Palm Beach County Water Utilities Department:
Enterprise GIS Portal Implementation
Enterprise System Category

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A. System
1. Name of system and ESIG™ category for which you are applying (Enterprise System or Single Process System).

Palm Beach County Water Utilities Department – Enterprise GIS Portal Implementation
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B. Jurisdiction
1. Name of jurisdiction
Palm Beach County Water Utilities Department

2. Population served by the organization/agency
Approximately 600,000 residents across 1,300 square miles of unincorporated Palm Beach County, Florida.

3. Annual total budget for jurisdiction
$176,000,000 - organizational total annual budget
$486,000 - total budget for GIS Projects and Services

4. Name, title, and address of chief elected and/or appointed official
James C. Stiles, Executive Director, Palm Beach County Water Utilities Department
8100 Forest Hill Boulevard, West Palm Beach, FL 33413

Verdenia C. Baker, County Administrator, Board of County Commissioners
Palm Beach County
301 N. Olive Avenue, West Palm Beach, FL 33401

5. Name, title, address, telephone, FAX, and email for contact person for system
Danny Thorpe, Systems Administrator III, Palm Beach County Water Utilities Department
8100 Forest Hill Boulevard, West Palm Beach, FL 33413
561-493-6115 (ph.); fax n/a
dthorpe@pbcwater.com

C. System Design
1. What motivated the system development?
The need to centrally distribute and manage our utility’s infrastructure access, web applications, as-built documents access, and system administration motivated the system development. The shift from older GIS technology to the implementation and adoption of innovative GIS technology that is web-based, user-friendly, and streamlined was necessary.

2. What specific service or services was the system intended to improve?
The system was designed to improve the way we deliver resources to our mobile workforce through web map access eliminating the need for end users to manually synchronize their computers, of which there are hundreds deployed in the field. The ease of accessing our GIS Portal on any internet browser on any mobile device, tablet or computer—whether office-based, or remote in the field—was a significant improvement.
3. What, if any, unexpected benefits did you achieve?
Our GIS team learned more about the IT realm of things pertaining to Lightweight Directory Access Protocol (LDAP), which was utilized to manage the enterprise portal account usernames and passwords with our Windows Active Directory (WAD). Prior to this implementation, none of the GIS staff had experience working with LDAP and it presented a great learning opportunity to understand a protocol used to talk to our WAD.

4. What system design problems were encountered?
We encountered a new challenge in the configuration of the security certificates across the GIS environment. Nonetheless, with the support of our IT infrastructure team we were able to mitigate and overcome the problem.

5. What differentiates this system from other similar systems?
Other GIS systems our utility relied upon in the past were static in the field, required manual updates and did not change dynamically like the newly-implemented web-based GIS portal applications now do, reflecting data in real time as it changes in the database, providing more efficiency for all users. Previous iterations our GIS team relied upon also required our end users in the field to manually update, or bring their device to the IT offices to do so, creating inefficiencies across multiple departments. This saves over 40 hours a month now that 250 mobile device users no longer need to synchronize twice a month.

D. Implementation
1. What phases did you go through in developing the system?
Our GIS team worked in several phases over the two-year-long process from conception to final rollout. Our Exploratory & Discovery Phase consisted of initial meetings and a robust cost-benefit analysis of the potential implementation of a GIS portal. This was followed by a System Development & Implementation Phase, during which we identified all the components required to support such a portal across 600 users with diverse needs in the organization. A key component of this phase included sizing the GIS-dedicated servers based on expected utilization of what we were designing to be a readily-available GIS environment. During our Configuration & Testing Phase, we then installed the software and applications, ran configuration and data migration to the new GIS environment, allowing a select group of end users the ability to test the environment and provide feedback to our GIS team. Lastly, the Training & Roll Out Phase of the project was reached, in which we held sessions to educate and train the users in how to access and use the portal, we developed and produced training videos for our internal SharePoint site to be accessed by all employees, and prepared to go live with the system. After addressing feedback received during our employee focus groups and training sessions, we were then ready to Go Live and release the full environment to all 600 end users throughout the utility.

2. Were there any modifications to the original system design? Why? What?
Implementing a High Availability (HA) environment presented its challenges when determining the utilization of a web adaptor or a software-based load balancer to handle calls to our servers. The original design plan was to utilize a web adaptor to handle requests between the servers. Originally, automatic web tier authentication single sign-on was part of the system design, which was modified for security concerns, such as credentials stored within web browser sessions and multiple people using a single laptop at times. We then decided to use LDAP as the primary protocol, allowing a one-time, non-automatic sign on using Windows Active Directory credentials.
E. Organizational Impact

1. What user community does the system serve and how?
We have several departments within our utility that rely upon the GIS portal:

Operations and Maintenance – This team relies upon the portal 24/7/365 for navigation to assets and access to maps for visualizing where potable water, sanitary sewer, raw water, reclaimed water, treated water, recharge water and recycled water infrastructure are located. This team consists of hundreds of field staff that work on the road, as well as office-based personnel who schedule and perform preventative, corrective and emergency maintenance on over 162,500 assets –everything from wastewater pumps to solar panels– maintained throughout the utility.

Laboratory – The GIS portal allows the lab staff to visualize past drinking water sample point parameters (pH, CL2, Free CL2 Residual, Nitrites, Nitrates, NH3, HPC) collected through time, to ensure water quality regulatory benchmarks are being met and adhered to. Over 80,000 water quality samples are collected and analyzed annually.

Contract Management – This revenue-generating team uses the portal as a service area map research tool for: new development projects and new connections to the potable water and wastewater collection system, tracking hydrant meter locations and looking up parcels/addresses/owner information pertaining to our service area, and fielding myriad inquiries from interested parties looking to connect to PBCWUD’s potable, wastewater or reclaimed water lines.

Engineering – The different teams within our Engineering division rely upon the portal in multiple ways, including accessing Capital Improvement and Plan Review Projects GIS through web map and submitting new data through web GIS editor development applications; accessing as-built drawings as hyperlinks through the portal; and for our Engineering Construction Inspectors, they now have real-time data available to them at the job site in the field.

Regulatory Compliance – Our Environmental Health and Safety team can access the Health and Safety Plan (HASP) GIS layer data on a map with attached HASP document for specific sites throughout PBCWUD’s service area. This team also works on the annual Water Quality Report, which draws upon the 80,000 water quality sample points conducted by the Laboratory.

Customer Service – Our Customer Service department and includes field representatives, who can be dispatched to turn on/off/repair a water meter or install a new one, as well as office-based call center agents who field telephone and web inquiries from our 600,000 customers. They now can all access- and rely upon- the integrity of the data in the GIS Portal as they serve our customers. As the Covid-19 pandemic has continued, patterns in call center inquiries have changed, as more customers were sheltering-in-place or working from home, therefore utilizing more water at home and looking for support in managing their accounts accordingly.

2. What are the ultimate decisions/operations/services being affected? If appropriate, provide a few examples including, but not limited to: screen input/output forms, paper products, or other descriptive graphics.

Just one example of the GIS Portal’s impact on services include using customer water consumption data cross-referenced with water main break histories to target areas where water loss or leakage might be indicated. This allows the various departments who depend on this data to address the issue to work collaboratively: Customer Service records an increase in call volume from concerned customers or in call volume from concerned customers and higher satisfaction rates. Overall, this leads to less “fire-fighting” and allows for more informed decisions when planning for Capital Improvement projects which will impact the entire utility’s future needs and budget.
The following graphics depict screen shots of the portal, beginning with the homepage and continuing through the various unique apps designed to serve our employee’s distinct needs on the job.

Palm Beach County Water Utilities Department GIS Portal Homepage available for all utility employees, in a user-friendly app interface.

Summary GIS Dashboard reflecting the latest data from production GIS database along with Zone Filters applied to dynamically show data based on Zone(s) selected available for the entire organization.
Utility Infrastructure GIS Application – a zoomed in area displaying the water and sanitary sewer infrastructure in more detail.

Infrastructure GIS Application with all utility infrastructure data layers available including potable water, raw water, reclaimed water, treated effluent water, recycled water and sewer collection system networks.
Supervisory Control and Data Acquisition Software (SCADA) Lift Stations Application showing location of Telemetry Antennas supporting SCADA and the results of parameters received from the lift stations.

Critical Facilities GIS Application for use before a hurricane makes landfall, during the storm event and post-storm response in the PBCWUD Emergency Operations Center.
Water Diameter/Material Application highlighting where large water mains run through the PBWUD service area (above) and where clusters of material types exist (below).
Sampling Application showing temporal sampling data on a map for CL2, CL2 Free, NH3, pH, HPC, Nitrites and Nitrates parameters as used by the Laboratory staff.
E. Organizational Impact - continued

3. What were the quantitative and qualitative impacts of the system?
With over 600 active user accounts on PBCWUD’s new GIS Portal, everyone in the organization has maps available to them without having to have any software loaded on their devices. Moreover, the Portal allows all users regardless of computer ability or degree of difficulty of their task, to access the data in a user-friendly interface.

4. What effect has the system had on productivity?
Empowering staff to utilize the Enterprise GIS Portal over desktop applications, we have also deployed web-based GIS editor applications. “Power Users” throughout the organization use these editor applications to manage their department’s data directly from the portal in real time, freeing up GIS staff time and resources to work on other projects. Our IT Help Desk team no longer needs to manage locally-stored GIS software applications on hundreds of laptops and field devices, as was necessary prior to the implementation of our new portal.

5. What, if any, other impacts has the system had?
Implementing the Enterprise GIS Portal at our utility has helped support a culture of spatial awareness throughout the organization. Putting the GIS in the hands of all employees through the web portal has brought a streamlined approach in delivering maps and apps to our end users. As the results have shown, the GIS maps that are now being delivered in a user-friendly app interface allow everyone from field staff on a mobile device, to office staff using a big screen for a presentation, the same access to the data and the confidence to navigate through it.

6. How did the system change the way business is conducted with and/or service delivered to clients? Give specific examples comparing the old way with the new.
Prior to the rollout of the new portal, field staff would need to bring in their Trimble GPS units or laptop devices to have data updates manually installed. It took time away from their response efforts to critical work in the field, and also required the availability of an IT professional to run the updates. Dashboards configured in the portal inside the office help monitor and track field data collection efforts. As field crews enter a new asset in the field, such as a water meter at a new address, it is instantly updated across the entire system, so all 600 employees are seeing the same data at the same time.

PBCWUD is a critical first-responder agency during hurricanes or storm events, which are all-too-frequent in South Florida. Prior to the portal’s availability, staff in the Emergency Operations Center, or the emergency response team in the field, would need to reply on back-up paper maps detailing infrastructure in the event of a power failure. Staff also were not able to enter or receive GIS data updates in real time during the storm event, so as pumpstations or generators came off line due to the hurricane, it wouldn’t be updated. Now, staff will be able to see which assets are impacted by the hurricane in real time and dispatch emergency repair crews as needed, decreasing response time and providing improved customer service.
F. System Resources
1. What are the system’s primary hardware components? Give a brief list or description of the hardware configuration supporting the system.
Our highly available GIS environment consists of a load balancer as the front end to the environment. Two GIS servers with data stores, two GIS Portal servers and a highly available Microsoft SQL server database.

2. What are the system’s primary software components? Describe the primary software and, if a commercial package, any customizations required for the system.

3. What data does the system work with? List and briefly describe the database(s).
All the web GIS services are published from a dedicated SQL GIS Published Enterprise Database onto the ArcGIS Servers which are federated with the ArcGIS Portal. Other systems integrated are our Customer Information Software (CIS), Laboratory Information Management System (LIMS), GraniteNet Sanitary Sewer CCTV system and Maximo, our Asset Management System, which tracks all aspects of an asset’s lifecycle including maintenance scheduling and map location of work orders.

4. What staff resources were required to implement the system? (i.e., report approximate staff and consultant time as FTE’s)
The team, comprised of the GIS Manager, two GIS Analysts and two GIS Support Specialists worked collaboratively over the course of developing the portal. Combined, they brought over 40 years of experience to the project, over the course of a two-year period beginning in 2018 and concluding in early 2020.

5. Comment on anything unusual about the resources used to develop your system, such as data, software, personnel and financing.
An unusual aspect of developing the system entailed maintaining and replicating the data from our production geodatabase to then publishing the geodatabase to serve the web applications once we’d completed beta testing and were ready to launch the portal live.

Working with the software was a learning process for us, after a period of educating our GIS team about the options available and associated best practices, we decided to implement a stand-alone load balancer, which eliminated another point of potential failure, which could have been the case had we elected to implement a web adaptor with a load balancer.

PBCWUD is a unique utility in that it is a revenue-generating enterprise fund, with the benefit and flexibility of having its own in-house finance and procurement teams, unlike smaller agencies within the Palm Beach County government which must go through a central purchasing unit. This afforded us a shorter lead time from initial scoping to final vendor selection, in which we acquired Esri Enterprise Advantage Program (EEAP) consulting services to assist with implementing our unique Enterprise GIS environment.
Letter of Authorization for Award Submission

To whom it may concern,

Please be advised that Palm Beach County Water Utilities Department authorizes Danny Thorpe to submit an application entry for the 2020 URISA ESIG™ Award in order to nominate our organization for the prestigious URISA Exemplary Systems in Government (ESIG™) Award.

Sincerely,

John Acton
Utilities Assistant Director Operations & Maintenance
Palm Beach County Water Utilities Department
8100 Forest Hill Blvd. S West Palm Beach, FL 33413
Phone: (561) 493-6250 S E-Mail: JActon@pbcwater.com

"An Equal Opportunity Affirmative Action Employer"
In 2018, the Palm Beach County Water Utilities Department (PBCWUD) embarked on an ambitious project to shift from older ArcGIS technology, ArcReader, to a full web based Enterprise GIS Portal accessible anywhere, at any time, to any employee. A collaborative approach led by PBCWUD GIS Team members with input from key stakeholders from across the utility, focus groups and beta testing, the portal was fully deployed to the 600-person organization in February of 2020. All 600 employees can now access targeted applications geared specifically to a variety of departmental needs. As an organization, PBCWUD serves nearly 600,000 residents across a 1,300 square mile range of Palm Beach County, providing wastewater collection and drinking water services around the clock. With four wastewater plants, five drinking water plants, four regional operations centers and over 1,000 wastewater lift stations spread strategically throughout the service area, every employee’s GIS needs vary based on their assignment, their location, and even the weather conditions.

The portal allows all 600 users to have GIS maps available to them absent of software loaded on their devices. A few examples of the eight unique applications contained within the portal include: Critical Facilities for Hurricane Response, Utility Infrastructure Map, Summary Dashboard of Utility Assets, Water Quality Sampling, Themed Maps for Water Main Diameter/Material and SCADA for Lift Stations. The team, comprised of the GIS Manager, two GIS Analysts and two GIS Support Specialists worked collaboratively over the course of development. Combined, they brought 40 years of experience to the project.

Empowering staff to take ownership of the Enterprise GIS Portal, web-based editor applications were also developed. Power Users were identified to update their team’s data directly in the portal in real time, providing end users in the field the modified data, increasing efficiency in response times along with customer satisfaction. Power Users have reported efficiencies in their workflow and no longer need to request additional support from IT.

Among the many benefits the portal brings to PBCWUD, the management of GIS software stored locally for hundreds of devices by our IT support team has been eliminated. Field crew can access all maps needed on any web browser, instead of needing software installed on their machine. Previously, field crew would need to bring in their devices to have data updates manually installed, taking time away from their response efforts to emergencies in the field. Dashboards configured in the portal inside the office help monitor and track field data collection efforts. As a new asset is entered in the field, such as a water meter, it is instantly updated across the entire system, so all 600 users see it. This has streamlined the Customer Service representatives’ process; they now have up-to-the-minute data as customers call in with routine or emergency inquiries.

As the results have shown, the GIS maps that are now being delivered in a user-friendly app interface allow everyone from field staff on a mobile device, to office staff using desktops, the same access to the data and the confidence to navigate through it. This was apparent during the recent Covid-19 outbreak, as office staff worked remotely and field staff received their work order routes electronically, all supplemented by our web based Enterprise GIS Portal. Moving into the future, we understand it is imperative we continually adapt and implement new GIS technology beneficial to our organization’s success in delivering life-essential water and wastewater services to the public.
Palm Beach County Water Utilities Department

Enterprise GIS Portal Implementation –

2020 URISA ESIG submission testimonial for your consideration

The Palm Beach County Water Utilities GIS Portal is an essential tool utilized daily by myself and my 20-member staff. The system provides the different layers of our infrastructure, which allows information gathering to be unified into one application. Using the Utility Infrastructure tool, I can easily determine where samples within our 1,300 square-mile distribution network or sanitary sewer system can be safely planned for routine or special collection.

The Water Distribution Sampling Application maps our distribution system’s required sampling locations. Remarkably, the system our GIS team designed illustrates field and laboratory results at each sampling point and also applies conditional color-coded formats to indicate if a specific parameter is within range or outside regulatory limits. Furthermore, this color-coded view can effectively display if there is a problem in a geographic area, requiring the implementation of preventative or corrective action across departments in Palm Beach County Water Utilities, enabling faster response time notification of our customers.

Stephanie Weder

Stephanie Weder
Laboratory Manager, Central Laboratory
Palm Beach County Water Utilities Department
Palm Beach County Water Utilities Department

Enterprise GIS Portal Implementation – 2020 URISA ESIG submission testimonial

To Whom it May Concern:

As a long-time worker in the utilities industry, I have witnessed a dramatic shift in the way we identify and track our underground assets. When I started in this business, the only way to find a valve or figure out what size or type of pipe was in the ground was to pull out the old paper maps and flip through them until you found what you were looking for—maybe.

The transition from our old way of doing things to the new digital format has been amazing. Our GIS team has also worked collaboratively with different teams within our utility, designing the system with our needs in mind. As an end-user I am now not only able to see an overview of our entire system but zoom down to a street-level view of a problem area and identify every aspect of an asset prior to dispatching the maintenance or repair crews out to the site. Combining all available information into one place has not only saved our utility time and money but has given our field workers a much better understanding of how our system and all of its components work together to provide our customers with the best possible service. The GIS Portal has been a great addition to our toolbox and just when you think it can’t get any better our GIS team adds more.

I use our GIS Portal every day and find myself asking, “how did we ever get along without this?”

Craig Moyer
Manager
Operations and Maintenance- Lines Division
Palm Beach County Water Utilities Department

"An Equal Opportunity
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May 29, 2020

Ralph Estime  
Project Coordinator II  
Palm Beach County Water Utilities Department (PBCWUD)

Subject: 2020 URISA ESIG (Exemplary Systems in Government Award)

Reference: Palm Beach County Water Utilities GIS Portal

To Whom It May Concern:

Our Palm Beach County Water Utilities GIS Portal is essential to my daily job functions, as well as to the PBCWUD organization. I utilize the GIS Portal for retrieving historical information, ascertaining and prioritizing the utility’s five (5) year Capital Improvement Projects, as well as for generating a multitude of pictorial maps for presentations and to communicate with executive management, colleagues, other municipalities and the public. The GIS Portal is a pivotal component within our organization and makes my job easier to have GIS resources at my fingertips.

Sincerely,

Ralph Estime  
Project Coordinator II  
Engineering Division, PBCWUD