Underground Mine Mapping Survey
Interstate Mining Compact Commission

The Interstate Mining Compact Commission (IMCC) has conducted a survey on the current status of Underground Mine Mapping efforts in the states. The results of the survey are submitted to the Office of Surface Mining (OSM) and the Mine Safety and Health Administration (MSHA), in order to ensure that the federal agencies are aware of current impediments further development and enhancement of state Underground Mine Mapping efforts.

Question 1:	
What is the current status of Underground Mine Mapping efforts in your state? (i.e. is progress still being made?)	
Alabama	All known maps are scanned and are in TIFF format. Roughly 4.6% have been digitized.
Colorado	All known historic coal mine maps have been scanned, georeferenced and vectorized.
Illinois	The ISGS work is ongoing, and is based on 7.5' quadrangle mapping of mined areas and information compilation. Progress is still being made—the state is approx. 65% done, (251 of 387 mined-area quads completed). ISGS mined-area maps and information products are for the public, and are not quite the same effort as mine map archival scanning as done by Bob Gibson. (The ISGS compiles additional mine information—such as years of activity, production information, geologic problems, etc.—and couples this information with mined-area maps and GIS data.)
Indiana	All known abandoned underground mine maps have been collected from either the Bureau of Mines or the Indiana State Archives. Active underground mine maps are collected on an annual basis from the Indiana Bureau of Mines and are scanned/geo-referenced/digitized . All known maps located at the Indiana State Archives have been rescanned at 400dpi.
Kentucky	All of the licensed coal mine maps both underground and surface are scanned and recorded in a database and made available on the website in real time. Old maps on file are scanned when time allows and made available on the website in real time. Old hardback collections and over size maps are being provided to NMMR for scanning/cataloging as well. Currently we have zero external funding and two full time personnel to operate all phases of the program. With a Capital Equipment award from the Governor we have over the last year hired contractors to re-write and expand our

	database. This was supposed to fund the re-coding of the mapping process as well, but "road blocks" have presented serious issues.
Maryland	Geo-referencing is sporadic. More effort has been placed on making the scanned maps available to the public through online GIS. Occasionally, "new" maps are discovered (at a rate of 1-2/year).
Missouri	
Montana	Montana AML plans to inventory all of their library documents to determine if there are mine maps that need to be scanned and to review previously scanned mine maps. Consideration would be given to georeferencing, digitizing, and determining how/where to make the data available to the public.
North Dakota	Complete.
Ohio	There are 2 data sets in Ohio representing Underground Mine Mapping: Abandoned Underground Mines (AUM_Mines), and Active Underground Mines (UG_Mine_Extent). The Abandoned Underground Mines layer is compiled by the Ohio Department of Natural Resources, Division of Geological Survey and comprises all known underground mines abandoned prior to August 3, 1977. The Active Underground Mines layer is maintained by the Ohio Department of Natural Resources, Division of Mineral Resources and comprises all underground mines permitted after August 3, 1977. Currently, progress is slowly being made on georeferencing the mine map images on an as-needed basis. There is no programmatic effort to complete the georeferencing project due to the lack of funding.
Pennsylvania	Staff at the Pennsylvania Department of Environmental Protection's (DEP) California District Office (CDO) continues to locate, inventory, scan, georeference, and vectorize underground mine maps on a daily basis. The DEP's Mine Safety Staff and Bureau of Mining Programs also contribute to mine mapping efforts, but the majority of the work is done at the CDO due to the availability of staff and equipment resources. Since mine mapping efforts began at the CDO, a significant amount of data has been produced and in June of 2012, the CDO was granted approval to take the lead in coordinating the release of the data to the public. Since that time, the CDO has made great progress in sharing PA's mine map resources. The following is a summary of the achievements made: **Pennsylvania Historic Underground Inventory System (PHUMMIS).** This application has been in use internally since 2009. PHUMMIS was created to have a centralized database of PA's mine mapping resources. In May of 2013, an external version of PHUMMIS was released online to allow public access to the

	resource. The application can be accessed here: http://www.ahs2.dep.state.pa.us/PHUMMISExternal/default.aspx. **PA Mine Map Atlas.** This is an online interactive mapping application that allows the public to download and view PA's mine maps. The application is maintained by the PA Spatial Data Access Program (PASDA) and can be accessed here: http://www.paminemaps.psu.edu/. Users have the option to download available maps in a compressed MrSID format directly from the viewer or in a TIFF format from the viewer's ftp site. They can also view georeferenced mine maps where available. The CDO is continuously preparing and transferring more mine maps to PASDA to add to the viewer. It is an ongoing process with a goal of having all of PA's map resources available to the public. Another recent advancement was creating a connection between PHUMMIS and the PA Mine Map Atlas. Now users can search for a mine map record in PHUMMIS and have the ability to click on a link to either download or view the image of that map from the PA Mine Map Atlas. This connection also allows users to view the PHUMMIS record of an image they are viewing on the PA Mine Map Atlas. The connection only works for map images that are currently available on the Atlas. Also, in early 2013 the PA DEP's Bureau of Mining Program's (BMR) created the Mine Map Grant Program that awards $1.65 Million over a three year period to PA educational institutions and incorporated non-profit organizations to provide funding to restore, inventory, scan, georeference, and vectorize, PA's underground mine maps. Seven organizations are participating in the first grant period, which began on July 1, 2013. In its first year of the program, over 10,000 maps have been scanned, over 3,000 have been geo-referenced and 71 maps have been digitized at a cost of $404,864. The processed mine maps undergo a quality control check by CDO and BMR staff and are sent to PA Spatial Data Access (PASDA) where they are made available online through the PA Mine Map Atlas. There are two years remaining in the grant period but the Bureau is considering extending the existing grantees and/or soliciting for addition grant proposals. The Mine Map Grant Program is financed by Pennsylvania Surface Mining Conservation and Reclamation Act funds as well as state Mine Subsidence Insurance funds and the Acid Mine Drainage Abatement Fund.
Virginia	Progress is still being made but in a very limited capacity. Most

	effort is focused on including current map submittals into the Virginia Coal Mine and Mine Map Inventory System. Pursuit of additional collections of maps or major improvements to the system is not possible without additional resources.
West Virginia	We are at the 90-95% level with the material in State possession and will probably be at this level forever. As we progress, new material continues to come in. We have a fairly large mining industry. We continue to work with WVMHST to keep our map coverages up to date. In addition, we are slowly having some old maps scanned to replace the mine map repository microfiche. In West Virginia, mine maps seem like a never-ending task. Monte Hieb – Chief engineer, West Virginia office of Miners' Health, Safety, and Training There are several thousand maps that WVOMHS&T has uncovered that are either in the process of being archived or are awaiting review and processing. Discovery of these maps and their map location determinations remains principally the work of this office. Progress toward this effort is primarily a function of available manpower resources. It is important that we proceed with this work, although as you know we get side-tracked when disasters occur.

Question 2:	
How many underground mine maps do you estimate have been identified and collected by your state?	
Alabama	1,500 in database.
Colorado	Approximately 1,508 mines, approximately 2,600 separate map sheets.
Illinois	8,000-10,000 as a rough high-end estimate for ISGS map holdings. Database records are duplicated for many maps depending on source, so an accurate count is not available (and also include surface mines). Some of these maps in this count overlap with those maps scanned by Bob G.
Indiana	Approximately 3,600
Kentucky	We have in-house over 100,000 underground and 70,000 surface mine maps. Exceeding 1 million square feet of coal mine maps. Currently about 2,000 new map documents are scanned yearly.
Louisiana	

Maryland	900
Montana	AML has at least 50 underground mine maps. I'm estimating that 50% of those mine maps have been scanned.
North Dakota	313
Ohio	The Ohio Department of Naturla Resources , Division of Geologcial Survey has compiled mine maps for approximately 4,400 unique abandoned underground mine operations, which includes 5,169 map images. The Ohio Department of Natural Resources, Division of Mineral Resources Management has compiled mine maps for approximately 69 active underground mine operations. Between 1874 and 1977, mine operators were required to submit final abandoned mine maps to the state. But, mines operating between 1800 and 1873 were not required to submit mine maps. In addition, any mine that had 10 or less employees was not required to submit a mine map. Thus, we estimate there are approximately an additional 3,600 mine operations that do not have mine maps or will be very difficult to discover and collect mine maps.
Pennsylvania	From surveys completed at various DEP offices, we are aware of approximately 60,000 underground mine maps stored across PA. This number also includes a large collection stored at a PA DCNR office. We also know of various private collections of maps that exist with no count of the amount of maps they hold.
Virginia	Currently we have identified and scanned approximately 56,000 mine maps.
West Virginia	>50,000 and <100,000

Question 3.
If possible, please estimate how many underground mine maps have yet to be identified and collect. If this number cannot be estimated, are there any collections/repositories of maps you know of that need to be accessed?

Alabama	Indeterminate. No additional collections known.
Colorado	There may be a few mine maps on microfilm that have not been scanned and digitized, but the number is small. The greatest cost will be the time needed to go through the microfilm.
Illinois	No response.
Indiana	Unknown but should not be significant numbers. County courthouses have been contacted and any maps have been collected, scanned and returned.

Kentucky	The agency had over 30,000 maps burn in 1948. Of that group perhaps 1,000 individual mines were lost. Many of these are lost forever, but we have records back to 1884 for every mine. We have identified external collections and many are available to scan given the time, money and resources to get these scanned. Some collections would require us to scan at their location.
Maryland	50-100
Montana	AML's library needs to be inventoried. MBMG is conducting public outreach efforts to obtain mine maps from private citizens.
North Dakota	None, to the best of our knowledge.
Ohio	There are an unknown number of maps that still need to be collect. There have been some mine maps that were never submitted to the state, and there have been some mine maps that have been lost between that time period of 1874 and 1977. Even with the previously mentioned exceptions, we believe that the vast majority of the available mine maps have been collected and reside in the Ohio Department of Natural Resources archives. Between 2010 and 2013, the Ohio Department of Natural Resources, Division of Geological Survey visited a number of museums, university archives, and private individuals. Some locations that were visited include Ohio University Library archives, the Athens County Historical Society, and the archives of Professor Ann Harris of Youngstown State University. The large majority of the maps held in these collections were older annual mine maps, no the final abandonment map. Those few maps that were not part of the Ohio Department of Natural Resources archives were scanned and added to the collection. There are two collections of interest that need to be examined. Dry Dock Coal Company, which is in the process of going out of business, has original linen and velum mine maps. The Sunday Creek Coal Company collection, which was recently purchased by Buckingham Coal Company, is known to have mine maps not in the Ohio Department of Natural Resources.
Pennsylvania	We do know of other collections that exist at county courthouses, museums, and by individuals. However, at this time there is no way to provide any type of estimate on the amount of maps within each collection. Our priority at this stage in the project is to process all of the PA DEP and PA DCNR maps before focusing on the outside collections.
Virginia	It is unknown how many additional collections or how many maps outside of Virginia DMME's control are available. In the past, potential collections were identified and preliminary discussions with owners were made. No additional follow-up on these

| | collections were made due to lack of resources.

One known collection, which is on-hand and immediately accessible, is a large collection of aperture card/microfilm records. Estimates for this collection range from 5,000 to 7,200 maps.

Of these maps, many were scanned into a digital image. These digital images were created many years before scanner technology had advanced to its current level and are of such poor quality that they have limited usefulness. |
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| West Virginia | We are always looking for new repositories. I suspect we have the majority of the mine maps, but there are early mined areas that are currently undocumented. |

Question 4.	
Of those maps collected, how many have been scanned into a digital image?	
Alabama	1,500.
Colorado	All.
Illinois	~75%, but see clarifications explained below.
Indiana	All maps collected have been scanned into a digital image except for 26 maps that need significant repair.
Kentucky	80,410= 43,219 scanned mine maps (underground and surface). 34,954 Transmittal documents. 2,237 stitch partials.
Maryland	900 (100 percent)
Montana	AML has had the majority of its known mine maps scanned.
North Dakota	All 313 of them.
Ohio	All of the final abandonment maps in the Ohio Department of Natural Resources archives have been scanned. This is a total of 5,169 map images for approximately 4,400 abandoned mines.
Pennsylvania	To date approximately 31,000 of the 60,000 have been scanned to the PA DEP's 400 dpi, 24-bit color scanning standard.
Virginia	All hardcopy maps collected by Virginia DMME were scanned into a digital image format. Almost all map collections came from outside sources and were returned to their owners after scanning.
West Virginia	All of our mine maps are available in digital format.

Question 5	
Of those maps scanned, how many meet a scanning standard of 400 dpi and 24-bit RGB depth?	
Alabama	911.
Colorado	None. All of the scans appear to be 300 dpi, 8-bit depth
Illinois	Most of our ISGS maps are not scanned at this resolution, and most are scanned as Bitmap (B/W, not color). Due to the nature of our mapping and information compilation, lower-than-archival-quality resolution and file size suits our needs. That being said, Bob G. would have a better answer on the number of mine maps scanned for Illinois that meet this archival-quality scanning criteria.
Indiana	Approximately 1,360.
Kentucky	All are 24 bit RGB. Approximately 5,000 are scanned at 400 dpi. The remainder are scanned at 300 or 200 dpi depending on overall size of the document and text/line work size. We base the dpi on the legibility of the scan and the maximum size in megabytes. We cannot create images larger than Photoshop can open.
Maryland	0 (0 percent)
Montana	This is unknown and would have to be verified.
North Dakota	All meet the standard 400 dpi, but they are grayscale.
Ohio	Almost all of the final Abandonment Mine maps are at 400 dpi. These were scanned by the Ohio Department of Natural Resources, Division of Geological Survey. A small number of maps were too large to scan by the Ohio Department of Natural Resources, Division of Geological Survey. These maps were sent to OSM for photographing and imaging. The small number of maps sent to OSM were scanned at 200 dpi, and so do not meet OSM standards. We do not have an exact count of how many map images are above or below the scanning standard of 400 dpi and 24-bit RGB color depth.
Pennsylvania	All of the approximately 31,000 scanned.
Virginia	All maps scanned by Virginia DMME since 2003 were scanned at an archive image minimal of 400 dpi with a color depth of 24-bit if necessary. Not all images required 24-bit color depth.
West Virginia	20-30%, more or less. Much of the State's material are digital versions of microfiche from the mine map repository.

Question 6.	
Of those digital images below this scanning standard, how many have been geo-referenced?	
Alabama	The maps that were geo-referenced were reduced to 200 dpi for data storage purposes. I estimate 8-% of them have been geo-referenced.
Colorado	All.
Illinois	(Again, filtered by ISGS mined-area mapping needs…) but good estimate is about half of our holdings have been georeferenced? We typically only georeference one map per mine, if the map is marked 'complete.' We do not georeference all iterations of a mine's maps if we have a final complete map.
Indiana	Approximately 850
Kentucky	37,950 map scans are rectified and geo-referenced. Every map we have scanned that needs to be geo-referenced as part of the comprehensive mined out area coverage has been done. Additional maps still need to be done.
Maryland	541 (60 percent)
Montana	Some of our mine maps have been geo-referenced, but without knowing the scanning settings I can't provide a count.
North Dakota	All of 313 have been georeferenced.
Ohio	Unknown. The Ohio Department of Natural Resources, Division of Geological Survey has georeferenced map images both above and below the scanning standard. A total number of 4,190 map images have been georeferenced out of 5,169 map images (81%).
Pennsylvania	Unknown.
Virginia	Archive images of 400 dpi, raw tiff format and 24-bit color depth were not geo-referenced. More manageable derivative image files where generated for geo-referencing. Of the 56,000 images approximately 1/3 have been geo-referenced
West Virginia	The vast majority of our maps have been located, cross-referenced, and geo-referenced.

Question 7.	
Of those digital images at or above the scanning standard, how many have been geo-reference?	
Alabama	NONE>
Colorado	None of our digital images meet the 400dpi/24-bit depth scanning standard.
Illinois	N/A
Indiana	Approximately 1,200.
Kentucky	All of them that are locatable.
Maryland	N/A
Montana	See the answer to Question 6.
North Dakota	All 313 have been georeferenced.
Ohio	The Ohio Department of Natural Resources, Division of Geological Survey has georeferenced map images both above and below the scanning standard. A total number of 4,190 map images have been georeferenced out of 5,169 map images (81%).
Pennsylvania	Approximately 10,000
Virginia	Archive quality images have not been geo-referenced. This preserves the integrity of archive images and typically archive quality image files are too large to geo-reference in standard software packages.
West Virginia	All except the latest ones we received. We are always updating newly received maps.

Question 8.	
Of all the maps geo-referenced, how many have been vectorized? (i.e. drawn features converted to GIS layers.)	
Alabama	Around 4.6%
Colorado	All.
Illinois	All of our georeferenced mine maps have been vectorized (bounding outlines only, not all interior pillars or haul routes). Current quadrangle mapping efforts re-digitize the outlines for each mine to improve upon previous work which was formerly

	done on a digitizing board—which did not allow for the accuracy that current scanning/digitizing methods allow for.
Indiana	All maps have been converted to GIS layers, including mine entries.
Kentucky	I estimate 80% of the scanned maps have good, labeled, polygons created.
Maryland	541 (100 percent)
Montana	I received an update from MBMG and at this time they have not digitized any of their scanned mine maps.
North Dakota	All 313 have been vectorized.
Ohio	The Ohio Department of Natural Resources, Division of Geological Survey has vectorized approximately 1,700 mine maps, out of 5,169 map images (33%).
Pennsylvania	Approximately 3,000.
Virginia	Approximately 8,000 mines have been digitized from the images
West Virginia	All that need to be to document the extent of mining. Duplicate maps are cross-referenced to the most up to date maps.

Question 9	
What are the impediments to additional progress?	
Alabama	Impediments include current workload versus available manpower. Progress is being made as far as digitizing goes, but it takes time.
Colorado	Locating as-yet unidentified maps, cataloging map availability in our Historic Coal Mine database.
Illinois	Funding and staff (which stems from the funding issue) are our only major impediments.
Indiana	Limited personnel as far as map repair/geo-referencing of any new maps and for a backlog of 26 maps that are in need of significant repair.
Kentucky	We need additional workers provided for all stages of the workflow.
Maryland	Map quality - lack of legible features to help with geo-referencing.
Montana	Right now schedules, staff availability, equipment to be purchased and installed, completion of a document and records management project, and completion of the new data facility set-up. I'm hoping in the fall AML will have the opportunity to inventory all maps and determine what scanning, geo-referencing, and digitizing efforts

	need to be implemented.
North Dakota	None.
Ohio	Shortage of funding is an impediment to additional progress.
Pennsylvania	Personnel, gaining access to private map collections, maps in poor condition in need of intense restoration, lack of digital storage space.
Virginia	Lack of personnel resources has been the greatest impediment to this work.
West Virginia	Lack of map power which is likely to get worse in the future.

Question 10.	
How does your state plan to serve up the maps and maintain them over time?	
Alabama	Currently, State Law limits accessibility. The maps are in the process of being converted to a digital format which can be maintained indefinitely.
Colorado	We would like to develop a statewide mine map inventory and subsidence hazard map and make that available online. Currently we do not have the needed resources.
Illinois	Current plans are to migrate the county and quadrangle mined-area maps and mine outlines to a web-based map service. Currently, PDF maps and informational directories of mined areas, as well as GIS data for the mines, are available on the ISGS website for free download. The web-based service will allow for data query and custom-area prints by the user on-the-fly. ISGS staff will continue to update the mined areas (yearly updates of actives mines, and continued quadrangle mapping), and host the data over time.
Indiana	We currently have a Coal Mine Information System website. There is a map viewer that displays all known surface and underground mines. The final mine map is available from the website. We are planning to provide links to all available mine maps via our mine report pdf that is also available from the website. We currently have a contract with the Indiana Department of Natural Resources, Division of Reclamation that provides funding for the CMIS database and website. As long as that funding is available the website and maps will be hosted and maintained by the Indiana Geological Survey (including backups).
Kentucky	All 80,410 of our currently scanned documents are online for anyone to download, view in a GIS map viewer or run reports on at

	http://www.minemaps.ky.gov . This website has been online for over 10 years. The GIS map viewer has just been rewritten and is about to go live. Continuity is dependent on the future of the agencies involved. Currently the Office of Mine Safety & Licensing is experiencing a 30% budget cut and reorganization.
Maryland	We have created interactive online GIS mapping tool users can access. May either search a database or use the mapping tool to identify mine maps. User can then download the appropriate maps.
Montana	That would be decided by AML and DEQ's OIT Department in terms of available technologies and agency standards. My initial idea would be to provide them at the AML Webpages. I would also evaluate offering them through other DEQ web services, our State Library, and MBMG depending on how they are going to provide public access to their scanned mine map collection.
North Dakota	They are stored and maintained on an internal SDE (spatial database engine).
Ohio	Ohio Department of Natural Resources utilizes ArcGIS to create, maintain, and store the vector data, and store the geo-referenced rasters on file shares. We have two online applications in which we serve the vector geometry, and hyperlink to raster images. One application is for internal use which is named Coal Mapper, and the other application is for external users, named the Ohio Mines Viewer. The data is also used by other systems and organizations through ArcGIS web services.
Pennsylvania	By continuing to share PA's mine maps through PASDA on the PA Mine Map Atlas and metadata about the maps through the PHUMIS database.
Virginia	Maps are served by our enterprise GIS and by the Virginia Coal Mine and Mine Map Inventory system. This system is being ported to a commercial cloud-based platform for long-term storage and file retrieval.
West Virginia	We already serve and maintain the maps on the WV Geological Survey website. We currently plan to continue maintaining these records into the foreseeable future.

Question 11.	
What additional resources (e.g. general funding, personnel, equipment) would be necessary to making further progress?	
Alabama	Time with existing personnel.
Colorado	We would need additional funds to rescan the maps at the scanning standard. We also need funds to make the map available online in a

	searchable database and to research and scan mine maps on microfilm.
Illinois	Current funding is for one staff to perform our mined-area mapping work. Any additional money could be used to support additional staff/time, thereby likely increasing the number of mined-area quadrangle maps completed per year. (If our scanning is to be done at an archival level, digital storage space will need to be vastly improved—and money could be put toward that).
Indiana	Part-time hourly person to complete geo-referencing and make final repairs for 26 maps.
Kentucky	The state of Kentucky no longer allows us to purchase or posses equipment as the result of an IT takeover by the Commonwealth Office of Technology. The restrictions and freezes on hiring have in the past caused us to have to return personnel funding, so obtaining that funding is not ideal. (1) We would be best served by general funding to go towards the existing program costs. (2) Ideally we would benefit the most from workers being provided to us externally. I have had this before where OSM contracted private employees to work at my site under my direction. These workers could prep and scan maps or do database entry. Alternately workers could be sent to collection sites to scan maps.
Maryland	Personnel to spend time trying to geo-reference maps.
Montana	Funding and equipment. Depending on how we decide to serve it to the public we would need to acquire and pay for server space and associated costs. There could be additional costs associated to storing the paper documents once they've been scanned and being able to offer the public a way to acquire a printed copy of a map in person.
North Dakota	This data could potentially be hosted and shared on the cloud for public access. I think the most logical web service would be OSM's Geomine viewer, in order to centralize the data for all states.
Ohio	We need additional personnel and funding to complete the work.
Pennsylvania	Additional digital storage space and updated server equipment and also new graphic workstations for personnel to process the large amounts of data.
Virginia	General funding and targeted personnel funding is necessary to advance the project work. Currently, we have the necessary equipment in place to make further progress.
West Virginia	One full-time equivalent would be very useful.

Question 12	
If possible, please provide a dollar figure estimate for each of the resources identified in question 11.	
Alabama	Time costs are already included in the AML Annual Budget for positions which interact with the mine maps.
Colorado	$225,000 to rescan maps to scanning standard $150,000 for providing the maps to the public online in a searchable database $75,000 to create inline statewide subsidence hazard map $10,000 to research and georeference mine maps on microfilm
Illinois	No response.
Indiana	Approximately $18,000 for part-time hourly per year.
Kentucky	(1) General Fund funding of any amount up to $150,000 per year to help cover existing contracted personnel costs. (2) Externally contracted workers provided at any level of work hours or costs. If these workers wouldn't be on a Federal contract then the contracts could be routed through the University of Kentucky Center for Applied Energy Research or similar agency.
Maryland	No response.
Montana	Without a map inventory to know how many maps we actually possess and the mechanisms to provide public access, I can't provide an estimated cost at this time.
North Dakota	The costs are unknown.
Ohio	GIS technical staff approximately $35/hr. with benefits – 3 man years, or 6,000 hours, along with time and staff for project management and QA/QC, which works out to $70,000 per employee year, or $210,000 in total.
Pennsylvania	Server and server storage space - ≈$150,000 to $200,000 Graphic Workstations - ≈$11,000 each
Virginia	Estimates to complete the remaining work vary based upon number of trained personnel, designated duration of the project or receipt of a currently unknown map collection. Estimate example: Contract Employees $30,000/yr * 3 = $90,000 * 5yrs = $450,000
West Virginia	1 year's salary for a GIS tech……….$25-$40k plus benefits.

Contact Information		
State	Name/ Title of person completing survey	Phone #
Alabama	Jeffrey E. Butler, Branch Chief Planning & Maintenance.	(205) 945-8671
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Illinois	Chris Korose, Illinois State Geological Survey (ISGS) Jen Obrad, ISGS	(217) 333-7256
Indiana	Becky Meyer, Indiana Geological Survey	(812) 855-6641
Kentucky	John K Hiett , Mine Mapping Program Manager and Principal Investigator; UK Center for Applied Energy Research contracted to the Dept. for Natural Resources, Office of Mine Safety & Licensing.	(502) 573-0140
Maryland	Jaron Hawkins – Geologist II	(301) 689-1450
Montana	Kim Wells – AML Database Analyst	(406) 841-5081
North Dakota	Matt Fischer – GIS Specialist, ND Public Service Commission.	(701) 328-4779
Ohio	Robert Johnson, Data Administration Manager, Ohio Department Natural Resources, Mineral Resources Management. John McDonald, GIMS Systems Administrator, Ohio Department of Natural Resources, Office of Information Technology.	(614) 265-6788 (Robert Johnson) (614) 265-6779 (James McDonald)
Pennsylvania	Matthew Cavanaugh – Mineral Resources Program Specialist	(724) 769-1100
Virginia	Daniel Kestner – Geographic Information Supervisor,	(276) 523-8193

	Virginia Dept. Of Mines, Minerals and Energy	
West Virginia	Bascombe M. Blake Jr. (Mitch)	(304) 594-2331