolbar by going to View>Toolbars>Network Analyst
 - 7) Add the Network Dataset created in Step 5 to ArcMap
 - 8) Using Network Analyst Toolbar drop down – create “New Service Area”
 - 9) Open up the Network Analyst Window by selecting the  button.





- 10) Right click Facilities layer, select Load Locations, and navigate to the DSLAM/Central Office facilities feature class.

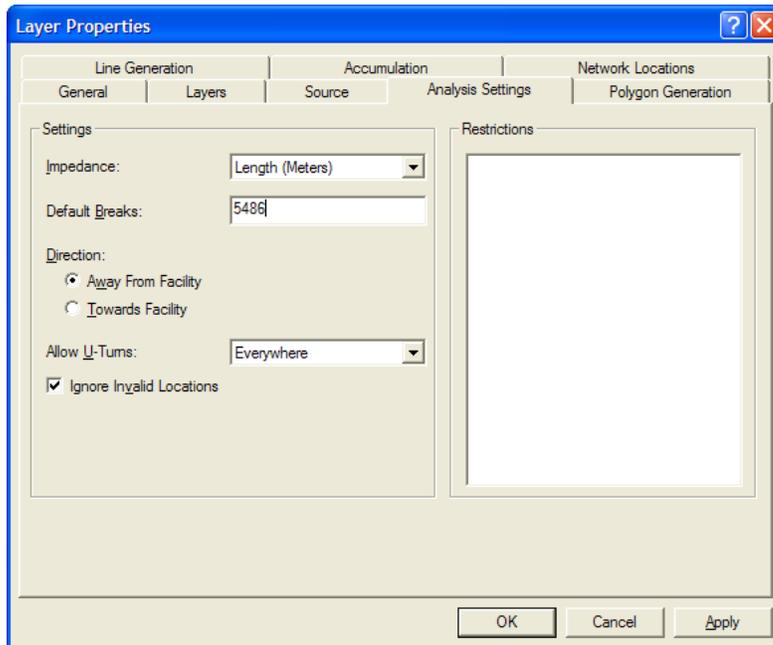


- 11) Press OK.
- 12) Click the Service Area Properties button 
- 13) For the following tabs change the following properties:
 - a) "Polygon Generation" tab
 - i) Select "Merge by break value"
 - ii) Also disable the Trim Polygons option
 - b) "Analysis Settings" tab – using and converting the specified DSLAM buffer distance from feet to meters – input buffer distance value in meters into the "Default Breaks" location





- i) Generally, 18,000 feet (5486 meters) from DSLAM or Central Office location is used as the buffer distance



- c) Click OK.

- 14) On the Network Analyst Toolbar click the “Solve” button  to create service area polygons.
- 15) Right-click on the created service area polygon in the layer list, and select Data>Export Data from the dropdown list.
- 16) Export to a feature class in the file geodatabase you created earlier
- 17) In ArcCatalog, create an empty feature class with the schema of the bb_cov feature class and load the feature class created in Step 16 into it.
- Right-click on the empty feature class, select Load>Load data from the dropdown menu and navigate to the location of the service area feature class
 - Press the Add button, hit Next
 - Accept the defaults and hit Next
 - Do NOT attempt to map any fields, as seen below:





BROADMAP
Beyond The Boundaries

Simple Data Loader

For each target field, select the source field that should be loaded into it.

Target Field	Matching Source Field
ProvName [string]	<None>
DBAName [string]	<None>
FRN [int]	<None>
GeogUnit [string]	<None>
GeogUnitID [string]	<None>
TransTech [short int]	<None>
MaxAdvDown [short int]	<None>
MaxAdvUp [short int]	<None>
ARPU [float]	<None>
SWNomSpeed [float]	<None>

Reset

< Back Next > Cancel

e) Press Next, then Next again, then Finish.

18) In ArcToolBox, go to Data Management Tools>General>Append

19) Append the formerly empty feature class to bb_cov, completing the dialog box as seen below:

Append

Input Datasets

C:\Working\Broadband\ProviderData\Columbine\Columbine.gdb\service_area_bb...

Target Dataset

C:\Working\Broadband\ProviderData\Columbine\Columbine.gdb\bb_cov

Schema Type (optional)

TEST

Field Map (optional)

OK Cancel Environments... Show Help >>





- 20) Leave the Schema Type as TEST
- 21) Press OK.
- 22) In ArcMap, open up bb_cov for editing and manually input associated attribution.

3.5.2.7 Broadcast Tower Location – Address Data

In the event that the provider supplies wireless broadcast tower location address data please follow the steps below:

- 1) Follow the process for geocoding points in Subscriber Location – Address Data, above.
- 2) Follow the steps detailed in Broadcast Tower Location – GIS Data below.

3.5.2.8 Broadcast Tower Location – XY Data

In the event that the provider supplies wireless broadcast tower location XY data please follow the steps below:

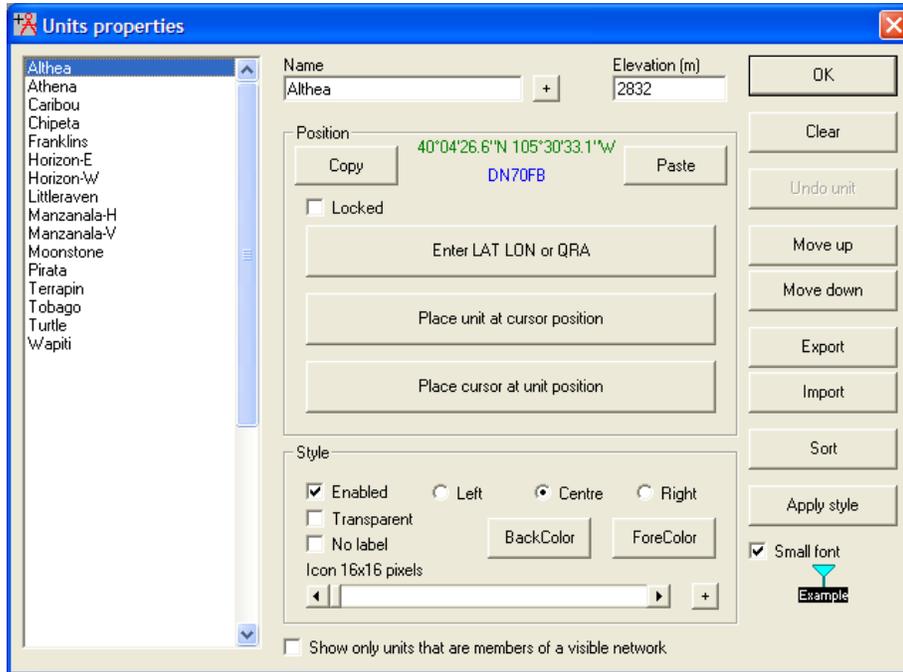
- 1) Follow the process for creating points from XY data in Subscriber Location – XY Data, above.
- 2) Follow the steps detailed in Broadcast Tower Location – GIS Data below.

3.5.2.8.1 Broadcast Tower Location – GIS Data

In the event that the provider supplies wireless broadcast tower location GIS data please follow the steps below:

- 1) Download the required software (Radio Mobile) from the website:
<http://www.cplus.org/rmw/english1.html>
- 2) Install the software according to the standard directions, found here:
<http://www.cplus.org/rmw/download/download.php?S=1>
- 3) Open up the application
- 4) Load the broadcast tower location and elevation information by selecting File>Unit properties. The following dialog box appears:





- 5) Add in the information for all the towers supplied by the WISP data provider, including the elevation. If provider does not supply elevation, this information can be obtained from Google Earth.
 - a. If available, use the Import button to import a Google Earth KML of the tower locations.
- 6) Go to the National Map Seamless Server (<http://seamless.usgs.gov/>) and download elevation data sufficient to contain the tower locations.
 - a. At least the 1/3" NED data is needed. Select this by clicking the Download button in the upper right of the web site and checking the box next to 1/3 " NED.
 - b. Zoom to the area of interest and use the Download tools:



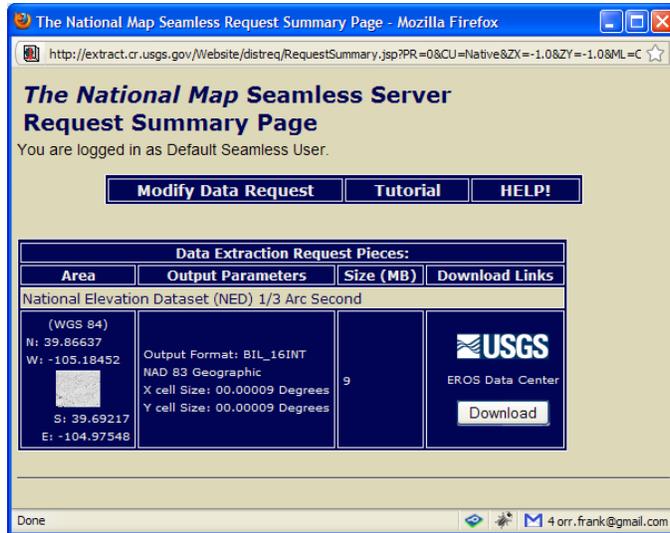
to define the area to download.

- c. Click the Modify Data Request button to request the data in BIL_16INT format, not ESRI GRID, as seen below:

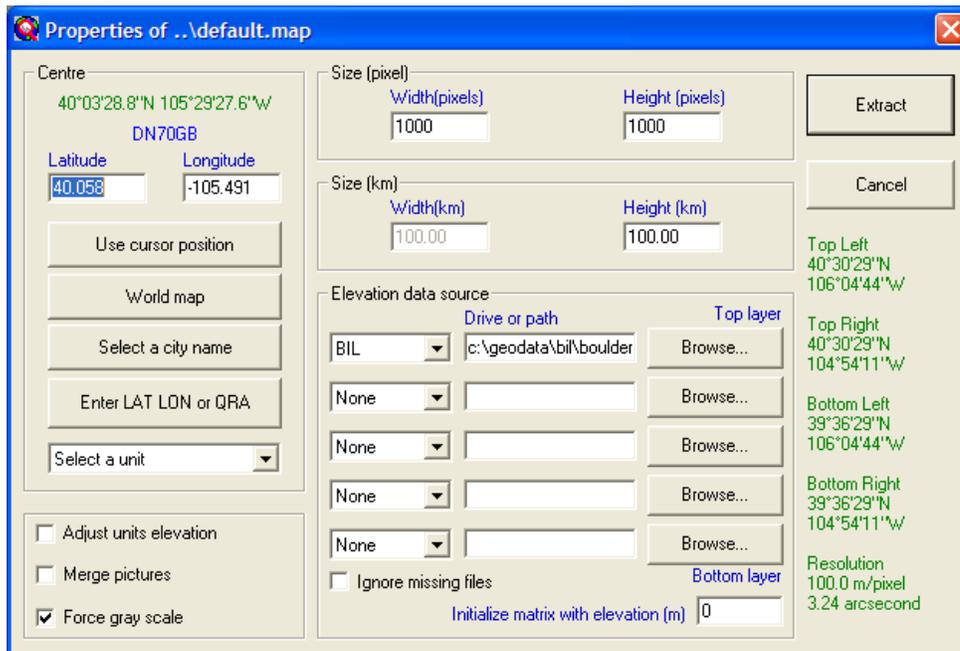




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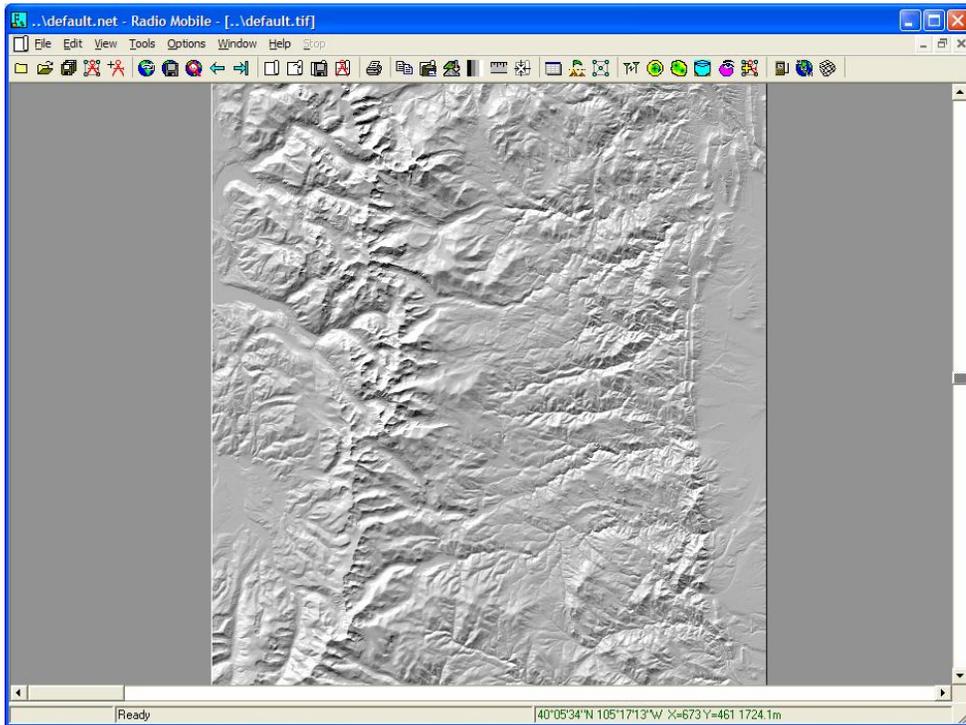


- d. Download the data and unzip it.
- 7) Select File>Map Properties to define the map
- 8) Enter in a latitude and longitude in the center of the tower locations
- 9) Set the size (in pixels) and the size (in kilometers) of the map
- 10) Set the directory path leading to the BIL elevation data just downloaded
- 11) The dialog box is seen below:





- 12) Hit Extract.
- 13) The elevation data is render as a hill shade, as seen below:



- 14) Select File>Network properties from the main menu
- 15) Create a new network and enter in the frequency range under the Parameters tab, as seen below:





Networks properties

List of all nets

- Nednet
- Jade
- Ouray
- COMobile
- Nedernet**
- Net 6
- Net 7
- Net 8
- Net 9
- Net 10
- Net 11
- Net 12
- Net 13
- Net 14
- Net 15
- Net 16
- Net 17
- Net 18
- Net 19
- Net 20
- Net 21
- Net 22
- Net 23
- Net 24
- Net 25

Default parameters Copy Net Paste Net Cancel OK

Parameters Topology Membership Systems Style

Net name: Nedernet

Surface refractivity (N-Units): 301

Ground conductivity (S/m): 0.005

Relative ground permittivity: 15

Minimum frequency (MHz): 2400

Maximum frequency (MHz): 2400

Polarization: Vertical Horizontal

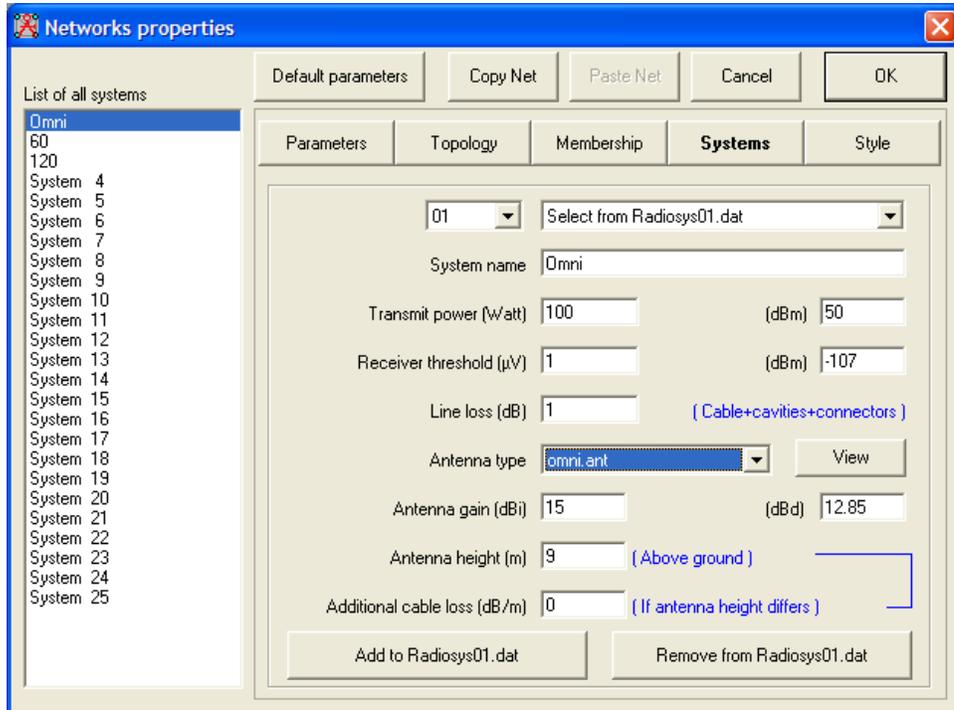
Climate: Equatorial Continental sub-tropical Maritime sub-tropical Desert Continental temperate Maritime temperate over land Maritime temperate over sea

Mode of variability:

- Spot % of time: 50
- Accidental % of locations: 50
- Mobile % of situations: 70
- Broadcast

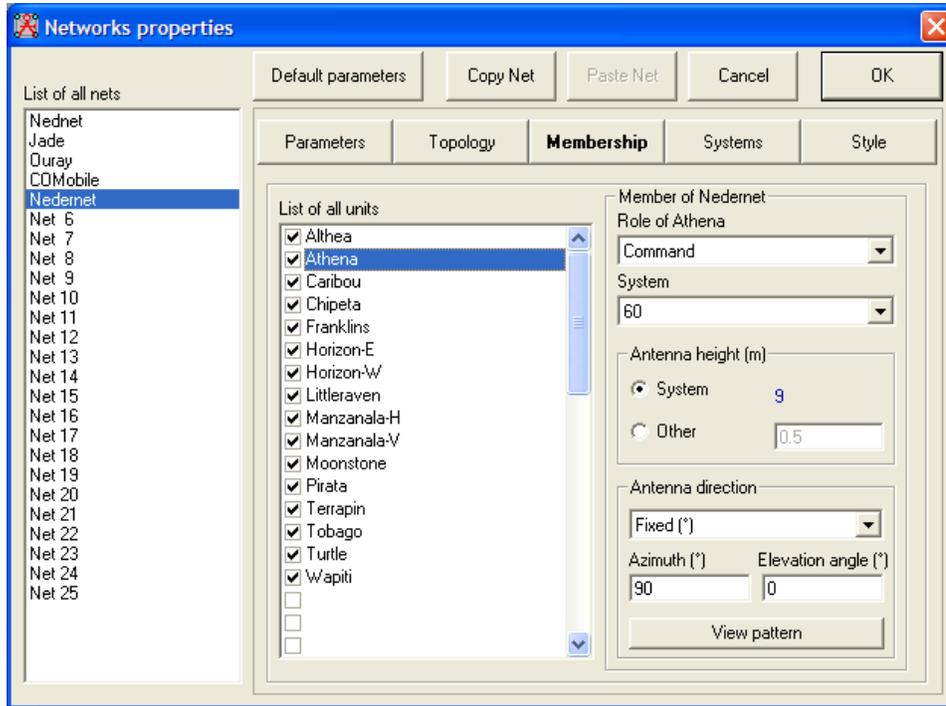
- 16) Leave all the other values as they appear, and select the Systems tab
- 17) Create enough systems to cover all the varieties of equipment in the provider network. This will include the antenna type, height, and line loss, as seen below:





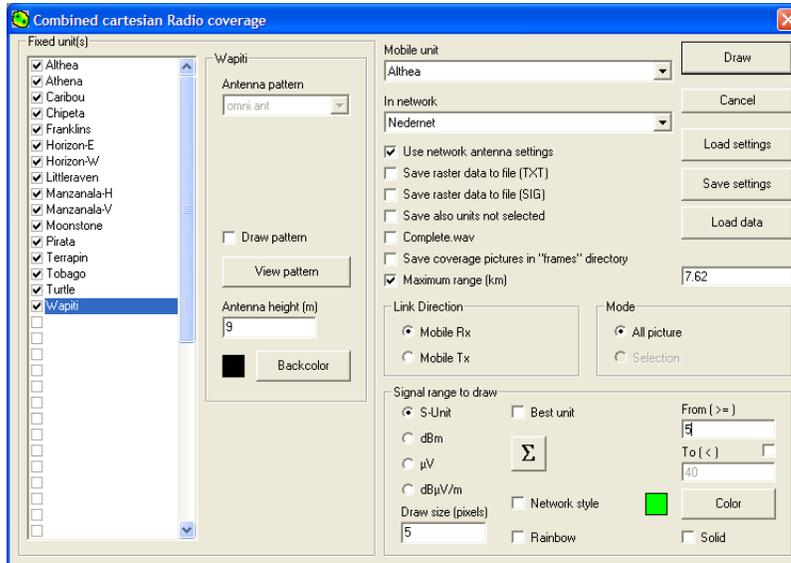
18) Now click on the Membership tab, and assign the individual towers to their respective systems, providing the azimuth for non-omnidirectional antennas, as seen below:





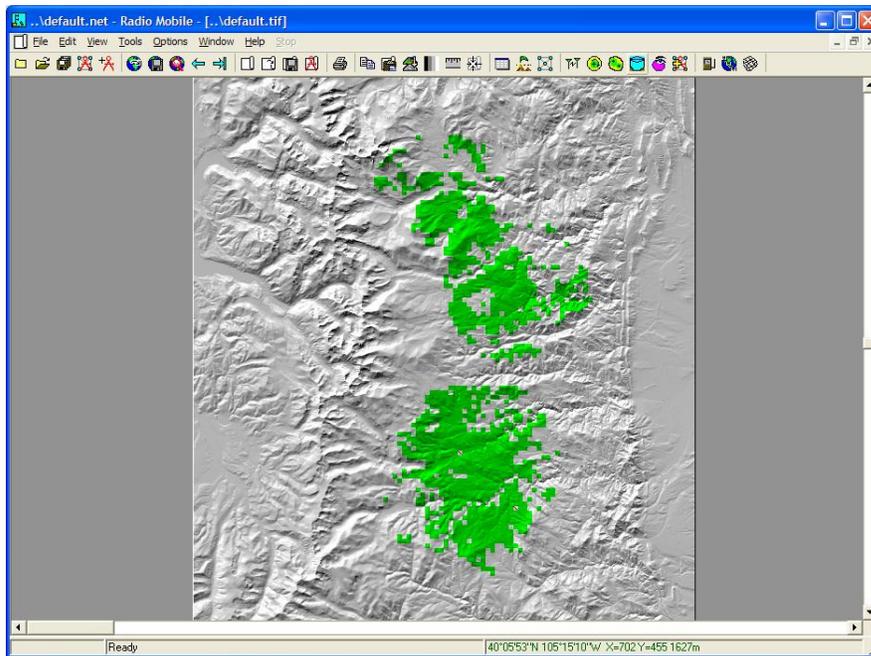
- 19) Press OK.
- 20) Select Tools>Radio Coverage>Combined Cartesian from the main menu
- 21) Complete the dialog box as seen below, providing the Maximum Range from the highest tower beam radius supplied by the provider.
- 22) Set the Pixel Size at 5 (experiment depending on the area covered to get the right level of granularity) as seen below:





23) Set the signal range to draw to S-Unit and type 5 in the From (>=) box.

24) Press Draw.



25) Save the resulting image as a TIF by selecting File>Save Picture as.

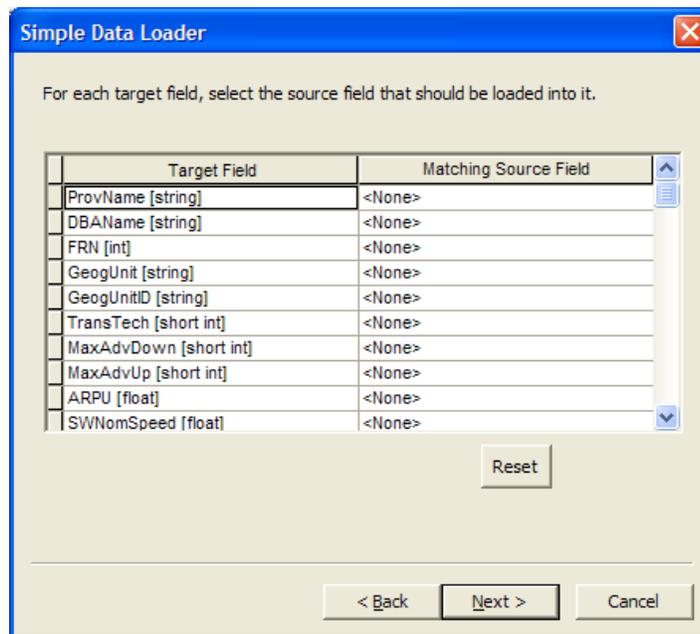
26) Open ArcMap and load the BIL elevation data you used in Radio Mobile.

27) Load the TIF image you created and georeference it using the corners of the BIL data.





- a. The corners of the data can be seen in the TIF image.
- 28) Follow the georeferencing directions from the Coverage Area – PDF/JPG/Other Image Format section below.
- 29) Use the Georeferencing Toolbar to Update the Georeferencing for the TIF data set.
- 30) In ArcToolbox, select Data Transformations>From Raster>Raster to Polygon and input the georeferenced TIF you just created as seen below:
- 31) Open the resulting polygon feature class up for editing using the Editing toolbar in ArcMap and clean up as necessary.
- 32) In ArcCatalog, create an empty feature class with the schema of the bb_cov feature class and load the feature class created above into it.
 - a. Right-click on the empty feature class, select Load>Load data from the dropdown menu and navigate to the location of the service area feature class
 - b. Press the Add button, hit Next
 - c. Accept the defaults and hit Next
 - d. Do NOT attempt to map any fields, as seen below:

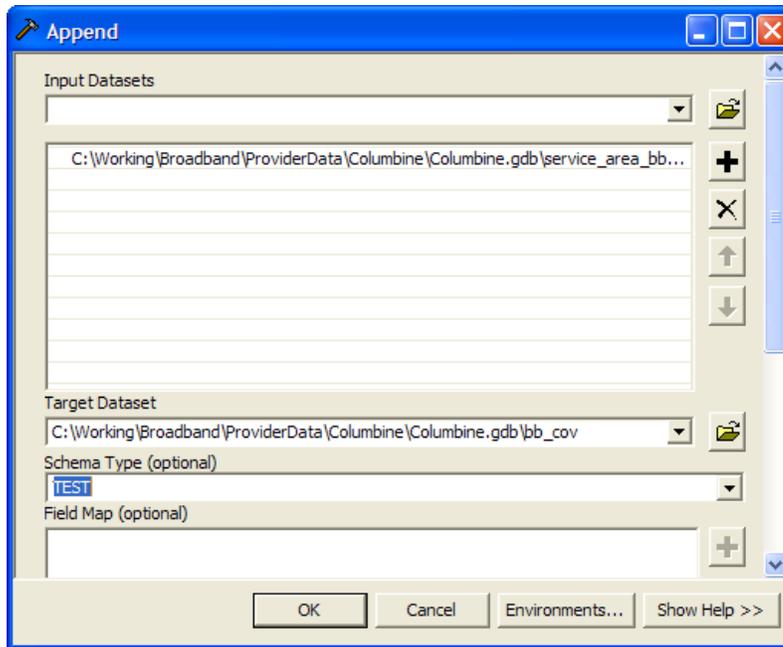


- e. Press Next, then Next again, then Finish.
- 33) In ArcToolBox, go to Data Management Tools>General>Append
- 34) Append the formerly empty feature class to bb_cov, completing the dialog box as seen below:





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- 35) Leave the Schema Type as TEST
- 36) Press OK.
- 37) In ArcMap, open up bb_cov for editing and manually input associated attribution.

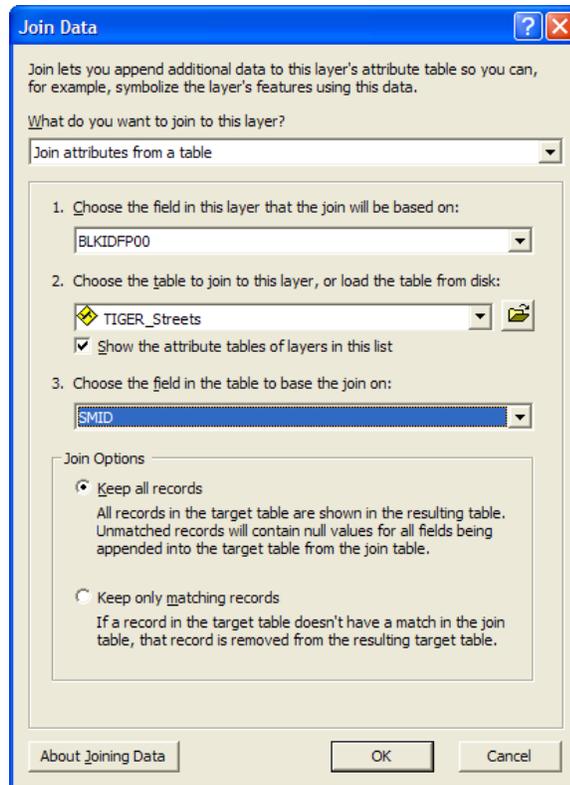
3.5.3 Linear Data

3.5.3.1 TIGER Street Segments – List, Spreadsheet, or GIS Data

In the event that the provider supplies TIGER street segments in list or spreadsheet format please follow the steps below:

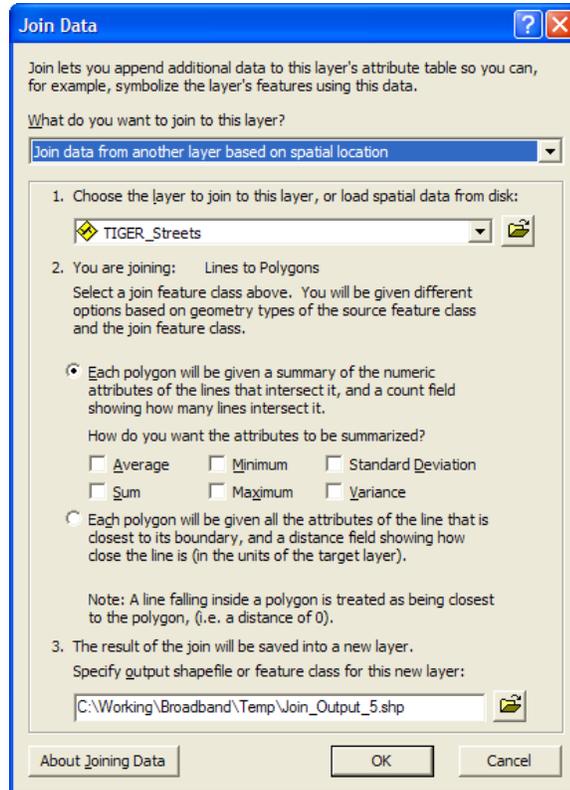
- 1) Join TIGER road segments to 2000 census blocks feature class using one of two methods based on how the data is provided:
 - a) If the TIGER data is provided with a Census Block ID, then join the segments to the Census Block geometry based on that ID
 - i) Load both data sets into ArcMap
 - ii) In the layer list, right-click on the 2000 census block feature class and select Joins and Relates>Join
 - iii) In the dialog box, select the TIGER road segments data and the proper attribute fields for joining, as seen below:





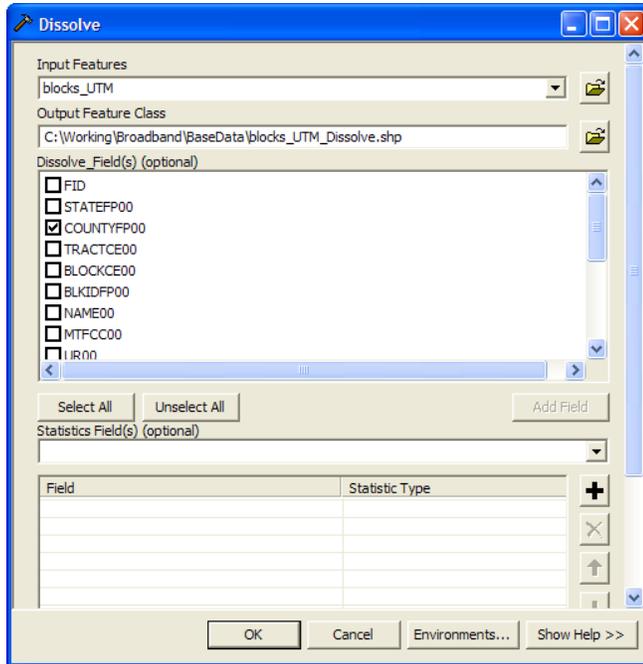
- iv) Press OK
- b) If the data provided is a list containing TLIDs, then join to the TIGER line data using the TLID, and use a spatial join to associate the TIGER segment with the coterminous block based on the block ID
 - i) Load both data sets into ArcMap
 - ii) In the layer list, right-click on the 2000 census block feature class and select Joins and Relates>Join
 - iii) Select “Join data from another layer based on spatial location” from the dropdown menu
 - iv) Complete the dialog box as seen below and press OK.





- 2) Export joined records into a temporary feature class.
- 3) If joined Census Block geometry is confined to one specific area then dissolve blocks into one record. If joined Census Block geometry is distributed throughout a particular state then dissolve sub-selections of census blocks for each county.
 - a) Use the County FIPS code to dissolve by county.
 - b) In ArcToolbox, select Data Management Tools>Generalization>Dissolve
 - c) Complete the Dissolve dialog box as seen below:





- d) Press OK.
- 4) For each dissolved region, open up the feature class for editing using the Editing tool in ArcMap and remove unnecessary slivers and other small holes. For general guidance on editing features in ArcMap, see http://webhelp.esri.com/arcgisdesktop/9.3/pdf/Editing_Tutorial.pdf
- 5) In ArcCatalog, create an empty feature class with the schema of the bb_cov feature class and load the feature class created above into it.
 - a) Right-click on the empty feature class, select Load>Load data from the dropdown menu and navigate to the location of the service area feature class
 - b) Press the Add button, hit Next
 - c) Accept the defaults and hit Next
 - d) Do NOT attempt to map any fields, as seen below:





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Simple Data Loader

For each target field, select the source field that should be loaded into it.

Target Field	Matching Source Field
ProvName [string]	<None>
DBAName [string]	<None>
FRN [int]	<None>
GeogUnit [string]	<None>
GeogUnitID [string]	<None>
TransTech [short int]	<None>
MaxAdvDown [short int]	<None>
MaxAdvUp [short int]	<None>
ARPU [float]	<None>
SWNomSpeed [float]	<None>

Reset

< Back Next > Cancel

- a) Press Next, then Next again, then Finish.
- 6) In ArcToolBox, go to Data Management Tools>General>Append
- 7) Append the formerly empty feature class to bb_cov, completing the dialog box as seen below:

Append

Input Datasets

C:\Working\Broadband\ProviderData\Columbine\Columbine.gdb\service_area_bb...

Target Dataset

C:\Working\Broadband\ProviderData\Columbine\Columbine.gdb\bb_cov

Schema Type (optional)

TEST

Field Map (optional)

OK Cancel Environments... Show Help >>





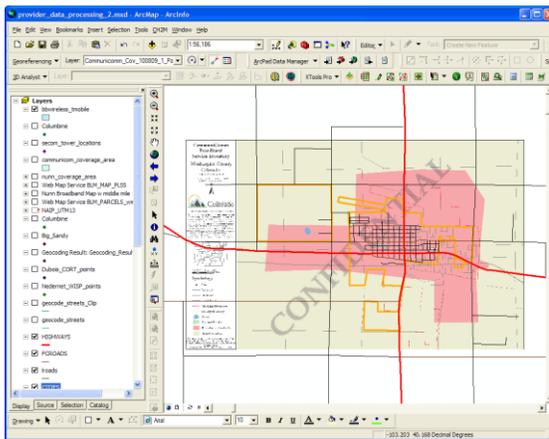
- 8) Leave the Schema Type as TEST
- 9) Press OK.
- 10) In ArcMap, open up bb_cov for editing and manually input associated attribution if necessary.

3.5.4 Polygonal Data

3.5.4.1 Coverage Area – PDF/JPG/Other Image Format

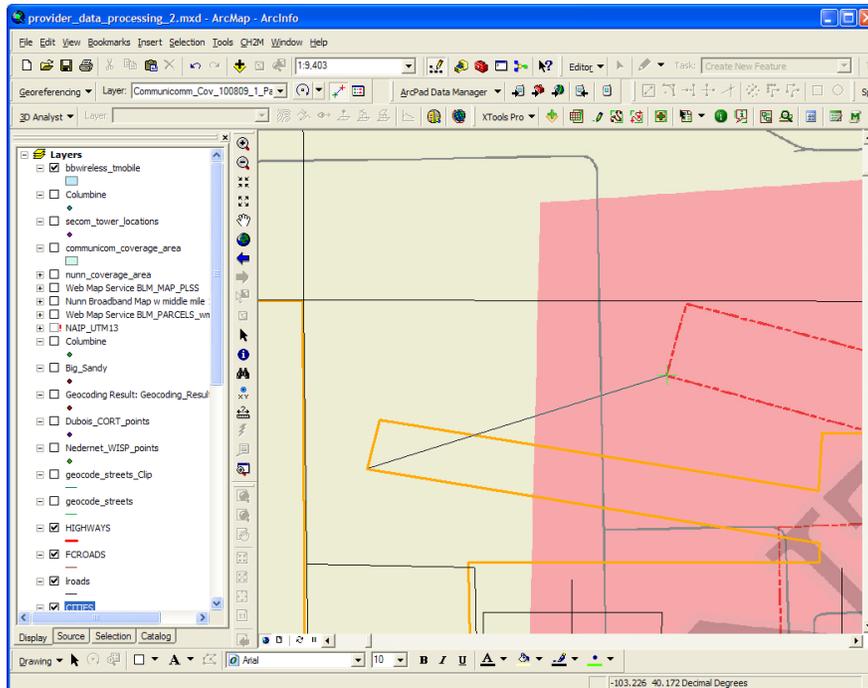
In the event that the provider supplies coverage area data in some image format such as PDF or JPG format please follow the steps below:

- 1) If in PDF format, open in Adobe Acrobat and Save As... JPG format.
- 2) Open up the JPG image in ArcMap.
- 3) Add the required basemap vector data for georeferencing.
 - a) This will generally be either the CDOT data or TIGER data
- 4) Change the coordinate system of the data frame to the desired end coordinate system
- 5) Zoom to the general location of the JPG map image
 - a) This is the location based on the vector data, not the JPG image itself. For example, if you know that the JPG image represents an area around the town of Limon, zoom to the town of Limon in your vector data.
- 6) Open up the Georeferencing toolbar by selecting View>Toolbars>Georeferencing from the main menu bar.
- 7) Using the Georeferencing toolbar, select Fit to Display, results seen below:



- 8) Use the Control Point button  to add control points to the map
- 9) Use common points in the base data set and the JPG image
 - a) For example, find major street intersections, county/city boundaries, etc.
 - b) Try to distribute the points more or less in the four corners on the image for the best transformation
- 10) Click on the location on the image first, then click on the corresponding location on the vector data base map, as in the image below:





- 11) After placing each control point, the image transformation will update automatically.
- 12) Repeat until satisfied with the transformation.
 - a) Note: The transformation may take up to four points, although sometimes only two are necessary.
- 13) When satisfied with the transformation, select Update Georeferencing from the Georeferencing toolbar dropdown.
 - a) This will create a “world” file (.jgw in the case of JPGs) in the same directory as the image file.
- 14) In ArcCatalog, create a new polygon shapefile with the appropriate data schema for a provider coverage area, which can be found in Appendix D.
- 15) Add the shapefile to ArcMap.
- 16) Using the Editor Toolbar, select Start Editing. Set the Task: to “Create New Feature.”
- 17) Use the Sketch Tool  to digitize a new coverage polygon using the coverage area outline from the georeferenced JPG and add the required attributes manually.
- 18) Repeat the above steps for all subscriber speed coverage areas provided.
- 19) Follow the steps detailed in Coverage Area – GIS Data below.

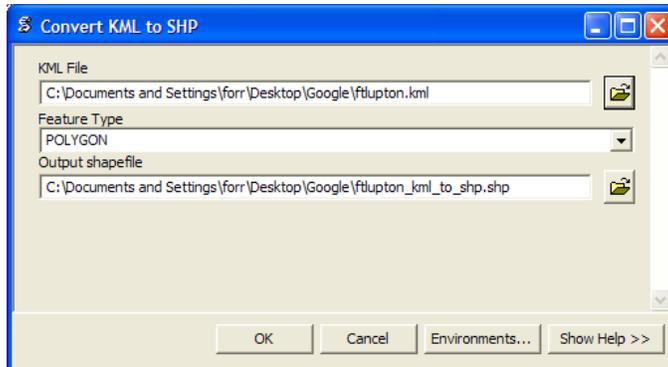
3.5.4.2 Coverage Area – KML/KMZ

In the event that the provider supplies coverage area data in Google Earth KML or KMZ format please follow the steps below:





- 1) Use a KML to SHP converter to translate file into an ESRI format
- 2) <http://arcscripts.esri.com/details.asp?dbid=15603>
- 3) Download the script and follow the provided instructions for installing it in ArcToolbox.
- 4) Double-click on the script in ArcToolbox and navigate to the location of the KML file, as seen below:



- 5) Add the new shapefile to ArcMap. Repeat for all KML files provided.
- 6) Follow the steps detailed in Coverage Area – GIS Data below.

3.5.4.3 Coverage Area – CAD Data

In the event that the provider supplies coverage area data in GIS format please follow the steps below:

- 1) Transform the CAD dataset into an ESRI format
- 2) http://webhelp.esri.com/arcgisdesktop/9.2/index.cfm?TopicName=Transforming_CAD_datasets
- 3) It may be necessary to contact the provider first to determine the coordinate system of the CAD data.
- 4) If the CAD data is not in a standard coordinate system, it may be necessary to use ArcMap to georeference the CAD data to a known coordinate system first.
 - a) To do so, follow the instructions provided above in “Coverage Area – PDF/JPG/Other Image Format.”
- 5) In ArcCatalog, create a new polygon shapefile with the appropriate data schema for a provider coverage area, which can be found in Appendix D.
- 6) Add the shapefile to ArcMap.
- 7) Using the Editor Toolbar, select Start Editing. Set the Task: to “Create New Feature.”
- 8) Use the Sketch Tool  to digitize a new coverage polygon using the coverage area outline from the georeferenced CAD file and add the required attributes manually.
- 9) Follow the steps detailed in Coverage Area – GIS Data below.

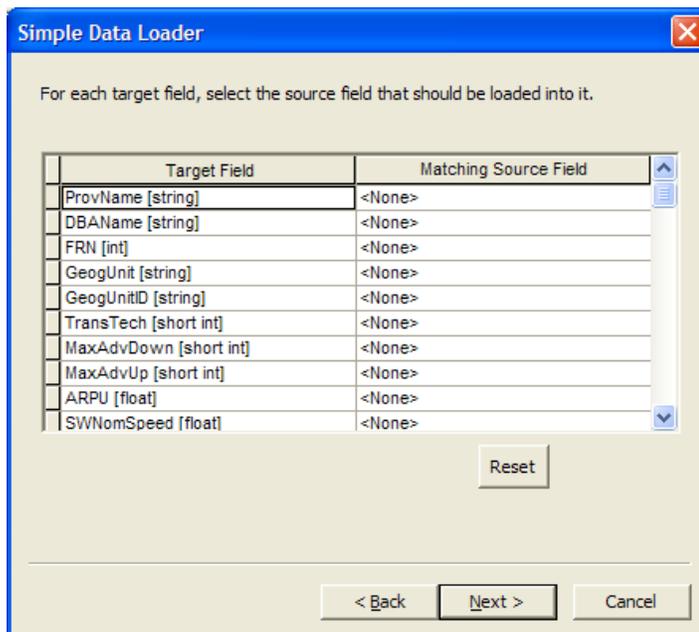
3.5.4.4 Coverage Area – GIS Data

In the event that the provider supplies coverage area data in GIS format please follow the steps below:



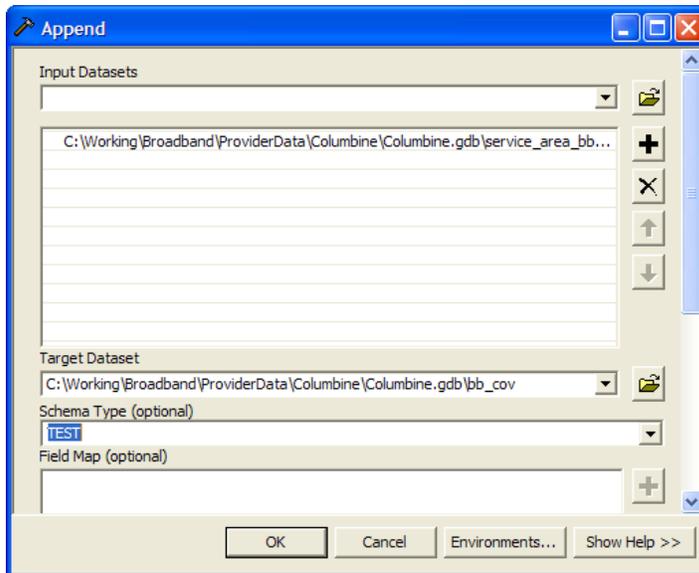


- 1) In ArcCatalog, create an empty feature class with the schema of the bb_cov feature class and load the GIS feature class either created above or supplied by the provider into it.
 - a) Right-click on the empty feature class, select Load>Load Data from the dropdown menu and navigate to the location of the service area feature class
 - b) Press the Add button, hit Next
 - c) Accept the defaults and hit Next
 - d) Do NOT attempt to map any fields, as seen below:



- e) Press Next, then Next again, then Finish.
- 2) In ArcToolBox, go to Data Management Tools>General>Append
- 3) Append the formerly empty feature class to bb_cov, completing the dialog box as seen below:





- 4) Leave the Schema Type as TEST
- 5) Press OK.
- 6) In ArcMap, open up bb_cov for editing and manually input associated attribution, if necessary.

3.5.4.5 Compact Polygon From Subscriber Points

- Geo-code address list using latest state “Composite Locator”
- Verify that your geo-coded file has only one TT (Technology Type). If not export individual geo-coded layers for each Technology Type.
- For each TT check for differences in speed values or speed tiers and create separate layers for each speed value/tier.
- Clean your geo-coding results - remove any points that geo-code to accuracy levels below ZIP+4 (ZIP centroids, carrier route centroids, etc). Also, verify that outliers with acceptable accuracy levels are legitimate, i.e. fall in correct City and Zip.
- Perform spatial join between county polygons (using stcnfyips field) and the cleaned geo-coded subscriber points, in order to carry the county name and stcnty fips.
- Summarize the number of subscribers by county and use the subscriber counts by county to populate the Rate Tier table.





- Un-join the county data from the geo-code subscribers list.
- Create Compact Polygon using cleaned geo-coded layer or sub-selection of using – **XtoolsPro** – **ConvexHull-DetailedHull** option. A sub-selection of geo-coded points will be used in areas where more than one polygon will need to be created for one provider’s service area.
- Evaluate output Hull carefully – looking for areas that should not be covered by hull polygon.
 - If it is determined that an area or areas should not be represented in coverage area, manually reshape hull polygon until coverage area is adequate.
 - When not obvious and as a general rule, manually resolve compact polygon when the distance between the subscriber points used to define the outer boundary of the compact polygon exceeds 5 miles . When reshaping the hull polygon, snap to the outermost geo-coded points. See figure 2 and 3 for an example.

FIGURE 2- Compact Hull: Manual Resolution Required

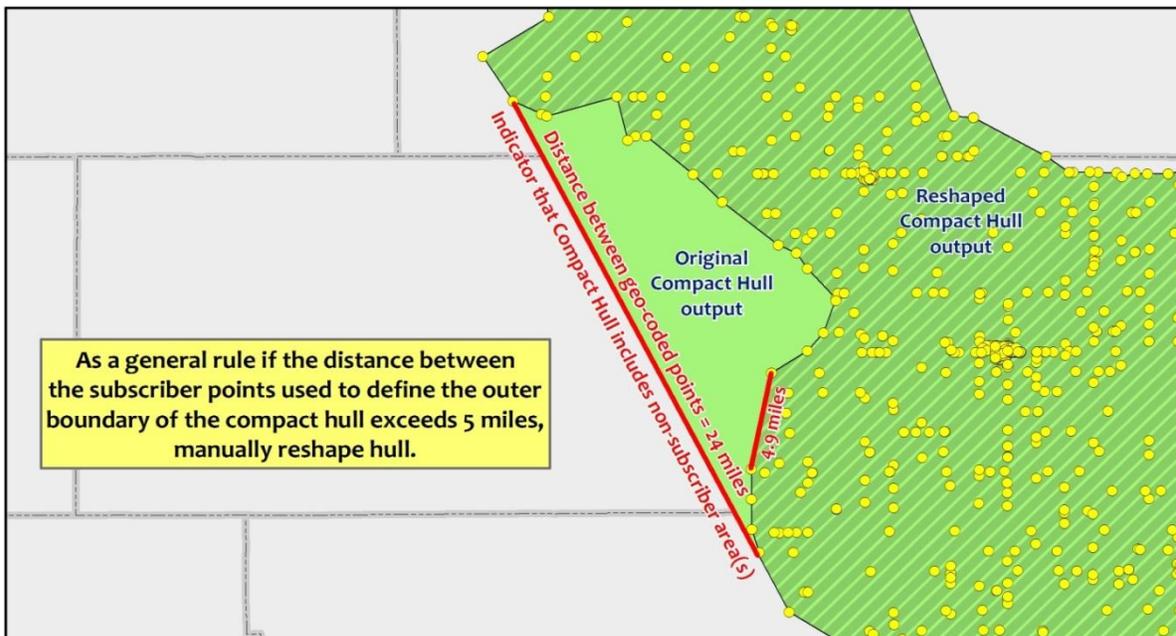
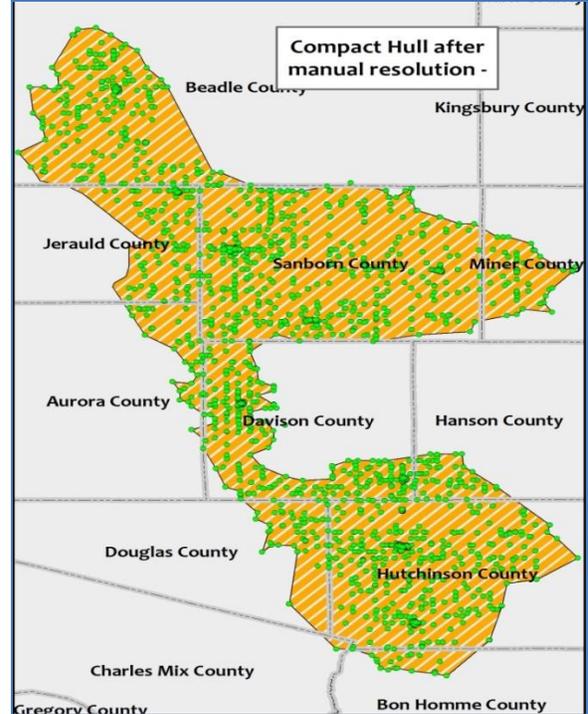




FIGURE 3a- Compact Hull: Manual Resolution Required



FIGURE 3b- Compact Hull: After Manual Resolution



- To attribute the compact polygon - Perform a “Spatial Join” where your Target Feature Class is the compact polygon and the Join Feature Class is your geo-coded point layer. Export compact hull with joined attributes and name file appropriately.
- **Append** attributed compact polygon to BroadBand TT template Feature Class and if required manually input any provider attribution that may not have carried over in the append process.
- **Intersect** compact polygon with county boundaries to create unique records by county and use the state-county-fips field to populate “stcty_fips” field. Also use the county name field to populate the “BBCov_Name” field.
 - Exceptions is where a provider’s coverage is distributed throughout more than one area of any given county where the “BBCov_Name” should be populated using an appropriate city or other logical name based on geographical location.
- **Export/Load** into appropriate BB TT model Dataset.





3.5.4.6 Census Blocks – List or Spreadsheet

In the event that the provider supplies census block data in a list or spreadsheet, please follow the steps below:

- 1) Ensure block polygons supplied by the provider are 2000 currency
- 2) If other currency, convert to 2000 currency before proceeding
 - a. To do this, remove the trailing letter (a, b, etc.) from the block ID
 - b. You will now have two blocks that equate to one block in the 2000 block geometry
 - c. Delete duplicate block IDs, retaining the higher service tier in each case
- 3) Prepare the block list in clean Excel format, removing all Excel-only formatting, merged cells, colors, borders, etc.
- 4) Import the spreadsheet into ArcMap.
- 5) Right-click on the 2000 census block feature class in the layer list in ArcMap and select Joins and Relates>Join from the drop down menu. Join the census block list to the 2000 census blocks feature class using the block ID and export joined records in a new feature class. The Join dialog box and process can be seen above in the TIGER Street Segments – List, Spreadsheet, or GIS Data section.
- 6) Follow the steps in Census Blocks – GIS Data below.

3.5.4.7 Census Blocks – GIS Data

In the event that the provider supplies census block GIS data please follow the steps below:

- 1) Ensure that the blocks supplied by the provider are in the required data schema and are complete as far as require attribution.
 - a. If not, manually enter the required attribution or contact the provider to fill gaps.
- 2) If census block geometry is distributed throughout more than one county then select Data Management Tools>Generalization>Dissolve in ArcToolbox and dissolve based on County/Provider/TT/Speed Tier so that unique records are created for each unique combination.
 - a. The dissolve dialog box can be seen above in the TIGER Street Segments – List, Spreadsheet, or GIS Data section.



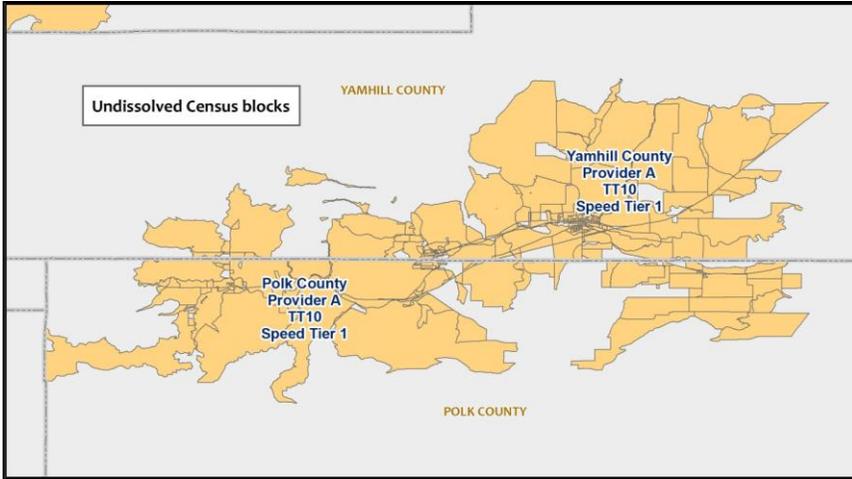


Figure 1: Undissolved census block polygons

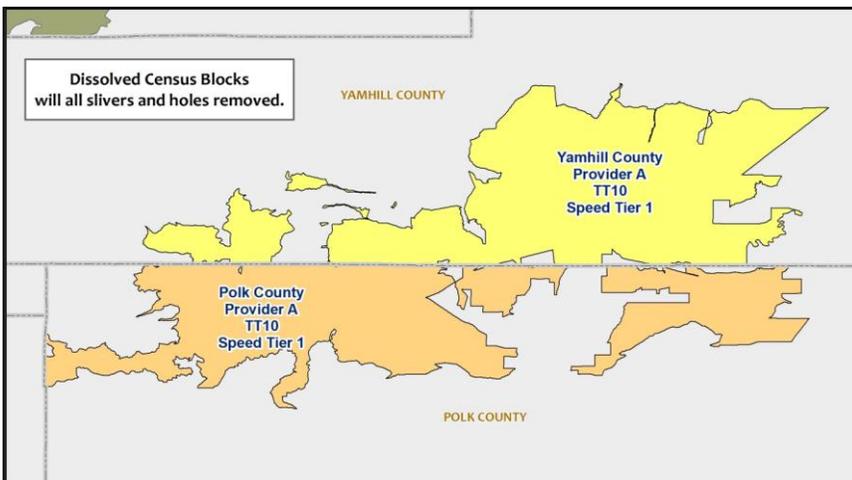


Figure 2: Census block polygons dissolved by county

- 2) For each dissolved region use the Editing toolbar in ArcMap to remove unnecessary slivers and other small holes.
- 3) In ArcToolbox, select Data Management Tools>General>Merge and merge the processed polygons together into single layer.
- 4) The merged census blocks will need to have the subscriber's "frn" field added and populated.
- 5) In ArcCatalog, create an empty feature class with the schema of the bb_cov feature class and load the GIS feature class either created above or supplied by the provider into it.
 - a. Right-click on the empty feature class, select Load>Load Data from the dropdown menu and navigate to the location of the service area feature class





- b. Press the Add button, hit Next
- c. Accept the defaults and hit Next
- d. Do NOT attempt to map any fields, as seen below:

Simple Data Loader

For each target field, select the source field that should be loaded into it.

Target Field	Matching Source Field
ProvName [string]	<None>
DBAName [string]	<None>
FRN [int]	<None>
GeogUnit [string]	<None>
GeogUnitID [string]	<None>
TransTech [short int]	<None>
MaxAdvDown [short int]	<None>
MaxAdvUp [short int]	<None>
ARPU [float]	<None>
SWNomSpeed [float]	<None>

Reset

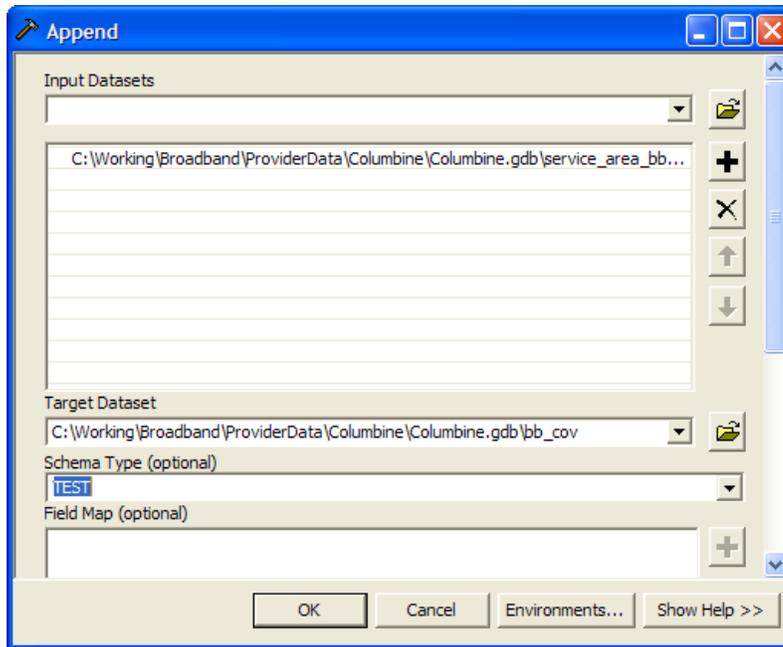
< Back Next > Cancel

- e. Press Next, then Next again, then Finish.
- 6) In ArcToolBox, go to Data Management Tools>General>Append
 - 7) Append the formerly empty feature class to bb_cov, completing the dialog box as seen below:





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- 8) Leave the Schema Type as TEST
- 9) Press OK.
- 10) In ArcMap, open up bb_cov for editing and manually input associated attribution, if necessary.

3.6 Metadata Transactions

Following any updates or changes completed within the file geodatabase (fGDB) stored on the GIS-Analysts staging environment, the GIS-Analyst runs transactions to compare that fGDB with the one stored on the Core server to ensure metadata on all changes are recorded.

Below outlines the steps taken to run transactions on the updated Core database:

1. Open a command line window and run generateTransactions.py
 - a. Usage: generateTransactions.py [Core fGDB] [Staging Environment fGDB]
 - b. Example of command line:

```
<path>generateTransactions.py <path>ST_BB_POLY_SRV_AREAS.gdb <path>ST_BB_POLY_SRV_AREAS.gdb
```

2. Below is an example of the output screen that will be displayed:





```
----- Collecting Transactions -----

Calculating rec_id field for BBCov_0_BB_POLY_TEMPLATE
value can not be 0 or less
Trouble creating the progress meter

Calculating rec_id field for BBCov_10_CenturyLink
% 10 20 30 40 50 60 70 80 90 100
---|---|---|---|---|---|---|---|---|---|      Goal = 8

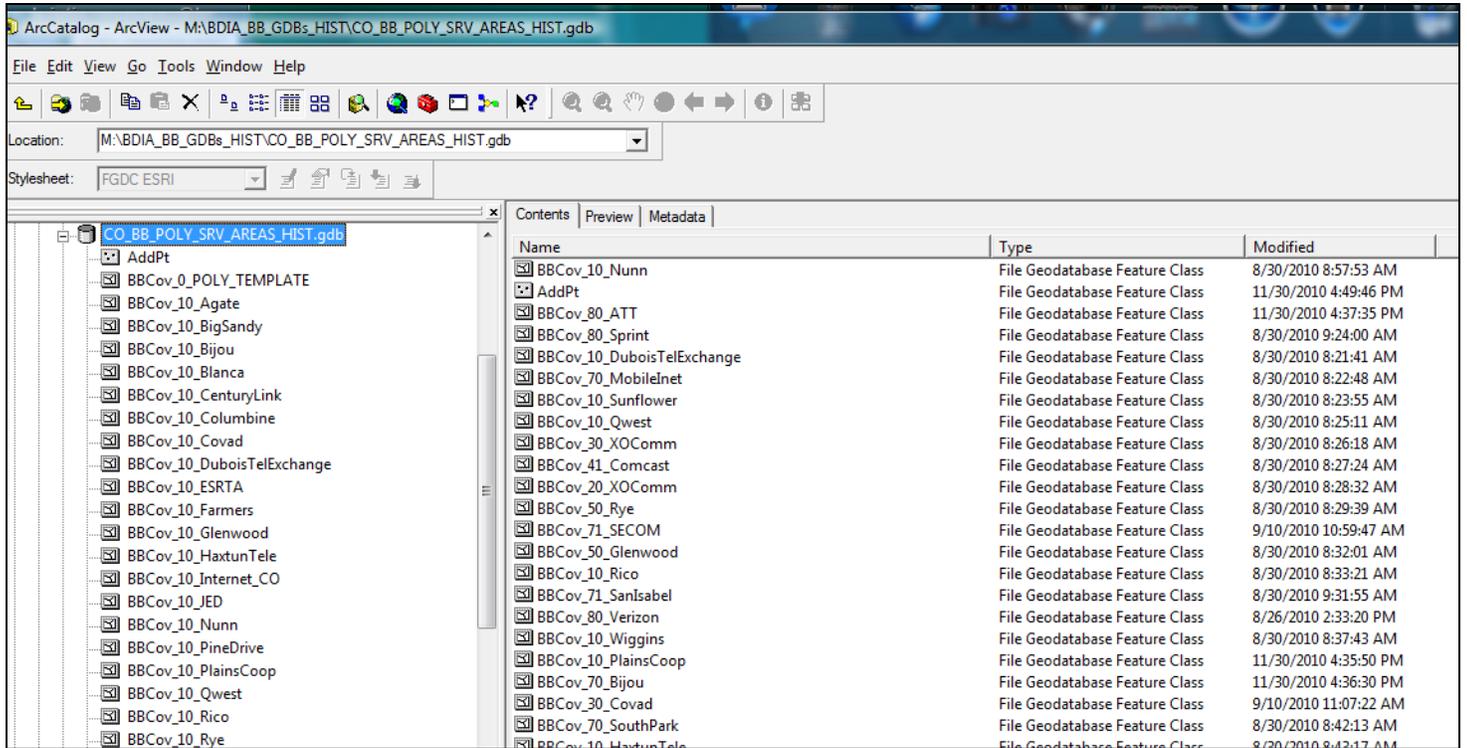
Merging change: X:\BDIA_BB_GDBs\MS_BB_POLY_SRV_AREAS.gdb\AddPt
Calculating Transaction fields for AddPt
% 10 20 30 40 50 60 70 80 90 100
---|---|---|---|---|---|---|---|---|---|      Goal = 1
*****
X:\BDIA_BB_GDBs\MS_BB_POLY_SRV_AREAS.gdb\AddPt...changes is complete.

Your transaction FeatureClasses are in:
\\michigan\AllAccess\BDIA_BB_GDBs_HIST\MS_BB_POLY_SRV_AREAS_HIST.gdb
-----

elapsed time = 2994.4 seconds
```

3. After process has completed, results can be found in the ST_BB_POLY_SRV_AREAS_HIST.gdb
 - a. The transactions scripts records changes at a feature level.
 - b. Below is a screen shot supporting the directory structure of the historical fGDB.





- c. Attribution associated with each added/removed/changed features is tracked, including the following additional columns appended to the end of each:
 - i. Commit_by
 - 1. Records the GIS-Analyst that committed the changes to the historical fGDB.
 - ii. Commit_date
 - 1. Records the date and time stamp that the changes were committed.
 - iii. Trans_type
 - 1. This field reflects the type of change recorded.
 - 2. Categorized by:
 - a. Adds/Change/Deletes
 - iv. New_values
 - 1. Records the new values when a change was completed on a feature. Example: Name or speed change





- d. MD_Process is also transferred from the edited fGDB to the historical fGDB, which states the actions completed by the GIS-Analyst.

ArcCatalog - ArcView - M:\BDIA_BB_GDBs_HIST\CO_BB_POLY_SRV_AREAS_HIST.gdb\AddPt

File Edit View Go Tools Window Help

Location: M:\BDIA_BB_GDBs_HIST\CO_BB_POLY_SRV_AREAS_HIST.gdb\AddPt

StyleSheet: FGDC ESRI

Contents		Preview	Metadata
CO_BB_POLY_SRV_AREAS_HIST.gdb			
AddPt			
BBcov_0_POLY_TEMPLATE			
BBcov_10_Agate			
BBcov_10_BigSandy			
BBcov_10_Bijou			
BBcov_10_Blanca			
BBcov_10_CenturyLink			
BBcov_10_Columbine			
BBcov_10_Covad			
BBcov_10_DulonisTelExchange			
BBcov_10_ESRTA			
BBcov_10_Farmers			
BBcov_10_Glenwood			
BBcov_10_HastunTele			
BBcov_10_Internet_CO			
BBcov_10_JED			
BBcov_10_Nunn			
BBcov_10_PineDrive			
BBcov_10_PlainsCoop			
BBcov_10_PWest			
BBcov_10_Rcco			
BBcov_10_Rye			
BBcov_10_SandT			
BBcov_10_Sunflower			
BBcov_10_TDS			
BBcov_10_Wiggins			
BBcov_20_Covad			
BBcov_20_Internet_CO			
BBcov_20_NewEdge			
BBcov_20_XOComm			
BBcov_30_Covad			
BBcov_30_Internet_CO			
BBcov_30_NewEdge			
BBcov_30_TWTelecom			
BBcov_30_XOComm			
BBcov_40_CommComm			
BBcov_41_Bijs			
BBcov_41_Bresnan			
BBcov_41_Comcast			
BBcov_41_EagleCom			

md_address	md_process	commit_by	commit_date	trans_type	new_values
addBaseBBMetadataFields_py_v1.2	added Jab Mid Mile points back into db per crlgen	cmabeey	8/24/2010 4:43:5	change	[5767]
addBaseBBMetadataFields_py_v1.2	added Jab Mid Mile points back into db per crlgen	cmabeey	8/24/2010 4:43:5	change	[5768]
addBaseBBMetadataFields_py_v1.2	added Jab Mid Mile points back into db per crlgen	cmabeey	8/24/2010 4:43:5	change	[5769]
addBaseBBMetadataFields_py_v1.2	added Jab Mid Mile points back into db per crlgen	cmabeey	8/24/2010 4:43:5	change	[5770]
addBaseBBMetadataFields_py_v1.2	added Jab Mid Mile points back into db per crlgen	cmabeey	8/24/2010 4:43:5	change	[5771]
addBaseBBMetadataFields_py_v1.2	added Jab Mid Mile points back into db per crlgen	cmabeey	8/24/2010 4:43:5	change	[5772]
addBaseBBMetadataFields_py_v1.2	added Jab Mid Mile points back into db per crlgen	cmabeey	8/24/2010 4:43:5	change	[5773]
addBaseBBMetadataFields_py_v1.2	added Jab Mid Mile points back into db per crlgen	cmabeey	8/24/2010 4:43:5	change	[5774]
addBaseBBMetadataFields_py_v1.2	added Jab Mid Mile points back into db per crlgen	cmabeey	8/24/2010 4:43:5	change	[5775]
addBaseBBMetadataFields_py_v1.2	added Jab Mid Mile points back into db per crlgen	cmabeey	8/24/2010 4:43:5	change	[5776]
addBaseBBMetadataFields_py_v1.2	added Jab Mid Mile points back into db per crlgen	cmabeey	8/24/2010 4:43:5	change	[5777]
addBaseBBMetadataFields_py_v1.2	added Jab Mid Mile points back into db per crlgen	cmabeey	8/24/2010 4:43:5	change	[5778]
addBaseBBMetadataFields_py_v1.2	added Jab Mid Mile points back into db per crlgen	cmabeey	8/24/2010 4:43:5	change	[5779]
addBaseBBMetadataFields_py_v1.2	added Jab Mid Mile points back into db per crlgen	cmabeey	8/24/2010 4:43:5	change	[5780]
addBaseBBMetadataFields_py_v1.2	added Jab Mid Mile points back into db per crlgen	cmabeey	8/24/2010 4:43:5	change	[5781]
addBaseBBMetadataFields_py_v1.2	added Jab Mid Mile points back into db per crlgen	cmabeey	8/24/2010 4:43:5	change	[5782]
addBaseBBMetadataFields_py_v1.2	added Jab Mid Mile points back into db per crlgen	cmabeey	8/24/2010 4:43:5	change	[5783]
addBaseBBMetadataFields_py_v1.2	added Jab Mid Mile points back into db per crlgen	cmabeey	8/24/2010 4:43:5	change	[5784]
addBaseBBMetadataFields_py_v1.2	added Jab Mid Mile points back into db per crlgen	cmabeey	8/24/2010 4:43:5	change	[5785]
addBaseBBMetadataFields_py_v1.2	added Jab Mid Mile points back into db per crlgen	cmabeey	8/24/2010 4:43:5	change	[5786]
addBaseBBMetadataFields_py_v1.2	added Jab Mid Mile points back into db per crlgen	cmabeey	8/24/2010 4:43:5	change	[5787]
addBaseBBMetadataFields_py_v1.2	added Jab Mid Mile points back into db per crlgen	cmabeey	8/24/2010 4:43:5	change	[5788]
addBaseBBMetadataFields_py_v1.2	added Jab Mid Mile points back into db per crlgen	cmabeey	8/24/2010 4:43:5	change	[5789]
addBaseBBMetadataFields_py_v1.2	added Jab Mid Mile points back into db per crlgen	cmabeey	8/24/2010 4:43:5	change	[5790]
addBaseBBMetadataFields_py_v1.2	added Jab Mid Mile points back into db per crlgen	cmabeey	8/24/2010 4:43:5	change	[5791]
addBaseBBMetadataFields_py_v1.2	added Jab Mid Mile points back into db per crlgen	cmabeey	8/24/2010 4:43:5	change	[5792]
addBaseBBMetadataFields_py_v1.2	added Jab Mid Mile points back into db per crlgen	cmabeey	8/24/2010 4:43:5	change	[5793]
addBaseBBMetadataFields_py_v1.2	added Jab Mid Mile points back into db per crlgen	cmabeey	8/24/2010 4:43:5	change	[5794]
addBaseBBMetadataFields_py_v1.2	added Jab Mid Mile points back into db per crlgen	cmabeey	8/24/2010 4:43:5	change	[5795]
addBaseBBMetadataFields_py_v1.2	added Jab Mid Mile points back into db per crlgen	cmabeey	8/24/2010 4:43:5	change	[5796]
addBaseBBMetadataFields_py_v1.2	added Jab Mid Mile points back into db per crlgen	cmabeey	8/24/2010 4:43:5	change	[5797]
addBaseBBMetadataFields_py_v1.2	added Jab Mid Mile points back into db per crlgen	cmabeey	8/24/2010 4:43:5	change	[5798]
addBaseBBMetadataFields_py_v1.2	added Jab Mid Mile points back into db per crlgen	cmabeey	8/24/2010 4:43:5	change	[5799]
addBaseBBMetadataFields_py_v1.2	added Jab Mid Mile points back into db per crlgen	cmabeey	8/24/2010 4:43:5	change	[5800]
addBaseBBMetadataFields_py_v1.2	added Jab Mid Mile points back into db per crlgen	cmabeey	8/24/2010 4:43:5	change	[5801]
addBaseBBMetadataFields_py_v1.2	added Jab Mid Mile points back into db per crlgen	cmabeey	8/24/2010 4:43:5	change	[5802]
addBaseBBMetadataFields_py_v1.2	added Jab Mid Mile points back into db per crlgen	cmabeey	8/24/2010 4:43:5	change	[5803]
addBaseBBMetadataFields_py_v1.2	added Jab Mid Mile points back into db per crlgen	cmabeey	8/24/2010 4:43:5	change	[5804]
addBaseBBMetadataFields_py_v1.2	added Jab Mid Mile points back into db per crlgen	cmabeey	8/24/2010 4:43:5	change	[5805]
addBaseBBMetadataFields_py_v1.2	added Jab Mid Mile points back into db per crlgen	cmabeey	8/24/2010 4:43:5	change	[5806]
addBaseBBMetadataFields_py_v1.2	added Jab Mid Mile points back into db per crlgen	cmabeey	8/24/2010 4:43:5	change	[5807]

Record: 1 | 1 | Show: All Selected | Records (of 29429) | Options





3.7 Data Processing

3.7.1 Data Processing Overview

The following items outline the actions required to process the service provider data further to meet the NTIA requirements.

- Weighted Nominal Speed
- Middle Mile
- Broadband Coverage Template

3.7.2 Weighted Nominal Speed

The weighted nominal speed is populated one of the following two ways:

3.7.2.1 Subscriber Data Supplied by Provider

Where the data provider supplies subscriber speed information, the following formula from the NOFA is used:

$$\frac{(\text{speed tier-1 in kbps} \times \text{no. of tier-1 subscribers}) + (\text{speed tier-2 in kbps} \times \text{no. of tier-2 subscribers}) + (\text{etc.})}{\text{Total average monthly subscribers}}$$

Data is initially broken up in the following order:

- 1) Stcty_fips
- 2) Transmission technology type
- 3) Subscriber tiers

3.7.2.2 Value Supplied by Provider

Some providers will supply their weighted nominal speed. In these cases, the data supplied will be populated instead of using the NOFA formula.

These obtained or calculated values are used to update the service overview layer. This can be done manually or by creating a table with the provider's FRN and average weighted speed and joining it to the service overview table in ArcMap. To Join, right-click on the layer to join to and select Joins and Relates>Join... from the dropdown menu. Then navigate to the table to join to and select the join fields from the drop down list. Then open up the source table (the table in ArcMap) and right-click on the header of the Average Weighted Speed field and select Calculate Field from the drop down menu. Use the value of the average weighted speed from the joined table.

3.7.3 Middle Mile

Middle mile information is generally provided in spreadsheet or text file format. The process is to take what is supplied by the provider and translate it into the required data schema.

- 1) If the data is supplied with address information, follow the process outlined above in Subscriber Location – Address Data.
- 2) If the data is supplied with associated XY coordinates, follow the process outlined above in Subscriber Location – XY Data.





- 3) Once the data is in GIS format, use the Append (Data Management Tools>General>Append) command in ArcToolbox to append the data to the overall middle mile dataset.
- 4) Set the schema type to NO_TEST and use the Field Map to map the attribute fields from the source to the target dataset.

3.7.4 Broadband Coverage Template

Below is the description of the fields within the BB_Cov layer, which is the interim data set that is used to create the final product deliverable.

Name	Alias	Description
objectid	OBJECTID	Internal Object ID
shape	SHAPE	Internal Shape storage
prov_id	PROVIDER_ID	Unique numeric identifier for each provider
prov_name	PROVIDER_NAME	Unique name for each provider
dba_name	DOING_BUSINESS_AS	An alternative "Doing-Business-As" name for the provider
frn	FCC_REGISTRATION_NUMBER	Provider FCC Registration Number
bbcov_name	BBCOV_NAME	BroadMap Broadband Coverage name
trans_code	TRANSMISSION_CODE	Unique code for the transmission technology type described by this layer
trans_name	TRANSMISSION_NAME	Name for the transmissions technology type
trans_desc	TRANSMISSION_DESC	Description for the transmissions technology type
spect_code	SPECTRUM_CODE	Unique code for the spectrum [WIRELESS ONLY]
spect_name	SPECTRUM_NAME	Name for the spectrum [WIRELESS ONLY]
spect_desc	SPECTRUM_DESC	Description for the spectrum [WIRELESS ONLY]
mad_dwn_t	MAX_AD_DOWN_TIER	Maximum advertised downstream speed available within given area (speed tier)
mad_up_t	MAX_AD_UP_TIER	Maximum advertised upstream speed available within given area (speed tier)
typ_dwn_t	TYPICAL_DOWN_TIER	Typical downstream speed available within given area (speed tier)
typ_up_t	TYPICAL_UP_TIER	Typical upstream speed available within given area (speed tier)
mad_dwn_k	MAX_AD_DOWN_KBPS	Maximum advertised downstream speed available within given area (kbps)
mad_up_k	MAX_AD_UP_KBPS	Maximum advertised upstream speed available within given area (kbps)





Name	Alias	Description
typ_dwn_k	TYPICAL_DOWN_KBPS	Typical downstream speed available within given area (kbps)
typ_up_k	TYPICAL_UP_KBPS	Typical upstream speed available within given area (kbps)
subs	SUBSCRIBERS	Total average monthly subscribers for this provider for this technology for this coverage polygon
md_geom	MD_GEOMETRY	Metadata: Comma separated list of source id's from which the polygon extent was produced
md_exists	MD_EXISTS	Metadata: Comma separated list of source id's used in understanding and editing the provider data for this polygon
md_who	MD_WHO	Metadata: Name of the editor who last edited this feature at the time in md_when
md_when	MD_WHEN	Metadata: Date/time that this feature was last edited
md_process	MD_PROCESS	Metadata: Comma separated list of processes used to create and/or modify this layer
stcty_fips	STATE_COUNTY_FIPS	State/County FIPS code
rec_id	RECORD_ID	Compound Key formed from STCTY_FIPS+" " +Provider_ID+" " +Trans_Code+" " +BBCov_Name
st_area	ST_AREA(SHAPE)	Area in square decimal degrees
st_length	ST_LENGTH(SHAPE)	Length in decimal degrees
Provider_Type	Type of Provider	Has Subtype (1:Broadband provider as described in the NOFA,2:Reseller,3:Unknown), default value = 1 (New 04/11 Model)

3.7.5 Verification and Validation

3.7.5.1 Provider Validation – Provider Portal/PDF Map Review

Following the collection and aggregation of provider data, the aggregated data is validated by the provider to ensure it is an accurate representation of their coverage area and supporting broadband information. This validation is completed through the Provider Portal web application, which is a secure interactive map that displays the provider's coverage areas and allows the provider to validate, submit feedback or request changes. If changes are requested, then the features on the portal are updated and an automatic request is sent to the provider to complete the validation process.

Providers that did not use the Provider Portal are asked to validate a PDF map displaying their coverage area(s). This is accomplished via e-mail notification.





3.7.5.2 Provider Verification – 3rd Party Source Review

After the provider has validated its coverage areas, a 3rd party source comparison and analysis is performed. Where anomalies or discrepancies are identified, a ‘SCAN’ point is dropped and descriptive comments are applied to be reviewed later with the provider.

During the provider review, the map is displayed along with the ‘SCAN’ points and potential refinement is completed based on input from the Provider.

3rd Party Sources Utilized

3 rd Party Source Name	Source Type	Verification Type
InfoUSA	Consumer and Business Listings	Community Anchor Institutions Can also be used for demographic information supporting the State websites
Pitney Bowes (PBBI)	Exchange Info Plus (Central Office Locations)	Exchange datasets are used to verify the following Transmission Technologies (TT): Asymmetric xDSL (10), Symmetric xDSL (20), Other Copper Wireline (30), and Optical Carrier/Fiber to the End User (50).
Media Prints	Cable Boundaries	Used to verify the following TT: Cable Modem—DOCSIS 3.0 (40) and Cable Modem—Other (41)
American Roamer	Wireless Coverage Patterns (EVDO, GPRS, WISP, HSPA)	Used to verify the following TT: Terrestrial Fixed Wireless—Unlicensed (70), Terrestrial Fixed Wireless—Licensed (71) and Terrestrial Mobile Wireless (80)
ComSearch	Wireless Spectrum Holdings and Tower Data	Used to verify the following TT: Terrestrial Fixed Wireless—Unlicensed (70), Terrestrial Fixed Wireless—Licensed (71) and Terrestrial Mobile Wireless (80)





BROADMAP
Beyond The Boundaries

3.7.5.3 Assigning Confidence Values

All findings and results from the above-mentioned validation and verification activities, plus internal peer quality reviews are captured and tracked in a Validation table and form the basis of the confidence value assigned for each provider and then each technology.

The confidence values are as follows:

- 0 = Coverage area has not been reviewed
- 10 = Extremely Low. Single Source QC.
- 20 = Very Low. Needs Additional Validation\Verification
- 30 = Low. Even with Validation\Verification, Coverage is still suspect.
- 40 = Acceptable, confirm with State prior to shipment.
- 50 = Meets requirements to be included in shipment.
- 60 = Moderate. Meets NTIA/State's standards, representative of Technology Type (TT)
- 70 = High. Accurate representation of coverage based upon TT.
- 80 = Very High. Multiple validation\verification with most 3rd party sources
- 90 = Extremely High. Multiple validation\verification sources
- 100 = Perfect. Multiple validation\verification sources, with complete alignment with sources and ground truth verification activities

This Validation table is maintained as updates or changes occur for each provider, down to technology type, with the overall goal to improve the confidence values and overall map representation.

Example of the Validation table:

OBJECTID	BBCOV	CONFIDENCE_CODE	PROVIDER_ID	PEER_QC	PROVIDER_QC	THIRD_PARTY_VERIFICATION	THIRD_PARTY_ID	Description
1	BBCov_15_Axis	40	771	11/4/2010	9/27/2010	11/4/2010	3070	Axis doesn't exist in Pinyonflakes exchange data. Geometry and attribution are ok.
2	BBCov_15_Beaer/FaCo	85	880	10/18/2010	3/6/2011	6/7/2010	2010	Beaver/FaCo #10 boundary has general shape of overlying pinyonflakes exchange boundary but not a perfect 1:1. 030911 confidence raised
3	BBCov_15_CandyTelcom	80	798	10/18/2010	9/23/2010	6/7/2010	2010	Candy Telcom boundary is roughly the shape of two exchanges but not 1:1.
4	BBCov_15_Cascadia	70	3085	11/4/2010		11/4/2010	3070	Cascadia still needs provider validation. This bbcov exists in Pinyonflakes exchange boundaries. Areas where they do not correspond to CenturyLink BBcov overlays Pinyonflakes exchange boundaries in some places, and not in others. Geometry and attribution representative of CenturyLink overlaps with Pinyonflakes Exchange boundary. Where it doesn't a scan pit was dropped. Geometry and attribution are ok.
5	BBCov_15_CenturyLink	70	710	11/4/2010	9/23/2010	11/4/2010	3070	CenturyLink BBcov overlays Pinyonflakes exchange boundaries in some places, and not in others. Geometry and attribution representative of CenturyLink overlaps with Pinyonflakes Exchange boundary. Where it doesn't a scan pit was dropped. Geometry and attribution are ok.
6	BBCov_15_CobaltTel	80	713	11/4/2010	9/16/2010	11/4/2010	3070	CobaltTel doesn't exist in Pinyonflakes exchange boundaries dataset. Geometry and attribution are ok.
7	BBCov_15_Covad	60	717	11/4/2010	9/23/2010	11/4/2010	3070	Covad does not exist in Pinyonflakes exchange boundaries dataset. Geometry and attribution are ok.
8	BBCov_15_DataVision	30	787	11/4/2010		11/4/2010	3070	SVL needs Provider QC. DataVision does not exist in Pinyonflakes exchange boundaries dataset. Geometry and attribution are ok.
9	BBCov_15_EasternOregonTelcom	60	899	11/4/2010	9/20/2010	11/4/2010	3070	Eastern Oregon Telcom does not exist in Pinyonflakes exchange boundaries dataset. Geometry and attribution are ok.
10	BBCov_15_Frontier	70	784	11/4/2010	9/16/2010	11/4/2010	3070	Frontier is partially overlaid by Pinyonflakes exchange boundaries. Areas of difference have scan pits dropped. Geometry and attribution are ok.
11	BBCov_15_Gerans	90	787	10/18/2010	9/23/2010	9/23/2010	2010	Main portion of boundary is general shape of corresponding exchange boundary.
12	BBCov_15_Hdb	70	726	11/4/2010	9/23/2010	11/4/2010	3070	Hdb BBcov resides mostly within Pinyonflakes exchange boundary of the same name. Scan Pits dropped where different. Geometry and attribution are ok.
13	BBCov_15_Integra	30	790	10/18/2010	9/27/2010	6/7/2010	2010	Many BBcov pits roughly align to 3rd party exchange boundaries in areas.
14	BBCov_15_Midwest	60	732	11/5/2010	9/27/2010	11/5/2010	3070	BBCov Midwest resides primarily within the Midwestern Exchange boundary in pinyonflakes dataset which is attributed as Verizon NW.
15	BBCov_15_Moila	60	734	10/18/2010	9/8/2010	6/7/2010	2010	Northern part of BBcov roughly aligns to northern part of 3rd party exchange boundary.
16	BBCov_15_MontanaCOOP	70	1180	10/18/2010	9/17/2010	6/7/2010	2010	Coverage area larger than overlying exchange boundary but overall shape roughly resembles the exchange boundary.
17	BBCov_15_Morone_Telephone	80	738	10/18/2010	9/20/2010	6/7/2010	2010	3rd party exchange boundary very similar to BBcov.
18	BBCov_15_MUAngel	90	787	10/18/2010	3/6/2011	6/7/2010	2010	3rd party exchange boundary very similar to BBcov. 030911 provider feedback via portal confirmed geometry and max speed and added type.
19	BBCov_15_Nashakem	80	795	10/18/2010	9/20/2010	6/7/2010	2010	Large portion of BBcov roughly aligns to underlying 3rd party exchange but not all.
20	BBCov_15_NorthStateTel	40	739	10/18/2010	3/15/2011	11/5/2010	3070	BBcov resides mostly within the Pinyonflakes exchange boundary. Geometry is suspect. Attribution is ok. Provider validated via portal.
21	BBCov_15_OregonTelCo	20	739	11/5/2010	9/14/2010	11/5/2010	3070	Very generalized bbcov partially overlying Pinyonflakes exchange boundary. Geometry suspect. Attribution is ok.
22	BBCov_15_People	80	1912	11/5/2010	9/17/2010	11/5/2010	3070	Peoples BBcov mostly resides within Pinyonflakes Exchange boundary of same name. Scan Pits dropped where differ. Geometry and Attribution is ok.
23	BBCov_15_PeakTelephone	70	797	10/18/2010	3/15/2011	6/9/2010	2010	BBcov area has general shape as underlying exchange boundary form. Coverage areas based off of Census Tracts. 031111 provider valid.
24	BBCov_15_Pioneer	70	740	11/5/2010	9/20/2010	11/5/2010	3070	BBcov Pioneer resides mostly within Pinyonflakes exchange boundaries of same name. Scan Pits dropped where differ. Geometry and attribution are ok.
25	BBCov_15_Overnet	80	1182	11/6/2010	6/7/2010	11/6/2010	3070	BBcov_15_Overnet falls within the extents of Pinyonflakes Exchange boundaries, but do not cover 1 for 1. Geometry and attribution are ok.
26	BBCov_15_Ronnet	50	897	11/6/2010	9/27/2010	11/6/2010	3070	Ronnet (UCC Telecom) doesn't exist in Pinyonflakes exchange dataset. Geometry and attribution are ok.
27	BBCov_15_Rooms	90	746	10/18/2010	9/16/2010	6/7/2010	2010	3rd party exchange boundary very similar to BBcov.
28	BBCov_15_Sandy	60	873	11/6/2010	9/17/2010	11/6/2010	3070	BBcov for city of Sandy does not exist in Pinyonflakes exchange dataset. Geometry and attribution are good for TT.
29	BBCov_15_Sop	90	880	10/18/2010	3/15/2011	6/9/2010	2010	3rd party exchange boundary roughly aligns to BBcov in the area 031111 Provider validated coverage confidence high.
30	BBCov_15_SCS	60	1030	11/6/2010	9/17/2010	11/6/2010	3070	BBcov for SCS does not exist in Pinyonflakes exchange dataset. Geometry and attribution are good for TT.
31	BBCov_15_SCTE	70	803	10/18/2010	9/17/2010	10/16/2010	3070	SCTE TT80 resides within pinyonflakes exchange area. Geometry and attribution are ok.
32	BBCov_15_SoftTel	80	750	10/15/2010	3/15/2011	6/7/2010	2010	BBcov roughly aligns to two 3rd party exchange boundaries but not perfect 1:1. Provider validated via portal.
33	BBCov_15_TDS	40	752	10/18/2010		6/7/2010	2010	BBcov partially aligns with overlying 3rd party exchange boundary.
34	BBCov_15_TransCascado	40	799	11/6/2010	9/21/2010	11/6/2010	3070	BBcov resides in part of Pinyonflakes Exchange boundary of the same provider name. BBcov also spills into two other PE exchange areas.
35	BBCov_15_CandyTelcom	80	798	10/18/2010	9/21/2010	6/7/2010	2010	Candy Telcom boundary is roughly the shape of two exchanges but not 1:1.
36	BBCov_15_ClearCreek	80	712	10/18/2010	9/17/2010	6/7/2010	2010	BBcov area very similar to 3rd party exchange here.
37	BBCov_15_Covad	60	717	11/4/2010	9/23/2010	11/4/2010	3070	Covad does not exist in Pinyonflakes exchange boundaries dataset. Geometry and attribution are ok.
38	BBCov_15_Integra	30	790	10/18/2010	9/27/2010	6/7/2010	2010	Many BBcov pits roughly align to 3rd party exchange boundaries in areas.
39	BBCov_15_NewEdge	20	796	11/6/2010	9/17/2010	11/6/2010	3070	SVL needs Provider Validation. Business Only provider's coverage areas do not exist in Pinyonflakes exchange datasets. Geometry and attribution are ok.
40	BBCov_15_QuantumCom	90	1031	11/6/2010	9/23/2010	11/6/2010	3070	QuantumCom coverage areas do not exist in Pinyonflakes Exchange boundaries. Geometry and attribution are ok for TT.
41	BBCov_15_Ronnet	50	897	11/6/2010	9/27/2010	11/6/2010	3070	Ronnet (UCC Telecom) doesn't exist in Pinyonflakes exchange dataset. Geometry and attribution are ok.
42	BBCov_15_CandyTelcom	80	798	10/18/2010	9/21/2010	6/7/2010	2010	Candy Telcom boundary is roughly the shape of two exchanges but not 1:1.
43	BBCov_15_Covad	60	717	11/4/2010	9/23/2010	11/4/2010	3070	Covad does not exist in Pinyonflakes exchange boundaries dataset. Geometry and attribution are ok.
44	BBCov_15_Integra	30	790	10/18/2010	9/27/2010	6/7/2010	2010	Many BBcov pits roughly align to 3rd party exchange boundaries in areas.
45	BBCov_15_Lightspeed	20	793	11/6/2010	9/17/2010	11/6/2010	3070	SVL needs Provider Validation. Business Only provider's coverage areas do not exist in Pinyonflakes exchange datasets. Geometry and attribution are ok.
46	BBCov_15_Midwest	40	732	11/5/2010	9/27/2010	11/5/2010	3070	BBcov as a single record buffered point residing in a Pinyonflakes exchange boundary attributed for another municipality and provider. Geom =





3.7.6 Community Anchor Institution (CAI) Data

3.7.6.1 Data Collection

The CAI data was initially collected from the State to create the baseline inventory. All location information and broadband coverage data supplied was also ingested into the data deliverable.

Additional collection of CAI information was done via data mining and/or webscraping to build out the inventory further. For example: Collection of additional CAIs and location information.

The state-agency-provided CAI inventory was comprehensive but the challenge is collecting broadband related data; service provider(s), technology and speed data for each CAI. Availability of the CAI portal has not significantly increase submission of this data. Additional promotion to CAIs to utilize the CAI portal will be needed to increase this data for subsequent deliverables.

3.7.6.2 Institution Data

Institution data is obtained from a variety of sources and almost always provided in Excel spreadsheet format. The general process for incorporating this data is below:

- 1) If the data is provided in Excel or some similar format:
 - a. Clean and standardize the Excel spreadsheet, removing any cell formats, merged cells, etc.
 - b. Standardize the address format as defined in the staging CAI database
 - c. If the spreadsheet includes X and Y values, such as latitude and longitude, use the Add XY Data tool in ArcMap to create a spatial data layer.
 - d. If there are only addresses, then follow the geocoding steps outlined above to create spatial data points for each of the institutions.
 - i. Institutions that do not geocode based on the TIGER 2009 data set will have to be manually located using Google Maps, Google Earth, or some other information source.
- 2) If the CAI source data is in GIS format, add the Latitude and Longitude fields and use the Calculate Geometry tool to populate them, using the WGS 84 coordinate system.
- 3) Using ArcCatalog, load the new data into the staging CAI database.
- 4) This database is ready for the [makeDeliverable.py](#) script to process the information into the final state and NTIA deliverables.





3.7.6.3 Community Anchor Institution (CAI) Portal Updates

A web application has been released to allow for further data collection and validation of anchor institution location information, broadband coverage, and speed test data.

Information collected from the CAI Portal is then ingested into the overall inventory and will later be compared against the provider coverage areas mapped for any potential discrepancies.





3.8 Product Extract

3.8.1 Python Scripts

The following sections make use of Python scripts. In general, to use a Python script, you must have Python installed on your computer. To download the latest version of Python, go to <http://www.python.org/download/> and download the latest stable version. As of August 2010, this was version 2.7. Once this is installed, the general way to run a script is to type the following at a command prompt: C:\Python27\python.exe C:\<location of script>. Many of the scripts provided have environment variables that must be set before they can be run.

The python code for BroadMap's product extract has been incorporated into a Hudson CI System, which is detailed in the Process Operation and Monitoring section of this document. This was a process improvement activity so all processes can be monitored, controlled and contain historical tracking on each process.

3.8.2 Product Extract Process

Note: specific Python scripts are called out in red font in the sections below.

The MapConnect product extract process, **makeDeliverable.py**, uses the BB_Cov and BROADMAP_POINTS interim data sets to create the following layers according to the current specifications:

- BB_Service_Road_Segment
 - This layer contains all broadband services associated with specific street segments for census 2000 blocks larger in area than two square miles
- BB_ServiceCensusBlock
 - Contains all broadband services associated with census blocks of no greater than two square miles.
- BB_Service_Wireless
 - This layer contains all wireless services not associated with specific addresses.
- BB_ServiceOverview
 - This layer contains subscriber-weighted nominal speed for each provider's service area at a county level and is meant to act as a summarized view.
- BB_ConnectionPoint_MiddleMile
 - This layer contains middle-mile and backbone interconnection points
- BB_Service_CAInstitutions
 - Broadband Service at Community Anchor Institutions (CAI)
 - Community Anchor Institutions consist of schools, libraries, medical and healthcare providers, public safety entities, community colleges and other institutions of higher education, and other community support organizations and entities.

Due to a NTIA model change for the October 2010 data deliverable, an addition to this code was created to support both models in the case a comparison is later desired or a request is made to revert back to the original model. This script name is **bdia2ntia.py** and creates the following layers in addition to the layers mentioned above, rolled up to **NATL_Broadband_Map**.





- **BB_ConnectionPoint_LastMile**
 - This layer contains last mile infrastructure points, which is only populated if data cannot be provided at a more granular level.
- **BB_Service_Address**
 - **Represents broadband availability for service address points.** Address Point availability refers to those individual addresses at which each facilities-based provider of broadband service can provide broadband services of minimal characteristics within 7 - 10 business days.
- **State_Boundary**
 - State boundary supporting topological validation of point feature classes.
- **NATL_Broadband_Topology**
 - Supports basic topology quality checking. Example: No CAI's or Middle Mile points outside of the state boundary

The following process flow provides a view of how the Core fGDB is extrapolated to the NTIA final deliverable via the makeDeliverable.py script. Following that, the bdia2ntia.py script is run, which limits what's placed in the final layers based on the NTIA modeling standards.

The product scripts and supporting extract were originally created separately per request, in case data model comparisons were to be completed.

3.8.3 Product Statistics

Following the completion of a product extract, the product statistics script ([BDIA_ReleaseNotesStats.py](#)) extracts the following information supporting that product deliverable.

- **Provider Statistics**
 - Collects all provider information, listing by Provider Name
 - Provides output of FRN
 - Counts the number of features supported within the following layers:
 - Census Block
 - Street Segment
 - Max Upstream
 - Wireless Services
 - Infrastructure Points
 - These updates were made to support the Data Package required to accompany every NTIA product deliverable.
- **Community Anchor Institution (CAI) Statistics**
 - Breaks CAI down to the 8 categories
 - 1: School: K through 12
 - 2: Library





- 3: Medical/Healthcare
- 4: Public Safety
- 5: University/College
- 6: Other Government
- 7: Other Community non-government
- None: Unknown Category
 - In cases where this occurs, further investigation is completed prior to product shipment to ensure all CAI's are categorized accurately
- Reports out the following counts
 - Total CAIs within that category
 - Total CAIs that contain partial BB coverage
 - Contains any of the following information for given CAI:
 - ◆ BB Subscriber, Transmission Technology, Speed Down Speed Up
 - Total CAIs that contain full BB coverage
 - Contains all of the above-mentioned BB information for given CAI.

The output of this script is two CSV files: AnchorInstitutions.csv and Providers.csv. These files can then be inspected to ensure that there are the expected number of CAIs and providers for every release.

3.9 Quality Assurance

Quality assurance is supported manually and algorithmically on the interim data, BB_Cov file geodatabase, and on the final product. For scheduled product releases, a test product extract and subsequent manual and algorithmic QC run is completed along with a release review. The product specifications, project status reports, previous product release notes are used as references throughout this review.

The following parameters are tested using the methodology listed below each:

- Product Deliverable Format
 - Correct names and format of data deliverables
 - **BDIA_QC_SUITES (please see below for details)**
 - Correct Projections/Datum
 - Manual interaction with product
 - Metadata Present and Correct
 - Manual interaction with product
- Table Structure
 - All required tables included
 - **BDIA_QC_SUITES**
 - Extraneous tables identified
 - **BDIA_QC_SUITES**
- Field Structure
 - All fields included





- **BDIA_QC_SUITES**
- Extraneous fields identified
- **BDIA_QC_SUITES**
- Correct field names, types and widths
- **BDIA_QC_SUITES**
- Field Domains
 - Values in all tables are constrained to the specified values specified
 - This action is accomplished via **BDIA_QC_SUITES** and manual review of the product
 - This tends to identify project completeness issues as fields with a null value are identified.
- Geometric Representation
 - Identify if all layers have the correct geometric representation
 - Manual review of the BB_ServiceOverview layer
 - Dependent on NTIA and client requirements
- Geographic Extent
 - Product includes the necessary Geography associated with Product?
 - Manual Review - ArcGIS
 - Is there extraneous geography included in Product?
 - Manual Review - ArcGIS
- Completeness
 - Products contain the expected amount of data?
 - Manual review of product stats relative to weekly State reports and defined expectations.
- Accuracy
 - Product meets the stated accuracy requirements for the deliverable?
 - Sampling procedure to manually review source material to resulting product
 - Provider Validation
 - Verification using 3rd Party Data
 - Verification against reality, where applicable
- Data Regression
 - Any unexplainable data loss or change?
 - This action is accomplished by comparing results within product statistics script (**BDIA_ReleaseNotesStats.py**) from previous releases, as well as manual review of the product
- Confidentiality
 - Any unauthorized confidential information included in the delivery?
 - Review of NDAs and delivery expectations
- Prior Issues Resolved
 - Have expected internal issues been resolved?
 - Manual review of data against previous product release notes
 - Have agreed upon customer issues been resolved?
 - Manual review of data against previous product release notes, status report and client feedback
- Delivery Medium





- Has the product medium been verified?
 - Manual review
- All files present
 - Manual review of SFTP site to ensure all files are copied correctly, including file/directory size
- Correct location
 - Manual review – confirmation of SFTP link, username and password

3.9.1 QC Suite

The **BDIA_QC_SUITES** consists of four main types of scripts supporting the overall QC process. These scripts are all run in concert and are called from the **test_runner** script and the **test_BDIAProductGDB** script.

3.9.1.1 Configuration

These scripts establish the configuration for the **test_BDIAProductGDB** script which is the core of the QC Suite.

- **update_test_config**
- **active_config**
- **config_PROCESS01_automated**
- **config_PROCESS01_manual**
- **set_active_config**

3.9.1.2 Libraries

These scripts provide additional functionality that is called from with the **test_BDIAProductGDB** script.

- **bb_unittest_fixture**
- **bbcov_structure**
- **BC_XmlWriter**
- **file_folder**
- **search_and_replace**
- **unittst_fixture**
- **validate_BB_DB**
- **validate_BB_GDB**
- **xmlrunner_gui**

3.9.1.3 QC Suite

This is the core script for performing automated QA/QC on the interim and final data deliverables.

- **test_BDIAProductGDB**

3.9.1.4 Other

These scripts perform other functions detailed below:

- **test_runner** – this is the main script that runs all the other QC scripts and imports all the necessary scripts and libraries





- **which_build** – this determines the current build and passes information to the configuration scripts

3.10 Process Operation and Monitoring

Product Extract, **makeDeliverable.py** and **bdia2ntia.py**, is run within BroadMap using a platform called Hudson that has been enhanced to support BDIA product extraction, process monitoring, as well as product validation. The same platform can be planned for implementation for the State, if desired.

Below are examples of the product create, product validation, product statistics and monitoring processes which are managed within the BroadMap Hudson CI-System. All of the above-mentioned python scripts, with the exception of metadata transactions script, are run via this system.

3.10.1 BDIA Product Create

Below is an example of the main page where the type of product build can be selected.

All	BDIA Product Create	BDIA Product Validation	BDIA_Sourcing	Core Database Validation	FCC Product Validation	MCE Product Validation	Map Connect Enterprise	Mesh Creation	Postal Product Create	Postal Product Prep	WebPortalPrep

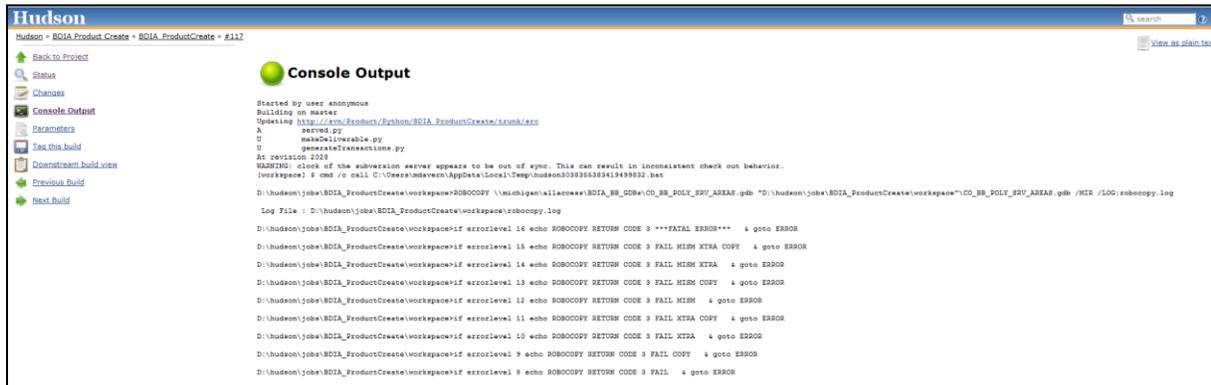
Selecting based on the type of process that will be initiated.

The first screenshot shows the Hudson dashboard with the 'Build Now' button circled in red. The second screenshot shows the 'Project BDIA_ProductCreate' configuration page with the 'Build' button circled in red.

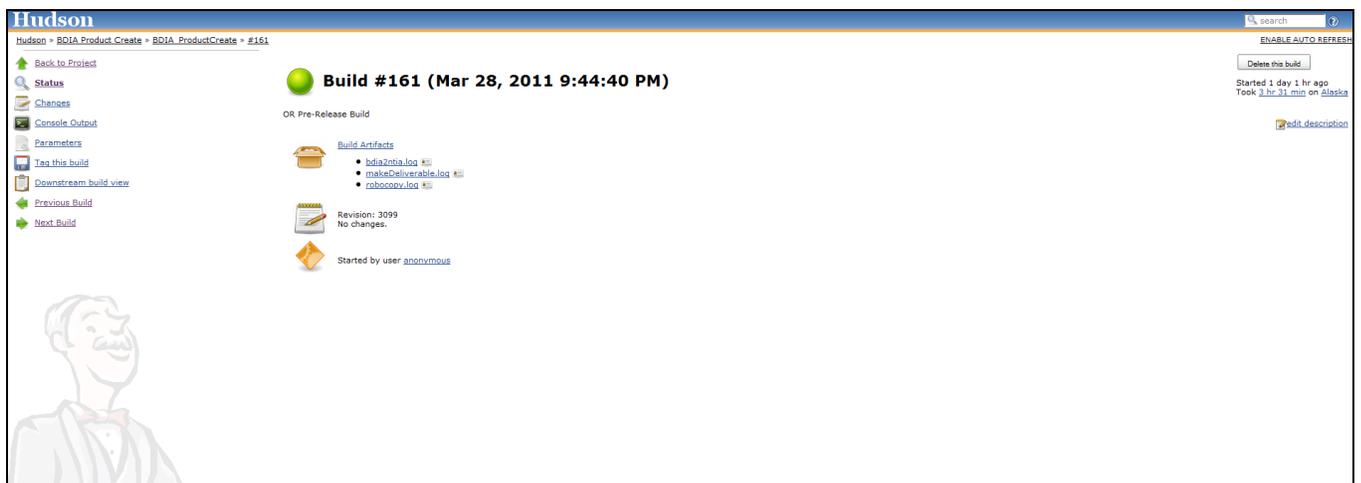




The Console Output can be reviewed to see the progress of product create. Following the completion of each product creation process, an e-mail notification is automatically sent to the team.



All processes run via the BroadMap Hudson CI-System are stored for historical reporting. Each process can be reviewed, including the Console Output and Build Artifacts from that run.



3.10.2 Product Validation and Statistics

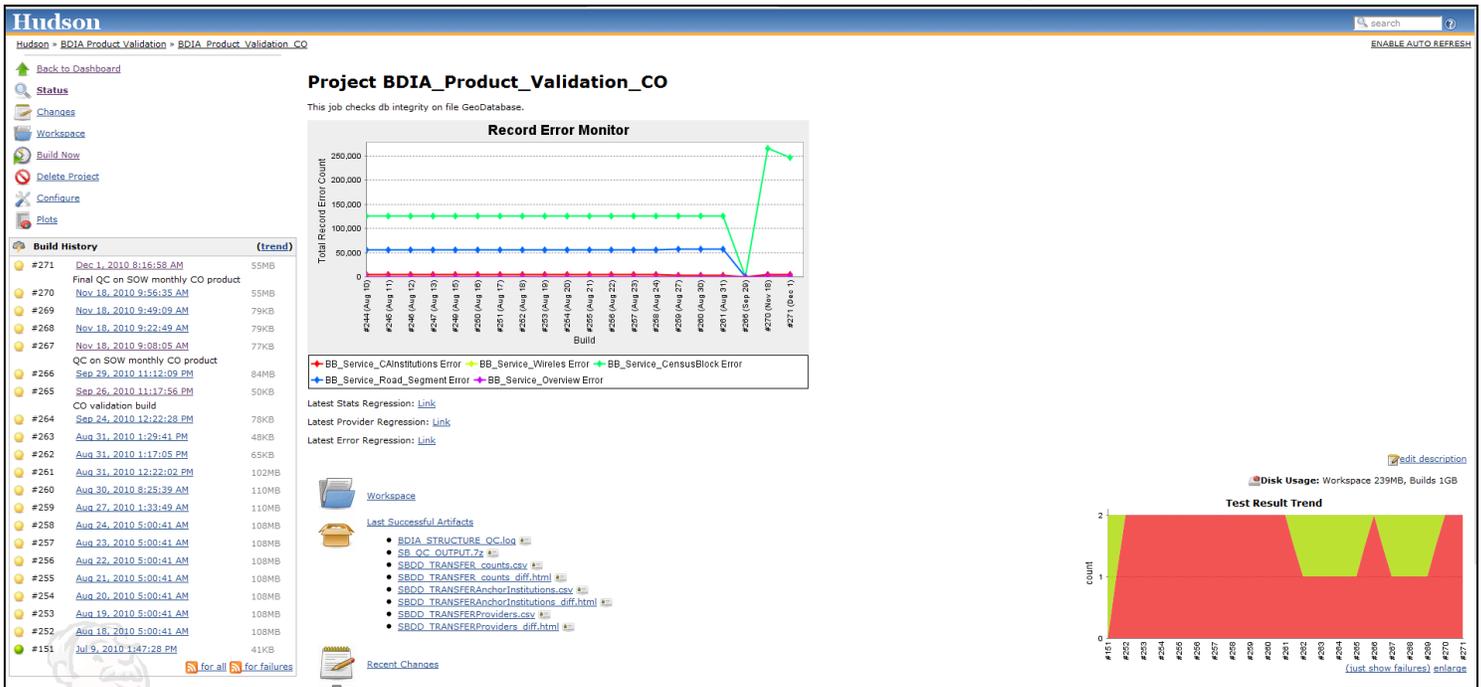
Once the product creation process is complete, Product Validation and Statistics are then initiated. These support the **BDIA_ReleaseNotesStats.py** script and the **BDIA_QC_SUITES** scripts detailed above.

All statistics and reports are stored for historical review with the capability to place violation criticality on each quality control check allowing the identification of errors due to project status/completeness verses project correctness. Example: Typical Speeds populated.





Below is an example of the report provided based on various control points running over a specified time period:





Hudson | BODIA_Product_Validation_CO

Project name: BODIA_Product_Validation_CO

Description:


```
<p>This job checks db integrity on file GeoDatabase.</p>

<p>Latest Stats Regression: <a href="http://vermont.8080/job/BODIA_Product_Validation_CO/lastSuccessfulBuild/artifact/SBDD_TRANSFER_counts_diff.html">Link</a> <p>
<p>Latest Provider Regression: <a href="http://vermont.8080/job/BODIA_Product_Validation_CO/lastSuccessfulBuild/artifact/SBDD_TRANSFERProviders_diff.html">Link</a> <p>
<p>Latest Error Regression: <a href="http://vermont.8080/job/BODIA_Product_Validation_CO/lastSuccessfulBuild/artifact/CO_error_summaries_diff.html">Link</a> <p>
<p>Latest CAI Regression: <a href="http://vermont.8080/job/BODIA_Product_Validation_CO/lastSuccessfulBuild/artifact/SBDD_TRANSFERAnchorInstitutions_diff.html">Link</a> <p>
```

Discard Old Builds

Days to keep builds: _____

Max # of builds to keep: 20

This build is parameterized

String Parameter

Name: TestMethodPrefix
 Default Value: BODIA_STRUCTURE
 Description: _____

String Parameter

Name: GDBLocation
 Default Value: //alaska/ReleaseCandidates/CO_2010117-1947
 Description: Parent path for the release candidate GDB

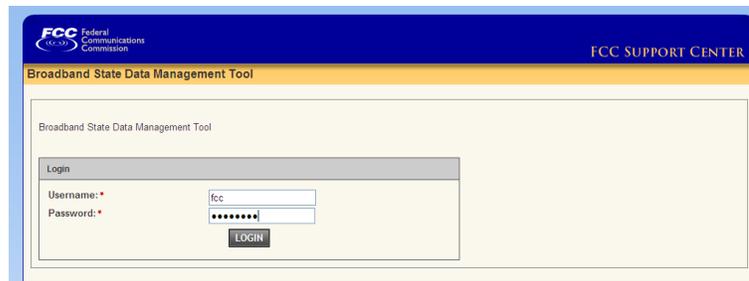
Build History (trend)

ID	Time	Size
#280	Dec 22, 2010 9:47:05 AM	2MB
#279	Dec 21, 2010 11:41:46 AM	5MB
#272	Dec 17, 2010 9:41:12 PM	84MB
#271	Dec 1, 2010 8:16:58 AM	55MB
#270	Nov 18, 2010 9:56:35 AM	55MB
#269	Nov 18, 2010 9:49:09 AM	79KB
#268	Nov 18, 2010 9:24:49 AM	79KB
#267	Nov 18, 2010 9:08:05 AM	77KB
#266	Sep 29, 2010 11:12:09 PM	84MB
#265	Sep 26, 2010 11:17:56 PM	50KB
#264	Sep 24, 2010 12:22:28 PM	78KB
#263	Aug 31, 2010 1:29:41 PM	48KB
#262	Aug 31, 2010 1:17:05 PM	65KB
#261	Aug 31, 2010 12:22:02 PM	102MB
#260	Aug 30, 2010 8:25:39 AM	110MB

3.11 Product Extract Data Delivery

Product delivery for MapConnect Broadband is handled two ways, depending on client requirements:

- 1) State Submittal
 - a) Data is submitted via SFTP site
 - b) Product Release Notes and QC Test Report accompanies the delivery
- 2) NTIA Submittal
 - a) Directions for using the NTIA State Broadband Data file submission tool
 - b) Go to the following WWW web site: <https://esupport.fcc.gov/statedata>
 - c) Enter your username and password as provided to you from the NTIA program administrator.



- d) Click in Upload a file field
- e) Browse to local file for submission using the 'Browse' button. Select file then select ATTACH FILE.



A screenshot of the FCC Broadband State Data Management Tool interface. The page has a blue header with the FCC logo and "FCC SUPPORT CENTER". Below the header, it says "Broadband State Data Management Tool" and "Alaska (jgeorge@denali.gov) Logout". There are two tabs: "Upload File" (selected) and "View Files". The main content area is titled "UPLOAD NEW FILE" and includes a note: "* denotes required field." Below this is a form with a label "Upload File" and a text input field containing the file path "C:\Users\20100323142745_offer\20100323.pdf". To the right of the input field are "Browse..." and "ATTACH FILE" buttons.

- f) Logout / Receipt using the Logout button in the Top Right of the screen
- g) A receipt of submission is emailed to username e-mail address

