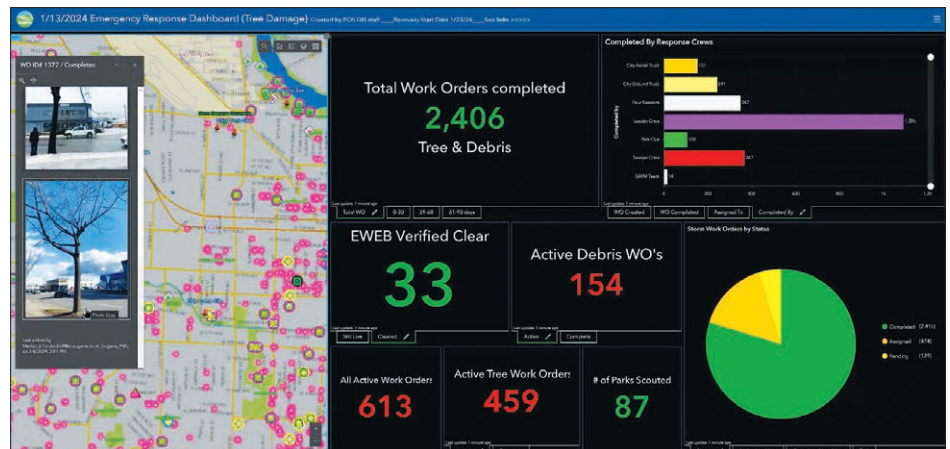


City of Eugene, Oregon, Deploys GIS to Empower Scouts During Severe Ice Storm

The City of Eugene, Oregon, is a vibrant community known for its natural beauty and commitment to preserving its parks and open spaces. The Public Works Parks and Open Space (POS) team has experienced its fair share of ice storms, which can have a profound impact on the city and its residents. To manage ice storm response more effectively, the team implemented geographic information system (GIS) technology to improve its ability to enhance the safety and well-being of community members. Although the use of modern GIS tools has transformed the storm response effort, “the most important part of any emergency storm response event I have been involved in during my 30-year tenure at the City of Eugene is our dedicated staff,” says Eric Cariaga, GIS analyst and administrator with POS. “Our staff’s commitment to service is obvious in the way they have shown up, even when their families were without power and their homes were affected. No matter how many advancements we make in technology, without our dedicated staff willing to go out and clear roads and mitigate hazards,



↑ Tracking all the data on any given work order validates their efforts during the FEMA (Federal Emergency Management Agency) auditing process. Before-and-after photos and x, y coordinates of every storm response work order has helped the team tremendously during the reimbursement process.

the technology used would be irrelevant.” Nevertheless, GIS tools have been “vital to our ability to complete and track work, both on blue-sky days and especially during emergencies,” emphasized Eugene Public Works director Matt Rodrigues.

Before 2016, Eugene staff could not spatially track and organize tree-related storm damage and relied heavily on their call intake system to drive response efforts.

On-site staff would respond to calls from the public regarding hazards and complete work orders without detailed documentation. They would simply turn a list of completed jobs over to the office or radio in to the command center that a job was complete. They wouldn’t take any photos or document what kind of hazard they were dealing with, or the work they had done to mitigate it.

continued on page 4



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Eugene, Oregon, empowers scouts during severe ice storm continued from cover

The chaos that resulted during significant ice storms could not be effectively managed by a centralized model. Public calls were recorded in the Maintenance Management System, a custom-built application and call intake system. Those calls would be triaged by a small group of operation chiefs and dispatched to over 50 on-site crews through paper lists of addresses or over handheld radios. While having the ability to utilize the eyes of Eugene's 178,000 valued community members is critical to providing excellent service, solely relying on citizen input and a centralized model created inefficiencies and slower response times to potentially life-threatening hazards.

GIS Empowers Scouts to Tackle the Storm Effort

During the 2016 ice storm season, the POS staff had started capitalizing on ArcGIS® Online and had enough Creator accounts to start decentralizing a hectic model of work order dispatching to empower their staff to implement a "storm scout" model. With this in place, the call intake system was now being pulled into web maps so scouts could visualize, document, assign, and prioritize

↓ "Our GIS tools are vital to our ability to complete and track work, both on blue-sky days and especially during emergencies," said Eugene Public Works director Matt Rodrigues. "The city values data-driven decision-making, and GIS data informs our stewardship of resources."

work using custom services (layers) via ArcGIS Field Maps on mobile devices. These highly skilled tree scouts worked methodically throughout the city. First, they canvassed and documented the inspection of priority routes—high-traffic roadways and areas where there was more of a chance that falling trees could damage property or injure the public. They then branched out to other areas of the city, eventually evaluating every street, park, and trail in Eugene. Now that there was a visual element to calls from the public, staff could quickly break route to verify high-priority calls and create work orders. These efficiencies were important to assist emergency services in moving freely through the travel ways and getting the community back on its feet.

"We empowered our staff with these tools by creating services where it was easy for them to track near real-time storm data from both a desktop web application and their mobile device," said Cariaga. "We had technicians, contract managers, field staff, storm scouts, and our response crews all working from these apps to help in our storm response effort."

The responding city staff capitalized on GIS for their tree inventory, which contains information important to storm response such as location, species, diameter, height, and health. Understanding the type of tree is important to this ice storm workflow

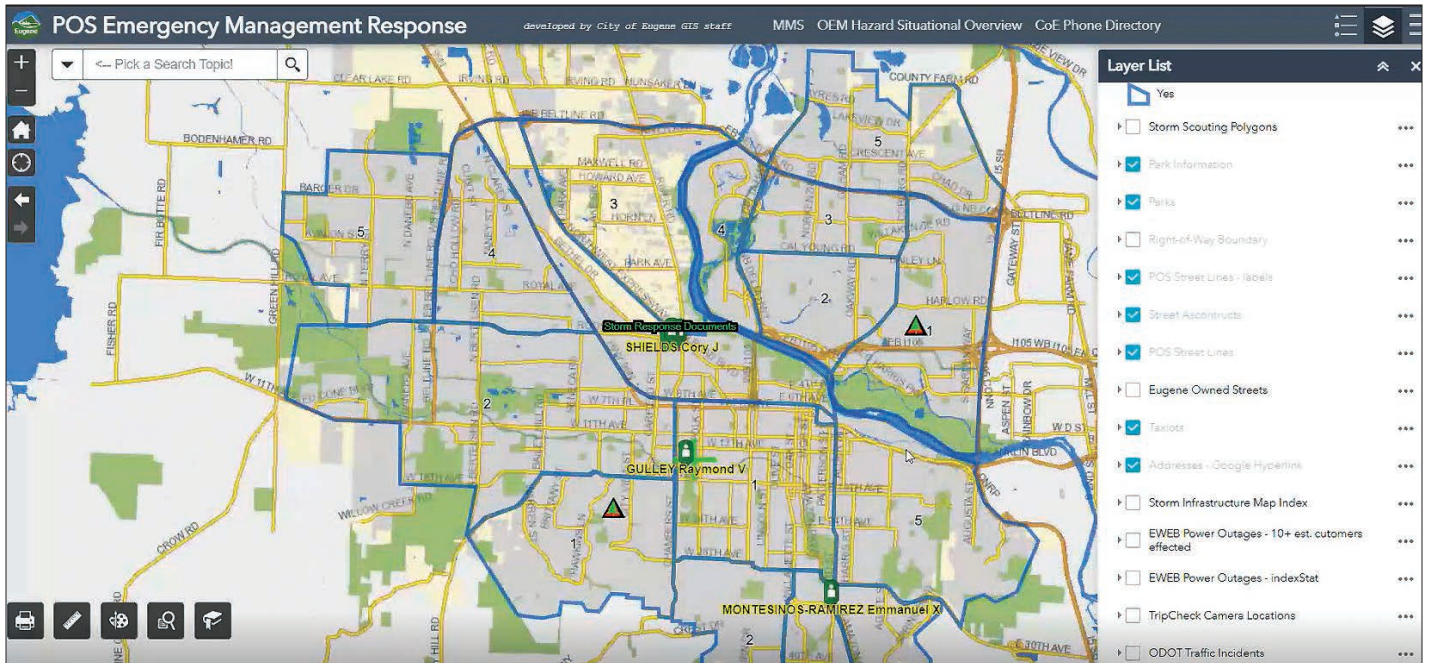
because each tree responds differently to the ice. Softwood tree limbs bend and flex with the ice, but hardwood trees hold the weight until they reach a critical mass and violently break. Many of the hardwood trees reached this critical mass at the same time and increased the number of work orders from 12 tree calls on the first two days to over 600 calls.

The City of Eugene's utilization of Esri's industry-standard GIS platform provides an opportunity for seamless data sharing and integration, thus preparing them for potentially larger-scale emergency events such as earthquakes. In this storm response, the POS GIS team began pulling data from their regional partners from Eugene Water & Electric Board (EWEB), Lane County, the City of Springfield, and Oregon Emergency Management. This regional GIS data, coupled with the tree inventory and many other city GIS data layers, helped better inform incident commanders and response crews of where there was likely to be considerable damage and potential electrical hazards.

During a 2024 ice storm, new features within Esri's suite of products were implemented to increase efficiency and staff safety. When an electrical line was involved with a given work order, the geofencing feature in Field Maps Designer was utilized to alert any staff within a 750-foot radius. A custom push notification alert was sent to



↑ Dedicated Eugene first responders meet with technical staff to review updated functionality and modifications to their GIS applications before going out in the field for the day.



their mobile devices indicating that they may be close to a potential electrical hazard. Alerts remained in place until certified EWEB staff verified that the line was turned off and the area was safe for the on-site crews to mitigate the tree hazard. Additionally, for tracking the debris cleanup and hazard mitigation effort, POS GIS staff implemented location tracking of their on-site crews by utilizing the “My tracks” layer in Field Maps. The storm scouts drove up and down each street and their route was tracked all day, allowing them to verify where they had scouted for tree hazards. This real-time data feed also streamlines the efficiency of the response efforts. All response staff can look at the map and see who is closest to a community member request, then make geographically based decisions on who is responding to a specific work order. The necessary number of licenses and newly implemented functionality were available to Eugene due to a recent acquisition of an Esri enterprise agreement (EA).

The Emergency Response Dashboard was an extremely vital tool for the team to track the storm response efforts, but even more so for the city manager and executive managers. The dashboard provided city leaders with a holistic real-time view of the response effort, critical insight into the

recovery effort timelines, and provided assurance that the team’s efforts were being managed effectively and efficiently.

Spatially Aware Response

When Todd Johnson, GIS administrator with POS, began his career, it was as a park specialist. Todd’s first tree-related storm response was in 2014, and he remembers the way things were before the use of any GIS tools or the storm scout model. “Far too often during storms, we would hear the words ‘stand-by’ over the radio while we sat and waited for our next job, hoping it wasn’t another duplicate call or that we would have to drive by undocumented issues that were a higher priority,” recalled Johnson. “It was terribly inefficient compared to our new model and tool chest, which decentralized command and empowered the experienced staff in the field who had eyes on the ground.”

Before utilizing this broad range of GIS applications (ArcGIS Web Applications, web maps, Field Maps, and ArcGIS Dashboards), the storm response teams lacked spatial awareness of critical assets such as trees and a shared real-time view of prioritized work orders. Knowing where key assets and prioritized detailed work

orders were located was crucial to their storm response model. If an outage occurred and one of their apps went down, it would halt the work of 80 staff members and significantly reduce the organization’s recovery efforts. GIS serves as the mission-critical technology for the City of Eugene and has replaced handwritten lists and printed paper maps. Without GIS, the team’s newly found workflow efficiency would be completely obsolete, and they would lack the ability to have accurate reporting for the Federal Emergency Management Agency (FEMA).

“We have come so far, and these tools have helped us so much,” continued Eric Cariaga. “The thought of us going back to our old chaotic system makes me anxious and stressed. Thankfully, the successes we have had with our deployment of GIS solutions have all but ensured its use in future emergency events.”

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Revitalizing Des Moines's Trail System with GIS Technology



The John Pat Dorrian Trail is a popular segment of the larger network of trails in Des Moines. (Photo courtesy of the City of Des Moines)

The trails crisscrossing Des Moines, Iowa, stand out as one of the city's most popular amenities. More than 3.2 million users, including cyclists, runners, and walkers, traversed the paved trailways last year—a figure greater than the entire population of Iowa.

However, limited resources have made maintaining the trail network difficult. When park planner and landscape architect Colby Fangman joined the City of Des Moines Parks and Recreation Department in 2017, he faced a daunting backlog of deferred maintenance needing to be documented and corrected.

"We only have one full-time employee and one seasonal employee taking care of 70 miles of trails," Fangman said. "Our trail system got way over its skis in terms of maintenance, staffing, and financial allocation." Routine upkeep (like mowing, tree-trimming, and trash removal) consumed most of the days for the two trail operators. They didn't have time to fix problems, such as potholes or erosion, so most issues compounded and worsened.

"We had so many issues," Fangman said. "We had no money. And our city manager is a finance person, so we were clearly instructed, 'Prove you have issues. Prove what it's going

to cost. Prove you have a plan to address it.'"

The backlog of park projects ranged from minor noncompliance issues to major safety hazards. Fangman and his colleague Derek Hansen, a fellow park planner, needed to show where each problem existed and prioritize areas of concern. They used GIS software to guide their approach.

Bringing Visibility to Trail Issues

Fixing Des Moines's damaged trails started with making a map. In 2019, Fangman and Hansen developed a new point location audit and analysis strategy to capture maintenance concerns and display them geographically.

As part of their new strategy, they conduct an audit every fall to gain a baseline understanding of trail conditions. The park planners scour each mile of concrete and asphalt, noting liabilities like cracks, unstable embankments, and rotting trees.

Fangman and Hansen use a GIS data collection app to record the precise location and details of each issue. Then, the results are presented on a shared trails audit web map, which categorizes issue points by level of liability and repair status.

After each yearly audit, they analyze the data to determine where repairs are most critical. This ensures limited resources are wisely spent.

In 2023, supported by their analysis and dynamic web map, park planners presented city leadership with a proposal for additional trail maintenance funding. The proposal outlined a \$3.9 million increase over 10 years to support trail operations and capital repairs.

When Fangman and Hansen presented the proposal to the city manager, a bill had just been passed to reduce spending by cities and counties across Iowa. Despite the new financial constraints, city leaders approved the Parks and Recreation Department's proposed budget increase for trails. "We were able to prove the value of applying more funding to address all these liabilities," Fangman said.

Clear data and visuals, supported by community feedback, helped persuade city leadership.

Des Moines residents consider the city's 22 trails a beloved and vital commodity—one that provides community wellness and connectivity. In addition to gauging trail usage, the City of Des Moines conducts resident satisfaction surveys every two to three years.

Consistently, residents rank trails as a top priority for the department.

Making the Right Repairs

The new trail maintenance budget not only meets community needs, it also mitigates risks.

Trails pose an inherent liability to cities. People have 24-hour access to trailways, and maintenance concerns raise the potential for harm. Improperly placed pylons may restrict access for users with disabilities. Uneven surfaces may cause a cyclist to crash. Flooding can knock over fencing and undermine trail stability.

As Fangman and Hansen audit Des Moines trails, they assign priority levels to each issue. These levels factor in liability. "Derek and I triage our issues based on health, safety, and welfare," Fangman said. "What is the greatest risk to the user? This is also inherently the greatest risk to the city in terms of litigation."

The highest priority problems demand immediate mitigative action. Failure to do so could put trail users and staff at risk. These issues include cracks or gaps in pavement large enough to catch bike tires, dead trees that pose a hazard of falling, and unstable soil that could cause the trail to collapse.

Typically, repairs of this magnitude require assistance from the city's engineering department, the public works department, or contractors. Since the trail audit web map is shared across the city departments, engineers or other city employees can quickly reference the data park planners collected.

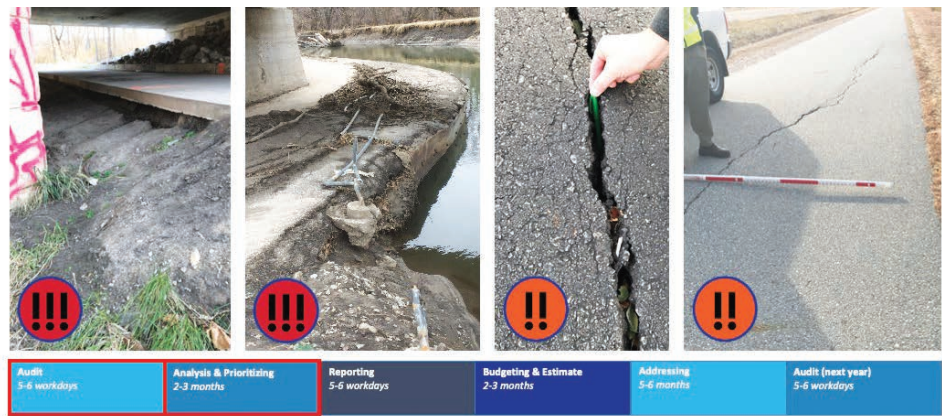
"It allows others to see what we've seen, so we can work together towards addressing it," Fangman said.

Nature finds new ways to challenge the park planners with each turn of seasons. After three years of drought, Fangman and Hansen saw a huge spike in issues due to soil weakening.

"We jumped from 400 to 900 active trail issues between our 2022 and 2023 audits," said Hansen. This equates to about \$5 million in new damages in a single year.

Luckily, the point audit and analysis approach treats the trail maintenance program as a living system. The trail audit web map updates in real time, and priorities can be adjusted based on resident feedback or other contextual factors.

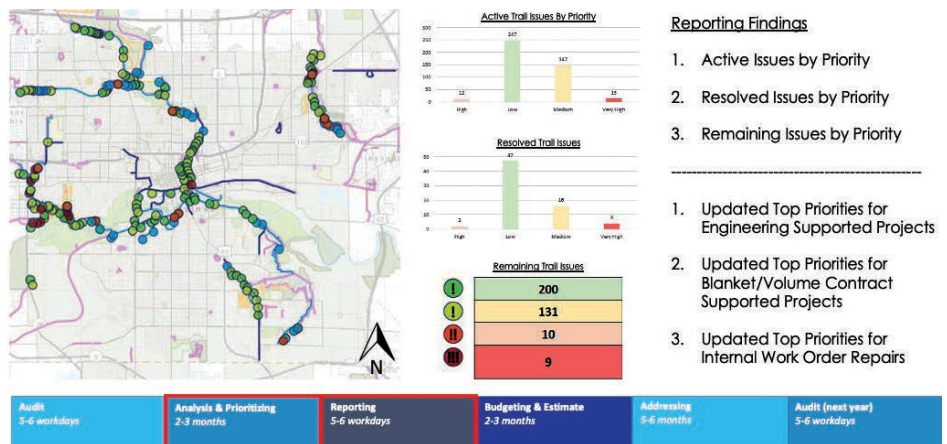
The park planners were rewarded with another financial windfall last year, following their increased budget proposal to city leaders.



↑ Trail audits discover a number of issues. Each of these issues required immediate attention. (Screenshot courtesy of the City of Des Moines)



↑ Smaller cracks, bumps, and obstructions are noted and put on the less urgent list. (Screenshot courtesy of the City of Des Moines)



↑ A map of active maintenance issues helps prioritize individual issues as well as larger refurbishment projects. (Screenshot courtesy of the City of Des Moines)

"We also got a one-time, \$1 million allocation from the city's American Rescue Plan funds," said Fangman. "The city manager told our department, 'Take a million and pick off two of your worst corridors.'"

Thanks to careful data collection and GIS, Fangman and Hansen knew exactly which

trails to target. Construction began in the Spring of 2024.



Learn how cities take a geospatial approach to outdoor recreation with GIS.

Maps, Apps, and Location Help Residents in Cobb County Get Outside

Cobb County, located in Georgia, is known for its commitment to providing exceptional recreational opportunities for its residents and visitors. The mission of Cobb County PARKS is to be an accountable steward of public park lands and recreation resources, as well as an efficient provider of quality, wholesome leisure services to benefit the body, mind, and spirit of all Cobb County residents. With a staggering 162 parks and over 250 miles of trails, the county's GIS team understands that, as a core component of a healthy and vibrant community, parks and recreation management is a location-based challenge.

To ensure that constituents of the community have equitable access to these beautiful spaces, Cobb County GIS staff took an innovative approach to engage the community by rolling out their centralized site titled "Get Outside,"

created with ArcGIS Hub™. This public hub provides all the maps and apps the community needs in one space to get outside and explore, whether for exercise, education, therapy, or adventure.

Parks and Trails Rely on Location

Accessibility plays a major role in the team's work, because to "get outside" people need to know where things are. Within the hub site, users can find all the parks and outdoor spaces near them with the Cobb County Park Locator map. This tool allows prospective visitors or residents to filter by the amenities offered, such as tennis courts, swimming pools, baseball fields, or football fields, and find the park or outdoor space that suits their needs. The park locator app has significantly enhanced park accessibility by providing residents with real-time information on park locations, amenities, and operating hours, ensuring

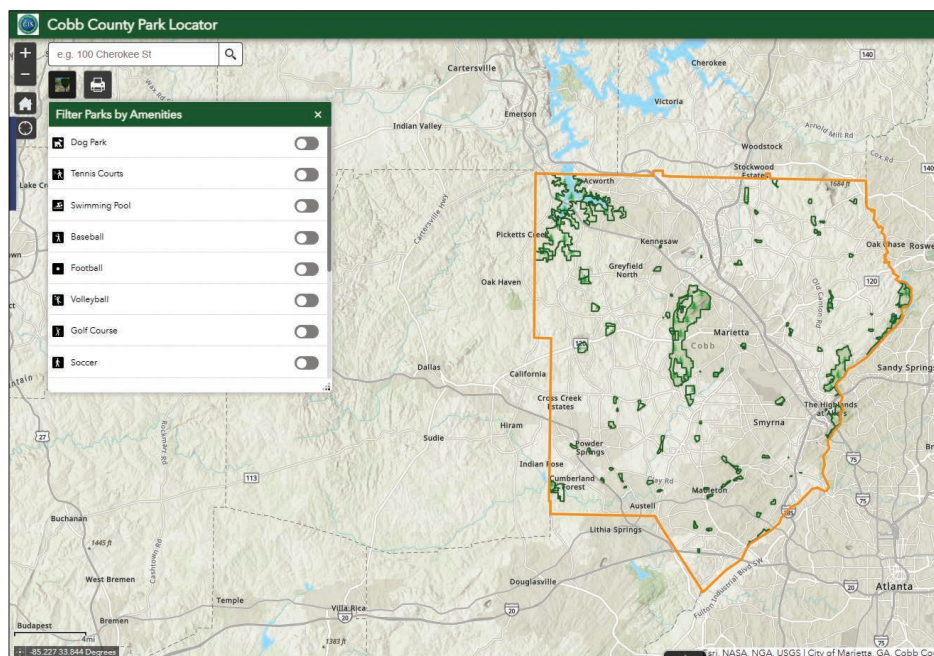
that everyone can easily find and enjoy local green spaces.

The Get Outside hub site also includes the Cobb County Trail System story created with ArcGIS StoryMaps™, which provides information about each of the trails managed by the county. The county has hundreds of miles of existing and programmed trail networks that connect major areas throughout the region. It is critical to ensure these trails are maintained so they can provide a healthy commuting alternative for travelers who want to avoid road congestion or just enjoy the outdoors. Each trail system is displayed on the map and gives information about the trail system, including distance, amenities, and location.

The county's trails are supported by an Emergency Locator Marker (ELM) program, which is explained in detail on its own site built with ArcGIS Hub. Studies show that 34 percent of US emergency response calls go to a location without a street address—and recreational trails are a leading category of these calls. To combat this problem, the GIS team developed a standardized ELM system that can be used anywhere in the nation in a variety of scenarios.

Every quarter mile of trail network within the county has an ELM that is backed by the US National Grid (USNG) alphanumeric coordinates. When provided in 911 calls, this coordinate serves as an "address" to get first responders as close as possible to the source of the emergency. Although the site of the emergency might not be precisely at its nearest marker, the ELM gets first responders very close to the incident and reduces the amount of time it takes to help those in need. First responders have embedded notes in their front hazard code that give detailed instructions on how best to access the point of emergency.

In an emergency, time is critical. Location-based information from Cobb County's ELM system has successfully aided in the response of over 400 calls from people who were lost or in need of medical assistance. For the trail user, this easy-to-use method provides a feeling of security when out on the vast network of trails.



↑ People who visit the Get Outside hub site created with ArcGIS Hub can filter by amenity to find exactly what they are looking for in their park experience.

Park Maps and Apps Serve as a Tool for Education and Outreach

GIS helps recreation managers understand recreation trends, tailor educational content to their audience, conduct outreach efforts, and facilitate engagement around priority initiatives. With their ELM system, Cobb County GIS has been able to extend their outreach efforts to educate children on trail safety. Through annual events like a summer mountain biking camp and the Cobb 911 Kids Expo, young trail users are exposed to tips on how to remain safe on trails and how they can help others in need while recreating in more remote terrain.

But education does not stop with the children and the ELM system. Cobb County PARKS manages and maintains 12 ponds within several of their park properties. Part of that responsibility includes managing and maintaining healthy, stable fish populations for the angling enjoyment of Cobb County residents. Park patrons can access the PARKS Ponds hub through a link on the Get Outside site to plan their fishing expeditions. This site enhances the visitor experience by providing all the information needed when planning to fish, such as current pond statuses, pond locations, the species of fish stocked, parking information, and even instructions on how to obtain a Georgia fishing license.

The hub site also includes a story created with ArcGIS StoryMaps that shows pond visitors all the information in a fun and interactive manner. Aerial imagery of each pond is displayed along with supplemental images of on-the-ground views to give potential visitors a firsthand look of what to expect from each pond.

In addition to their hub site, PARKS staff are putting up information signs at their ponds across Cobb County. As Cobb PARKS GIS analyst Caroline Johnston stated, "The PARKS pond signs project came about because we wanted a way to more efficiently manage our ponds, but also provide an educational resource for the public." The signs include a link back to the PARKS Ponds hub site that has all the latest information. Further, the ELM system did not stop at the trail system, but is also fully integrated with each of the county's ponds, providing an immersive and safe environment to fit all leisure preferences in their parks and open spaces.

Leave No Trace in Open Space

Cobb County PARKS serves as a trailblazer in creating smart parks with GIS. By leveraging ArcGIS capabilities, the county could drive the purpose of their mission to provide park access and enjoyment to all residents and visitors. "Leave No Trace," a slogan employed by the team, can serve as the benchmark for all other parks and

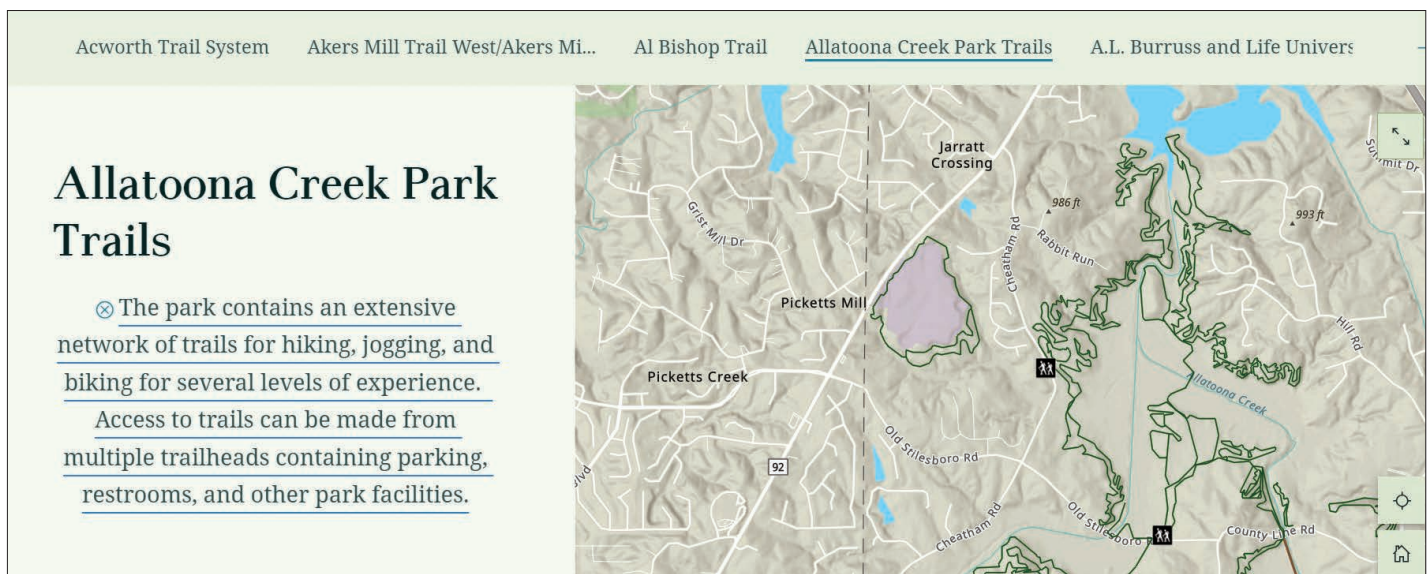


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recreation management professionals. Creating an inclusive and informed park patron community gives people the opportunity to take ownership in keeping parks and open spaces clean and green. Through location technology, the GIS staff made parks and recreation information more accessible and actionable.

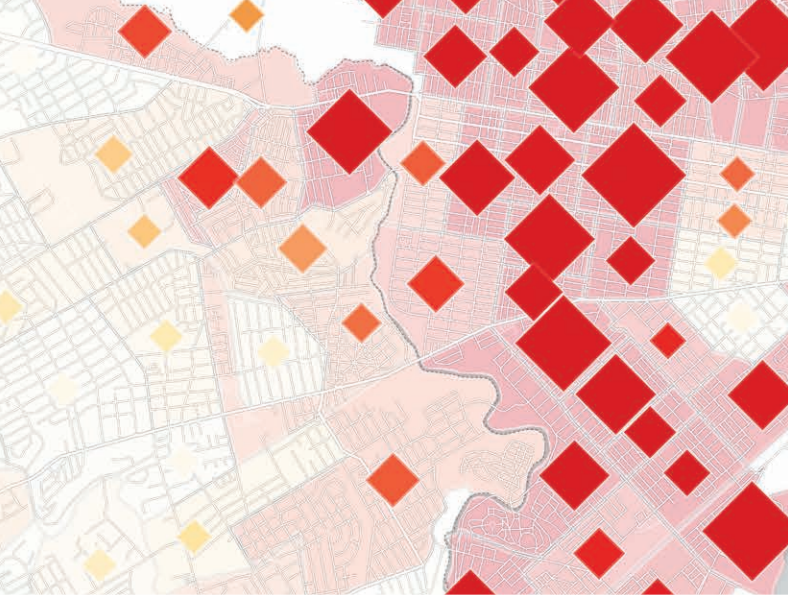


Acworth Trail System Akers Mill Trail West/Akers Mi... Al Bishop Trail Allatoona Creek Park Trails A.L. Burruss and Life Univers...

Allatoona Creek Park Trails

- ⊗ The park contains an extensive network of trails for hiking, jogging, and biking for several levels of experience.
- ⊗ Access to trails can be made from multiple trailheads containing parking, restrooms, and other park facilities.

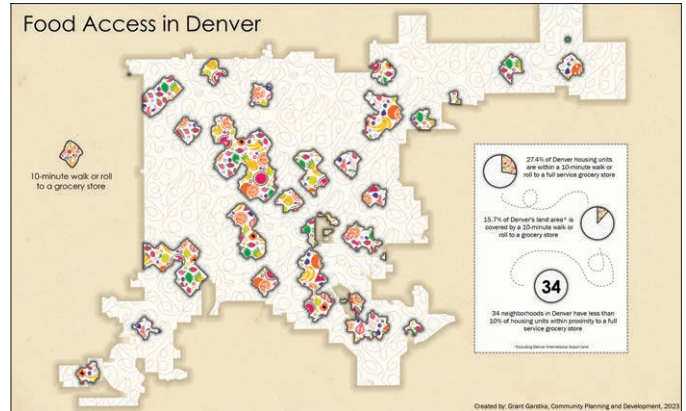
↑ Each trail system is displayed on a map with a brief description to provide an equitable means of selecting a trail.



City and County of Denver

Food Access in Denver

Combining data around grocery store locations and housing units allows the city and county to prioritize the 34 identified neighborhoods in Denver that are not within close proximity to a full-service grocery store.



Highlighting Equity Use Cases Across Industries

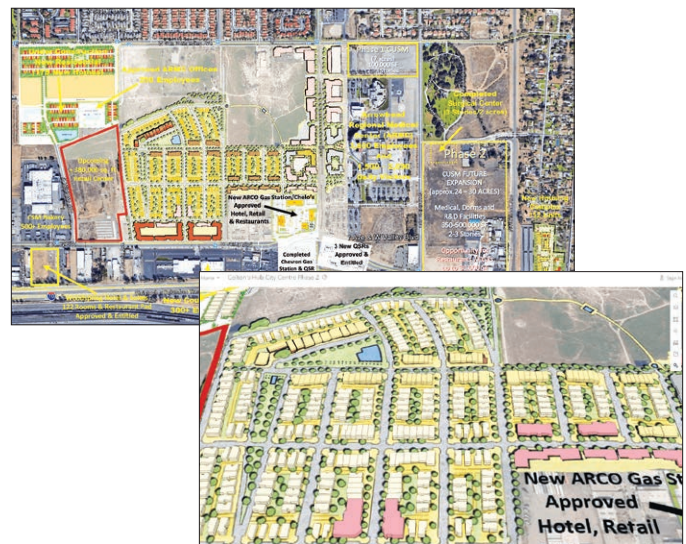
Esri's Inaugural Equity and Social Justice Map Booklet

The inaugural Esri Equity and Social Justice Map Booklet highlights over 50 user examples across 13 industries who are working at the intersection of equity and GIS. The jurisdictions and organizations found in the booklet have successfully embedded equity into their operations with data, mapping, and facilitated community engagement. Throughout the booklet you will also discover how each project highlights one of the four steps within a GIS-based equity strategic plan: understand your community, create a location strategy, operationalize your work, and measure impact. By leveraging data and mapping software, organizations across the globe have been able to operationalize their equity plans and continue to monitor them with a variety of GIS tools. Here you will find key organizations who have successfully executed their equity initiatives with GIS technology.

City of Colton, California

Bringing a Stalled California City to Life

The City of Colton turned to GIS technology to map Colton's transformation into a more livable, healthier city. A GIS-driven digital twin of the city was used to plan and market the development of the Hub City Centre.



Rocky Mount, North Carolina

Solving the Affordable Housing Puzzle

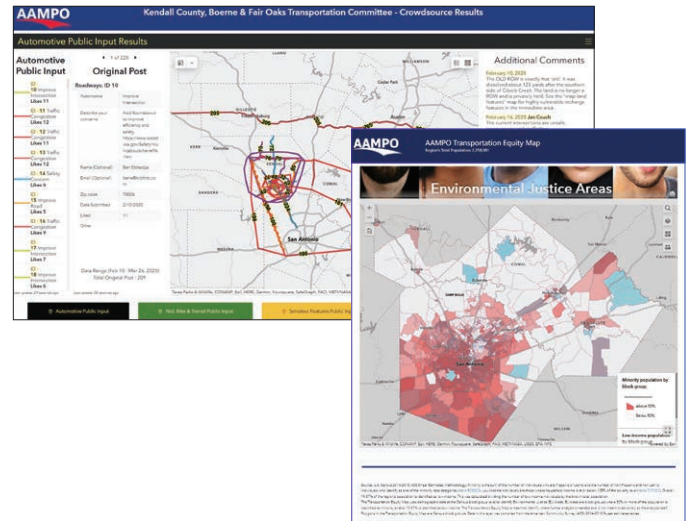
Rocky Mount, North Carolina, built a digital twin representation of the city's existing built environment to serve as contextual background. Applying GIS tools helped the city analyze where the need for more affordable housing is the greatest. The digital twin allowed them not only to determine how many housing units could be built but also to see if additional parking would be required.



Alamo Area Metropolitan Planning Organization

Prioritizing Environmental Justice Areas

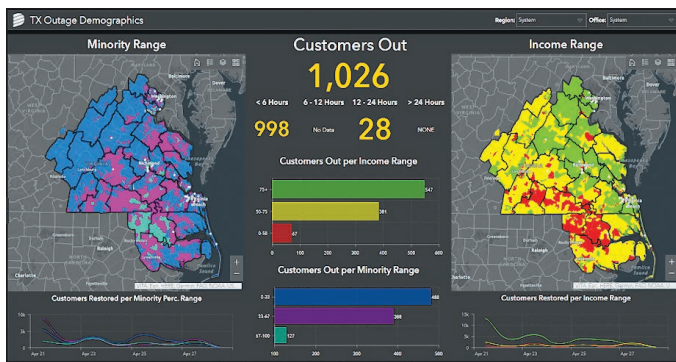
The Alamo Area Metropolitan Planning Organization in Texas leveraged a suite of GIS tools to build out their Transportation Equity Map. The map uses demographic data at the level of census block groups to identify environmental justice areas in the region.



Dominion Energy Virginia

Operationalizing Environmental Justice, Social Equality, and Customer Equity

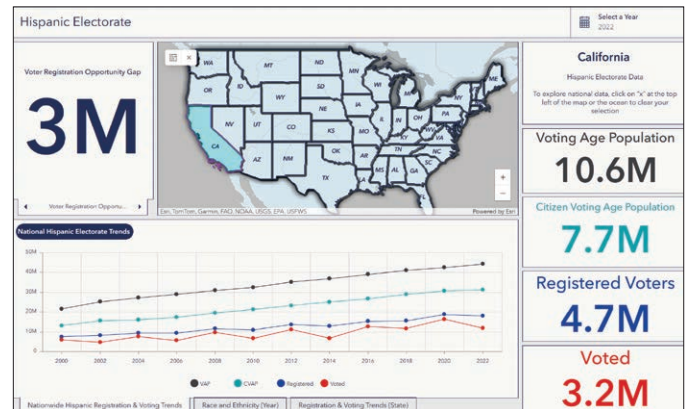
Dominion Energy Virginia is an electric transmission and distribution subsidiary of Dominion Energy, and they utilize GIS software through applications that help make better decisions regarding large projects, like the Outage Restoration Plan. The software allowed the company to ensure their projects were not causing any population to bear a disproportionate share of negative environmental effects.



UnidosUS

UnidosUS Latino Vote Initiative

UnidosUS, the nation's largest Hispanic civil rights and advocacy organization, sought to establish an accurate understanding of the Hispanic electorate to foster greater and more effective engagement with these voters. Leveraging ArcGIS Hub, they were able to provide detailed insights into the perspectives and priorities of Hispanic voters.



Access the complete Esri Equity and Social Justice Map Booklet





esri SAG AWARD

SPECIAL ACHIEVEMENT IN GIS

Esri acknowledged the achievements of several domestic and international organizations with the Special Achievement in GIS (SAG) Award ceremony at the annual Esri User Conference (Esri UC) in San Diego, California. The SAG Awards recognize innovative and intelligent applications of GIS technology. Esri users are nominated by Esri leaders and distributors, and finalists are selected by Esri president Jack Dangermond. These organizations set new standards throughout the GIS community. Organizations from around the world are honored at Esri UC. They span industries including agriculture, public works, economic development, education, transportation, health and human services, law enforcement, emergency response, and utilities. "The SAG Awards highlight extraordinary achievements and efforts to improve our world," said Dangermond. "Each year, I look forward to being part of this ceremony. It is a tradition that means a great deal to Esri and to GIS professionals." Here are the US state and local government users recognized this year. See the full list of SAG Award winners at go.esri.com/2024-SAG-Gov.

US State and Local Government SAG Award Winners

- Arizona Department of Administration 9-1-1 Program
- Arizona Game and Fish Department
- Arkansas Department of Transportation
- California Department of Transportation
- Central Contra Costa Sanitary District, California
- Central Florida Regional Transportation Authority (LYNX)
- Central Mississippi Planning and Development District
- Chatham County Emergency Services, Georgia
- City of Auburn, Alabama
- City of Boulder, Colorado
- City of Evansville Water & Sewer Utility Department, Indiana
- City of Greenville, South Carolina
- City of Grimes, Iowa
- City of Las Cruces, New Mexico
- City of Lawrence, Kansas
- City of Nampa, Idaho
- City of Oak Hill, West Virginia
- City of Oakland IT Department, California
- City of Portland Public Works, Maine
- City of Rocky Mount, North Carolina, and ViewPro
- City of Round Rock, Texas
- City of Sandy Springs, Georgia
- City of Scottsdale, Arizona
- City of Tucson, Arizona



- City of Tulsa, Oklahoma
- City of Waukesha, Wisconsin
- City of West Fargo, North Dakota, and Pro West & Associates Inc.
- Commonwealth of Kentucky Transportation Cabinet
- Commonwealth of Massachusetts
- County of Carroll, Maryland
- County of Dupage, Illinois
- County of Franklin GIS Department, Virginia
- County of Franklin, Pennsylvania
- County of Kauai Planning Department, Hawaii
- County of Mecklenburg, North Carolina
- County of Olmsted, Minnesota
- Douglas County GIS Department
- Hackensack Police Department, New Jersey
- Inland Empire Health Plan, California
- Kansas Overdose Response Strategy, Kansas
- Massachusetts Executive Office of Energy & Environmental Affairs
- Metropolitan Governments of Nashville & Davidson County, Tennessee
- Mid-America Regional Council
- Midpeninsula Regional Open Space District, California
- Milwaukee Metropolitan Sewerage District, Wisconsin
- Monroe County, Ohio
- Nebraska Department of Natural Resources and Nebraska Emergency Management Agency
- New York City Department of Finance
- Ohio Geographically Referenced Information Program (OGRIP) and Catalis
- Oklahoma City Utilities Department, Oklahoma
- Pennsylvania Game Commission
- Port Authority of New York and New Jersey Airports
- Port of Los Angeles, California
- Rhode Island Department of Public Health
- Snohomish County GIS, Washington
- South Florida Water Management District
- St. Johns County Public Works Department
- St. Tammany Parish, Louisiana
- State of Alaska Department of Environmental Conservation
- State of Connecticut
- State of Montana
- State of Utah and County Assessors
- Texas Department of State Health Services
- The Mohegan Tribe CAD/GIS Document Control Department
- The New York Power Authority; Canals
- The Oregon State Marine Board
- The State of New Mexico Department of Finance
- United States Forest Service
- Xenia Rural Water District, Iowa

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Mecklenburg County Streamlines the Addressing Process Using GIS

As the second largest county in North Carolina and with nearly 700,000 addresses to maintain, Mecklenburg County is serving as a model for others to follow by using GIS technology. The Address Data Management Division of Geospatial Information Services is responsible for maintaining situs addresses and road centerlines for all of Mecklenburg County. A single address record holds information including the house number, street name, zip code, postal city, jurisdiction, volunteer fire districts, and special tax districts. All this data is vital to the permitting process for code enforcement, supports 911 dispatch for emergency management, and is shared with other county agencies as well as the public at large. GIS is the critical system for the addressing department in Mecklenburg

County to create and maintain their addresses in the most efficient way.

The county's GIS professionals have developed a state-of-the-art, geographically based system to streamline the process of creating and maintaining addresses from beginning to end. Addressing managers are using GIS solutions to more easily delegate work and track staff performance, as well as to eliminate the duplication of work and addresses. Most importantly, the public is also much better supported, as requests are received and resolved more quickly.

Navigating Manual Address Creation

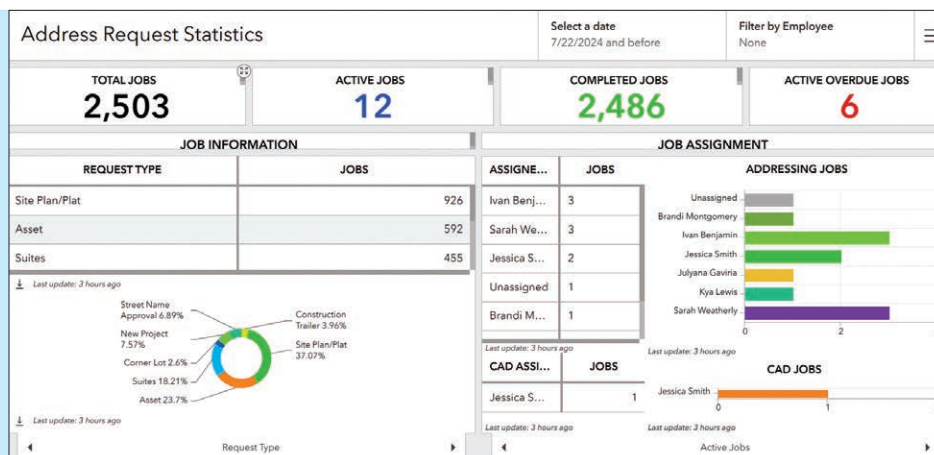
Before implementing GIS, the county managed address creation manually in Excel spreadsheets, which only tracked major and minor developments involving

new parcel creation. This did not include other requests, such as facility assets like meters, retaining walls, or accessory dwelling units' cell towers. And it could take up to a week or longer for an individual address to be created upon its request.

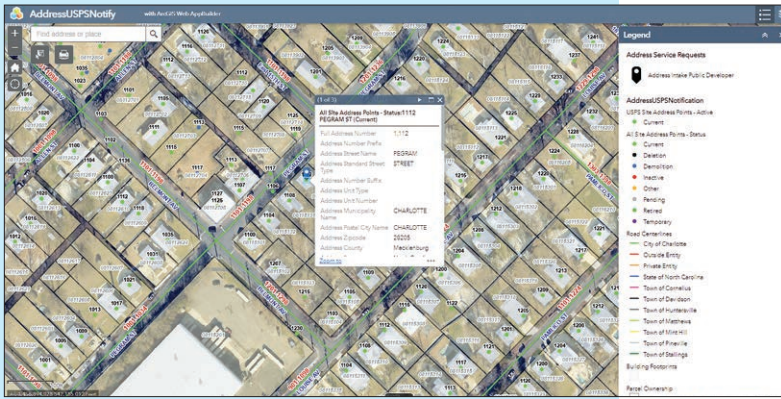
The limited ability to track staff performance was also an issue. For years, customer service management, as well as ad hoc phone calls and email requests, had also been handled by internal Excel spreadsheets. This made it hard to delegate work and avoid the duplication of addresses, causing customer service to suffer overall as customers had no way of knowing what the timeline for the creation of their address would be. If addresses were not created in a timely manner, then problems in other departments would also occur. For example, 911 services would not have a location with a new address on file, making it difficult to respond to an emergency there.

Implementing GIS Web and Mobile Apps for Success

With public engagement being a top priority to resolve in Mecklenburg's addressing system, the team got together to develop a new customer request system using ArcGIS Enterprise. The new addressing assignment request system comprises a series of configurable GIS tools woven together to make a more cohesive and understandable system—not only for GIS staff to work within each day, but also for the public to interact with.



↑ GIS dashboard showing live tracking of work order projects and staff assignments.



← Address verification and notification viewer in ArcGIS Web AppBuilder.



← Completed address service request map viewer.

Starting with ArcGIS Survey123, the team designed a customer-based interactive web form that was made accessible through the county's GIS addressing web page. The form was designed to accept digital file attachments and to capture customer contact information. It provides a standardized way for customers to submit requests, which can all be managed by staff in the same system.

The next product in play was ArcGIS Web AppBuilder, another configurable GIS software product. County staff used Web AppBuilder to display where new addressing service requests are located geographically. Any requests sent through Survey123 are automatically reflected on the web app. This visual component is a huge plus for staff, allowing them to see where address requests are coming from, and which ones need to be worked on.

Now that they had an easier process for receiving addressing requests, the team needed an internal system to manage and work on the requests. ArcGIS Workflow Manager Server functions as the main workhorse of the overall system. Used for

the step-by-step management of working address service requests, the system also contains an email customer notification component for when certain addressing work "actions" take place. This allows addressing staff to better support the customer as they are notified in real time of a project's status.

Lastly, ArcGIS Dashboards was configured to help manage service request volume, status, and assignments to staff. This dashboard allows staff to check the status of overdue requests, view all their addressing data in a more organized way, and download comprehensive monthly reports of their work to present to other managers for long-term progress tracking.

GIS Addressing System Boosts Efficiency and Staff Satisfaction

Having spent nine months building their new GIS platform, the county's significant efforts did not go unrewarded. The entire addressing department is in favor of the new system. They like the fact that it does a lot more of the work for them, particularly with the customer/requester engagement portion. The typical address requester

is primarily either a land developer or construction company. They have also adapted quickly and appreciate the new system, especially its new email notification capabilities that provide updates on the progress of their individual request.

Overall, the new system is a significant time-saver and allows county staff to be better supported in their addressing work. Address creation, which used to take over a week, now only takes one to three business days. When an assignment is overdue, managers know exactly where to turn their attention. This provides significant and much-needed improvement to the customer service aspect.

The county also won an award from the National Association of Counties (NACo) for their outstanding work in the addressing department, which serves as a model for other addressing and land records departments to follow.

“ GIS has completely streamlined our addressing department from beginning to end. It has made everyone's work much easier, and passing critical addressing information to other departments, including 911 services, allows everyone to do their work better and more efficiently. ”

Jia Wei

Director of Geospatial Information Services, Mecklenburg County

The Future of GIS at Mecklenburg County

Mecklenburg County's GIS manager, Jia Wei, is very satisfied with the addressing department's new address assignment and request system. Wei and other GIS professionals at the county have hopeful plans to further implement GIS in other areas, including in urban planning and tracking construction projects. Mecklenburg County's ambition and success serves as an example for other addressing departments to follow.



Manage your addressing data with GIS. Scan the QR Code.

Small City, Big Initiatives

City of Seguin Improves Water and Electric Asset Management with GPS and GIS

Seguin's Utilities Department uses high-accuracy maps to assist with regulation compliance and to migrate their electric network to ArcGIS Utility Network

About one hour northeast of San Antonio, Texas, the small city of Seguin serves just over 30,000 residents with water, wastewater, and electric utilities.

Within the Utilities Department, smart grid solutions manager John Saldana creates systems that tie together the water utility department and the electric utility department.

"If anyone needs a map for internal, nonpublic information—whether it's electric, water, or sewer—in order to support utility infrastructure projects, that comes from us," Saldana said. "We are the middleman between utilities and the city, so we support all of their technology needs, beyond the traditional IT department."

Increased Development Drives the Need for Accurate Utility Maps

The City of Seguin is experiencing solid growth as it expands toward neighboring New Braunfels, and vice versa. As farmland between the cities is developed, the demand for municipal water, sewer, and electric services is rising.

The city wanted to find a way to accurately map existing assets prior to development, as well as new construction as utilities are installed. In this way, they help builders avoid hitting existing utility infrastructure during construction and set them up for success in the future, when crews will inevitably be sent to service the utility grid.

"The assets are all very close in proximity to each other, so it's important that we have the best accuracy we can," Saldana said. "We're trying to prevent accidents with water and electricity."

The Solution: ArcGIS Field Maps, Arrow Gold GNSS Receivers, and Tablets

Saldana equipped field crews with ArcGIS Field Maps, which allowed him to control incoming data quality.

"Data does not exist in a silo," Saldana said. "It's designed to be shared, expanded upon, integrated, and consumed upstream and downstream. We keep this in mind as we're building and capturing something as simple as a point. This is where it all starts. That information keeps flowing through the systems to build upon these projects and information to whoever would like to use it."

To ensure location data comes in with high accuracy, Saldana deployed four Arrow Gold global navigation satellite system (GNSS)



↑ This image shows part of Seguin, featuring a substation, along with new neighborhoods that are currently under construction.

receivers from Esri partner Eos Positioning Systems. The Arrow Gold receiver connects to an Arrow Gold base station, which provides real-time kinematic (RTK) corrections that allow field crews to stream survey-grade locations into ArcGIS Field Maps on mobile devices.

Saldana tried many GNSS receivers before choosing the Arrow Gold, but each came with its own limitations: expensive subscriptions, complex training, inability to achieve the advertised level of accuracy, poor customer service, and, in one case, a receiver that could no longer support the evolution of Esri apps.

"All told, we had gone through several other manufacturers and their products, and they were just not what we were looking for," Saldana said. "With our small team, we have limited resources, limited budgets, and diverse projects. So we're always looking for technology that is very simple but also complex enough to handle a variety of situations."

The city also chose to install its own Arrow Gold base station to control its RTK corrections, after testing various private base stations in the area.

"We would pay a fee to use them, but they were down too often," Saldana said. "They just weren't giving us the right amount of reception and satellites needed, and we noticed a lot of base stations, especially those in rural areas, were not maintained too well."

The Workflow: Capturing Existing Assets and New Developments

Today, the City of Seguin has one full-time data collection employee who captures high-accuracy data all day long. All other field staff have been trained to use field data collection tools set up with ArcGIS Field Maps and the Arrow Golds.

To map existing utilities, Saldana waits to hear the key action items from the city's predevelopment meetings. There, landowners, builders, and other stakeholders discuss what utilities are currently on the land, how best to tie them into the municipal system, and whether existing assets require upgrades to accommodate the amount of expected new residents or development. This information is passed back to the Utilities Department so Saldana

can assess how quickly he needs to send someone to map existing utilities. He can pass that information on to third-party builders, then share it with the appropriate staff and outside parties.

Once on-site, the data collector interprets drawings and their knowledge of the area to determine where assets are located. Sometimes they use underground utility locators or, in the worst cases, dig up (or "pot-hole") the ground to locate assets.

"Older infrastructure is harder to map," Saldana said. "It takes experience plus treasure hunting. But once we capture a few, we can identify a pattern and usually sort some things out. Thankfully, some of our staff can point at a tree and tell you not only there's an asset there, but also what direction it's flowing. They're our go-to people when we want to know what's around. So now we're capturing that in our system as fast as we can."

As the data is captured, utility data analyst Felecia Helms performs quality control checks before publishing information to the enterprise GIS. Saldana hired Helms in 2023 as the city's second utility data professional.

Then, as construction occurs, Saldana sends someone to map assets in real time. The quality of their own captured data is far better than interpreting paper as-builts from third parties, according to Saldana.

"I can tell you that on new developments, when we receive a big roll of paper drawings, those are not 100 percent accurate," Saldana said. "By going out there and validating it ourselves, we can be sure that years later, when we receive a call to go out there, we'll be glad that we put our own eyes on it and captured that information firsthand. Now we know for sure where our assets are."

continued on page 18

→ The data the analyst collects informs stakeholders ranging from city hall members to contractors to colleagues in the city's water and electric departments.



By building out the city's utility maps with such high accuracy, Saldana and Helms have been able to better prepare for two big upcoming projects. There is one each for the water utility and electric utility departments, with Saldana leading the electrical project and providing help as needed to the water project.

AMI Meter Replacements Help Compliance Efforts

Like many cities, Seguin is currently deploying an advanced metering infrastructure (AMI) upgrade. As technicians install smart meters, they take before-and-after photos and map each meter's location. The data is captured in ArcGIS Field Maps with centimeter-grade accuracy, and Saldana expects the photos and locations to help the city comply with federal regulations for lead service lines.

Normally, the city doesn't concern itself with infrastructure beyond the meter, as that belongs to the customer. But new regulations are asking the utility to help determine whether any service line material running through the system is lead, including any lead line running past the meter, so it can be replaced. According to Saldana, the photos they're taking will be submitted to regulators, who can input them into their internal tools that will help determine which residential service areas have lead service lines and should be targeted for replacement and validated for compliance.

"The primary information they want is the picture," Saldana said. "Then they can utilize their systems tools to review those pictures and categorize if the asset is plastic, steel, or lead. By having a photo at each point with high accuracy, we can prove we're doing our due diligence and make everyone's job more efficient. We just want to know whether or not we have lead in the system."

In addition to streamlining water-utility compliance, the accurate enterprise GIS is also enabling a smooth transition to new technologies.

Migrating Electric Records to ArcGIS Utility Network

Another big project Seguin is undertaking is the city's migration of electric utility data to ArcGIS Utility Network, a tool for better managing utility systems. Helms is heading up this migration.

"Many people have no idea how much work goes into migrating to ArcGIS Utility Network," Saldana said. "Right now, she's tackling the Utility Network migration, which is a big task."

→ In preparation for utilizing the Arrow Gold GNSS receiver, Helms always makes sure assets include IDs. These IDs populate automatically each time city staff collect an asset with the Arrow Gold GNSS receiver and ArcGIS Field Maps.

Initially, Saldana built the city's ArcGIS Utility Network prototypes, and now Helms is bringing them into production. The city also hired a third-party company to collect field data and update some of the details and data; they will then put this data into the prototypes before Helms completes the migration. The Utilities Department has partnered with an outside contractor to assist with a comprehensive study and collection of electric assets, including transformers and poles, to ensure the data is of production-level quality. Helms has been monitoring the incoming data to ensure it meets the city's quality standards.

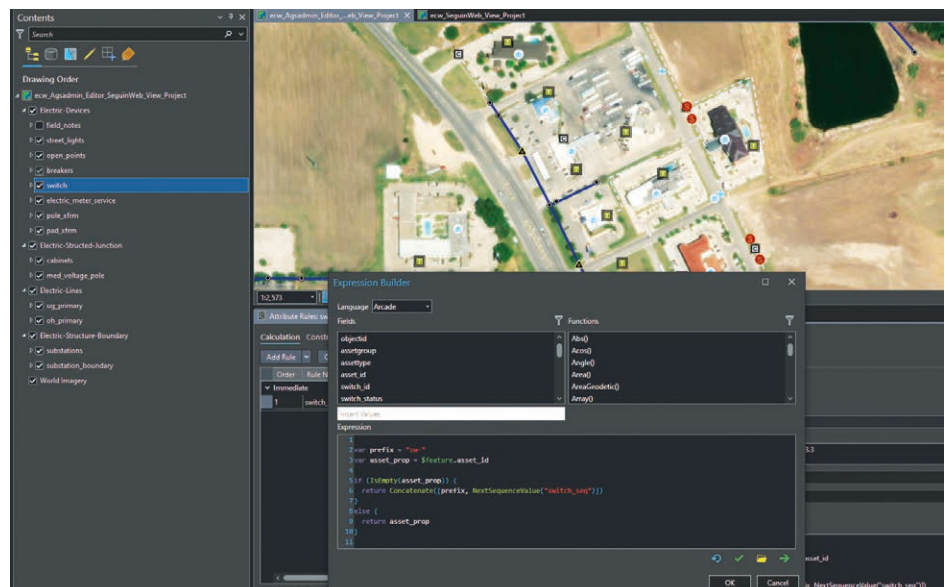
"With the help of John [Saldana], we already built a utility network that is mostly functional," Helms said. "It was all connected, except for one dirty area that couldn't seem to be fixed. So now we're just trying to get all the assets triple-checked and ensure the data is correct. Then we can do a full connection for our utility network to move to the next phase."

Once the migration is complete, ArcGIS Utility Network will be used to manage the entire electric system and feed the outage management system (OMS) with valuable data for proper intervention. Once the electric migration is successful, Helms will tackle the water utility network.

Looking Ahead

At the end of the day, Saldana says, the city's success lies in having accurate GIS data. The enterprise GIS acts as the system of record for the AMI, supervisory control and data acquisition (SCADA), billing, and OMS systems.

"I'm passionate about traversing all these data integrations and making sure it's accurate," Saldana said. "People have to recognize that good asset management starts with collecting good data."





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GIS Dashboards Boost Efficiency of Atlanta's Transportation Projects and Right-of-Way Acquisitions

Atlanta is a bustling metropolis and home to nearly 500,000 people. Like most cities, Atlanta works hard to maintain and improve its transportation network for all residents. The main funding sources are from the federal and state governments, with the remainder from local sources. Traditionally, these local dollars came through the city's General Fund, which was stretched thin.

When residents approved a half-cent sales tax to fund transit projects, they also approved a Transportation Special Purpose Local Option Sales Tax, known as TSPLOST. Over five years, TSPLOST was projected to raise \$300 million dollars in funding for transportation improvements, including resurfacing, restriping, bus stop and streetscape enhancements, pedestrian safety measures, and bicycle lanes. It was TSPLOST funding that finally made improving Cascade Road, a major thoroughfare in Southwest Atlanta, a reality.

The City of Atlanta's Department of Transportation (DOT) turned to GIS technology to visualize the process and progress of acquiring a right-of-way, which allows them to manage their data more efficiently. This improves the ease of access to information regarding the progress of their project and causes workflows to be significantly faster than before.

Keeping Cascade Road Improvements Project on Track with Advanced GIS Tools

With funding in hand, city officials knew they needed to find new ways to improve the project's efficiency, so they started with the right-of-way (ROW) acquisition process. The Cascade Road project, at \$20–30 million, required land rights from over 60 parcels of property. Road design and construction project manager Conredge Lewis felt the traditional spreadsheet method could

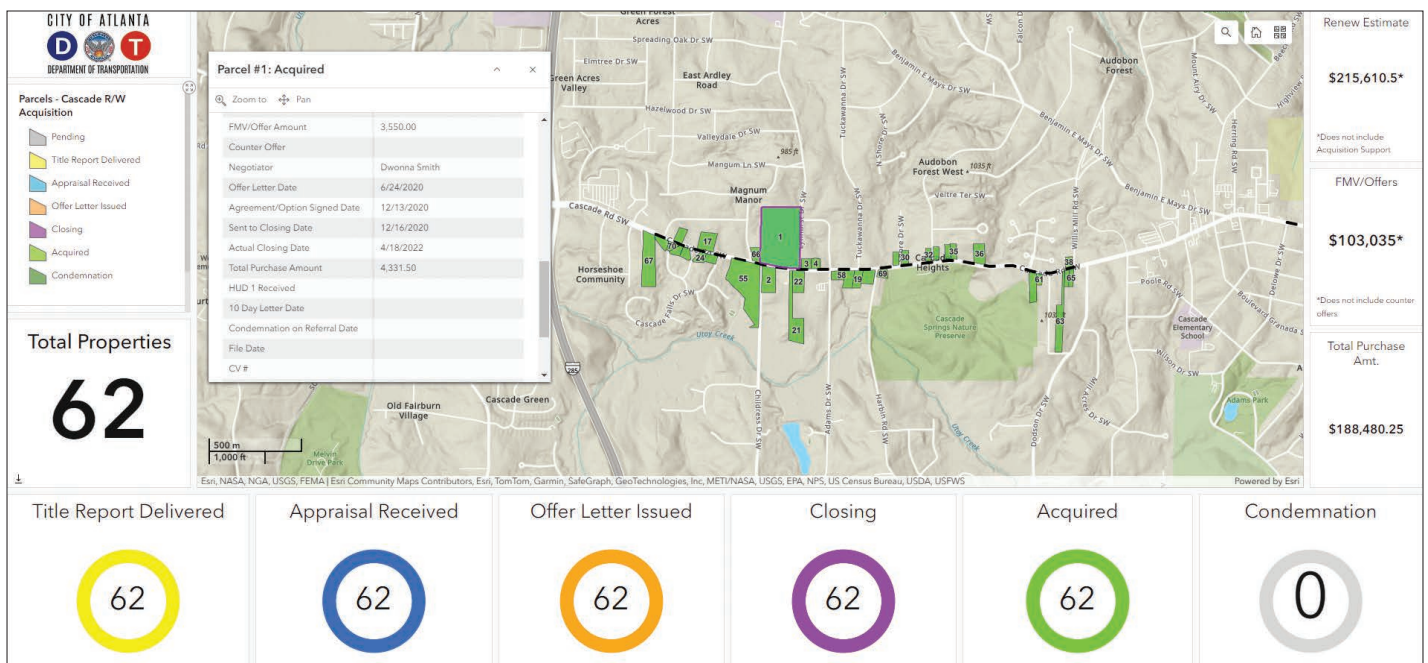
not handle a project of that scale. From experience, he knew the spreadsheets were cumbersome and difficult to analyze, which caused workflows to move slowly and made project updates hard to track, which was concerning.

"From the mayor, council members, neighborhood associations, appraisers, contractors, and other internal stakeholders, we knew it would be a challenge to keep everyone involved in the project informed with the latest information," said Lewis.

Without the use of an efficient ROW acquisition management system, officials also knew additional costs and project delays were likely.

Developing a Custom GIS Solution for Efficient ROW Management

So, Lewis consulted with GIS manager Greg Underwood, and they went to work developing a GIS solution. Underwood set



↑ GIS dashboard developed for Cascade right-of-way (ROW) acquisition

out to map every parcel of land that needed to be acquired for their project, which provided the foundational visualization of their management system.

Using ArcGIS Dashboards and ArcGIS Web AppBuilder, Underwood created a ROW acquisition application. This app tracked the progress of the project and updated parcel information in real time. By hosting the solution in ArcGIS Online, project managers like Lewis could easily edit and update parcels as their statuses changed. This allowed for easy communication about ROW acquisition progress.

GIS Enhances Collaboration and Streamlines Cost Management in ROW Acquisitions

Using GIS to manage ROW acquisition has proven very successful for Atlanta DOT. For the Cascade Road project, officials were able to monitor the cost of acquisition throughout the process, keeping the budget on track. Additionally, everyone had a comprehensive understanding of how acquisitions were progressing, which was vital to the project timeline since construction could not begin until all properties were settled. During public meetings and other interactions where current updates were sought

immediately, DOT staff also found the dashboard invaluable.

“The Cascade Road project is a big deal,” said Lewis. “Getting it funded was a big challenge, but now that residents are seeing progress, they are excited. The project means a lot to a lot of people.”

What Lies Ahead

Responsible for over 1,500 centerline miles of roadway, Atlanta DOT has no shortage of projects. Plans are already underway to continue expanding the use of ROW acquisition GIS dashboards for future projects. The next one will support the Campbellton Road Smart Transit Corridor project. The dashboard is already configured and ready for acquisition data to start flowing in.

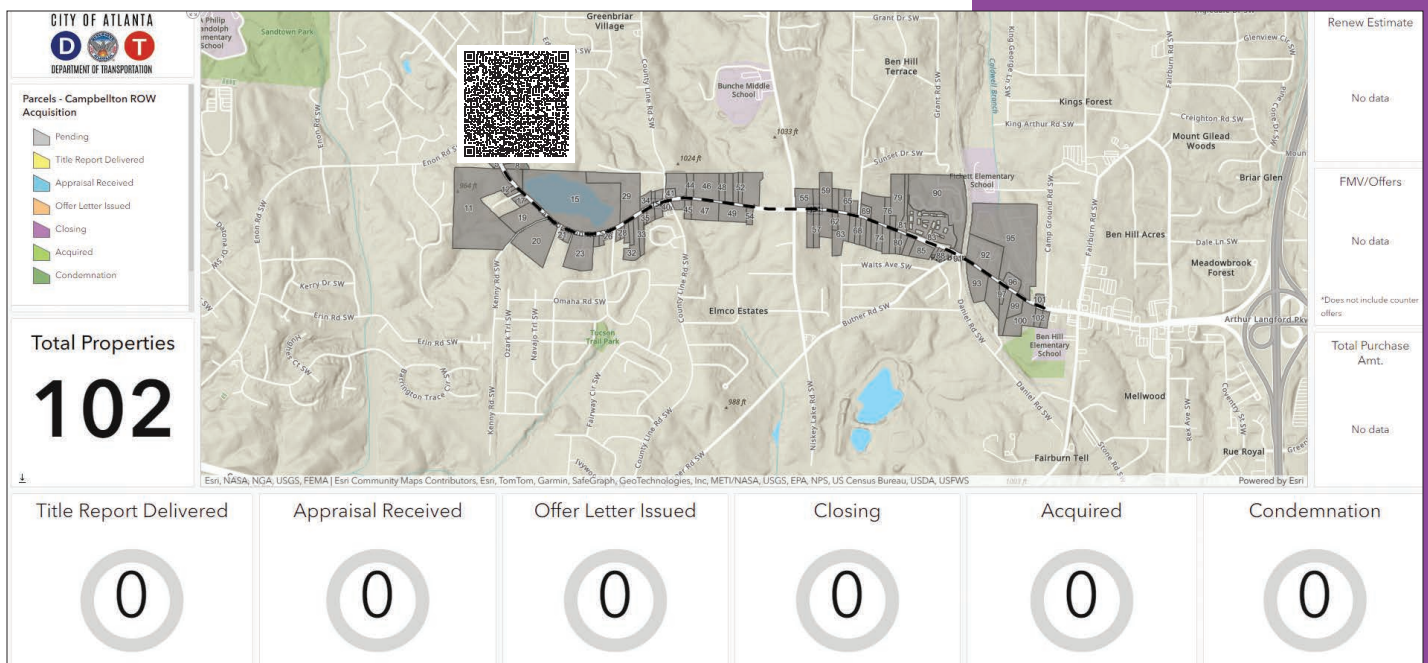
The Georgia Department of Transportation (GDOT) has also partnered with Atlanta DOT on some upcoming projects, which are more complex due to blended funding and other logistics, such as utility relocation and construction administration. The city will acquire ROW for the state, which means it will need to prove to GDOT that it is compliant with the acquisition regulations followed by the State of Georgia. DOT staff are excited to

have the GIS ROW acquisition dashboard in place. With slight modifications, it can be extended to track regulatory compliance alongside progress and be provided directly to GDOT in real time.



Discover how to manage your right-of-way acquisitions with GIS.

- Officials at Atlanta’s Department of Transportation turned to GIS to ensure that right-of-way (ROW) acquisition did not impede progress towards improving Cascade Road, a major thoroughfare in Southwest Atlanta, Georgia.
- ArcGIS Dashboards significantly enhanced the efficiency of ROW acquisitions for Atlanta’s Cascade Road project, streamlining communication and tracking of parcel statuses in real time.
- Products featured in this story are ArcGIS Dashboards, ArcGIS Web AppBuilder, and ArcGIS Online.



↑ Campbellton Road Smart Transit Corridor project ROW acquisition GIS dashboard.

Shoalwater Bay Indian Tribe Uses GIS to Map and Communicate Relocation Strategy for Funding

SBIT Emergency Communication Shelter

Severe coastal erosion has left the Shoalwater Bay Indian Tribe with few options. The loss of up to 130 ft. of land a year is threatening dwellings and lives, and interventions such as the building of berms are having little to no effect. Mass relocation is the only real long-term solution, and the use of GIS technology is proving central to the effort to access funding and technical support.

The Shoalwater Bay, descendants of the Lower Chinook, Lower Chehalis, and Quinault, are a small coastal Tribe. The Shoalwater Bay Indian Reservation, a little over a square mile, is located in Tokeland (which is itself named after a former chief of the Tribe) in Washington state.

The reservation has existed since 1866, when an original 355-acre area of land was set aside by presidential executive order for “miscellaneous Indian purposes.” However, from the start, there have been concerns.

“Since 1881, the Department of Ecology and other organizations have monitored and recorded the rate of erosion at Cape Shoalwater,” said Quintin Swanson, planning director and chairman-elect for the Tribe. “Up to 1999, we had lost 2.1 miles of land.”

Longer-Term Resilience

On three occasions, the State of Washington has intervened, working with the US Army Corps of Engineers to erect berms. The first, in 2012, washed away fairly quickly. Three have been built in total, and although research into the best rock type to use to counter the area’s unique wave patterns has resulted in the latest berms lasting longer, a protect-in-place approach is regarded as being “like putting a Band-Aid on a shotgun blast,” according to Swanson.

The most obvious solution is to migrate the Tribe to higher ground, but it has been calculated that more than \$400 million is needed to achieve this.

Using funding primarily from gaming

machine leasing, around 5,000 acres of land have been acquired. Geographical and geological studies by Red Plains Professional consultancy enabled identification of the upland sites. Whereas many present dwellings are only 12 ft. above sea level, the new locations—at 300–400 ft. elevation—offer appreciably greater solid ground.

However, the insecurity of gaming machine leasing as a funding source means that further land purchases have been halted until more dependable financial support can be established.

Building the Story

The Tribe has been engaged with Red Plains Professional since 2008, and GIS has been at the forefront of their efforts to communicate Shoalwater Bay’s dire predicament—both internally and to others.

The consultancy specializes in land-use development planning and provides competency in design and GIS services. That enabled them to bring together different file formats into a common application, which according to Ken Picard, assistant planning director and GIS specialist at Red Plains Professional, adds a “functional, live element which is constantly updatable, whether for internal use or for presentations.”

Additionally, Picard and the Tribe have developed stories with ArcGIS StoryMaps to better communicate their message. “These [stories created with ArcGIS StoryMaps] reinforce that you can present charts, tables, and data to people and talk your head off, but you gain a better understanding if you use the swipe tool and a map and can say, ‘This is where the water is and this is where it’s not,’” said Picard. “You can really drive the point home visually.”

Evolving Strategy

Starting in 2012, there was an initial land-use plan for the relocation, but that plan has now

been superseded with a new strategy. While the upland development planning was evolving, Red Plains worked with the Tribe to design and develop a tsunami emergency access road and building starting in 2014 with the structure being completed in the summer of 2017. In 2018, based on the new land purchases, Red Plains Professional and the Tribe started to re-envision the upland land development and the phases in which it would happen.

“Some of the earlier project phases involved tearing the tops off mountains and incredible amounts of infill,” said Picard. “Within the Tribe, we’ve used GIS to show how, with the land acquisitions, newer ideas make better sense. Converting Civil 3D into ArcGIS and putting the information into presentations enabled people to see what’s available and decide on options such as housing densities and layouts.”

Throughout the process, GIS has been critical to the evolution.

Data Collection

Starting offshore, bathymetric data is used to understand the coastal area and to gauge how water patterns and underwater channels might impact efforts to retain beaches.

Other information is gathered from contractors and consultants, and a lot of the basemap data has come from aerial surveys conducted by private companies. The Tribe is keen to utilize drones to collect topography and elevation data, and while their Natural Resources Department has achieved Part 107 certification, so far none of the drones they operate have lidar or real-time kinematic (RTK) capabilities. This is something that the Tribe seeks to change.

Much of the location information has been created using a combination of GPS and ArcGIS Field Maps, with the final data assembled in ArcGIS Pro. On-site crews have been collecting data on culverts and other drainage features, along with other information critical for the site plans. The geotechnical

reports are designed in AutoCAD and then converted into ArcGIS-compatible files. This facilitates better analyses of slope stability and site planning. Additionally, Red Plains Professional is working with the Shoalwater Bay Tribe on how to gain more current lidar information. All of this data is designed to develop the optimal site plan for the proposed developments, where it is safest—and best—to build properties and roadways, for instance.

Funding Sources

The Tribe has, so far, amassed around 10 percent of the funding they need to relocate, and the number of sources tapped thus far reinforces the complexity of the task facing grant writer Cynthia Toop.

Money to either sustain the planning effort or directly support pending building work has come from USDOT’s Rebuilding American Infrastructure with Sustainability and Equity (RAISE) and Thriving Communities programs, the Economic Development Administration, the Indian Department of Energy, FEMA’s Building Resilient Infrastructure and Communities program, Washington state’s Department of Commerce, and Congress.

Maps are vital to the funding effort. “I tend to use as many as I can to communicate our story to the granting agencies,” said Toop. “They do make a difference. For instance, our first RAISE application was unsuccessful, but the use of maps and live-time pictures meant we were successful the second time around.”

GIS, she shares, has been instrumental in the effort to gain new money from elsewhere, and will be a necessary component of future development work.

Gaining Visibility

All of this must be done in an environment where openness is not always prized.

“Grant funding pits people against each other when competing for resources,” said Swanson. “That’s the elephant in the room. It makes people reluctant to share more openly.”

That has made learning from other Tribes who have relocated more difficult, although there are exceptions.

As an example, he points to the plan for Taholah, an unincorporated village within the nearby Quinault Indian Reservation. “That

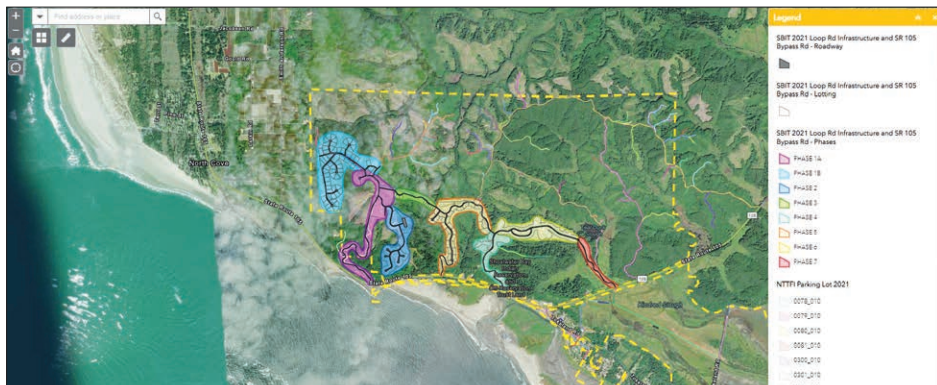
contains a healthy amount of GIS information and shows how you can retain data sovereignty but also share and help those in similar circumstances,” Swanson continued.

The Shoalwater Bay Tribe’s willingness to be open has led to opportunities to present at numerous events, including those hosted by the Bureau of Indian Affairs Branch of Tribal Climate Resilience and the National Transportation in Indian Country Conference.

GIS has helped put the Shoalwater Bay Indian Tribe—a small, remote nation—on the map and given them a voice, Swanson emphasized. Others would seem to agree, as at a federal level, there is interest in making their efforts a model for other Tribes’ future efforts.



GIS can help you build a more equitable transportation system. Learn more.



↑ Each phase of the development process is given a different color on a web application to help differentiate them for the planners.



↑ GPS and ArcGIS Field Maps data are displayed in ArcGIS Pro for better decision-making and improved analysis.



↑ A story created in ArcGIS StoryMaps gives staff a holistic view of cost estimates for the new development projects by phases.



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