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Option 1-Term Paper

The Missing Tool in Smithfield Planning Decisions

"Smithfield is a livable community that respects its heritage while facilitating responsible residential and commercial growth. This will be accomplished by providing necessary services to ensure a healthy, safe family environment that strives to foster environmental, social, and economic accountability. We welcome all who share our vision."
-Smithfield City Vision Statement

Introduction:

Early in the 1900s the United States reached a point where over fifty percent of the population lived in urban areas. As populations throughout the world have increased, this statistic has become true for most industrialized nations. In fact, it is estimated that by 2030 sixty percent of all Asians will live in urban areas (Kwok, 2008). With most people living in urban environments, community planning has become essential and is often required by law. In 1909, the first "comprehensive" city plan was put together by Daniel Burnham for the city of Chicago to help protect the public health, safety and welfare of its inhabitants (Utah Planning Commission Guidebook, 1-1). Then in 1913 Massachusetts became the first state to make the establishment of city planning boards mandatory (ibid).

Today most cities and counties have some form of a planning commission or at least a governmental department devoted to the planning of growth. In the last decade the utilization of Geographic Information Systems (GIS) has become paramount to the planning decision making processes. GIS software allows cities an effective means of containing their data, creating maps to solve geographic problems, providing spatial decision support, mechanizing inventories of geographic features within their city limits, discovering patterns and processes within their city, and reducing the time of what have historically been time consuming tasks. According to Amelia

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Kwok in her article *City Hall and GIS*, "It is reckoned that 80 per cent of all public sector information contains a geospatial reference, such as an address or GPS coordinates -- so presenting information in the form of maps, as opposed to traditional charts and tables enables a broader range of civil servants to manipulate complicated data with confidence" (2008). GIS allows personnel to quickly and effectively collect and display data to city councils and planning commissions so that decisions can be made that benefit public health, safety and welfare. Because of GIS, practically everything can be mapped and information between city employees, city decisions makers and the public can flow much more fluid.

Many cities throughout the world have effectively bonded the use of GIS with planning decision making. In Eskisehir, Turkey officials have utilized GIS to create thematic topological maps to address complex issues surrounding squatter settlements in their city. The maps have helped them identify insufficiencies "in public services and infrastructure" (Aksoylu and Uygucgil, 2005). Today in Eskisehir the percentage of homes with electricity, running water, and a hookup to a sewer system are much higher than the averages for the remainder of the country because of their use of GIS (ibid).

In the United States, the city of Murrieta, CA has used GIS to develop a unique planning map that combines land use with zoning designations, which ensures that their planning and zoning is in compliance with California's land use laws (ESRI, 2006). The city of Sumter, SC has estimated that it has reduced the time spent on ruling on rezoning petitions by ninety percent through the incorporation of GIS. Sumter city officials use GIS to track land use cases, create parcel buffers, generate public notifications letters, and have effectively used GIS "for an inspection by the National Flood Insurance Program and to perform a joint land use study with neighboring Shaw Air Force Base" (ibid).

Despite the proven uses of GIS in urban planning, many cities still underutilize it during the planning process. In the state of Utah, the Land Use Development Act (LUDMA) requires each municipality to have a planning commission and a general plan. While the city of Smithfield, UT has both, its planning commission is not using GIS to the fullest extent and is therefore not using all available tools to make planning decisions.

Smithfield, UT:

The city of Smithfield is located in Northern Utah in Cache County and is located in the mid-eastern section of Cache Valley. Smithfield is part of the Bear River Watershed, and is bordered by the Bear River Mountain Range to the east and the Wellsville Mountain Range to the west. Smithfield was founded at the mouth of three canyons coming out of the Bear River Range and is supplied by water from Summit Creek and Birch Creek along with several wells that access an aquifer the city is positioned above (Smithfield City General Plan, 2005). Historically, settlers in the region heavily relied upon the area of the three canyons for timber, stone and food. Currently, the canyon areas along with the riparian zones surrounding Summit Creek are utilized for recreational purposes.

Between 2000 and 2008, the population of Smithfield increased by 32.03% and is currently

Figure 1 The boundaries of Smithfield City. This map was generated on 01/26/2010 using the Land Use Data Viewer software provided by the state of Utah at http://mapserv.utah.gov/planning/.

nearing 10,000 residents (Smithfield City Police Department 2008 Annual Report, 2009). With this increase in growth and the growth that is speculated for the future, Smithfield's agricultural land, undisturbed land, and wildlife habitat are decreasing. Without an effort by the Planning Commission to preserve the natural resources of Smithfield and balance the ratio of growth with the preservation of historic agricultural land, the community may lose essential features that can only be regained at a great cost.

Figure 2 Lot advertisement in one of many new developments appearing in Smithfield in areas that have been used as agricultural land for over a century. Photo take February 27, 2010.

In 1833, Joseph Smith, founder of the Mormon religion, formulated what he called the Plat for the City of Zion. This was a plan for city building that included policies for density control, control of sprawl, preservation of agricultural land, growth caps, and zoning against undesirable land use. When Mormon settlers set up a fort along Summit Creek in 1857 they began constructing Smithfield based upon this plan. Over the years, city planning has moved away from this plan and smaller residential lots are being built on agricultural lands.

Today, Smithfield is a diverse community that is rapidly growing and encroaching critical lands that have been used for agriculture or open space, and are important habitat for a variety of wildlife. Without a meaningful plan, a commitment from the community to preserve critical lands, and an understanding of how current decisions will impact the future of its natural resources, the community of Smithfield may find itself without important aspects of its

community such as open space and wild life, which will directly impact the expected quality of life that Smithfield's residents have valued for over a century and a half.

Currently, Smithfield has a seven member Planning Commission, with a five member City Council with a mayor. City employees who work on planning issues include the City Engineer who is also the City Manager, the Assistant City Engineer, the City Building Inspector, and the Deputy Recorder. After the Planning Commission hears a request they make a recommendation to the City Council, who then makes the final decision on planning matters. Of the seventeen persons involved in this decision making process, only the Assistant City Engineer and his intern use GIS.

GIS is not generally present at Planning Commission meetings in Smithfield. Each commissioners has a copy of the city's general plan, complete with zoning maps, however, commissioners rarely bring or employ their maps during meetings. On occasion new maps are generated by the Assistant City Engineer and distributed to the commissioners at their or a city employee's request. This is not to say that the Assistant City Engineer couldn't do more with GIS for the Planning Commission, it is more a problem of the information not being requested.
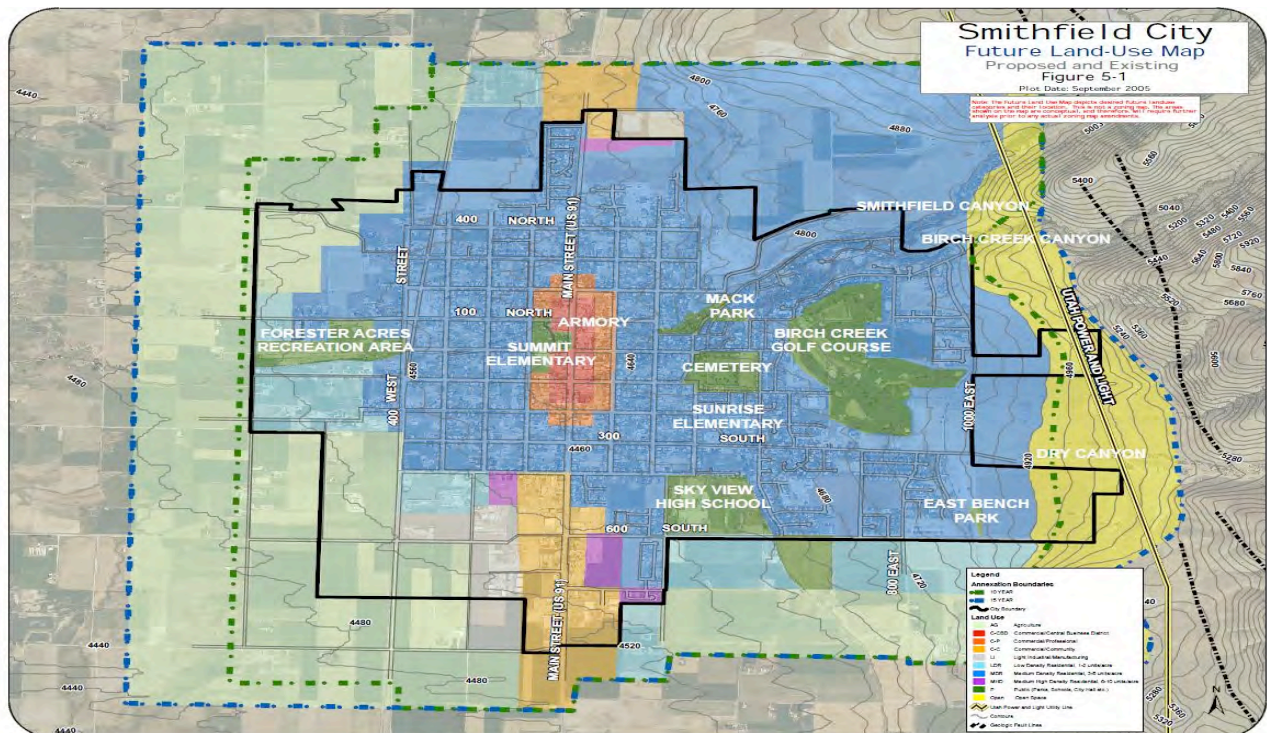
GIS, however, is not limited to use by a few city employees who have the software on their computers. The state of Utah provides a SUPER TOOL website where free GIS software is available to anyone. The questions that remain are: Why doesn't the Planning Commission demand more GIS information before they make planning decisions and why don't they utilize the GIS tools that are available to them?

There are many reasons that may perhaps account for the lack of demand for GIS information before planning decisions are made. The greatest perhaps is a lack of understanding of what GIS information can provide. Most, if not all of the Smithfield planning commissioners, have never used GIS themselves, so it would be hard for them to understand what information they can glean from its use. Without this understanding of what GIS can do, there is not motivation to make requests for information from the Assistant City Engineer. The simplest solution to this information misunderstanding, would be for the Assistant City Engineer to spend a few hours highlighting what information the city's GIS software possess and what information he can provide for them. A simple PowerPoint presentation may open the commissioner's minds to what information they have been lacking.

The question of why the free GIS software is not utilized is similar in that the commissioners have no experience with GIS, but also calls for an examination of the available software's usability in terms of both user compatibility and usefulness of the information that can be provided to the commissioners.

GIS Software Analysis:

Resources provided by Utah for those involved with the planning process can be found at the SUPER TOOL homepage at http://planning.utah.gov/super. Once on this page links are provided for Planner Education, Land Use Ordinance Library, Mapping, State Resources,

Critical and Public Land Resources, and Design Resources. For the purposes of this paper, only the section of Mapping will be examined.

On the Mapping Resources page, users are provided with links to the following GIS tools: Mapserve, Critical Lands Mapping Tool, Utah State University RS/GIS Lab, Virtual Utah, State of Utah Automated Geographic Reference Center Downloads, Google Earth, gvSIG, On the Map (US Census Bureau), ArcExplorer, KML to Shapefile, Export to KML, NRCS Soil Datamart, Infrastructure Mapping Program, Map Window GIS, Quantum GIS, Google Maps, DNR Garmin, and GIS Tutorials. Each link also has a short paragraph describing the software that the website visitor can choose from. See the below table for a description of the software provided by SUPER TOOL.

Mapping Resources Provided at http://planning.utah.gov/super/mapping.htm	
Mapserve	Mapserv.utah.gov/planning was created by the State of Utah Automated Geographic Reference Center)AGRC) and is Utah's premier online mapping server, and customized to meet the needs of planners in Utah, you can quickly view maps, and even create a printable PDF map with a scale bar, legend and north arrow.
Critical Lands Mapping Tools	A tool designed by GOPB and Utah State University's RS/GIS lab to map critical lands in the state of Utah. Build a model for your area and see what critical lands exist!
Utah State University RS/GIS Lab	Provides several different mapping and remote sensing tools for the intermountain west, including satellite imagery.
Virtual Utah	A tool created at the USU RS/GIS lab. Virtual Utah offers aerial imagery for most of the state of Utah beginning in 1993 up to current 2006 photos. The advanced viewer can also overlay other geographic datasets from land cover, elevation, satellite images and much more for your area .
State of Utah Automated Geographic Reference Center Downloads	The AGRC is the clearinghouse for GIS data in the State of Utah. Download both raster and vector data as well as aerial imagery here.
Google Earth	Google Earth combines the power of Google Search with satellite imagery, maps, terrain and 3D buildings to put the world's geographic information at your fingertips.
gvSIG	gvSIG is a fully functioning, open-source, geographic information system. It is characterized by a user-friendly interface, with a quick access to the most usual raster and vector formats. It includes many tools and capabilities for analyzing and manipulating geographic data and creating maps. It is aimed at users of geographic information, whether professionals or civil servants from any part of the world (offered in many languages), in addition to being free. Express download (recommended) at http://oadigital.net/ This site also features gvSIG for MAC users! View the user guide HERE.
On the Map (US Census Bureau)	provides detailed maps showing where people work and workers live with companion reports on worker ages, earnings, industry distribution, and local workforce indicators.
ArcExplorer	ArcGIS Explorer is a lightweight desktop client for ArcGIS Server, providing a way for you to publish ArcGIS Server capabilities within your organization, or to anyone on the Web. You can create your own content or tasks for ArcGIS Explorer by authoring globes and tasks using ArcGIS Desktop, then publishing it to ArcGIS Explorer via ArcGIS Server.
KML to Shapefile	This script converts features in a KML file to an ESRI shapefile. KML files can be created by digitizing features in Google Earth. The script provides an easy method to convert these kml features to shapefiles. The shapefile retains the names, descriptions, and the Google Earth folder of the kml features. The script is run out of ArcToolbox and will work with any license level of ArcGIS 9.2. The tool's documentation describes its use. The accompanying word document describes how to load the toolbox into ArcToolbox.
Export to KML	This is an extension developed for ArcGIS 9.x by the City of Portland, Bureau of Planning. The extension allows ArcGIS users to export GIS data in "keyhole markup language" (KML) format for viewing in Google Earth. Any point, polyline, or polygon dataset, in any defined projection, can be exported. Features can be exported as either 2-dimensional features, or 3D features "extruded" upwards by an attribute or z-value.
NRCS Soil Datamart	Download soils data from the NRCS via this site!
Infrastructure Mapping Program	In a collaborative effort, the Governor's Office of Planning and Budget and the State of Utah AGRC lend a GPS unit to communities to map their infrastructure. The AGRC trains the communities on the use of this technology, and also provides assistance in making the data usable.
Map Window GIS	The Map Window application is a free, extensible, geographic information system (GIS) that can be used as an alternative desktop GIS, to distribute data to others, or to develop and distribute custom spatial data analyses. Great for quickly viewing GIS data.

Quantum GIS	Quantum GIS (QGIS) is a user friendly Open Source Geographic Information System (GIS) that runs on Linux, Unix, Mac OSX, and Windows. QGIS supports vector, raster, and database formats. QGIS lets you browse and create map data on your computer. It supports many common spatial data formats (e.g. ESRI ShapeFile, geotiff). QGIS supports plugins to do things like display tracks from your GPS. QGIS is Open Source software and its free of cost. Manual available HERE.
Google Maps	Google maps is an easy online mapping service that can quickly show maps, aerial photography, and in some instances street level photography. To see how Provo City has used Google Maps in highlighting their historic district click HERE or visit their web page at http://www.provo.org/comdev.landmarkscommission_main.html
DNR Garmin	This extension was built by the Minnesota Department of Natural Resources to provide users the ability to directly transfer data between Garmin GPS handheld receivers and various GIS software packages. Using this program a user can use point features (graphics or shapefile) and upload them to the GPS as Waypoints. Line and Polygon Graphics or shapes can be uploaded to the GPS as Track Logs or Routes. Conversely, Waypoints, Track Logs, and Routes collected using the GPS can be transferred directly to ArcView/ArcMap/Google Earth/Landview and saved as Graphics or Shapefiles.
GIS Tutorials	Learning GIS on your own can be a daunting task, these links to GIS tutorials and seminars will help make the process easier!

First, it is important to note that the Mapping Resources page provides a link to GIS Tutorials to help planners who do not have GIS experience (see Figure 5). This page provides links to GIS training held throughout the state, online GIS training provided by ESRI, and online GIS tutorials provided by other states. This resource provides many options for first time users of GIS for both those who learn better in a hands on setting, or those who are proficient in online learning environments.

Figure 5 GIS Tutorials website found at http://planning.utah.gov/super/GISTutorials.htm.

With the provision of these resources, any planning official can work towards a basic understanding of GIS resources. While many of the onsite trainings listed under Utah Options are not free of charge, many of the online tutorials are provided free of cost.

It is essential to understand how usable the GIS resources provided online are to understand if Smithfield planning commissioners can use them to make decisions. With this in mind, the following is an analysis of the provided software regarding user compatibility (especially for those with little GIS knowledge) and applicability of the provided resources to Smithfield planning decisions.

Mapserve: A analysis of this resources was unable to be conducted, due to the website being "currently unavailable". Attempts were made on three different dates to access this software.

Critical Lands Mapping Tool: This database was not very user friendly for those who have not worked with the software before. The software provided a map of Utah and then several options that the user could choose to show on different tiers of the map. Once the options were selected and the program was asked to produce the selected criteria, it took several minutes to process the request and left the user waiting indefinitely. When the map did finally load, it did not label municipality boundaries, making it difficult to zoom in on an area and tell what was being viewed, and the selected information was difficult to decipher.

Utah State University RS/GIS Lab: This source was very user friendly, but only provided information that could be somewhat helpful to commissioners. The source provided a list of current and recent projects completed by the USU RS/GIS Lab where natural resource maps could be downloaded that included Smithfield. It also provided a page of additional resources.

Virtual Utah: This source was very easy for users to use and provided useful information. The site provided a checklist of information for the user to choose to display on the map. See Figures 6-8 for maps of Smithfield that were created as PDF documents using the Virtual Utah software.
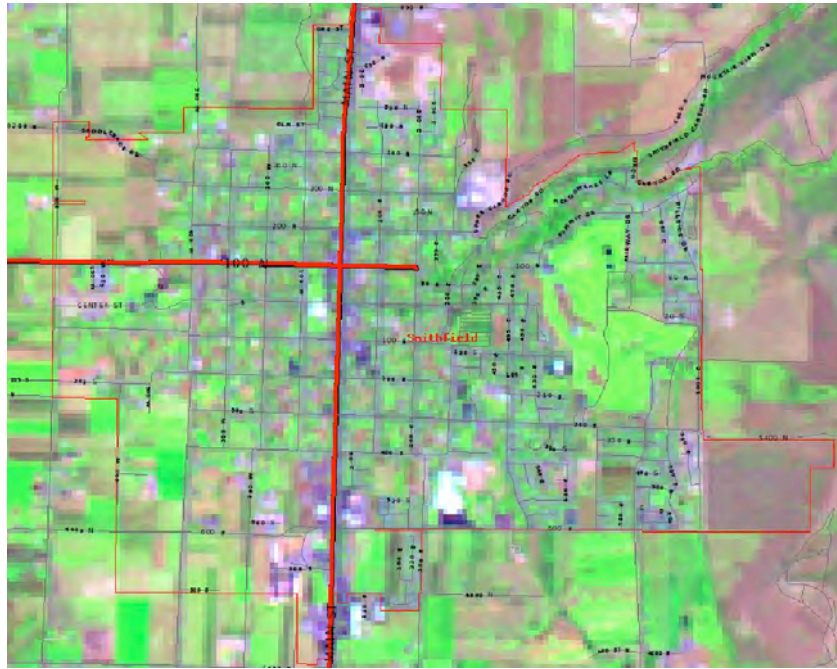

Figure 6 2006 Wasatch Land Mosaic of Smithfield, created using the Virtual Utah software on May 29, 2010.
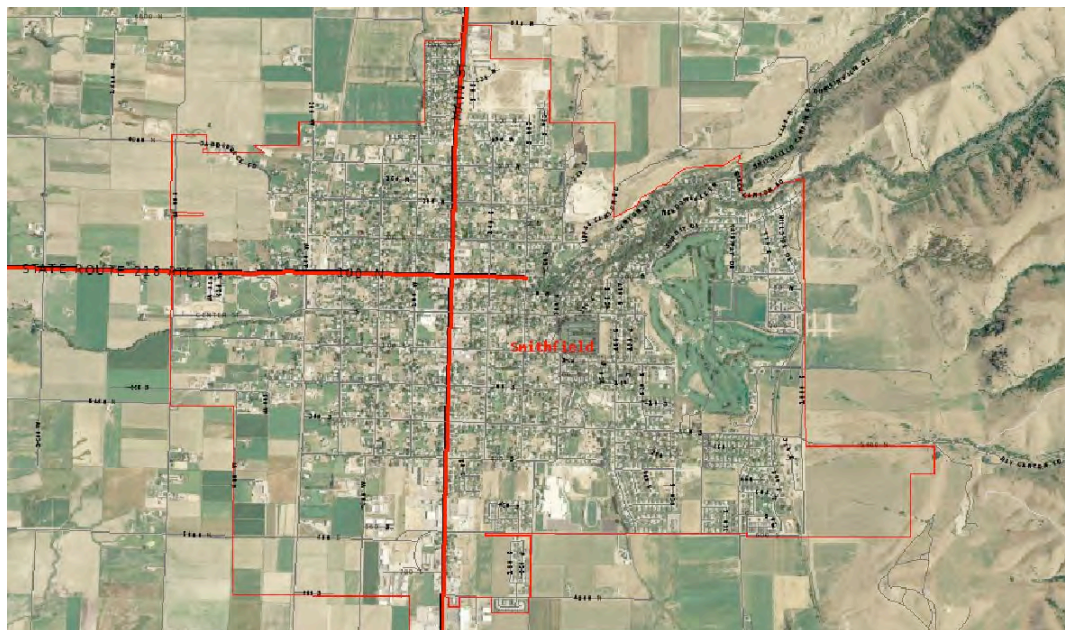

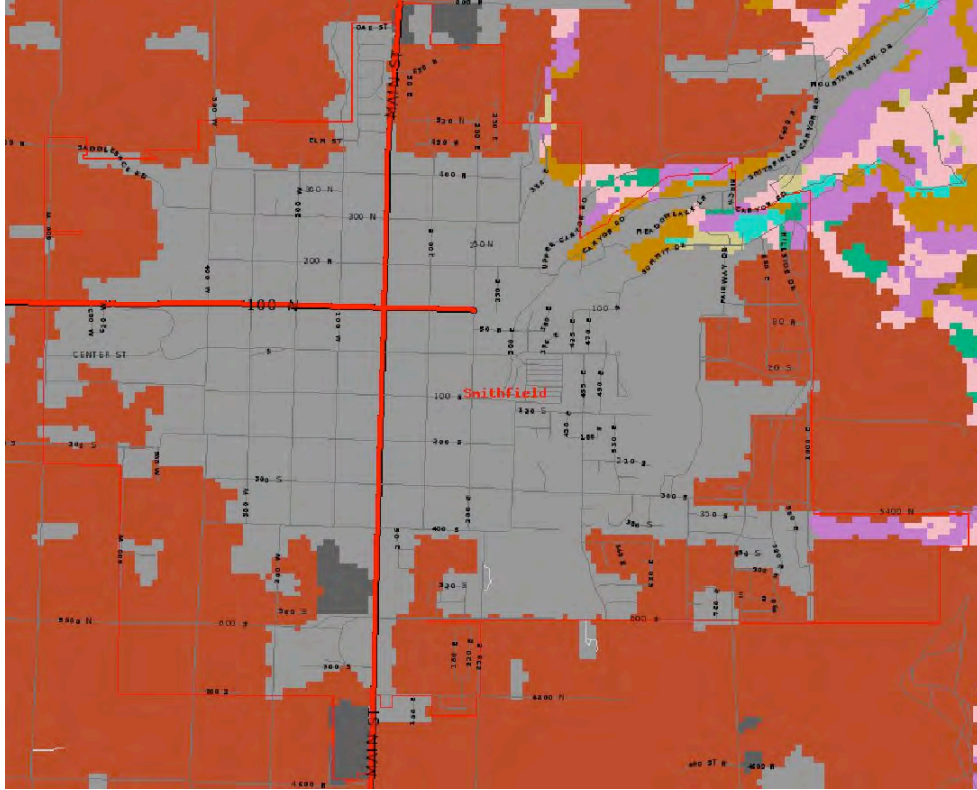**Figure 7 2006 Aerial Photo of Smithfield, created using the Virtual Utah software on May 29, 2010**

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State of Utah Automated Geographic Reference Center Downloads: This website is not a good resource for novices to GIS use. It provides raster and vector data that can be downloaded for use in GIS programs, but persons new to GIS use would not be able to understand the usefulness of this website.

Google Earth: This site allows users to download Google Earth 5 to their computers. Google Earth is very easy to use and allows users to quickly access aerial views of land both presently and historically. This software would be useful for commissioners who would like a quick view of land that is under discussion when an actual visit to the site is not permissible.

gvSIG: The description of gvSIG claims that it has a user-friendly interface and it is quickly

accessible, but that was not found to be true. When the link to gvSIG was selected, the user was

directed to a website in Spanish. When the user selected the hyperlink to where the software

could be downloaded on the mapping resources page, it was not immediately apparent where to

find the download. Upon further examination, the download link was never located.

On The Map (US Census Bureau): This website was a little more complicated, but a user would

be able to create a map and table showing worker statistics for their chosen area. The main

problem with this website is that not enough information was provided to explain the results of

the map created when the user went through the step by step process to create a worker map. The

table that accompanied the map was more usable than the map itself. See the table below for the

information provided by On The Map software for the greater Smithfield area.

Census Map						
Total Primary Jobs						
	2008					
	Count	**Share**				
Total Primary Jobs	3,254	100.0%				
Jobs in Places (Cities, CDPs, etc.) Where Workers Live						
	2008					
	Count	**Share**				
Logan city, UT	734	22.6%				
Smithfield city, UT	615	18.9%				
North Logan city, UT	230	7.1%				
Hyde Park city, UT	139	4.3%				
Hyrum city, UT	119	3.7%				
Providence city, UT	112	3.4%				
Richmond city, UT	66	2.0%				
Lewiston city, UT	56	1.7%				
Preston city, ID	55	1.7%				
Wellsville city, UT	53	1.6%				
All Other Locations	1,075	33.0%				
Jobs in Counties Where Workers Live						
	2008					

	Count	Share				
Cache County, UT	2,515	77.3%				
Box Elder County, UT	135	4.1%				
Salt Lake County, UT	121	3.7%				
Franklin County, ID	109	3.3%				
Weber County, UT	98	3.0%				
Davis County, UT	75	2.3%				
Utah County, UT	55	1.7%				
Bannock County, ID	45	1.4%				
Tooele County, UT	18	0.6%				
Summit County, UT	6	0.2%				
All Other Locations	77	2.4%				
Jobs in States Where Workers Live						
	2008					
	Count	**Share**				
Utah	3,052	93.8%				
Idaho	172	5.3%				
Wyoming	10	0.3%				
Pennsylvania	9	0.3%				
Oklahoma	2	0.1%				
All Other Locations	9	0.3%				
Data Sources						
US Census Bureau, LED OnTheMap Origin-Destination Database (Beginning of Quarter Employment, 2nd Quarter 2008, 2007, 2006, 2005, 2004, 2003, and 2002)						

ArcExplorer: Here the Mapping Resources page provides a link where users can download ArcExplorer software. Once the software was downloaded it was very easy to use. The software provided many options for a basemap and allowed the user to zoom to world, continents, countries, states, cities, and street levels. Figure 9 shows a physical map of Smithfield created using ArcExplorer software. This software would be very useful for commissioners to access street, physical and topological maps of Smithfield from their home or office computers when studying issues being presented to the Planning Commission.

KML to Shapefile and Export to KML:

These two resource options would probably not be useful for planning commissioners who have little or no GIS experience. KML to Shapefile links to downloadable software that will convert KML or keyhole makeup language to an

Figure 9 Physical map of Smithfield created using ArcExplorer on May 29, 2010.

ESRI shapefile for use in ArcGIS programs. Export to KML does the opposite of KML to Shapefile and converts data from ArcGIS to KML to be used in Google Earth. Without much knowledge of how GIS works, novice users would not benefit from these programs.

NRCS Soil Datamart: This resource was not very user friendly. A slide show was provided to walk the user through the site's usage. However after selecting the appropriate state and county, the site became more confusing and the report that was generated was not location specific, nor did it provide any viable information.

Infrastructure Mapping Program: This link provided information on a program offered by the state for all municipalities. The program allows cities to borrow a GPS unit from the state, be trained in its usage and map the infrastructure of their city. The state will then assist the city in downloading the information in a format that can be used with or without GIS software. This

resource is useful to cities that do not have GIS in place in their city or do not have the data for their city available to plug into existing software. Since Smithfield already has access to its infrastructure data, they would have no use for this resource.

Map Window GIS: Map Window GIS is useful in that it is free GIS software and easily downloaded from the link provided on the mapping resources page. However, it may not be entirely usable by planning commissioners because they would need a data source in order to view any applicable information in this software. It would be easier for them to simply request information from the Assistant City Engineer.

Quantum GIS: Quantum GIS is similar to Map Window GIS in that it is free and easily downloaded. However, again the planning commissioners would need to find a data source that they can use in the program and it would be easier for them to simply request needed information from the city staff.
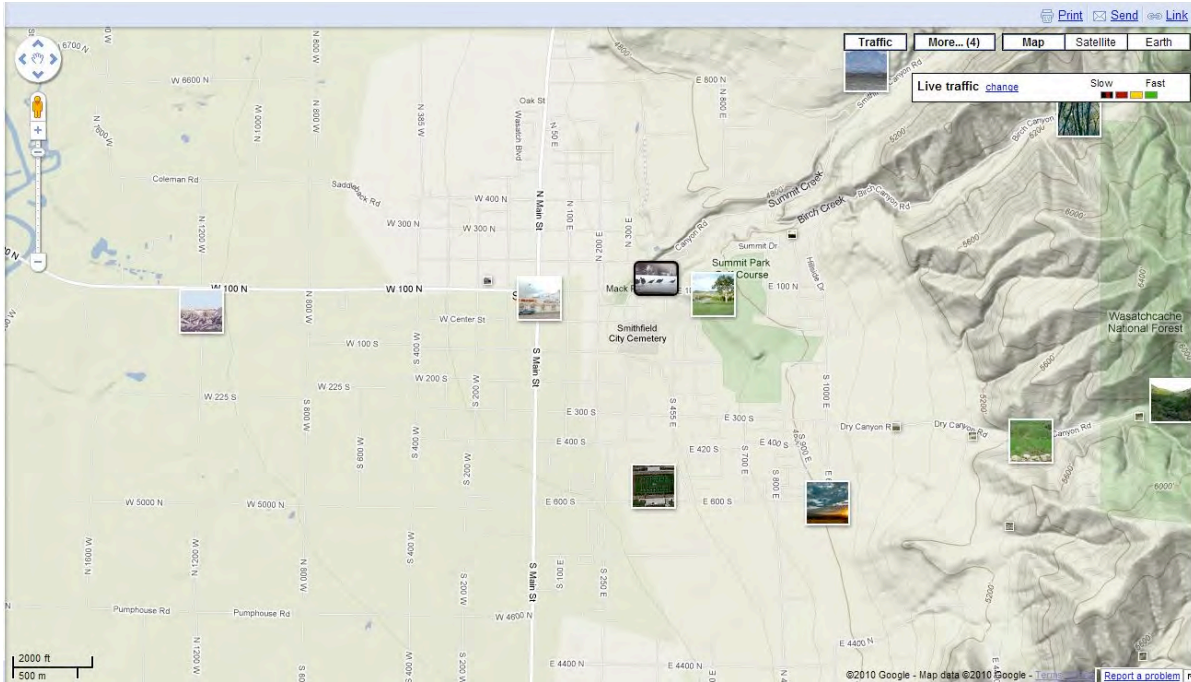
Figure 10 Map of Smithfield created using Google Maps that is complete with terrain, bicycling routes, and video and picture links. The map was created on May 31, 2010.

Google Maps: Google Maps is very easy to use and accessible through the internet without having to download software to a computer. A map of Smithfield was easily generated by doing a search on the city, state and zip code. Google Maps provided a list of options that could be selected to show on the map that includes traffic, photos, videos, Wikipedia links, buzz, terrain, bicycling, and real estate. This program would be very useful for planning commissioners if they need to take a quick view of an area and don't have time to visit the area in person.

DNR Garmin: This software was developed by the Minnesota Department of Natural Resources and would not have an applicable use for planning commissioners. This software is used exclusively to transfer data between Garmin handheld devices and GIS software. Since it is highly unlikely that any of the planning commissioners possess Garmin units, it is equally unlikely that they would ever have a use for this software.

The Implications of Not Utilizing GIS:

While not all of the free mapping sources provided by the state are usable, many of them would be very useful to Smithfield planning commissioners. By not using these resources and by not requesting more GIS information from the city staff, the commissioners are making decisions without a complete realm of information. If more maps were provided either by the commissioners themselves or the staff, then the commissioners could have a better idea of how their decisions will impact the surrounding area and the future communities of Smithfield.

How GIS Usage Can Be Improved:

There are two ways that GIS usage in Planning Commission meetings in Smithfield can be improved. The first is to have GIS present during meetings. On June 4, 2010, the Smithfield city offices will be moving into a new building with a larger council and planning commission chambers. Because of the larger meeting space and its added advantage of a projector and screen, it is suggested that during all meetings a computer with access to the city's GIS data be kept in the meeting room hooked up to the projector so that any questions regarding location, zoning and area can easily be answered using the software. By doing this, city staff could easily assist the Planning Commission in visually incorporating geographic features into their decision making.
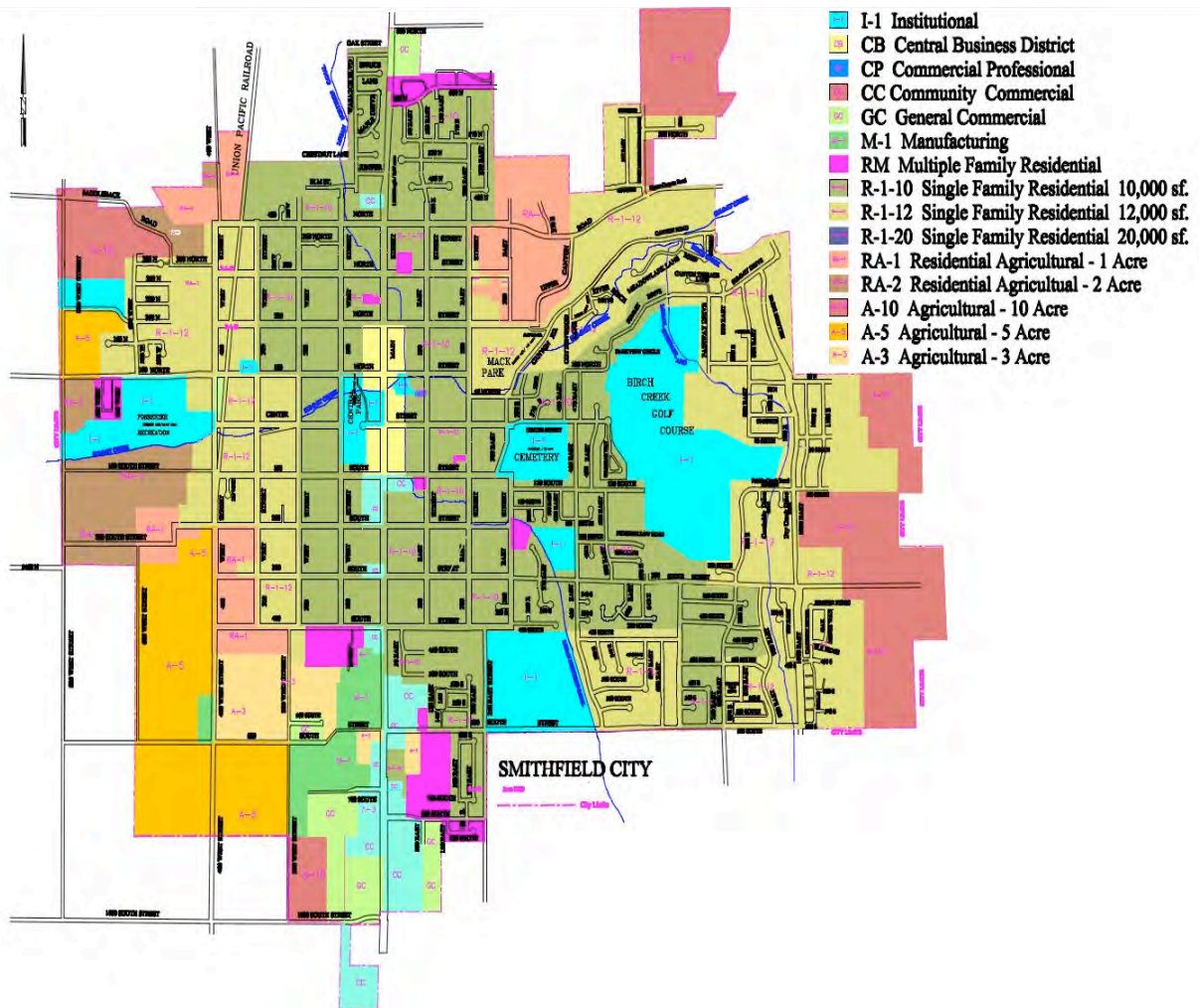
The second way to improve GIS usage in Planning Commission meetings is to encourage

the commissioners to utilize the free resources offered to them by the SUPER TOOL website. Of

the software offered on the state website, six of them are easy to use and can be used by the

commissioners to assist them in making decisions. Using these programs, commissioners can

easily view maps from their home that will assist them in being better prepared for meetings and

better able to answer questions posed by members of the public at meetings. By doing this,

commissioners will come to the meetings armed with better decision making skills because they

have researched the issues at hand and have better formulated ideas of how to promote the public

health, safety and welfare of the citizens of Smithfield. Most of the maps generated in this report by the software offered on the SUPER TOOL website took less than five minutes to create, which definitely does not make time an issue in their utilization.

Conclusion:

In her article, Kwok stated that "The development of GIS has had an enormous impact upon how local governments do business. Practically everything can be mapped, and problems can be solved" (2008). However, when governments fail to use GIS they are trying to solve problems and make decisions without a major tool in their planning toolbox. GIS provides effective means for cities to contain their data, create maps to help them visually solve geographic problems, mechanize inventories of geographic features within their city limits, discover patterns and processes within their city, and reduce the time it has historically taken to provide information to decision makers and the public.

The city of Smithfield has grown rapidly over the past decade and will continue to do so. The city that was once an agricultural strong-hold producing beets, beans and peas is now an area of suburban sprawl. It is up to the Planning Commission and the City Council to decide what direction the growth of the city will take and how they will protect historic agricultural areas, open space, and lands that are valued by wildlife. Without the use of GIS in this critical decision making process, an important element will be eliminated that would increase the quality of the decisions made by the Planning Commission and City Council.

Kwok stated that "Once government users get used to the convenience of accessing GIS data from their desktop, integrating multiple data sources, there is no going back" (2008). This statement is true and once the decision makers of Smithfield start utilizing GIS to its fullest extent, it is predicted that they will find themselves incapable of making further decisions without that important visual data at their fingertips.

Figure 12 The historic Delmonte pea factory on Main Street in Smithfield. This historic factory representing the traditional agriculture of Smithfield is part of what will soon be the Monte Vista 19 lot industrial subdivision. Photo taken February 27, 2010.

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