PERFORMANCE PROGRESS REPORT

11.b. Describe any challenges encountered with vendors or subrecipients.

PROJECT CHALLENGES:

[1] Broadband Mapping - The team has experienced some challenges in obtaining the full cooperation of some broadband providers and outreach continues to improve participation levels among the provider community.

[2] State Capacity Building & Planning - Due to various factors including an administration change, agency reorganizations, personnel changes, and National Public Safety Broadband Network (PSBN) developments, it was necessary to reevaluate and delay some components to ensure the best approach and address sustainability. Decision-making with regard to organization direction was finalized in Q3-2013.

PA's broadband program director has been in communication with the federal program office about redirecting unused funds to expand the scale and reach of the state's extremely successful and impactful broadband Technical Assistance component to deepen impact on libraries statewide in partnership with the PA Department of Education. This approach aligns with the original intent of the Planning and Capacity Building components with the promise to generate more economic impact than the original work plan. An Award Action Request (AAR) being prepared by the recipient agency for submission to NTIA during Q1-2014. Resolution of this matter and receipt of authorization to proceed from NTIA will allow for full implementation of PA's SBI program and the commitment of all remaining SBI funds.

REPORTING NOTES:

[1] In #9, Row 3, the % of Total Federal Funding Expended for this component (Capacity Building) equals 0.002% or, when rounded, 0%, however this field within the PDF template does not appear to calculate and return a value for percentages less than 1%, nor is the field editable to make the appropriate correction.

[2] In #10.b, per guidance of the Federal Program Office, this table now includes only federally paid recipient staff. Please note that 100% of the recipient-employed State Broadband Director's time continues to be paid using approved match. In total, 1.5 FTEs are dedicated to the program by the recipient.

Please note that the percentage of time dedicated to each project by the federally-funded recipient staff person listed in #10.b. (State Administrative Officer) remained the same since Q3-2013. These proportions will change over time as additional project components are launched, stabilized, and completed.

[3] In #11.a, Rows 7-9 represent subcontract agreements yet to be determined.

PERFORMANCE PROGRESS REPORT (continued)

[4] In #12, the Total Matching Funds Expended column includes some costs not reflected in PA's current approved match budget, but that were expended in carrying out the grant activities.

Given Commonwealth accounting practices to automatically code and track all expenses associated with the federal grant, these state-paid expenses (e.g. travel to SBDD events, specialized services associated to grant administration, hardware and telecommunications costs etc.) are tracked and reported each quarter as part of our PPR and SF425 reporting. This does not suggest that our approved match sources have or will change, rather it simply reports overmatch in some categories.

We are hesitant to remove such expenses costs from our PPR reporting, as this action would: (1) result in a discrepancy between the matching expenses reported on the PPR and the SF425, and (2) require us to maintain a secondary financial tracking system to back-out such costs, which may increase the chances for error or confusion.

This situation has been discussed with the Federal Program Officer and we welcome guidance from NTIA and/or NIST on how to best address this situation in the event that our ongoing reporting of excess match dedicated to the project raises issues and/or is burdensome to federal program staff.

[5] In #12, any difference found between the figures in the budget table and the sum of the individual project budgets included in the Excel attachments is due to rounding, as the Excel document allows for the entry of decimals and accounts for those in the sum, whereas the PDF document allows only whole numbers. Some minor/non-substantive adjustments of a few cents may have been made in a few fields by the preparer to ensure that the figures would match across documents.

[6] In #9 and #12 and on the Project Attachment budget tables, please note that the dollar amount of federal expenditures for the Capacity Building "Other" line item decreased between the Q3-2013 and Q4-2013 period by $1,178 from $3,475 to $2,297. This relates to the adjustment of expenditures originally associated with the federal grant, but that were later reimbursed by a funding source outside of this project. Regular monitoring and review of project expenses by the recipient ensures that all charges billed to the federal grant align with the project work plan and budget.

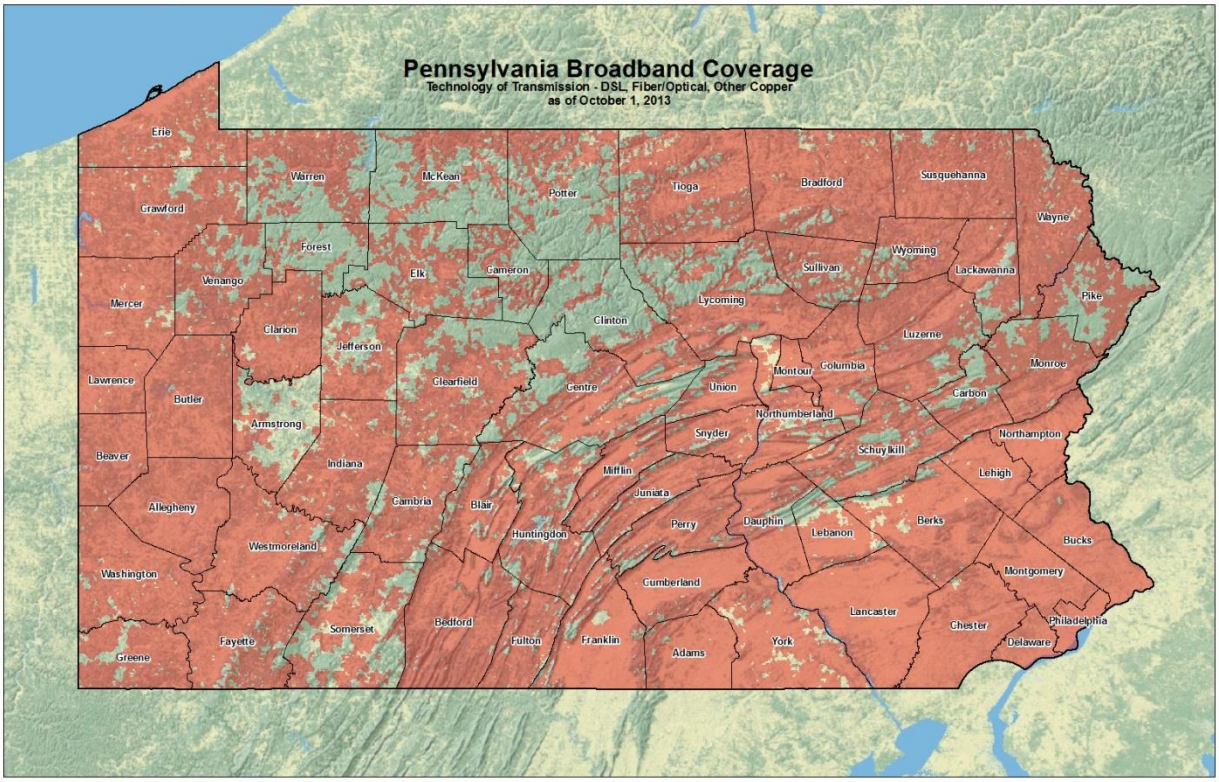
DATA COLLECTION

14.a.2. Describe any additional project milestones that have been accomplished over this reporting period (Ex. Updates to state broadband maps and websites, map outreach activities)?

PA Broadband Map Continues to Be Updated

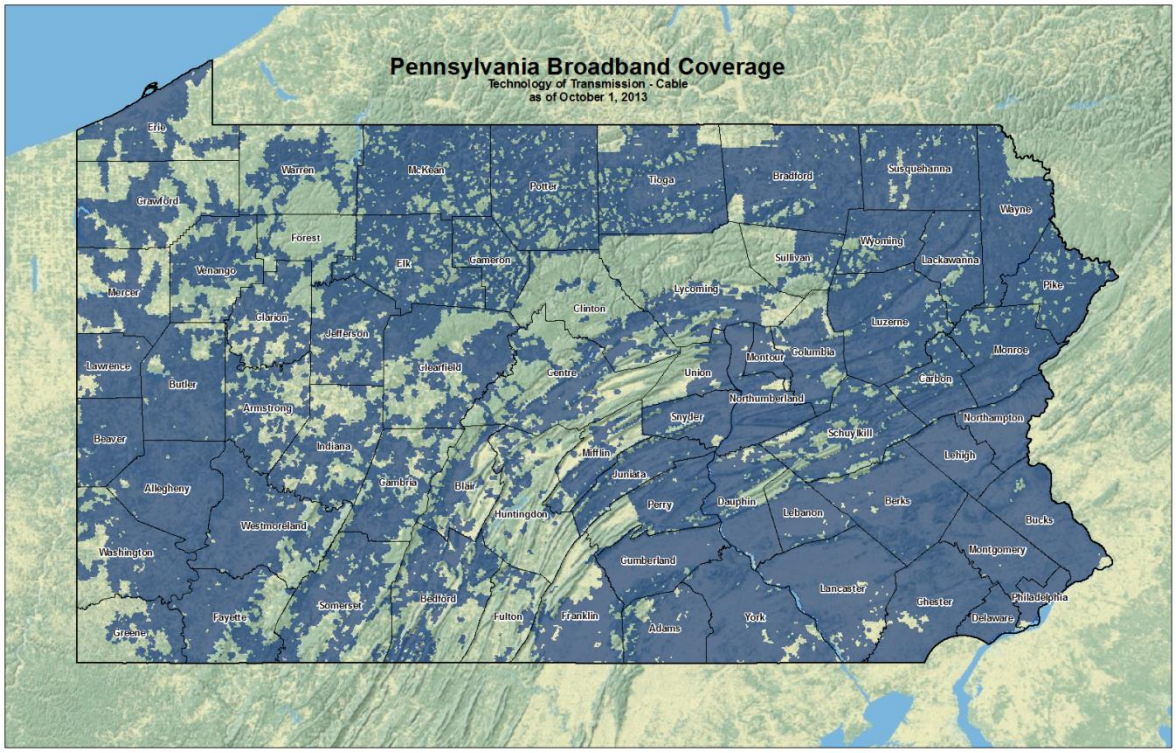
- In accordance with Pennsylvania's work plan, the data collected through the SBDD program is being made available to the public online via a searchable, interactive interface. This mapping tool is available at www.broadbandinpa.com. An official press release about the public mapping tool was released in November 2010. Through Q4-2013, it has received 21,155 hits to the state broadband mapping entry page.
- Following are a series of maps that provide a geographic representation of the reported broadband coverage (excluding satellite provider data) included in the October 2013 data submission. The PA map is refreshed with each semi-annual data delivery to NTIA.

REPORTED WIRELINE/DSLCOVERAGE:

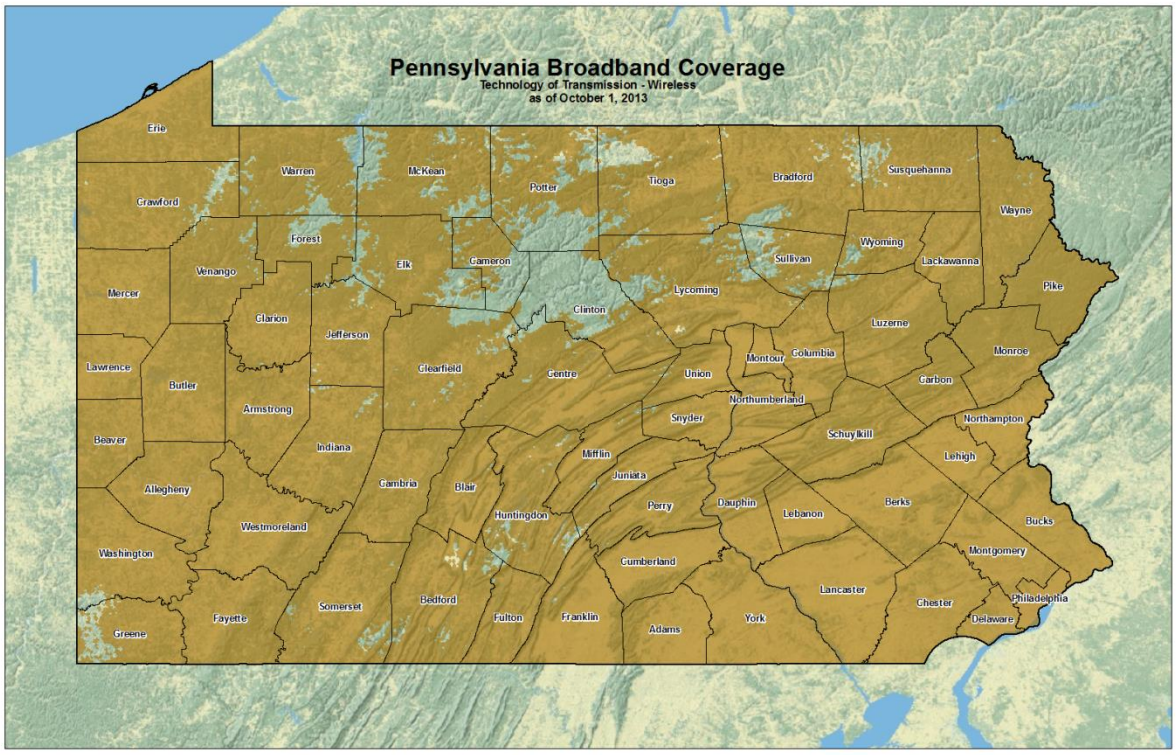


DATA COLLECTION (continued)

REPORTED CABLE COVERAGE:



REPORTED WIRELESS COVERAGE:



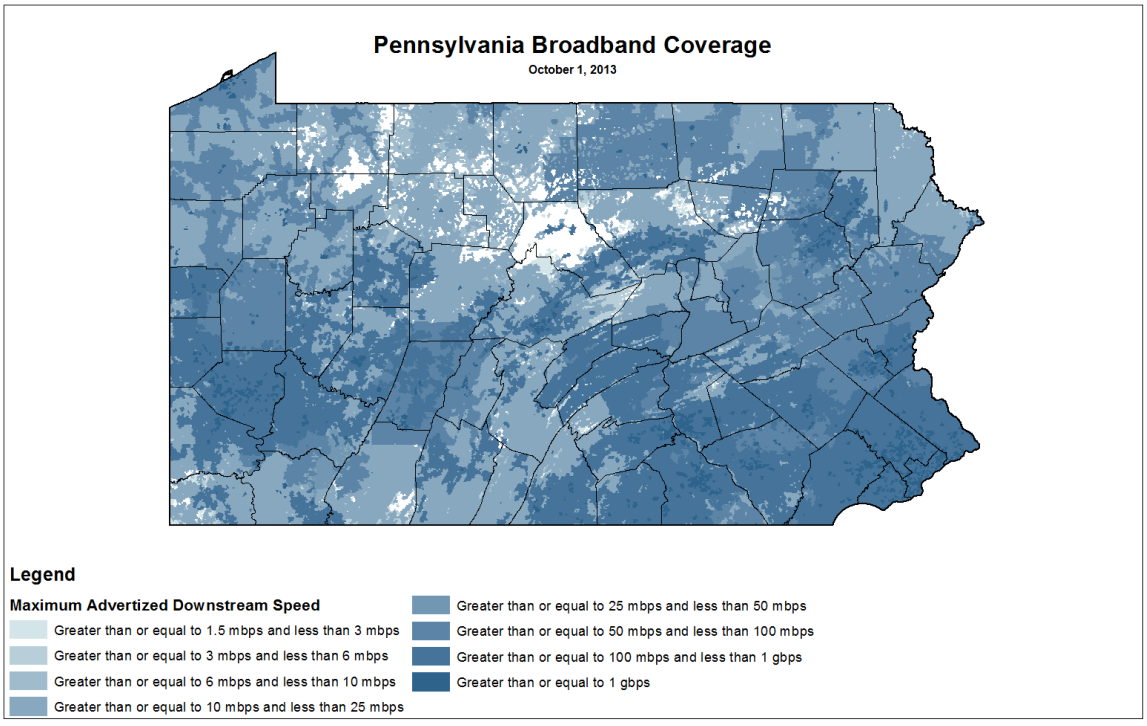
DATA COLLECTION (continued)

- **Data Confidence Scale Published:** With each NTIA data submission, the state broadband mapping website is updated with the latest data and data confidence scale. When someone queries the state broadband mapping website for available broadband service at a specific location, the data confidence scale is shown with each provider's service that is listed. The data confidence scale was updated on the state broadband mapping website during Q4-2013 based on the October 2013 data submission.

- **Small Provider Technical Support:** Technical assistance will be provided to small providers, in preparation of their data updates for the April 2014 NTIA data submission and will continue to be provided for future data submission cycles.

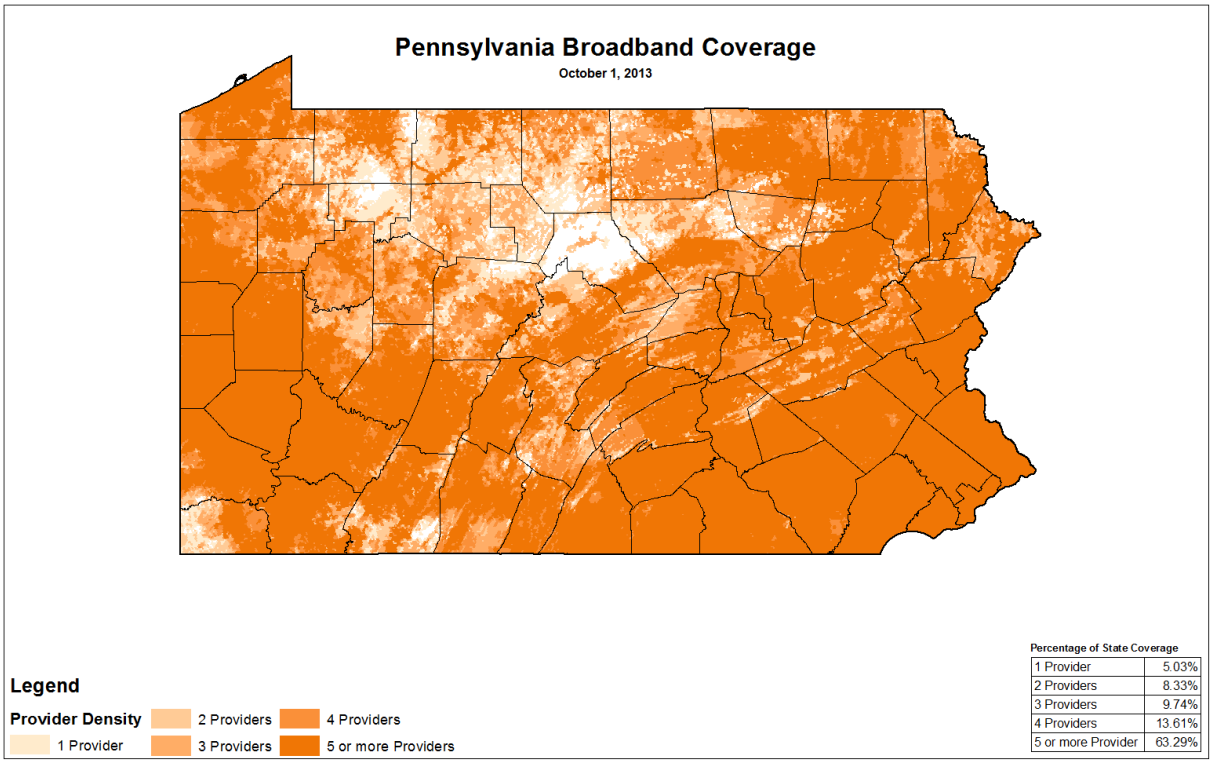
- **Data Quality Feedback Loop with Providers:** With each NTIA data submission, the project team provides data quality feedback to the providers based upon findings during the validation process. In Q4-2012, Provider confidence maps were produced and distributed for corrective actions by the Providers for the April 2014 NTIA data submission.

- **Speed Geography:** The following speed tier map shows the maximum advertised download speeds offered across Pennsylvania that is reported in the October 2013 data submission.



DATA COLLECTION (continued)

- **Provider Density:** The following map shows the density of providers offering service in Pennsylvania, derived from the data reported in the October 2013 data submission.



Specific Mapping Enhancements Implemented or In Process:

- **Mobile Device Accessibility Deployed:** During Q4-2013, the beta version of Pennsylvania's broadband map (www.bakerbb.com/pamobileapp/map.html) remained accessible from mobile devices, including the iPhone (iOS), Android, Windows Phone, and Blackberry.

- **Provider Submission Portal Utilized:** For the October 2013 data submission, the project team witnessed increased usage of the broadband mapping provider submission portal. It is anticipated the usage will increase even more with the April 2014 data submission. This secure, web-based application is designed specifically for providers to streamline the transmission of coverage data between providers and the project team and improve accuracy.

DATA COLLECTION (continued)

- **Secure Map Updated:** Recognizing that broadband data collected is most powerful as an economic development and planning tool when viewed and analyzed in context, Pennsylvania is building out a secure version of its public broadband. This interface is accessible by various state agencies, along with select internal and external partners.

  Permissions ensure the confidentiality of the data and enable users to access additional non-broadband data in the GIS interface and/or upload their own datasets to view in relation to broadband. This application is also used as a tool to facilitate stakeholder participation in data validation. During Q4-2013, the data on the website was refreshed with the October 2013 data submission information. The update of the secure website will continue for subsequent update cycles.

- **Propagated Coverages Generated:** For the October 2013 NTIA data submission, propagated wireless coverages were included for the fixed wireless providers who either refused to participate, were non-responsive, or had supplied a questionable coverage.

- **CAI Outreach Enhanced:** Pennsylvania implemented an online survey tool and leveraged existing data sources to amass data on 64% of identified K-12 schools and 93% of identified libraries collected for the October 2013 update. The following table shows the current CAI outreach results. Data collection continues, with additional responses to be included in the April 2014 update.

Community Anchor Institution Type	*Number of Community Anchor Institutions Identified*	*Number of Institutions with Connectivity Attributes*
K-12 Schools	*4,898*	*3,118*
Libraries	*769*	*720*
Post-Secondary Schools	*535*	*104*
Police Departments	*1,025*	*280*
Hospitals	*278*	*63*
Health Departments	*616*	*30*
Other Non-Governmental	*7*	*7*
Other Governmental	*5*	*5*
Total:	***8,133***	***4,327***

- **Improved Middle Mile Inventory:** During outreach activities to providers, the project team continues to emphasize the importance of supplying middle mile with their service data. For the October 2013 data submission, the project team included four (4) additional providers' middle mile locations from the previous NTIA data submission.

DATA COLLECTION (continued)

- **Reseller Data Included:** For the October 2013 data submission, reseller data was included. Although it has been a challenge getting resellers to participate, outreach will continue to increase their participation in the program in the coming data submissions. During Q4-2013, the state broadband mapping website was updated to include the participating resellers.

- **Typical Speed from Public Sources:** During outreach activities, the project team continues to emphasize the importance of supplying complete data. Where typical speed values will not be supplied by the provider, the missing typical speeds are calculated from public speed tests supplied by the FCC and collected from the state broadband mapping website.

- **WiFi Hotspots Published:** WiFi hotspots continue to be made available on the secure map and on the state broadband mapping website. In addition, a WiFi self-reporting application is available on the state broadband mapping website.

- **Data Sharing:** The project continues to make the raw data available for use by municipal and other entities to support their specific planning and mapping needs. The project team has provided the ability for municipal and other entities to download the non-confidential data from the public website after completing a short request form.

DATA COLLECTION (continued)

14.a.4. Provide any other information or statistics that you think would be useful to NTIA as it assesses your broadband data collection, validation and publication activities.

Provider Stats: The Pennsylvania broadband mapping team is working hard to fulfill the obligations under the program and we are pleased with the progress thus far. To summarize the Commonwealth of Pennsylvania's broadband mapping project progress, the following table outlines Broadband Provider participation through December 31, 2013.

Status Categories	*# of Providers*
Total ISPs/Providers Identified/Contacted	*310*
Providers That Report They Do Not Provide Broadband Service in PA	*122*
Providers That Report They Are Resellers	*28*
Companies In Which We Are Unsure If They Provide Broadband Service	*33*
Known Broadband Provider Universe	*127*
Providers That Have Not Yet Responded to Contacts from the Project Team	*11*
Providers That "Will Not Provide Data"	*11*
Providers That "Have Submitted Partial Data"	*0*
Providers That "Will Provide Data" But Have Not Yet	*0*
Provider Data That Has Been Validated	*105*
Providers Included in the October 1, 2013 Delivery	*105*
Resellers Included in the October 1, 2013 Delivery	*4*

The matrix below indicates the progress made with each SBI data submittal through October 2013.

	As of May 2010	As of Oct. 2010	As of Apr. 2011	As of Oct. 2011	As of Apr. 2012	As of Oct. 2012	As of Apr. 2013	As of Oct. 2013
Total Number of Broadband Providers Identified	101	113	115	120	121	121	125	127
Providers that Have Agreed to Participate	75	93	99	101	95	98	103	105
Entities with which we have executed NDAs	40	40	41	41	41	41	41	41
Entities which we are actively negotiating NDAs	2	1	0	0	0	0	0	0
Providers that have submitted data	69	89	94	94	92*	96	102	105

* NOTE: Three (3) broadband providers who supplied data in previous data submissions but are no longer providing service and one (1) broadband provider supplying data for the 1st time.

TECHNICAL ASSISTANCE

14.b.2. Describe your progress meeting each major activity/milestone approved in the Project Plan for this project; any challenges or obstacles encountered and mitigation strategies you have employed; planned major activities for the next quarter; and any additional project milestones or information.

During Q4-2013, the network of 20 economic, community, and workforce development partners involved in this effort continued to carry out this scope of work to assist businesses and community anchor institutions adopt and/or make better use of broadband.

Technical Assistance cases are underway statewide and small business clients/community anchor institutions are being referred to and assisted through the program. During Q4-2013:

- The Pennsylvania Technical Assistance Program (PennTAP) at Penn State University (PSU) closed 23 one-on-one technical assistance cases with small business or community anchor institution clients and had another 30 in process. This brings the number of closes cases to 258 (108% of commitment).
- PennTAP completed 6 additional cases of intensive technical assistance with businesses and community anchor institutions, bringing the total of intensive cases to date to 172 (180% of commitment).
- PennTAP provided training or assistance to 332 individuals, bringing the cumulative total to 1,952 individuals impacted (112% of commitment).
- PennTAP mentored and placed 11 additional PSU undergraduate IT students as interns within client organizations as part of an intensive technical assistance component to address specific technology issues and business problems related to broadband adoption by implementing broadband solutions. This brings the number of intern placements to date to 33 (83% of commitment).
- Prospective technical assistance clients continue to be referred to this educational webinar: https://online.ist.psu.edu/sites/ist402penntap/files/presentation/penntap_broadband.swf
- PSU's College of Information Sciences and Technology (IST) is nearly complete with the broadband-related online course which will target IT professionals. This curriculum will be made available as an open source course through Penn State University and the partners continue their planning to market this learning opportunity.
- Social Media Marketing, Search Engine Optimization training with assistance for Mobile accessibility and utilizing Credit Card tools on mobile devices continued to be hot topics for both one-on-one and group trainings provided through the program.

TECHNICAL ASSISTANCE

- PennTAP's clients receiving broadband technical assistance have reported the creation or retention of 71 jobs. In addition, $2,600,000 in economic benefits have been realized due to the assistance provided through this program (includes increased revenues, cost savings, cost avoidance, capital investments, etc.)
- Clients are once again being recruited by PennTAP to hopefully be chosen by PSU students for their "Google Adwords" national competition. One of the Penn State student teams placed in the top 15 out of 4,000 teams worldwide in the last competition. The goal to have one of PennTAP's broadband clients in the top 10 for 2014.
- The Local Development District (LDD) network entered into a contract with New Horizons Computer Learning Centers, the qualified vendor selected through its competitive procurement process to support the rollout of its municipal/community broadband outreach/training program. Program planning and marketing preparations were completed during Q4-2013in partnership with the recipient, all regional partners, and the selected vendor in Q4-2013 for launch in Q1-2014.
- Under the LDD-led training program, New Horizons will provide access to an online course library of 110 courses and over 500 online videos to up to 4,000 individual users across Pennsylvania, with special emphasis on engaging community anchor institution personnel. Courses will cover broadband-related or supportive topics such as Online Marketing, Email Marketing, Website Development, Social Media, Advanced Wireless Technologies, Cloud Computing, Internet Security, Information Security of End Users, Quickbooks, Microsoft Applications (Word, Excel, Outlook, PowerPoint & Access), Graphics / Graphic Design, Business Skills, Project Management, SharePoint/web collaboration, etc.
- The Industrial Resource Center (IRC) Network and its regional partners (who are also the federally-designated entities charged with assisting manufactures through NIST's Manufacturing Extension Program (MEP)) completed 28 Broadband Assessments and 21 Technology Strategic Plans for manufacturers during Q4-2013, bringing the total to 176 Broadband Assessments (88% of commitment) and 159 Broadband Technology Strategic Plans (80% of commitment) to date.
- Manufacturing client companies assisted by the IRC Network through this program have reported the following impacts as a result of implementing the broadband recommendations provided.
    - $ 6.5 million in increased sales
    - 12.8 million in retained sales
    - $1.4 million in cost savings
    - 62 jobs created
    - 106 jobs retained

  (NOTE: The above impact data above represents only 42 manufacturing client survey responses with 28% representing multiple engagements.)
- Outreach and communication continue throughout the state and the subrecipients are continuing to actively engage manufacturers to strengthen their knowledge and use of Broadband technology. Some manufacturers are now positioned to implement recommendations made in the Technology Strategic Plans are beginning to utilize the Broadband Implementation Micro-grants to support their project implementations.

TECHNICAL ASSISTANCE (continued)

MICRO-GRANT IMPLEMENTATION ASSISTANCE:

Recommendations are one thing, but if the company cannot or does not implement them, what good are they?

- For this very reason, the Broadband Implementation Micro-grant program component was launched in Q1-2013 to incent firms to actually pull the trigger and implement the technology plan recommendations provided. $400,000 in total will be deployed to businesses and community anchors statewide to incent the implementation of broadband recommendations resulting from the Technical Assistance initiative. Clients are eligible to apply for 50% of their broadband project costs up to $10,000, which will be reimbursed upon project completion. Application rounds are held monthly. All recipients will report on the economic impacts resulting from assistance received, metrics include job creation/retention, increased revenues, cost savings, cost avoidance, capital investments, etc.
- Only companies who have graduated from the technical assistance process are eligible to apply and the project must be signed off on by the sponsor organization providing the assessment/plan indicating that it aligns with the broadband recommendations provided.
- During Q4-2013, 27 micro-grant assistance awards to PA businesses and community anchor institutions from 19 counties were approved, totaling $123,911. These grants leveraged $608,750 of private investment this quarter alone.
- Cumulatively, at the close of Q3-2013, a total of 10 micro-grant funding rounds had been completed. In total, 88 applications were received and reviewed in that time, of which 80 from 32 of Pennsylvania's 67 counties were approved, totaling $276,776 in micro-grants (69% of commitment), leveraging $1,901,302 in private company investment (7:1 leverage ratio) to support broadband-related project implementations. These projects will improve the operations of the client companies, while generating significant ROI, economic impact, job creation/retention.

TECHNICAL ASSISTANCE (continued)

14.b.5. Attach as a separate document any success stories or best practices you **have identified. Please be as specific as possible.**

St. Mary's Carbon, a global supplier and industry leader in producing electro-mechanical, custom carbon products with 85 employees located in rural Elk County, was struggling to increase and refresh its web presence so it could become more competitive. The organization recognized the need for a more global user friendly website and the ability to implement Search Engine Optimization (SEO) suggestions vital to the organization. PennTAP's Advanced IT Specialist provided SEO training specific to the company, acted as a liaison for the company with the web developer and assisted in securing a broadband implementation micro-grant for the company. St. Mary's Carbon has already recognized **$55,000 in economic benefits** due to the assistance provided, with more yet to come.

The Need:

St. Marys Carbon, a global supplier and industry leader in producing electro-mechanical, custom carbon products, needed to refresh their web-presence. The existing website not only looked 'old' but also had some incorrect data.

The PennTAP Connection:

PennTAP had helped St. Marys Carbon with engineering and energy related projects in the past. With the prior PennTAP success, St. Marys Carbon turned again to PennTAP for Advanced IT assistance.

The Project:

The website project included making a comprehensive plan for the rebuild from site architecture to content, images, and more. PennTAP provided St. Marys Carbon with:

- Search Engine Optimization training to equip them to improve the rankings of their website in Search Engine Result Pages.
- The PennTAP consultant also acted as a liaison between the company and their developer.
- PennTAP was able assist St. Marys Carbon in securing a grant to reimburse St. Marys Carbon for half of the project costs.

The Outcome:

The new/improved website has turned out to be very beneficial to the company. It has attracted new leads and generated enthusiasm for the company. To date the company has realized $55,000 of economic impact.

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"Don was our IT liaison when working with our website developer. He would frequently check their work and offer advice as to what was needed behind the scenes. He was fluent in the IT world, but could explain to our team on a beginner's level. He gave us much confidence when making decisions. I would highly recommend him for any IT project."

Jacob Stager
Website Rebuild Team Lead

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Creating Viable Solutions

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Jacob Stager, Account Manager – Sales Dept.

County: Elk
Employees: 85
Industry: Graphite Products

TECHNICAL ASSISTANCE (continued)

Pediatric Care of York (PCY) located in York & Lancaster counties provides pediatric healthcare services in their communities. This small organization needed to implement an electronic healthcare records (EHR) system and required assistance to make it happen. Being a partner with the Industrial Resource Centers (IRCs) for the broadband implementation micro-grant program made PennTAP a go-to organization when MANTEC, the IRC serving south-central Pennsylvania was asked by PCY who could assist them. PennTAP assisted the client in evaluating options related to use of the cloud for their EHR and helped them improve their internet connection. PCY has realized $345,000 in economic benefits thus far as a result of their broadband project implementation, made possible by the technical assistance provided through and further supported by a $10,000 micro-grant which was approved on their decision to act on the program's broadband recommendations.

The Need:

Pediatric Care of York (PCY) located in Lancaster and Shrewsbury provides pediatric healthcare services to children and families in their community. This small organization needed to implement an electronic healthcare records (EHR) system and required monitory assistance to make it happen.

The PennTAP Connection:

Being a partner with IRC organizations for the Broadband Implementation Microgrant project made PennTAP a go-to organization for MANTEC when asked by PCY who might be able to assist them.

The Project:

PennTAP and PCY discussed their potential EHR project. The discussion included what software and systems had been reviewed and options studied. In the end all looked good. The most prominent part of their new system will be utilizing the "Cloud" for data storage allowing both locations access to client charts. PennTAP also reviewed their Broadband connection and were able to make suggestions that will provide potential savings to PCY.

The Outcome:

PennTAP assisted PCY with compiling that Micro-grant application, budget and proposals gathered. The application was then submitted to the review team, and approved for the maximum amount of $10k. The return on investment via the economic benefits survey Pediatric Care of York reported $345,000 in benefits. Broadband connection savings have yet to be realized.

PENNTAP
PENNSTATE

Advanced IT Team-Lead
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"PennTAP Staff was great to work with and very knowledgeable."

Judy Kilby
Practice Administrator

About the Organization

Pediatric Care of York

2675 Joppa Road, Lancaster, PA 18505
(717) 718-9715
www.P-C-Y.com
County: Lancaster
Employees: 47
Industry: Healthcare

OTHER - RESEARCH

14.b.2. Describe your progress meeting each major activity/milestone approved in the Project Plan for this project; any challenges or obstacles encountered and mitigation strategies you have employed; planned major activities for the next quarter; and any additional project milestones or information.

Manufacturing Benchmarking Study:

Overview: The broadband technology manufacturing study and research will combine state and regional economic data with competitive insights from leading manufactures. The study is focused on the availability and contribution of broadband technology to the Pennsylvania manufacturing sector to provide an understanding of the barriers in accessing broadband technology and best practices in order to accelerate the adoption of broadband technology by manufactures to be globally competitive, impact growth, productivity, job creation/retention, and economic wealth in Pennsylvania. The study will include lessons learned from the state's leading manufactures, and in-depth understanding of the technology base of manufacturing in the Commonwealth and of each of the state's regional economies, and conclusions from the research that take the lessons and understanding to an actionable level, providing recommendations on ways to eliminate barriers and provide resources to accelerate the adoption and implementation of broadband technology in manufacturing, to improve the competitive position of manufacturing employers through the use of broadband technology.

Status: In addition to the contract management and reporting, activity during Q4-2014 included planning and drafting the final report. Data analysis was done, results from the Broadband Technical Assessments were summarized and a plan for the report was developed. The sub-contract to write the final report was negotiated and writing is currently underway. A preliminary draft was completed Dec 31st with further refinement and review planned for January 2014.

Cumulatively, the following have been accomplished on this component:

- Research methodology, approach, and timeline have been developed.
- Secondary research completed.
- Survey methodology was agreed upon.
- Survey questions were finalized.
- On-line survey tool was selected.
- On-line survey was designed and questions uploaded.
- Survey was deployed to manufacturers within Pennsylvania.
- Received more than 70 survey responses.
- Survey data analysis was initiated.
- Developed interview protocol and targeted companies.
- Completed five company interviews.
- Documented and transcribed all company interviews and data.
- Identified trends evident throughout the company interviews.
- Identified needs for additional data.

OTHER – RESEARCH (continued)

- As a corollary effort, the IRC Network has completed over 100 broadband technology assessments and plans for companies across the state. In addition, over 50 technology improvement projects have been initiated. As appropriate, the results from these corollary efforts will be integrated into the analysis for the research report.
- Summarized results of Broadband Technical Assessments and Implementation grants.
- Issued sub-contract for the final report.
- First Draft Report is currently under review by the IRC Network.

The following list highlights the remaining tasks:

- Vet the draft report with stakeholders
- Finalize the report
- Publish and distribute report
- Promote and release findings

NTIA will receive an advance copy of the final draft report for review and comment prior to release.

Challenges: Successful completion of this project depends on IRC Network's ability to overcome the challenges of aggregating themes and findings across a topic that has such wide ranging levels of understanding, definition and application. Broadband is such a systemic technology it is difficult to isolate the definition and application. The challenges inherent in the understanding of broadband technology are further fragmented by the diversity and sophistication of the manufacturing community. To overcome these issues, The Network plans to rely on TrendScape's in-depth knowledge and overarching vision of both broadband technology and manufacturing. This background along with the Networks direct relationship and experience with Pennsylvania's manufactures will be key to compiling the final report.

Preliminary Observations: Preliminary research results indicate several key gaps that need to be addressed relative to broadband technology:

- PA small to mid-sized manufacturers as a whole do not grasp the potential of digitally enabled manufacturing and thus do not appreciate the need for high speed communications and data transmissions that will require broadband technology. This suggests a need for education and assistance programs focused on digital manufacturing, the competitive dynamics of digitally enabled business models, and the building blocks that will be needed in the hardware and software infrastructure.
- There is a need for clear case studies in multiple sectors, based on companies of a range of sizes and revenues, and targeted to a range of manufacturing types to better portray the implications of digitally based technologies on manufacturing.
- New metrics need to be developed that can capture the value added by digital technologies, specifically broadband. Both tangible and intangible value need to be explored.

OTHER – RESEARCH (continued)

- Models need to be developed that help SMEs assess what their needs are for future computing.
- A better understanding of the security implications must be developed. Information and training about privacy and security need to be articulated.
- While most manufacturers have a website, the level of interactivity and the importance of this in the future is perhaps poorly understood and undervalued.
- Serious consideration needs to be given to the targets for upload and download speeds that PA manufacturers will need to be more competitive relative to other national manufacturers.