

NOMINATION SUMMARY
BikeShare Research Tool

1. Abstract of the Program

The Montgomery County, Maryland, Department of Technology Services – Geographic Information Systems (DTS-GIS) team has developed and published a new and innovative Cloud based on-line tool that allows the County's Department of Transportation (DOT) to collaborate with two organizations outside the County while researching potential bikeshare station locations in Montgomery County.

2. The Problem / Need for the Program

In 2008, Washington, DC became the first jurisdiction in North America to launch a bikesharing system, Capital Bikeshare – at the start a network of ten automated, solar-powered bike rental locations to offer tourists and commuters alike the option of bicycling around the city. By 2012, the bikeshare system had spread throughout the city and into neighboring Alexandria and Arlington Virginia for a total of 175 stations. Now, an effort is underway to bring bikesharing to the Maryland suburbs in Montgomery County. Two separate funding projects propose 50 bikeshare stations to the lower and middle portions of the County by mid to late 2013.

But where should the first fifty Montgomery County stations go?

Several criteria make a location great for bikesharing. Density – either residential or commercial – may attract potential riders to the location. A distance from Metro¹ stations that is an easy ride is a big draw, as is easy access to the County's existing network of bike trails, bike lanes, and on-road bike routes. And while stations can be easily placed on public or private land, it certainly is easiest for the County to get the go-ahead on land it already owns.

Furthermore, the Mid-County portion of the project is receiving special funding from a JARC (Job Access and Reverse Commute) grant. That funding requires that the bikeshare locations are placed with a goal of connecting low-income workers to employment centers in the central part of Montgomery County, both within and outside of the City of Rockville.

Montgomery County's DOT looked to the DTS-GIS office for a way to share GIS data relevant to the bikeshare project criteria among not only DOT staff but also representatives from the City of Rockville as well as the private Capital Bikeshare program, none of whom were GIS experts. Such a solution could have entailed lots of telephone requests for custom paper maps of various areas of interest from the different

¹ Greater Washington, D.C. area's rapid transit system. The Metro system—rail tracks and bus routes--serves D.C. and its surrounding counties and cities, such as Arlington, Fairfax, Alexandria, Prince George's, and Montgomery.

organizations involved. However, DTS-GIS pursued a more robust, interactive tool that even those outside the County could use.

Finally, the solution needed to be simple to implement. DTS-GIS had already provided several specialized Flex²-based Internet map viewers for other applications that involved weeks if not months of customizing code, modifying configuration files, and tweaking graphic symbolization of map features. In contrast, this was a simple, urgent request for access to GIS data that DTS-GIS already possessed. The lack of time and the simplicity of the request necessitated that not so many man-hours of design and quality testing as some of the previous Internet map viewers. This solution needed to be as “out-of-the-box” as possible.

3. Description of the Program

Rather than building a custom viewer requiring staff to work with code, DTS-GIS implemented an ArcGIS Online viewer – a more formulaic template map viewer offered by GIS-software-maker ESRI that requires no writing or editing code at all. The viewer itself is hosted by ESRI, and can be configured on their website by linking to existing map services, uploading existing data, and making simple adjustments to the symbolization of the uploaded data. ESRI provides a variety of basemaps as spatial reference beneath the added map layers; DTS-GIS selected an appropriate basemap as a default, but users are given the ability to, for example, easily switch this basemap for an aerial photo. All the uploading, linking, symbolization, and basemap switching is done with clicks of the mouse. As a public online solution, all the project participants can access the tool, whether or not they work for a County agency.

Working with the ArcGIS Online system outputs both a published application on ESRI's server, as well as the necessary HTML code to insert a smaller version of the map on an existing webpage. DTS-GIS provided a smaller map on its website along with a link to the larger, more robust map on ESRI's domain.

The first version of this map viewer research tool displayed a simple handful of map layers for which DTS-GIS already possessed GIS data. Capital Bikeshare had provided rough locations of desired stations as points in a Google Earth KML file, which DTS-GIS converted to shapefile and applied ZIP compression so it could be uploaded to ArcGIS Online. The existing bikeway network in the County was quickly and easily added by linking to a Map Service already created and being used by the County's interactive Bikeways Map Viewer (<http://bikemap.montgomerycountymd.gov>).

To research the properties surrounding these locations to find favorable public properties wherever possible and identify private property owners who needed to be contacted, properties from the GIS property database needed to be shown. However, due to a limit on the number of features that can be shown from each dataset on ArcGIS Online, the application couldn't simply display all properties in the County. Instead, DTS-GIS queried all properties within a quarter-mile of the proposed points. Since public vs.

² One of ESRI ArcGIS Server supported Web application interface languages.

private ownership was so important for this research, these properties were further divided into privately owned, Federally owned, State-owned, County-owned, and City-owned, with each of these divisions symbolized with a differently colored polygon on the map. Right-of-ways and optimal County- or City-of-Rockville-owned properties could be readily identified by color, as could the locations where the County would have to work with a private owner.

This initial version of the tool was well received by all parties involved, and allowed much research and fine-tuning of the proposed station locations. However, after a few weeks, enhancements were requested. Because the Mid-County portion of the project was to receive money from a JARC grant, the project participants needed to make sure the bikeshare station locations allowed commuting via rented bicycle from lower-income residential areas to employment centers. DOT provided spreadsheet data of major employers in the area, which included a count of employees. DTS-GIS geocoded this data into map points, and divided the points into five classes according to number of employees. These five classes were displayed on the map using diamond-shaped points whose display size increased with the number of employees. To provide some representation of low-income resident locations, apartments were added, as were properties owned by the County's Housing Opportunities Commission. (The most recent decennial Census, unlike previous ones, does not provide income data at the fine level of geographic detail needed to be useful for the bikeshare study.)

While adding the new JARC-relevant layers, DTS-GIS also updated the refined proposed bikeshare station points and added some possible connection routes cyclists would likely follow between the stations. All of these many layers can be toggled on and off by the user.



Above: Existing Capital Bikeshare station in Washington, DC.
Below: Potential future Capital Bikeshare station in Rockville, MD.



Montgomery County Government

www6.montgomerycountymd.gov/gistmpl.asp?url=/content/gis/bikeshare.asp

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Property Research for Bikeshare Station Locations

Legend Find address or place

ACCT	02253130
DISTRICT	4
SUBDIV	201
LOT	P5
BLOCK	B
PARCEL	N396
GENLZONE	CZ
SPEZONE	TCM2
LEGALDESC	ROCKVILLE TOWN CENTER
LAND_USE_C	602
OWNER	MONTGOMERY COUNTY
PREM_NUM	00101
PREM_DIR	
PREM_SUFFI	
PREM_STNAM	MONROE

View Larger Map

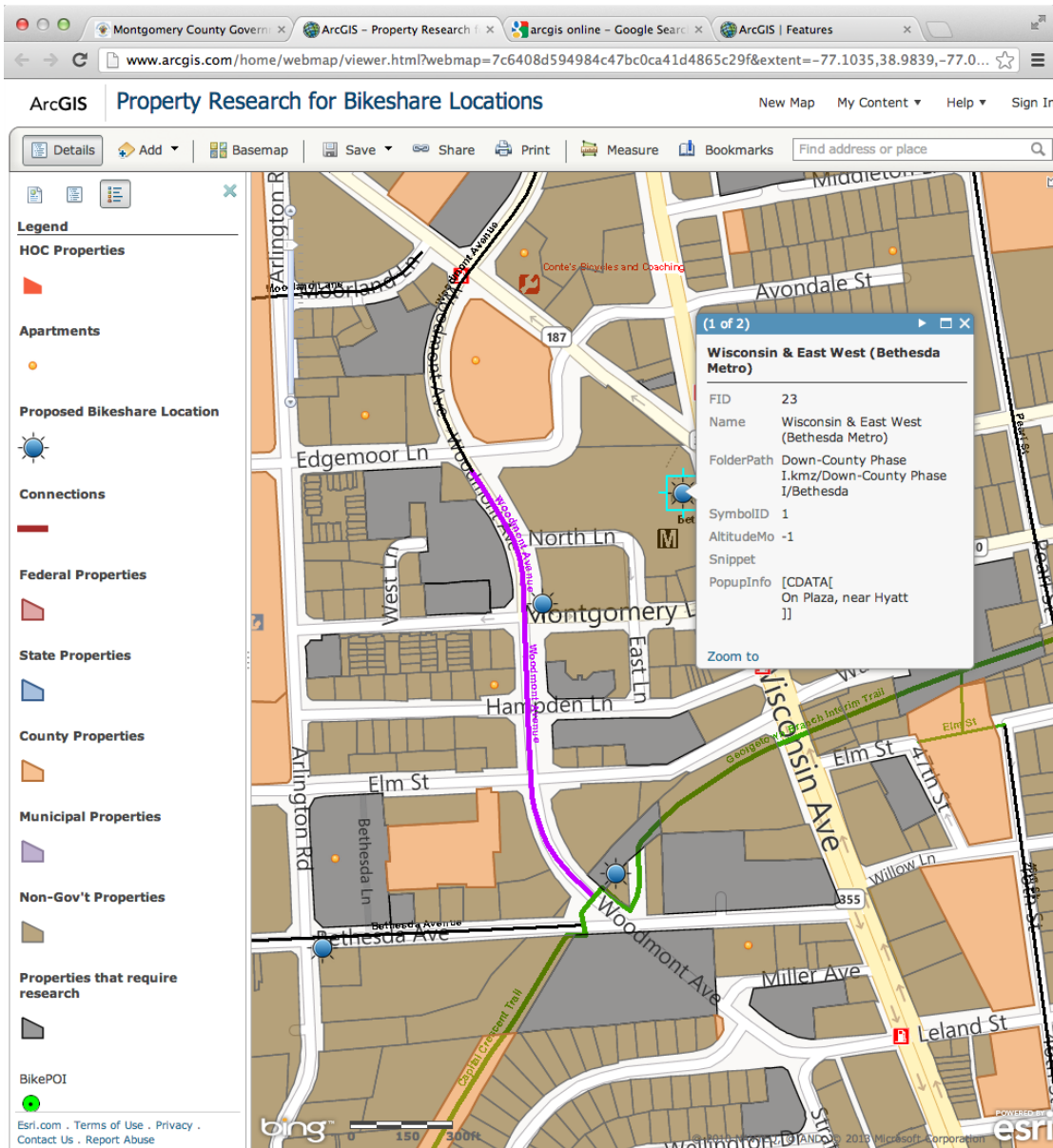
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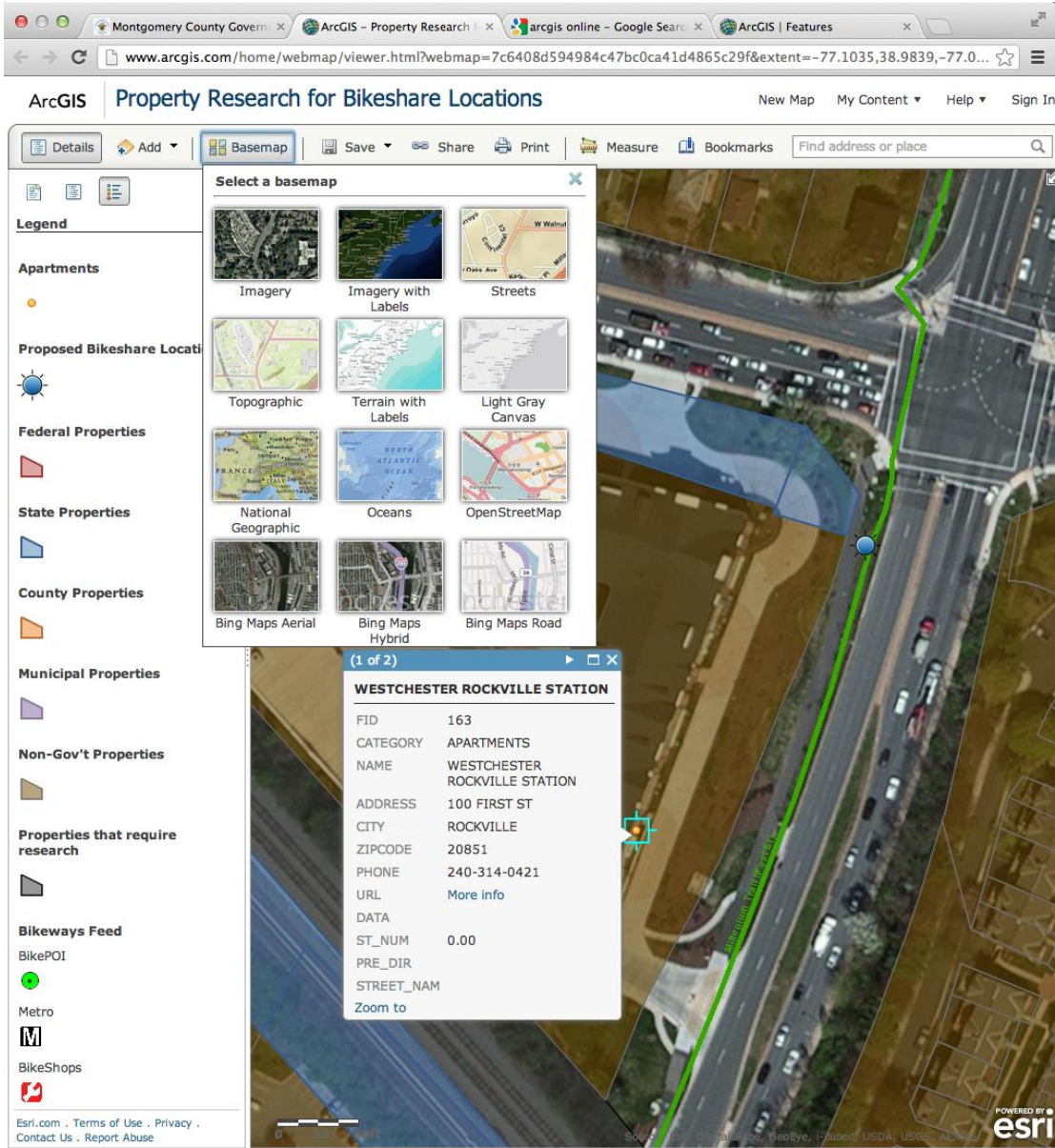
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Above: Page on Montgomery County DTS-GIS website with smaller version of the tool inserted. User clicks on a property colored according to ownership, and scrollable detailed data about the property is displayed. A link at the bottom left allows the user to access the larger, more robust version of the map hosted on ESRI's website.

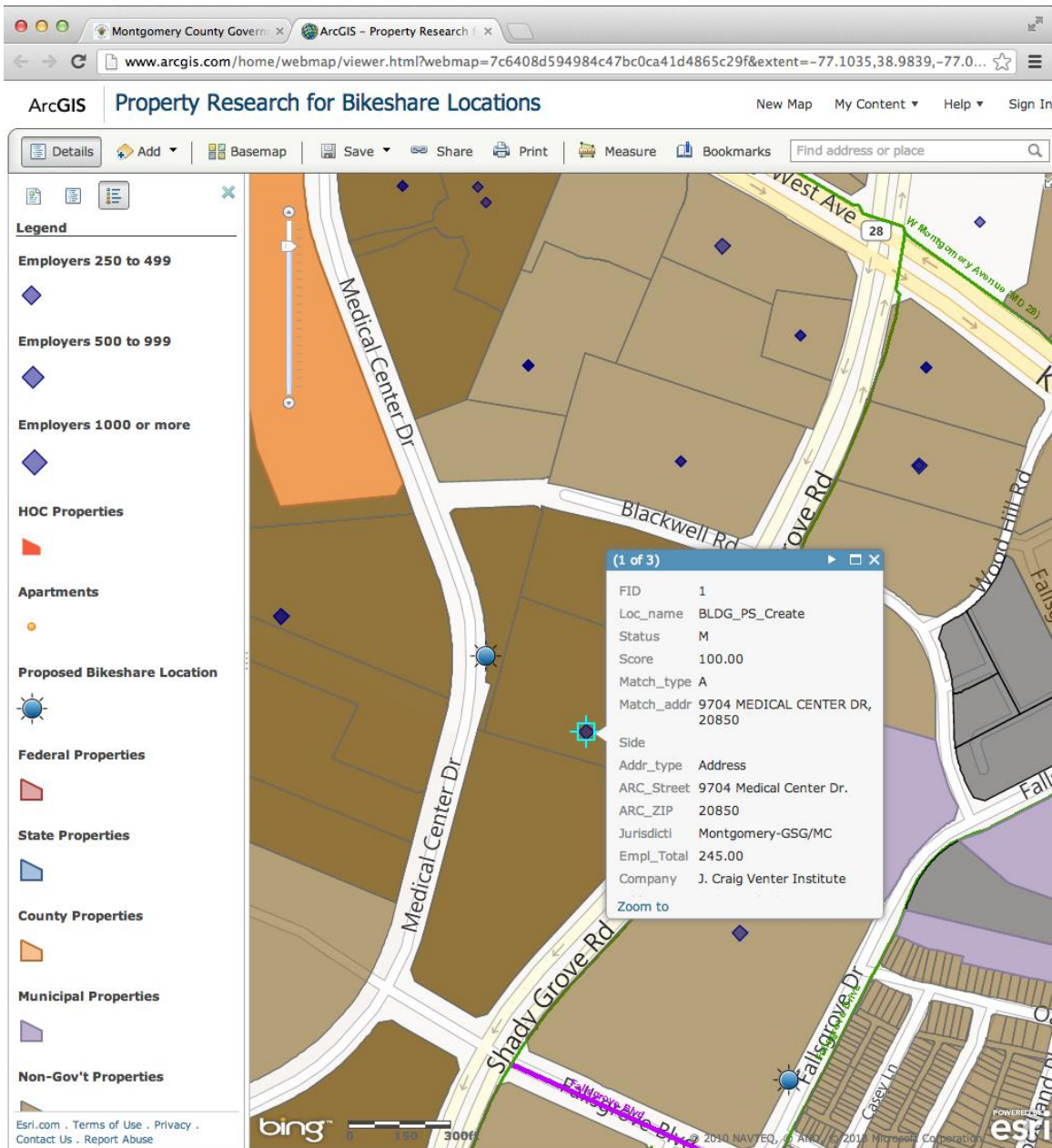
<http://www6.montgomerycountymd.gov/content/gis/bikeshare.asp>



Above: The larger, more robust version of the tool hosted on ESRI's website. Here, the user has clicked on a proposed bikestation location to display detailed attribute data about that location. The County's existing map service displaying the bikeway network automatically shows and labels on-road bike routes in black, bike lanes in purple, and off-road bike paths in green. A simple basemap provided by ESRI has been set as the default background.



Above: User can toggle the basemap to show aerial photos. Here, the user has clicked on an orange point representing an apartment to reveal detailed data. A proposed bikeshare station lies alongside an existing off-road trail, clearly in the right-of-way adjacent to both a state-owned and non-government property.



Above: Here, a user has clicked on one of the diamond-shaped points (sized according to number of employees) to display detailed data about that employer, including a total of 245 employees.

4. Responding to Economic Downturn (Optional)

Not Applicable.

5. Use of Technology

The Bikeshare Research Tool makes use of ESRI's ArcGIS Online technology. Several basemap options are provided by ESRI, and several in-house data layers that were created using ArcMap 10.0 software were uploaded as zipped shapefiles to appear atop the basemap. The bikeways data layer was automatically displayed from an existing map service being used for an earlier project, the Bikeways Map Viewer. When publishing the viewer, ArcGIS Online also automatically provided code to insert on an HTML page to display the map at one of several possible window sizes.

6. The Cost of the Program

The property data used in the project is part of the County's GIS foundation data layers. The Bike Ways, bike trails, and on-road bike lanes data were previously created for DOT's earlier projects. Staff spent about 20 hours on updating the refined proposed bikeshare station points and adding some possible connection routes cyclists would likely follow between the stations. The DTS-GIS Team also owns ArcMap, the desktop GIS software already. Staff working on this tool shares the \$2,500 annual ArcGIS Online subscription with four other staff. Staff spent a day creating the tool and some additional time adding enhancements.

All data used for this application was created in-house with the exception of the basemap options provided with the ArcGIS Online software.

7. The Results / Success of the Program

The tool proved to be successful and helpful. All project participants were able to use and reference the same tool, which became a platform for research on the bikeshare locations. At meetings about the project, screenshots from the application were often used to communicate pros and cons of specific locations. Participants commented that the application was easy to use and intuitive. The representative from Capital Bikeshare commented that this tool has made locating a Capital Bikeshare station on public property an easier task than it had been in other jurisdictions as he could better see where the opportunities exist.

This GIS tool implemented and deployed on the Cloud enabled the County, the City of Rockville, the bikesharing planning group and other interested citizens to collaborate in a convenient and effective manner. With the relevant planning factors (GIS data layers) in their fingertips, the decision process is quicker and the decisions arrived at are better.

8. Worthiness of an Award

The BikeShare research tool is a great example of a low-cost, innovative and highly effective solution deployed by the County. The on-line tool facilitates enhanced collaboration between different groups of project participants leading ultimately to improved and better informed decision making. Importantly, DTS-GIS was able to leverage existing County data to also enhance the utility of the tool by the end users.

This easily replicable on-line tool can be used as a model for other jurisdictions seeking to utilize similar GIS and web-based technology to support decision making relative to site selection for BikeShare or similar programs.

9. Supplemental Materials (optional)

Not Applicable.