

Esri News

for State & Local Government

Summer 2023

Digital Twin Boosts Growth, Sustainability Planning in Montgomery County

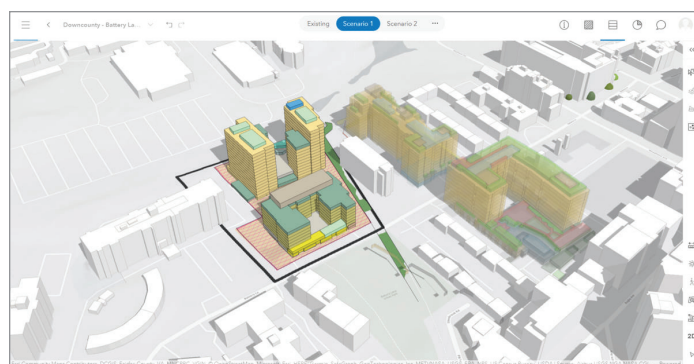
Maryland's most densely populated and wealthiest county updates maps and models of planned development—creating a planning digital twin—to shape housing and sustainability goals. The result: This dynamic digital twin gives developers an accurate picture of potential opportunities. It also helps residents understand what their community—down to a single block—will look like in the future.

Many of Montgomery County's 1.06 million residents live in Bethesda and Silver Spring, urban enclaves just outside the nation's capital. Like urban areas across the US, planners here contend with balancing affordable housing and an interest in preserving forests and farms.

Montgomery County officials have pioneered ways to manage these issues for decades. To address affordable housing in 1974, the county implemented the nation's first successful moderately priced dwelling unit program. In 1980, the county moved to protect open space and farmland—preserving 93,000 acres, almost a third of its land resources.

To keep pace with changing demographics and housing demand, Montgomery Planning staff have embraced geographic information system (GIS) technology. The county uses GIS to increase transparency, keeping developers and the public informed about projects while speeding regulatory processes. The county is digitizing 2D plans, integrating them with 3D modeling software, and sharing them online.

Montgomery County's Thrive 2050 plan prioritizes dense, sustainable housing. It concentrates growth in downtown areas, emphasizes transit-oriented development, and insists on racial equity and climate resilience. Passed with a unanimous



↑ A new feature in ArcGIS® Urban allows planners to add simulated buildings to distinguish between the plan being reviewed, what exists (in white), and other plans in the vicinity (out of focus).

planning board vote, the award-winning plan has officials optimistic that it will address housing needs far into the future.

"We know we need to satisfy more residential development to keep housing affordable," said Chris McGovern, manager of the information systems/geographic inventory system at Montgomery Parks and Planning. "By focusing growth along certain transit corridors near metro stations, we're giving developers an incentive to build a missing middle housing solution where duplexes, triplexes, and infill development can grow."

A Blueprint for Progress

The department has used digital tools to inform the public for years. The Development Activity Information Center (DAIC) indexes project descriptions, maps, drawings, and other

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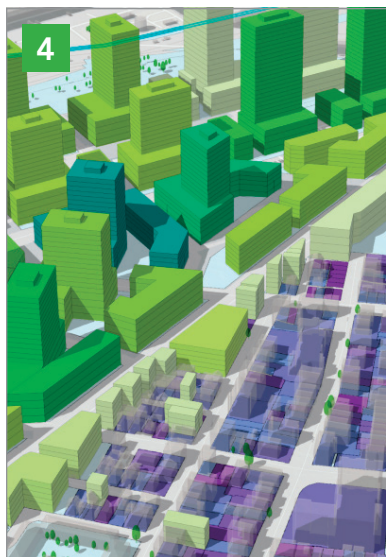
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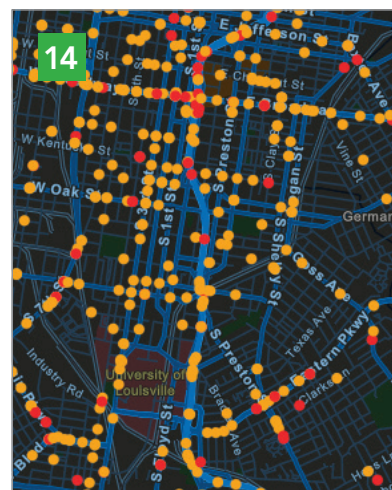


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What If You Had the Power to Prevent Drug Overdoses?

Making the Connection between Location and Health

Substance use disorders are devastating our communities and have become a public health emergency. This is not only a substance misuse problem but also a homelessness problem, a mental health problem, and a health equity problem, and it cannot be addressed without considering all these other factors.

By applying a geographic lens, datasets that are not commonly viewed together are opening new discussions and pinpointing specific neighborhoods that are more adversely affected. With geographic information system (GIS) tools, you can make a difference in your community and provide individuals living with substance use disorders with the help and resources they need.

Learn how at go.esri.com/SLGSUD.



A Life Saved

Condition:

Using prescription opioids for an injury has led to substance misuse.

Treatment:

Community organization leveraging GIS connected her with resources.



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From 3D Data to Story: How ArcGIS® Urban Can Empower Planners for Compelling Stakeholder Engagement

By Silvia Casas, Senior Product Manager, Esri
Keith Cooke, Planning and Community Development Manager, Esri

Effective stakeholder engagement is critical for building inclusive and equitable communities that meet the diverse needs of all residents. However, planners often lack the necessary resources to engage their community effectively. Limited resources, low participation rates at public meetings, language barriers, and resistance to change can complicate the planning process and strain relationships between local leaders and constituents.

To address these challenges, planners have begun adopting digital and virtual platforms as part of a new approach to community engagement. This shift reflects a growing desire for local governments to offer greater flexibility, convenience, and accessibility in how residents are included in community decision-making.

Fortunately, digital 3D visualizations of towns and cities can provide a more accurate and immersive representation of proposed development projects and the impacts of zoning or land-use changes. This technology is an invaluable tool for all stakeholders involved in the planning process, including government officials, developers, residents, and community groups, among whom there may be varying degrees of expertise and knowledge regarding the planning process.

Digital 3D representations have even more potential when paired with compelling storytelling. By integrating historical and cultural context into the narrative, planners can foster a more inclusive planning process by empowering their stakeholders with the information they need to give valuable input.

In February 2023, ArcGIS Urban—web-based 3D modeling software for towns and cities—introduced new alternatives to static maps and presentations. With StoryMaps, guided presentations, and self-directed exploration applications, planners can now bring their 3D models to life with dynamic and engaging storytelling.

Tailor to the Audience's Needs

When presenting to clients, team members, or the public, planners can now export a 3D design scenario focused on a specific area and the key performance indicators a proposed development generates. This allows stakeholders to see at a glance how different areas are impacted by population density, energy usage, and emissions—all in one visualization.

Start Storytelling in Minutes

Planners can now weave together their 3D design scenarios to create engaging

narratives using a combination of text, visuals, and maps. Creating a StoryMaps story is easy and convenient. One can be generated directly from a design scenario and shared with both internal and public stakeholders through a web link via email or social media.

Create Guided Presentations

For in-person and virtual meetings, planners can also export a design scenario seamlessly for use in custom applications, such as those created with ArcGIS Experience Builder. This format works well for guided presentations and self-directed exploration, enabling stakeholders to explore multiple design scenarios and closely examine the data for a specific building or parcel with pop-ups. These applications are versatile enough to be embedded on websites and repurposed in StoryMaps.

With the ability to now export design scenarios tailored to a specific stakeholder audience, planners can create dynamic and immersive presentations to foster a more inclusive planning process.



For more information,
scan the QR Code.

Managing Landfill Stockpiles with Modern Technology



Orange County Waste and Recycling is an agency that operates three landfills. These landfills are among the largest in California and receive more than four million tons of solid waste annually. A critical safety concern at landfills is monitoring and regulating waste stockpile temperatures.

Staff equipped drones with thermal imaging infrared cameras to test a way of detecting the surface temperature of stockpiles. As the surface of stockpiles reached a specific heat threshold, staff would manually record the internal temperature of each stockpile to mitigate the

risk of an internal fire that could quickly spread. Although this process helped landfill managers, it lacked real-time awareness and an active approach to internal temperature control.

The county was already familiar with pulling live data streams from its fleet vehicles into GIS to know when to provide preventative maintenance. The same concept was applied to waste stockpiles. County GIS staff inserted Raspberry Pi sensors into each stockpile, and the sensors would record the internal temperature automatically. Then, using ArcGIS Velocity, an add-on software as a service for ArcGIS Online, staff programmed the sensors to feed the data into a web map and show real-time temperatures within each stockpile.

"For about \$40 per device, we can deploy several sensors in different locations within a stockpile and collect precise insights 24/7," explained Cameron Smith, GIS manager at OC Public Works. "Outsourcing this to a vendor would've cost the county tens of thousands of dollars yearly."

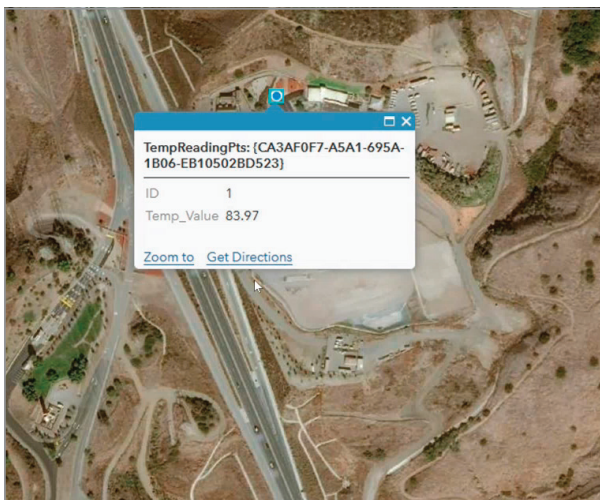
↑ A 3D web scene of the sensors in the landfill is shown above. As staff click across the interactive map, they can retrieve the real-time temperature of each stockpile.

Staff can also push alerts when internal temperatures have passed a certain threshold, putting time-sensitive information into the hands of managers and landfill personnel. Manually taking temperature probes is no longer required, eliminating the danger of someone facing a potential fire hazard. In addition, staff can build a dataset of temperature readings over time to look for trends and patterns. In the future, county staff can integrate other sensors—such as methane or moisture sensors—to enrich their data even further.

Although the county was already working with regulators to ensure that the landfills operate in full compliance with all federal, state, and local codes and regulations, this technology will keep the community and personnel safer and help save the county employee time and taxpayer dollars.



For more information on how GIS can help public works agencies rethink and reimagine business processes, scan the QR Code.



↑ Using ArcGIS Velocity, staff quickly set up sensors to feed maps with real-time temperatures of stockpiles.

The Right Way to Right-of-Way Permitting at West Fargo



The City of West Fargo, North Dakota, transformed its right-of-way permit management process, leveraging the city's existing GIS licensing to introduce visualization of permit locations, support accurate historical information tracking, and improve efficiency for staff.

The City of West Fargo needed to upgrade the process it used to issue, manage, and track right-of-way excavation permits. The existing system—though digital, based on an online form that applicants filled out and attached as a PDF indicating the location of the proposed work—was inefficient and lacked some important capabilities. Exacerbating these challenges were the growth in the number of permit applications received, the addition of other types of permits, and the demands of supporting staff in multiple departments who needed permit information.

The most important capability missing in the existing permit system was mapping. City staff were unable to visualize where permits had been applied for and issued. Seeing the locations of active or planned construction was impossible without looking up individual records—a time-consuming task that only added to a heavy staff workload. There was also no way to filter permits to find answers efficiently—for example, to show all open permits at a given time.

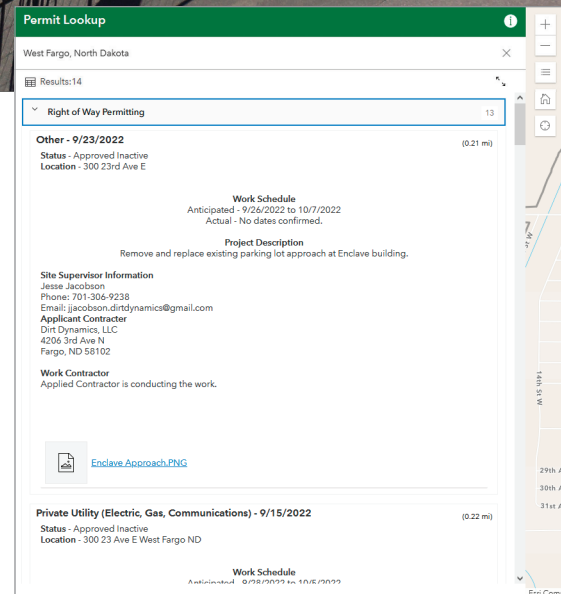
The city needed a better way to track right-of-way permits, visualize permit locations, and maintain and access historic permit information.

Leveraging GIS Investment

The city's Engineering Department considered its options for the technology platform on which the brand-new permitting system would be built. After looking at a system used by other city departments that would incur additional licensing fees, Engineering Department staff discovered that the GIS software already available to them would meet their needs without any new costs.

Benji Schwartz, West Fargo's right-of-way manager, and Kayla Volness, office manager in the Engineering Department who is responsible for administration of the permitting process, began collaborating with the city's GIS team, led by its manager, Travis Genty. Together, they identified specific requirements and started paving the way to a new right-of-way permitting system.

With a demanding GIS workload and the urgent need to deploy a new permitting system, the city enlisted support from its GIS partner, Pro-West & Associates. Pro-West brought additional resources and its significant experience in right-of-way projects and permitting system implementation for local



↑ Residents can explore the map and view more information on approved right-of-way permits within the city limits.

governments, allowing the city to reach its goals and start benefiting promptly.

A New Era for Right-of-Way Permitting

There are four permit types offered by the city:

- Right-of-way excavation
- Commercial civil site
- Residential civil site
- Sidewalk/Driveway

The system developed for right-of-way permitting would include all four permit types.

Leveraging GIS tools, the city collaborated with Pro-West to build an efficient process for the application, management,

and tracking of permits.

Esri's ArcGIS Survey123 was used to configure five web-based registration forms for right-of-way permits, and there is a form for each other permit type that requires contractor registration—all but the residential civil site permit—to gather information on the contractor, the proposed scope of work, and the certificate of liability insurance.

The submission of the contractor registration form triggers the next stage of the workflow. An email automatically notifies the city that a new company has applied

Beyond the Permit Process

Beyond the permit process itself, an ArcGIS Online software-based app, Permit Lookup, was configured to foster transparency between government and residents, and allow city staff and the public to visualize on an interactive map the locations where right-of-way excavation (and work being performed in other permit categories) is currently underway. By clicking on the dots symbolizing those locations, users can learn more about the work being performed.

Value

West Fargo's GIS-based permit management process has done the following to meet the city's goals:

- Added mapping and visualization capabilities to permitting
- Simplified and streamlined permit tracking from application to completion
- Automated much of the workflow
- Reduced staff workload

"Managing right-of-way permits has become much easier with our new GIS-based system. We can use filters to quickly see active or inactive permits, rather than trying to organize paper documents or look up individual permits.

It's made my life much easier, reducing the time I have to spend on permit management and allowing me to focus on other priorities," said Schwartz.

The start of 2023 marks the first time the city has entered a new year with each permit receiving a unique number, allowing for more efficient management. As an added benefit, permit numbers identify the year in which the permit was issued.

The value of an efficient permit management system extends beyond the Engineering Department. Upper management at the city can view where permits were issued as well as the associated costs, thanks to a set of dashboards. This marks a significant improvement from the previous process, which required manual permit-by-permit calculation. Costs can also be visualized per contractor and by type of work.

"City leaders need to be able to quickly see and understand the work being done and revenue being generated through our permit process. Having a system that allows us to automatically update dashboards that we can share without having to do time-consuming calculations is extremely valuable," said Volness.

The Future

City staff have extensive plans to build on the new right-of-way permitting system. Built on a scalable foundation of ArcGIS technology, it is ready for expansion and enhancement:

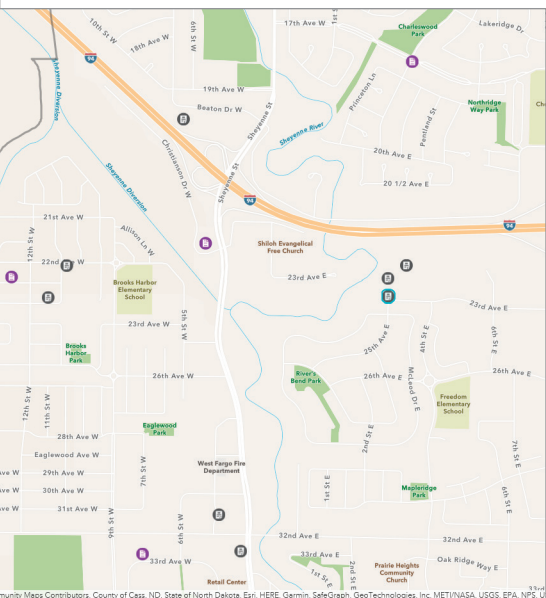
- A smartphone app, allowing team members to take and attach photos to a permit while in the field
- Additional filtering options to refine searches for permit information
- An archiving solution that allows information on historical permits to be accessed efficiently, and meets requirements to retain information for seven years
- A permit information page for the city's website to help contractors and residents easily find answers to questions about permitting
- Online billing to further automate and streamline the permitting process

Keys to Success

West Fargo's staff are clear about the keys to success for the city's right-of-way permitting project:

"Involving the individuals who will use the solution the most is critical. Even though I understand the GIS technology being used, I would not have been able to communicate what we needed the solution to do. I needed the team's expertise in permitting to create a valuable solution," said Genty.

He is echoed by Volness: "Be clear about your needs. Do your homework, be organized, and understand what will make your life easier."



for a contractor number. The number is sent to the company once insurance is verified. This number allows much of the permit application form to be prefilled, expediting the application process.

Once the application is received, Schwartz can update the permit status (reviewing or approved, and active or inactive). Since contractors are charged per day for permits, changing the status to approved—active indicates the start of the period for which the charge applies.

Once work is complete, the city is alerted by the contractor and performs an inspection before closing the permit, generating emails informing both the contractor and Volness of the applicable fee, for which the city's finance department is then responsible for billing.

GIS Putting Right-of-Way in Its Place

Knowing where your right-of-way is located enables you to make data-driven decisions to plan for infrastructure projects, manage acquisitions of land through visualized data, and improve operational efficiency and safety by understanding the right-of-way's condition in real time.

Learn how to manage your
rights-of-way with GIS.

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From Paper to Pixels: Rethinking Community Wildfire Protection Plans

By Anthony Schultz, Director of Wildland Fire Solutions, Esri

Wildfires have emerged as one of the most common natural disasters, posing a significant threat to public safety nationwide. This holds particularly true for western states, which have been grappling with unprecedented fire seasons on a seemingly endless loop. Over the last two decades, numerous communities have embraced Community Wildfire Protection Plans (CWPPs) to prepare for these incidents. These plans provide a comprehensive view of a community's wildfire risk, pinpoint critical infrastructure, and offer vital information to help determine where impactful mitigation efforts can reduce risk across the landscape.

In a groundbreaking move, the Infrastructure Investment and Jobs Act allocated an unprecedented \$1 billion to support the development of CWPPs and bring mitigation projects to life, promoting risk reduction. It's a significant down payment that has the potential to change the wildfire landscape for the better. However, there's a slight catch: The

current approach to CWPPs hails from a time when technology was far from cutting-edge. Considering the obstacles faced by the fire service in communicating wildfire risk and mitigation strategies to the public, it is evident that modernizing CWPPs is imperative for their future effectiveness.

The Impacts of Wildfire on Human Health, Environments, and Ecosystems

Wildfires pose a significant threat to human health, life, and the built and natural environments. Today, more people than ever live in the wildland-urban interface (WUI), where structures or other human development intermingle with vegetation. In fact, WUI is the single fastest-growing land-use type across the country, with one in three homes now located within WUI areas.¹ When a fire occurs, the loss of homes, businesses, and other property can be catastrophic, leaving individuals displaced and communities to recover from devastation.

The impact on the environment can be just as devastating. While many ecosystems have evolved to depend on fire occurrence, when fires burn too hot and too severe, large swathes of land can be destroyed, ruining habitat and natural resources.

Moreover, wildfires contribute to air pollution, releasing enormous amounts of carbon dioxide and other harmful emissions like fine particulate matter (PM_{2.5}) into the atmosphere. These pollutants not only exacerbate climate change but also pose serious health risks to humans. In fact, a new study estimates that in the contiguous US, wildfire-related PM_{2.5} is annually responsible for 4,000 premature deaths, with a corresponding economic loss of \$36 billion.

The consequences of wildfires extend far beyond the immediate destruction. Damage can continue long after a fire has been extinguished and the cleanup process has ended. For instance, and at the risk of oversimplification, soil can

continued on page 10

¹ Zhang, Y., Li, C., Zhou, X., Moore, J. C., and West, A. J. (2022). "Controls on the global distribution of contourite drifts: Insights from an eddy-resolving ocean model." *Science of The Total Environment*, 822, 153215. <https://doi.org/10.1016/j.scitotenv.2022.153215>.

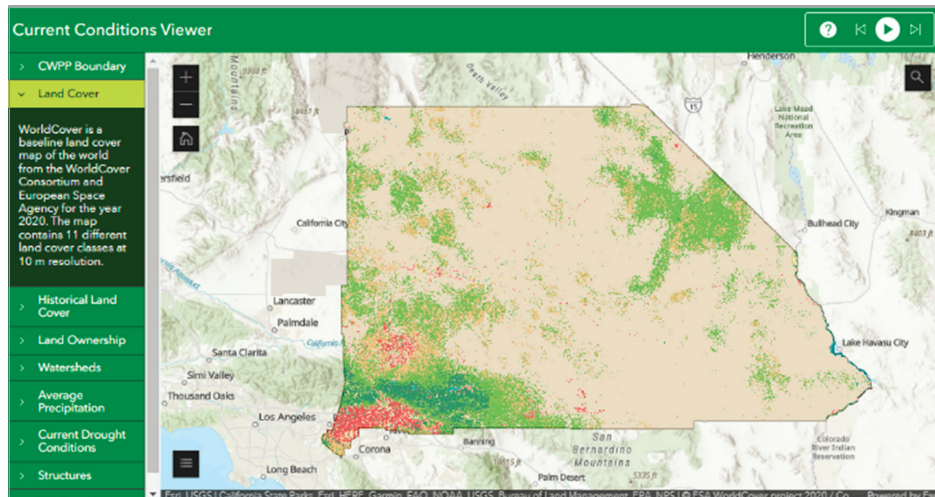
become unstable after a wildfire has consumed vegetation—trees, shrubs, and other ground cover. Once the soil in these areas becomes unstable, it is more susceptible to erosion from wind and water. Thus, the long-term risk of landslides and debris flows dramatically increases. This long-term risk further underscores the critical need for effective wildfire prevention and mitigation.

The Importance of Accessibility and the Planning Process

CWPPs have traditionally been delivered as written documents, some with well over 200 or 300 pages of content. Plans can incorporate everything from meaningful fire spread models and evacuation routes to the science and methodology behind vegetation type and health identification. While these elements may be important to include, realistically many fire management employees and most members of the public never engage with these materials. At times, much of this information is hard for fire management professionals (myself included) to understand, let alone the layperson or a community.

The type of information mentioned above is essential. It should be a part of any CWPP, but one cannot deny the importance of accessibility and a team-oriented approach. Imagine the untapped potential of reformatting these plans into a user-friendly online format that contains a veritable treasure trove of information at the fingertips of curious community members. Anybody can peruse the plan from the comfort of their living room, engage with interactive risk maps, and explore fuel treatments and mitigation plans in 3D. This style of delivery helps to pique interests and may even turn people into fledgling wildfire aficionados.

The digitization of CWPPs not only democratizes knowledge, it also fosters a sense of camaraderie as community members engage in the planning process. Picture lively in-person or virtual meetings, with neighbors sipping coffee



↑ Users can host critical information in the form of maps that display different factors that impact wildfire risk.

and engaging with fire departments, land management agencies, and other stakeholders. By shifting the focus of CWPPs from merely serving as a means to secure grants or as a collection of unengaging facts, and transforming them into a storytelling medium that highlights the community's unique characteristics, we foster a sense of teamwork.

This approach transforms the CWPP into a cooperative and engaging instrument for wildfire planning and prevention and underscores the importance of the planning process itself. A successful CWPP goes beyond merely presenting facts—it unites communities and stakeholders in the shared pursuit of risk identification and reduction. As observed by US president Dwight D. Eisenhower (paraphrased here), plans are useless, but planning is everything. In that spirit, we find inspiration for a more connected and effective CWPP.

A Changing Landscape

Over the past 20 years, the frequency and severity of wildfires have changed in ways that have lengthened a fire season to a fire year and produced record-setting destruction seemingly with each passing year. For wildland firefighters, strategies and tactics have also evolved in light of the changing fire environment. It follows that it

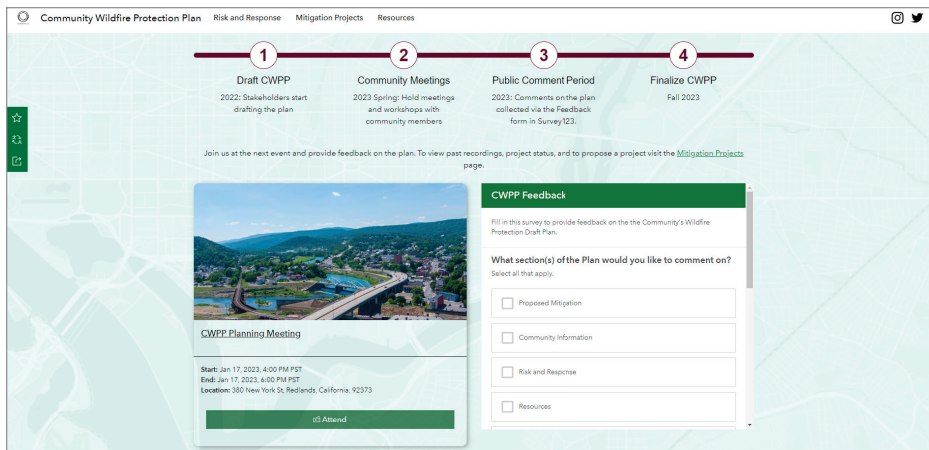
is overdue for community wildfire planning processes to catch up to the times.

To keep pace with the expanding WUI and ever increasing wildfire risk, CWPPs need to be more accessible, engaging, and relevant to the communities for which we are planning. We need to transform the industry paradigm, shifting from traditional paper-based plans to dynamic digital alternatives that foster community engagement and streamline planning processes. To help foster this change, Esri has developed a CWPP template using ArcGIS Hub.

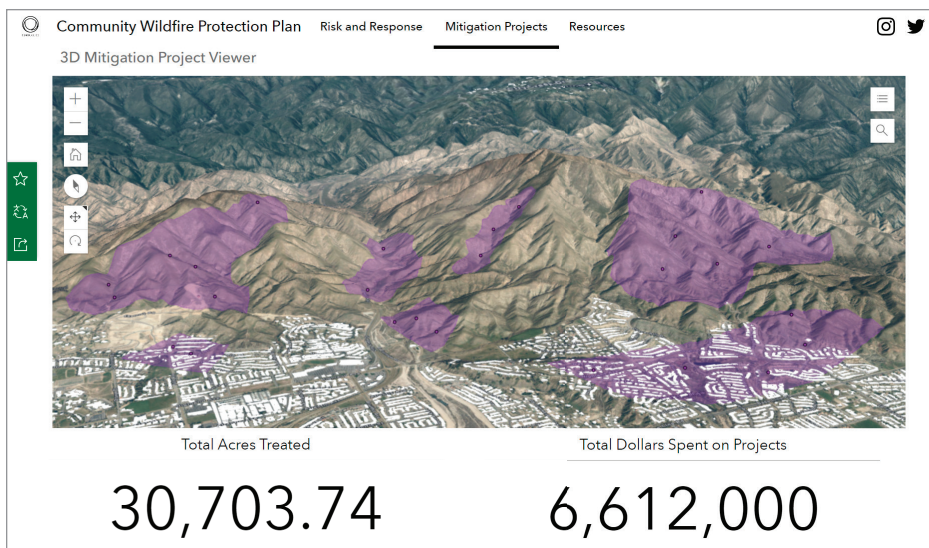
ArcGIS Hub and Why It's Suited for CWPP Development

ArcGIS Hub is a cloud-based engagement software as a service (SaaS) that enables organizations to communicate more effectively with their communities. You can create a hub site using ArcGIS Hub to aggregate resources and start conversations with internal and public audiences around a specific project, topic, or goal. Think of your hub site as a geoenabled website!

The transition from paper to digital CWPPs offers numerous benefits, including increased accessibility, real-time data updates, and a more interactive experience for community members. ArcGIS Hub allows stakeholders to create,



↑ This component of ArcGIS Hub helps solicit feedback from the community and stakeholders.



↑ Residents can explore mitigation plans in their community in 3D.

manage, and share digital plans with ease, enabling organizations and communities to stay connected and informed throughout the planning process.

One of the most significant advantages of using ArcGIS Hub to support CWPPs is its ability to foster community engagement. ArcGIS Hub provides an intuitive interface, encouraging participation by anyone from the layperson to the wildfire expert. Interactive maps, visuals, and other multimedia content make it easier for community members to understand the complexities of wildfire protection planning and contribute their insights and ideas. This collaborative approach ensures that the voices of all stakeholders are heard and incorporated into the final plan, ultimately leading to a more

robust and effective strategy.

ArcGIS Hub simplifies and accelerates the planning process by providing tools for data collection, analysis, and visualization. Users can access and integrate a wide range of datasets, such as local land use, infrastructure, vegetation, and fire history, to create comprehensive and detailed CWPPs. ArcGIS Hub enables stakeholders to identify patterns, assess risks, and prioritize mitigation efforts with greater accuracy and efficiency. By helping streamline these tasks, a CWPP template in ArcGIS Hub frees up valuable time and resources that can be redirected toward implementing vital wildfire protection measures.

The value of communication and transparency in the CWPP process cannot

be overstated. ArcGIS Hub promotes seamless communication and collaboration among stakeholders, including local government agencies, emergency responders, landowners, and community members. The sharing features in ArcGIS Hub make it easy to disseminate updates, solicit feedback, and coordinate efforts among all parties involved in the planning process. This level of transparency and information sharing fosters trust and cooperation, ultimately leading to more successful CWPP outcomes.

Conclusion

ArcGIS Hub is set to redefine how we approach community wildfire protection planning. By embracing digital transformation and harnessing the capabilities in ArcGIS Hub, we can create more accessible, engaging, and effective CWPPs that truly reflect the needs and concerns of our communities. We can leverage technology to build a safer, more resilient future in the face of growing wildfire risk.

To request a demo of the CWPP template for ArcGIS Hub, contact Anthony Schultz, director of wildland fire solutions, by emailing aschultz@esri.com.

We Want Your Stories

Partners, startups, nonprofits, and customers are encouraged to submit an article for inclusion in Esri's state and local government publications. Tell readers across the country how your organization or customers have saved money and time or acquired new capabilities through using GIS.

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Prioritize Infrastructure Investments Where They

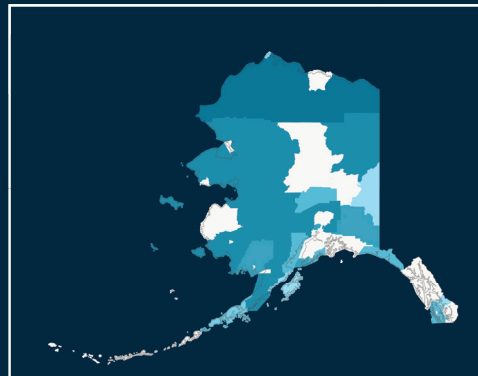
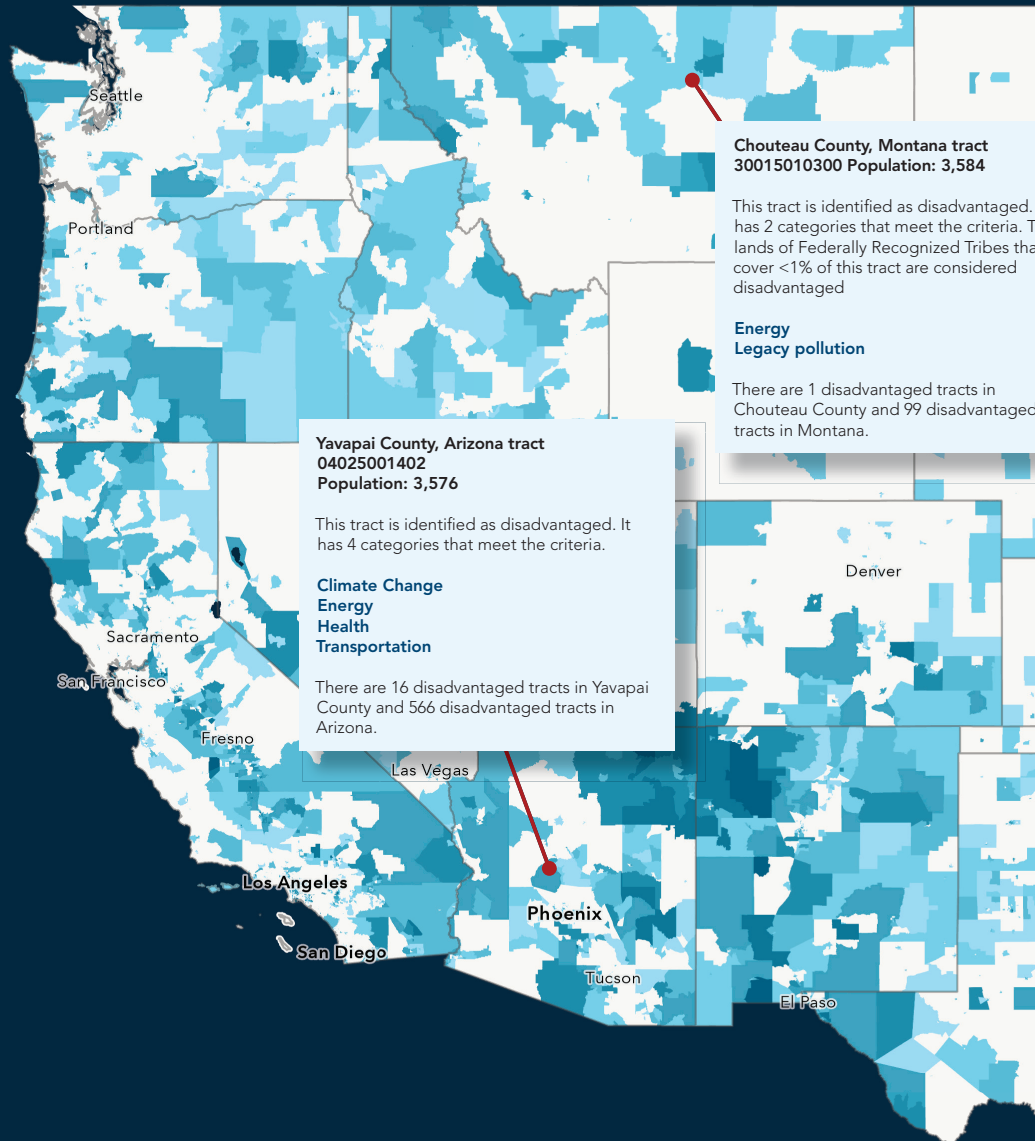
You can use the Justice40 layer to secure discretionary grant money and resou

Esri has released the latest Justice40 Initiative tracts data from the Council on Environmental Quality (CEQ) and incorporated it into ArcGIS Living Atlas of the World. Maps made with this important data help anyone determine which communities are most disadvantaged, according to Justice40 Initiative criteria, in the US and its territories. Tracts have been identified as disadvantaged across eight different categories:

- Climate change
- Clean energy and energy efficiency
- Clean transit
- Affordable and sustainable housing
- Reduction and remediation of legacy pollution
- Critical clean water and wastewater infrastructure
- Health burdens
- Training and workforce development

Use this layer to help plan for grant applications, perform spatial analysis, and create informative dashboards and web applications. The layer and map are available to use at no cost—they are suitable for dashboards, apps, and stories as well as for supporting material in major initiatives or policy changes. The next time you want to prioritize resources in your community, make sure to leverage this layer to lead with a data-driven approach.

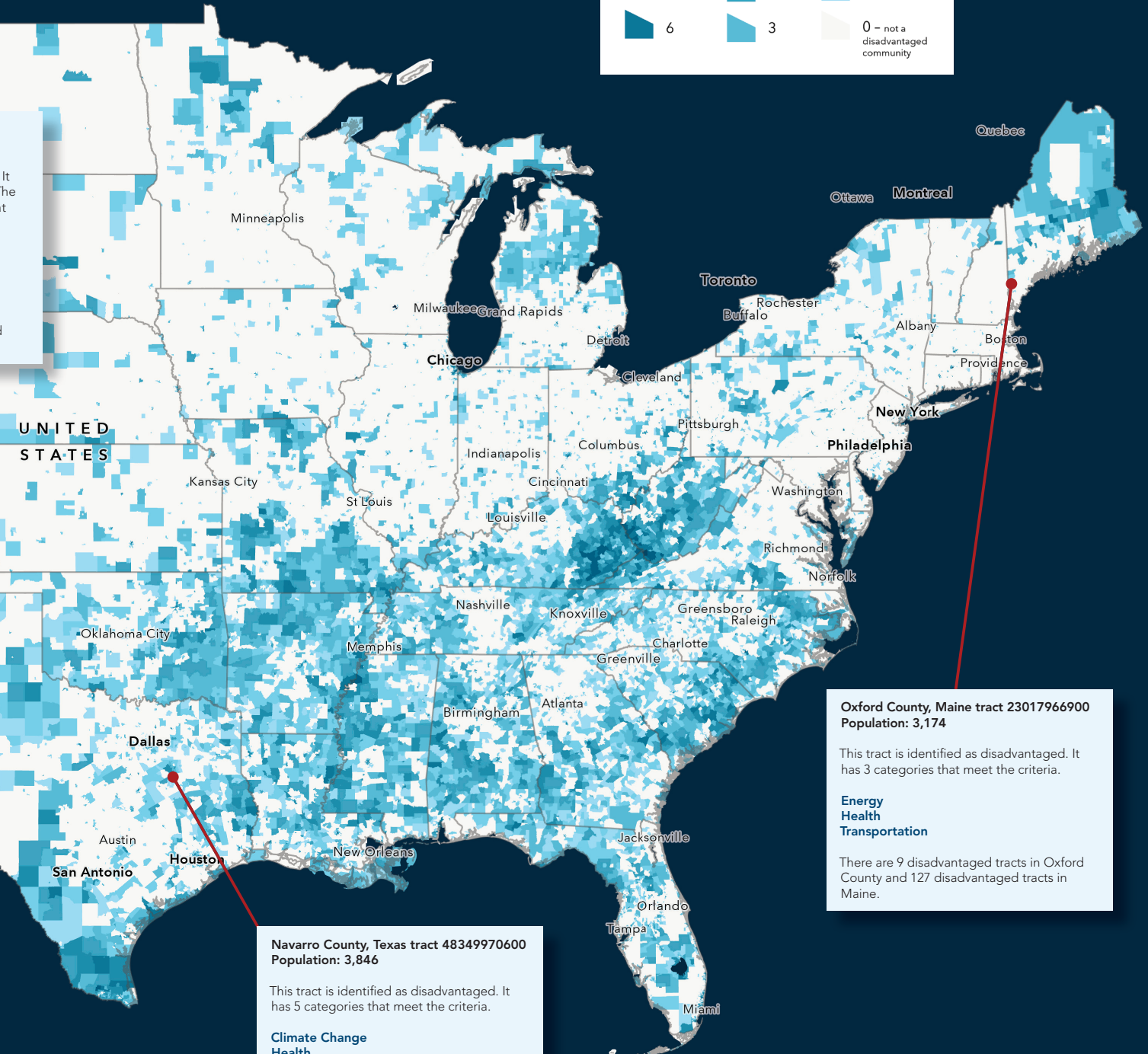
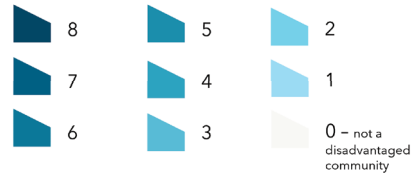
Go to go.esri.com/GIS4J40 to see the disadvantaged communities near you.



y're Most Needed

resources for your community.

Number of Categories That Qualify a Census Tract to Be Disadvantaged



Oxford County, Maine tract 23017966900
Population: 3,174

This tract is identified as disadvantaged. It has 3 categories that meet the criteria.

Energy
Health
Transportation

There are 9 disadvantaged tracts in Oxford County and 127 disadvantaged tracts in Maine.

Navarro County, Texas tract 48349970600
Population: 3,846

This tract is identified as disadvantaged. It has 5 categories that meet the criteria.

Climate Change
Health
Housing
Transportation
Workforce development

There are 10 disadvantaged tracts in Navarro County and 2,369 disadvantaged tracts in Texas.



Vision Zero: Maps Fuel Funding for Equitable Traffic Safety in Louisville

Avoiding automobile crashes starts with attentive drivers. But there's also a growing call to reengineer streets where fatalities and serious injuries chronically occur.

Road safety is a national priority. "Traffic crashes cost tens of thousands of American lives a year—a national crisis on our roadways—and everyone has an important role to play in addressing it," said US secretary of transportation Pete Buttigieg in February 2023 at the launch of a call to action. "Today we are asking all Americans—including private industry, nonprofit, and advocacy organizations and every level of government—to join us in acting to save lives on our roadways."

In Louisville, Kentucky, the government has made a commitment to end road fatalities by 2050. To start this initiative, staff used GIS technology to identify high-risk locations based on a combination of reactive and systemic crash analysis. These locations were then compared to data on vulnerabilities in communities. The conclusion is this: Harm has happened at higher rates in disadvantaged areas.

This data and accompanying maps then became Louisville's call to action.

The analysis appeared in the city's Safe Streets and Roads for All (SS4A) grant application, developed in partnership with the Kentucky Transportation Cabinet and Palmer Engineering. The city now has a \$21 million implementation grant from the US Department of Transportation (US DOT) to put planned changes in place.

The projects tackle the 10 corridors where safety improvements will have the greatest impact.

"The work to prioritize those projects was all a GIS exercise," said Amanda Deatherage, the transportation planner supervisor for Louisville Metro Government. "GIS analysis is woven through the work that we do. It's the foundation for a lot of our decision-making."

Larger Government, Greater Awareness

When Louisville merged with Jefferson County in 2003, Kentucky's largest city doubled its population, and its area grew sixfold. GIS helped the government come to terms with its larger size. The GIS team gathered data to provide the

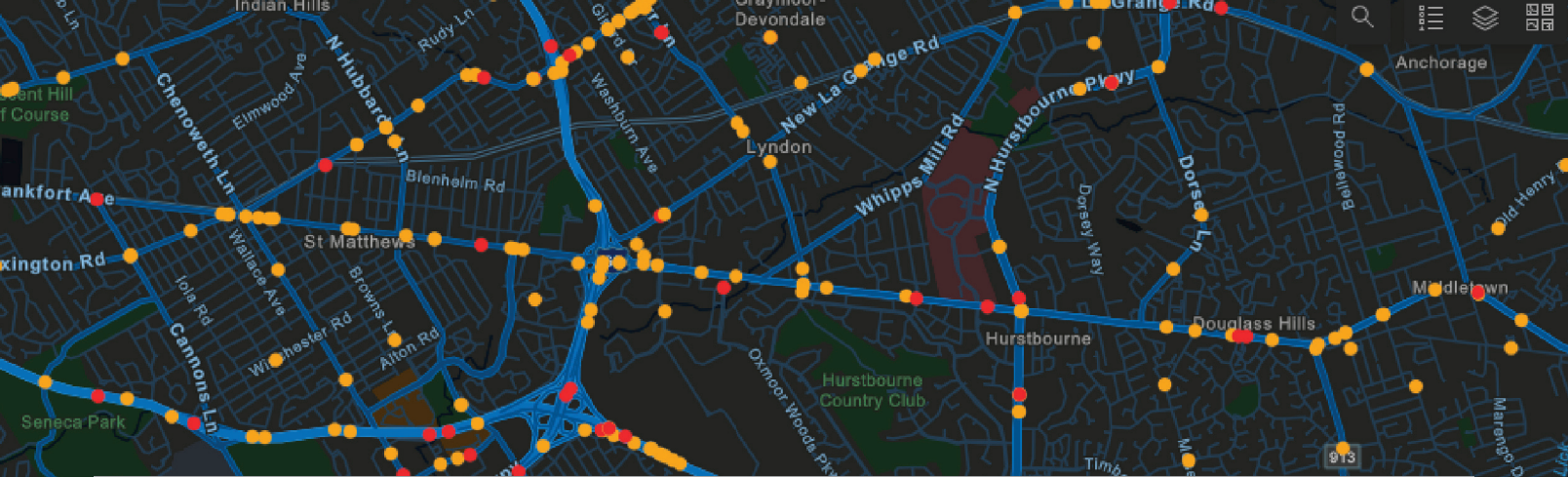
new picture of residents and services.

The city's department of public works mapped traffic fatalities and suspected serious injuries. It found that more than 900 people had lost their lives on Louisville's roadways since 2014, including 185 pedestrians. Staff then looked at hot spots and patterns.

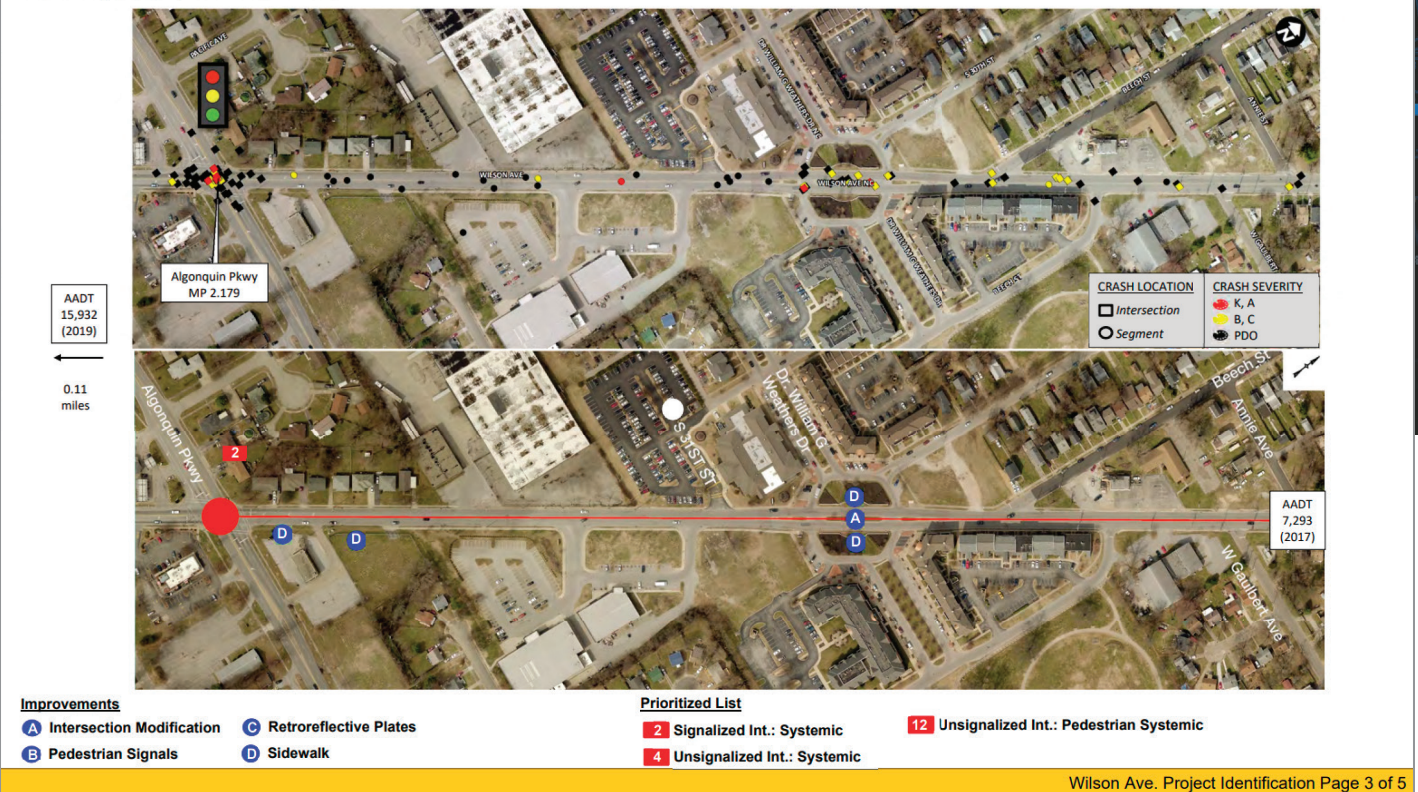
This awareness of fatalities and serious injuries led the city council to pass its Vision Zero Louisville ordinance. It marked a shift from the conventional reactive approach to traffic incidents. Instead, the city used the ordinance to look at the many layers of protection it could provide to both prevent crashes and reduce injuries.

"Our early Vision Zero work focused on educating the public about where fatalities were happening, using GIS," Deatherage said. "Now, we want to build support for projects to improve the transportation network and reduce the likelihood of crashes happening at all."

The 10 roadway corridors included in the SS4A-funded project will benefit from an array of safety improvements, including the addition of better lighting,



CRASH MAP (2013-2017) AND IMPROVEMENTS



↑ Intersection modifications, new sidewalks, pedestrian signals, and better lighting should reduce pedestrian injury collisions along Algonquin Parkway.

medians, and bicycle lanes. All project locations will be rightsized (e.g., converting a four-lane roadway into a three-lane roadway). Rightsizing is a Federal Highway Administration proven safety countermeasure that promotes safer speeds. It often adds a dedicated left-turn lane and provides enhanced mobility and access for all road users.

Priority Projects

When the Vision Zero Louisville ordinance passed in 2022, Claire Yates, a transportation planner, became the first program manager dedicated full-time to Vision Zero. Early on, she placed an

emphasis on communicating using maps and visualizations.

She mapped 16 priority locations, using maps to help leadership understand the changes needed. Louisville staff wanted to modernize how they tell the story of where incidents occur. Crash data is critical, but it doesn't encompass the entire story. GIS seeds solutions by providing greater context.

"We have a lot of elected leaders to answer to and a lot of priorities," Deatherage said. "We can't fund everything at once. We're trying to leverage technology in a way that helps us be more transparent to the public. We also

want the public to give input on what we should focus on."

Data analysis of potential road safety projects incorporated data from US DOT, the Kentucky Transportation Cabinet, and internal sources. Social vulnerability data from ArcGIS Living Atlas of the World gave Louisville the data it needed to focus on supporting the Justice40 Initiative. The initiative seeks to address chronic underinvestment in disadvantaged communities, with at least 40 percent of federal funding dedicated to closing gaps. Of Louisville's 10 safety improvement projects, 6 focus on

continued on page 16

Vision Zero: Maps Fuel Funding for Equitable Traffic Safety in Louisville continued from page 15

disadvantaged places.

Safety Measures to Save Lives

US DOT's recent call to action comes a year after the National Roadway Safety Strategy was released. This document defined a five-pronged safe system approach to reducing roadway fatalities. It includes safer people, safer vehicles, safer speeds, safer roads, and postcrash care.

"We must do everything in our power to make our roads safer for everyone, regardless of how you travel," said Louisville mayor Craig Greenberg in a statement. "Vision Zero is a new way of thinking, and it is achievable."

With projects in place to construct safer roads, Vision Zero Louisville next focused on safer speeds.

"We identified and filtered the highest posted speed limits and evaluated them for crash reduction," Yates said. A preliminary audit identified seven stretches where the posted speed limit was above 35 miles per hour. From 2016 to 2022, four

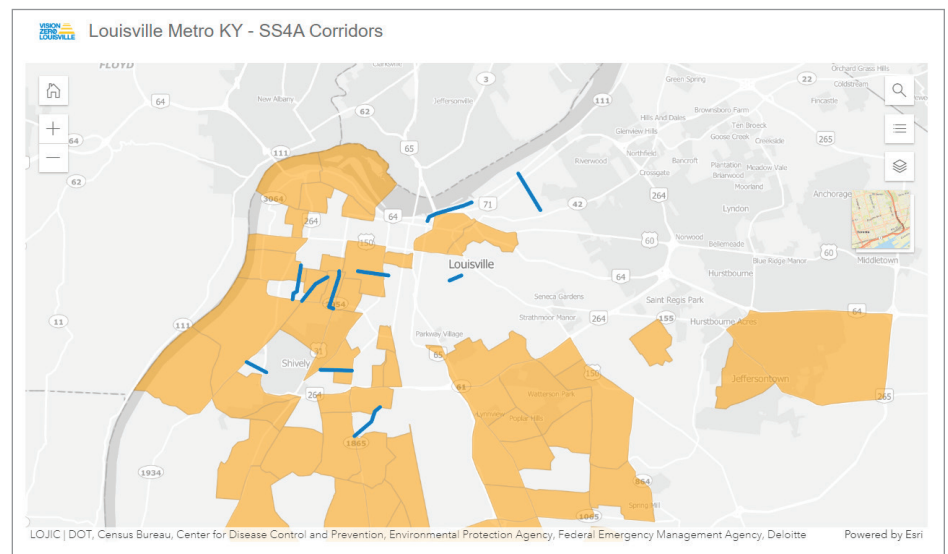
people were killed and 27 people were seriously injured on those stretches. The city is now going through the process of reducing speeds on those roadways.

Janet Heston of Matthew's Bridge is a transportation safety advocate. As Heston noted at Louisville's inaugural commemoration of World Day of Remembrance for Road Traffic Victims, "No reset button can be pressed to bring

back those killed. The best way to honor them is by making our streets safer."

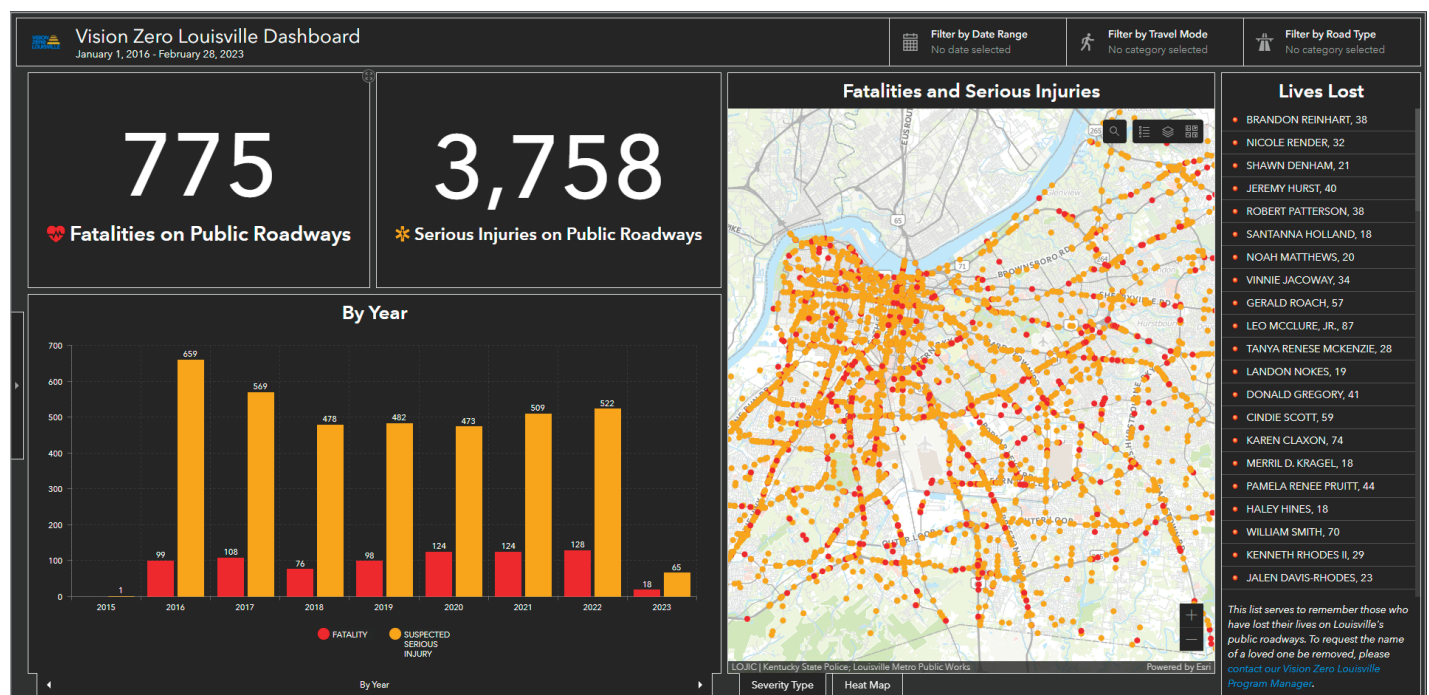


Scan to learn more about how Esri's Vision Zero solution helps municipalities deliver safety results.



↓ The Vision Zero Louisville Dashboard displays crash data from 2018 to the present, to providing an accessible, data-driven approach to address the causes of traffic crashes.

↑ Louisville identified 10 project corridors in disadvantaged census tracts in need of traffic safety improvements.



Digital Twin Boosts Growth, Sustainability Planning in Montgomery County continued from cover

information. The MCATLAS map viewer (mcatlas.org/viewer) displays related data—county and election boundaries, priority funding areas, and opportunity zones. An interactive development activity map (mcatlas.org/developmentactivity/) outlines developments by type and tracks progress.

Even with this robust set of resources, the county's city planners and GIS specialists knew they could offer a more intuitive view of planned growth. "The DAIC is where we convey our regulatory information to the public so that they have visibility on the process and take part in our meetings," McGovern said. "But we wanted to 3D render those projects, so they'd be able to understand what we're talking about without having to look at two-dimensional architectural drawings."

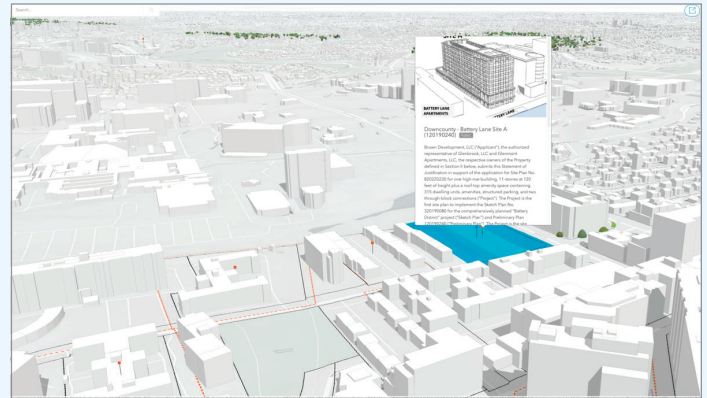
This, McGovern said, is where smart city planning software came in to create a countywide planning digital twin. Specialists combine 2D drawings and documents to generate a 3D model in ArcGIS Urban. Layers such as building footprints and property lines add context to the model to give anyone a quick visual of what is proposed. Architects, planners, and developers can access ArcGIS Urban to see the project's spatial aspects—something that once required looking through dozens of documents.

"I used to struggle to try to publish 3D things," said Jay Mukherjee, the planning department's principal GIS specialist. "The ability to create these amazing models that you can fly around and see is incredible."

The planning digital twin also makes it easier for planners and city officials to check the impact of land-use changes.

"The models distill the required elements of the proposal—green space, open space, pedestrian and vehicular circulation, parking, number of units, densities, and building height—and display the essential elements approved by the planning board," said Mary Beth O'Quinn, a Montgomery County architect and urban planner.

The ability to quickly check that proposals meet all statutes, zoning, and building regulations, O'Quinn said, transforms her work.



↑ Montgomery County planners use ArcGIS Urban to capture a digital twin of all proposed developments. Plans are moving forward for a new 10-story luxury apartment building on Battery Lane.

Looking to the Future

By pairing Thrive 2050 goals with powerful digital twin technology, Montgomery County has modeled additional ambitious projects for future growth.

Mukherjee and O'Quinn used ArcGIS Urban to build a model of a proposed high-density housing development (go.esri.com/batterylane) on Battery Lane, just south of the National Institutes of Health's (NIH) 300-acre campus in Bethesda. The new 10-story luxury apartment building will offer far more housing than the postwar three-story apartment buildings it will replace. O'Quinn and her colleagues posit that some of NIH's 18,000 employees will want to live there.

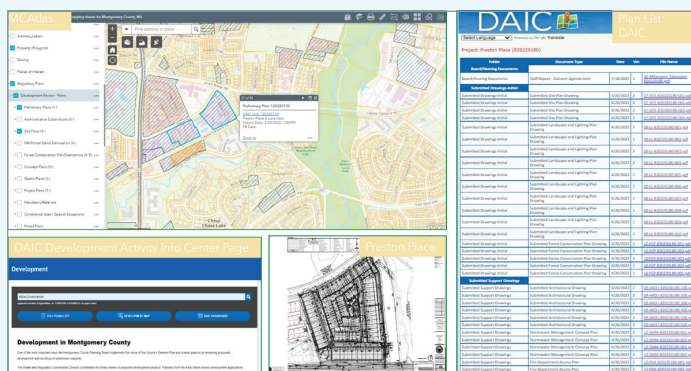
Development that creates more walkable communities is one of the county's priorities. Restaurants, a park, many bus and metro stops, and small businesses are within a 10-minute walk from the new project. On Sundays, residents can walk less than a mile to the Bethesda Central Farm Market for goods and fresh produce—including those grown on the county's agricultural reserve.

As projects are added to ArcGIS Urban, they will soon be shared on the planning department's hub site, created using ArcGIS Hub. The new site will sort projects based on their timeline: under review, approved, under construction, and completed.

Even though a new building takes years to complete, the benefits of seeing the models on the county's digital twin are immediate. "It's our responsibility," McGovern said, "to convey the work we're doing in a digestible way to the engineering and architectural communities and the residents who are getting these things built next to them."



To learn more about how planners use GIS for urban and community planning, scan the QR Code.



↑ Montgomery County planners maintain a suite of digital tools to keep the public informed of development plans.



Minneapolis Park and Recreation Board Leverages Winter Weather Solutions to Improve Trail Plowing Activities

The vibrant city of Minneapolis, Minnesota, has one of the most extensive public park systems in the nation. The city's 185 parks offer residents over 200 miles of biking and walking trails, seven golf courses, and natural assets that include 22 lakes and 12 gardens. The Minneapolis Park and Recreation Board (MPRB) manages active recreation programs and park assets for the entire Minneapolis park system.

With more than 50 inches of snowfall each year, MPRB is responsible for plowing park trails, sidewalks, ice rinks, and adjacent parking lots to ensure residents' safety as they commute and enjoy the outdoors. This involves efficiently managing operations in the office and giving snowplow vehicle operators the best data in the field to do their job. Each request for plowing a specific trail or area corresponds with a work order, which must be closed out by the driver after plowing.

To improve operations, staff at MPRB were exploring different tools to track

snowplow drivers in the field and automate the process for closing work orders. This was part of a larger initiative to utilize data and information to improve operations and services they deliver to residents. However, any options they looked at were either cost prohibitive or difficult to implement. But then they found Esri's Winter Weather solutions.

The project and systems team of MPRB deployed Esri's Winter Weather Operations and Winter Weather Outreach solutions. Designed to track and report snowplow activity in real time, the solutions have improved snowplow operations, increased operational effectiveness, and helped MPRB communicate the status of snowplow operations to the public.

Challenge

According to Chris DesRoches, MPRB project and systems manager, MPRB wanted a more holistic picture of the work that needs to get done across the system, which would help it make

informed decisions in the field.

MPRB also wanted to better manage work orders. With MPRB's old work orders and asset management software, snowplow drivers would plow a trail segment, access the work order system on their phones, and manually close the work order. Kelly Armstrong, project and systems analyst for MPRB, says the drivers were spending a lot of time just performing these actions.

This time-consuming process, which helps MPRB track work, was also causing inaccuracies, mainly when drivers weren't able to immediately close a work order. Operations managers began checking the system each day to see if trail segments were closed properly.

"Anytime anything is under 90 percent accurate, it's 0 percent accurate, right? And so, if 1 out of 10 of our drivers weren't closing their work orders in time, or not doing it, we couldn't trust that any of the information was accurate," says DesRoches. "It became more of a tracking

system that just wasn't working well."

MPRB also wanted a way to communicate more effectively with the public. Residents submitted feedback to MPRB asking for details on how and when trails are plowed, so MPRB wanted a new solution that would allow it to provide more up-to-date information.

Residents can submit maintenance requests via different channels such as calling the city or MPRB call centers or by email, but they don't often know what happens to their requests after they're submitted. MPRB wanted to improve visibility into these requests and ensure that the public not only had a centralized place to submit requests but could also check on their status.

Solution

To receive real-time information from the field, DesRoches and Armstrong licensed ArcGIS Velocity, a software as a service

(SaaS) offering for Internet of Things (IoT) analytics. The system MPRB currently uses to track vehicles is Verizon, with units placed in each snowplowing vehicle to enable tracking.

"ArcGIS Velocity piggybacked on our current system. It has a premade tool to ingest Verizon-specific data feeds from our automatic vehicle location [AVL] or automatic vehicle monitoring [AVM] system. So that was helpful," says Armstrong.

DesRoches and Armstrong also began exploring different options to manage the data received from ArcGIS Velocity and discovered Esri's Winter Weather solutions, which help agencies develop winter weather response plans, monitor weather operations, and respond to requests for service. Winter Weather Operations uses ArcGIS Velocity and live sensor data from its AVL system to determine when trails were last serviced. Armstrong says that ArcGIS Velocity seamlessly integrated

with the current system.

"From a GIS perspective, the ability to develop our own solution was fairly limited," says DesRoches. "I think the biggest advantage that we saw in ArcGIS Velocity and the Winter Weather Operations was having a solution that was configurable and didn't require a lot of additional hardware or servers."

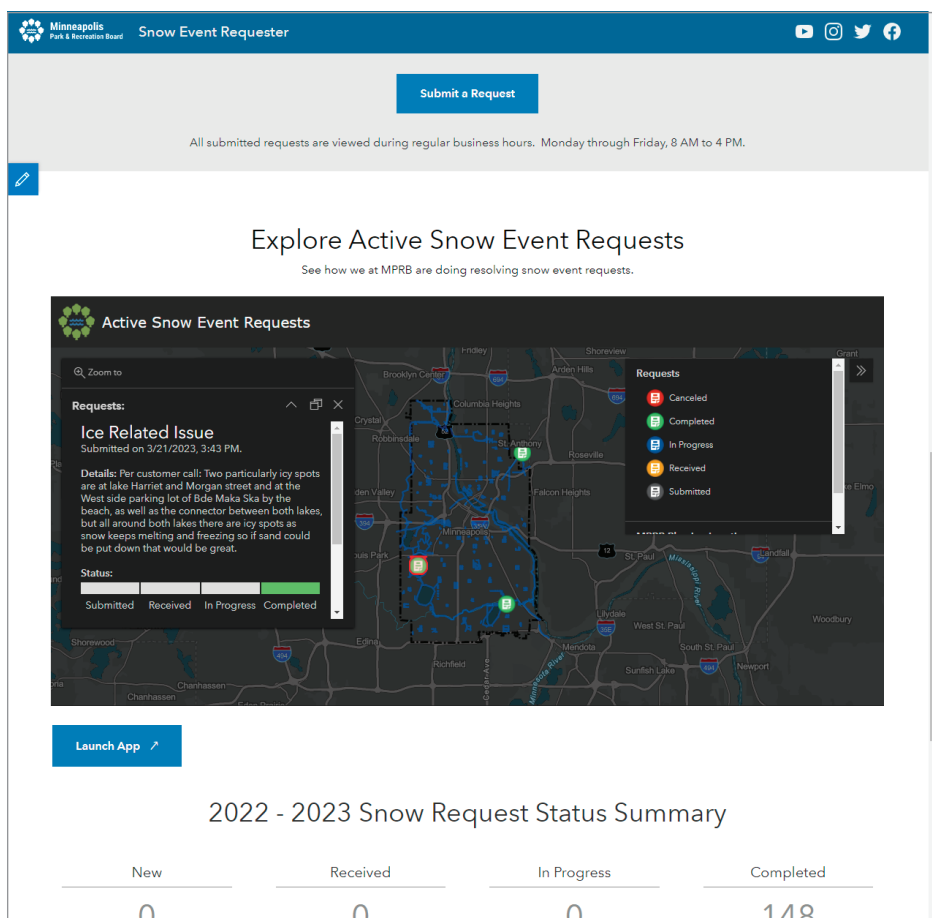
Armstrong says they used documentation on the Esri site as well as community forums to begin learning how to implement and configure the Winter Weather solutions. The pair also received help from their in-house GIS analyst administrator.

"I think it was far more advantageous for us to do [the setup] ourselves. I understand the solutions much more intimately. I can kind of fix any hiccups because I went through the implementation," says Armstrong.

MPRB performs similar operations on the parking lots and outdoor rinks it manages as well as on the sidewalks and walking and biking trails. The up-to-date details are now shared on a public-facing map.

MPRB was already using Verizon Reveal to track vehicles and had units placed in each truck or piece of equipment used to remove snow. The real-time data from the sensors is ingested with ArcGIS Velocity. Once a vehicle is turned on, the location tracking begins, and the moving vehicles are viewable on a map. Information like vehicle speed and direction can also be viewed. This snowplow feed is a live feed that updates every 10 seconds and ultimately feeds into MPRB's internal operation management tool from Winter Weather Operations.

The result is a vehicle stream that shows details like the last location of a plow and metrics on how far drivers have driven in each snow event. Each snow event is created when the team starts tracking vehicles during snowfall.



↑ The public-facing Winter Weather Outreach portion of MPRB's Active Snow Event Requests web page, where residents can interact with their own or others' requests.

continued on page 20

Minneapolis Park and Recreation Board Leverages Winter Weather Solutions to Improve Trail Plowing Activities

continued from page 19

Result

MPRB did a soft launch of the revamped solution in December 2022, which has helped improve operations and deliver vital information to residents. DesRoches says following the initial launch, they noticed a huge difference in the accuracy of the information they were producing from the first snow event to the second snow event.

"Very quickly, we were able to see in terms of all the segmentation that Kelly [Armstrong] did what was working well, what wasn't working well, and where we were not capturing things, and were then able to very quickly turn around some updates and solutions," says DesRoches.

The use of Winter Weather Operations and ArcGIS Velocity has allowed the team to perform advanced analysis and use data to improve decision-making. DesRoches explains that the AVL system was collecting data on snowplow locations, but until the visualization was available via a map or dashboard, the

information wasn't usable.

"I think the biggest thing is that difference between data and information. The AVL was producing all this data. It's collecting the pings, it knows where the vehicles are, but where it turns into information is via its organization and visualization to the folks who then can make decisions based on that," says DesRoches.

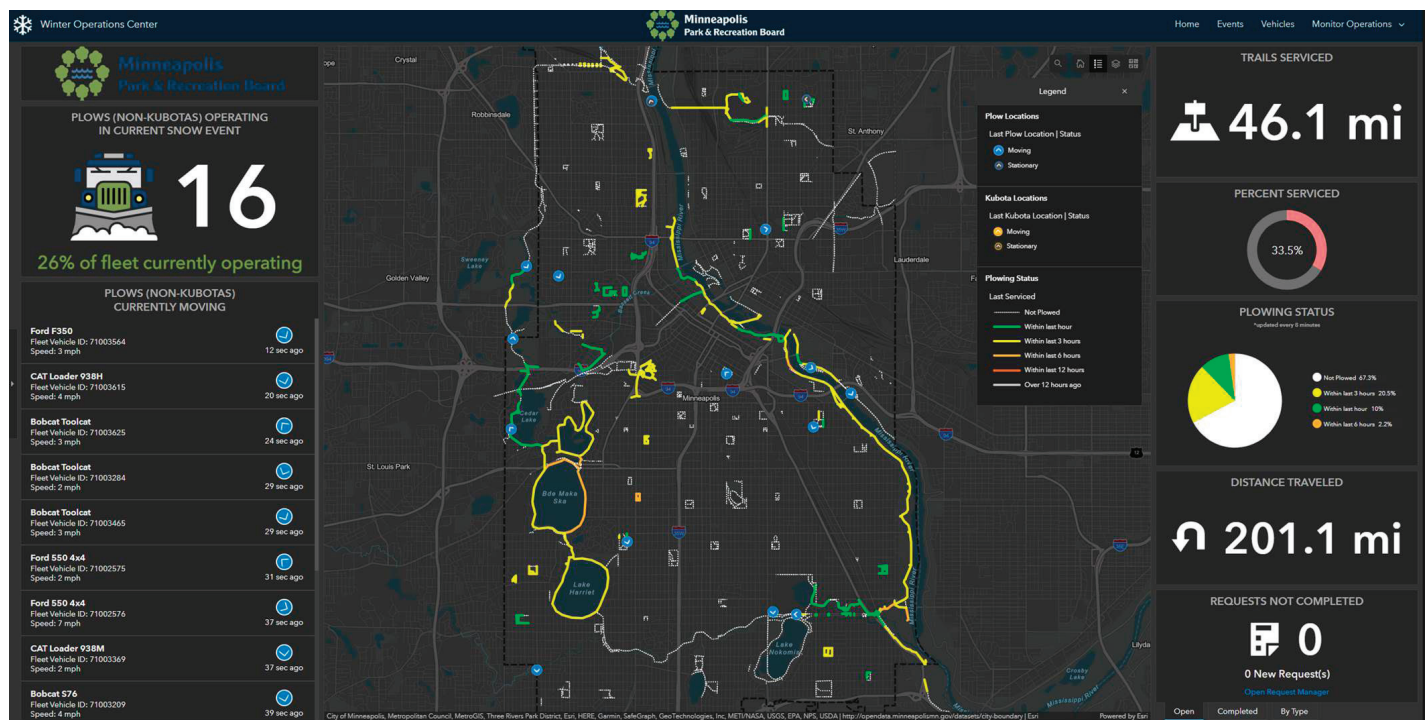
Armstrong says the implementation of the Winter Weather solutions and ArcGIS Velocity has enabled them to take the data collected about their snowplow vehicles and conduct analysis, see what trail segments are closed, and obtain a high level of details like time stamps and history. "[Previously] you could see where things are and see if vehicles were speeding, or if they go outside of an area, but bringing all that data into GIS will allow us to do the things we're looking to do," he says.

The use of Winter Weather Operations has streamlined plowing operations both

in the field and the office. DesRoches says they can proactively work with operations staff to dispatch drivers to areas in need because they know when a trail was last serviced. They no longer need to wait for requests to come in. Also, operations staff can now look at the map at the start of a shift and more easily determine what needs to be completed.

"That real-time information, and staff being able to essentially see a map and a dashboard, [lets them] respond to it in the field. We have 18 plow operators. They're not going to be able to communicate exactly what was done or what wasn't done," says DesRoches. "But now, by having this, we can actually have folks in the office or drive around and be able to see that real-time service data."

Along with Winter Weather Operations, MPRB also implemented the Winter Weather Outreach solution. Using this, the board established the public-facing Trail Plowing Status Map web page that allows the public to view the trail plowing



↑ With the internal view of the live trail plow status map within MPRB's Winter Weather Operations Center, staff can visualize plowing data and interact with the map.



↑ With Winter Weather Operations, snowplow operators like this one are able to see information in real time and respond to plowing needs in the field.

live status and history, view a map of locations of MPRB services, and submit maintenance or plowing requests with an ArcGIS Survey123 form. Survey123 is a formcentric data-gathering solution. The public now has visibility into all requests and how the board has responded to them, in an approach DesRoches calls “radically transparent.”

“We saw this as a solution not only communicating and pulling in information for us and for our staff but also being able to communicate with the public. This solution allows us to provide information directly to the public that says, ‘This trail that you are going to take downtown was plowed 30 minutes ago,’” says DesRoches.

If there is a trail that is not currently being plowed, the pair added a map with requests from the public on trails they’d like cleared, which they’ll examine during the season to see if operations can be expanded.

“We want to get input from the public about what trails they use and would like to see plowed that we don’t [currently] plow. We don’t want to hide the

information [about how we’re working],” says Armstrong. “We show the areas in our operations that we need to correct too. We don’t want to be afraid to share it.”

The use of Winter Weather solutions has given MPRB a more holistic view of operations. Armstrong says several snowstorms into the season have shown some weak points in their plowing operations, and they are now able to address them, which would have been more difficult with their previous processes. They also have data to support the expansion of operations.

“Our old way of doing things was all anecdotal. This person knows this part, this person knows the situation on the ground over here, but there was no one place for somebody to visualize this and see how things are going right now in real time but also over the length of a snow event,” says Armstrong. “So, this solution has brought [operational challenges] to the forefront and now it’s time to solve those.”

With the Winter Weather solutions, the process of receiving maintenance requests is now streamlined, saving time

and increasing efficiency. Requests are entered online into the snow request manager where all staff can view the status. Previously requests were received via different channels including emails, text messages, and phone calls.

The success of this new system in improving operations has led the team to explore future uses. Armstrong says the new solution will be used similarly to manage and track mowing operations in the summer and garbage pickups in local parks.

“There are a ton of things to do with [the Winter Weather solutions], and I think the lightbulb is turned on in how efficiencies could be created in a lot of our operations just by having a one-stop shop,” says Armstrong.



For more information on Esri’s Winter Weather Operations solutions, scan the QR Code.



Frisco, Texas, Finds Success with a Public Safety Digital Twin

Frisco, Texas, has a live map of public safety incidents and personnel locations shared across police, fire, and transportation departments. This map, a public safety digital twin, extends inside schools, allowing responders and staff to see live video of hallways. If traffic backs up, the live map is viewed by transportation engineers who can remotely change traffic signals. When incidents occur, fire and police staff use the digital twin to route themselves to calls and to coordinate response.

After 15 years of continuous evolution, there are numerous examples of how the Situational Awareness for Emergency Response (SAFER) platform (friscotexas.gov/1080/SAFER) lives up to its name.

Frisco's use of GIS technology, the underpinnings of SAFER, has grown, keeping up as the city grew from 30,000 to 230,000 residents between 2000 and 2023. Safety has become a big selling point for the city. For the second consecutive year, Frisco was recognized as the safest city in the US due to its low rates of property and violent crime.

"Back when I started in 2001, we didn't have an IT department, but city leadership embraced the power of GIS," said Susan Olson, assistant director of IT, and lead for GIS and SAFER. "I was told, 'We need GIS because we can't grow without understanding our city.'"

Frisco police chief David Shilson likes how SAFER provides access to information in the field for faster responses and

resolutions. "In simple calls like minor accidents, dispatchers and responding officers can pull up traffic cameras through links in SAFER and determine the best approach. In larger scenes, incident commanders can look at where units are in order to quickly set perimeters and direct incoming resources."

SAFER has gained daily use across multiple city departments, increasing collaboration among city staff. When problems occur, it provides clarity, allowing first responders to get critical information fast.

Meeting Needs and Finding Champions

Today, SAFER supports the needs of all first responders and has become a passion project for Olson, who pioneered the system. She now oversees all enterprise GIS for the city. Olson first earned the trust of public safety professionals by using GIS to make sure all city roads and addresses—even those still in the planning phase—were accurately mapped.

"Often accidents and crime happen when sites are under construction," Olson said. "We put new roads on the map when there's a plan so everyone has awareness of where new development is happening."

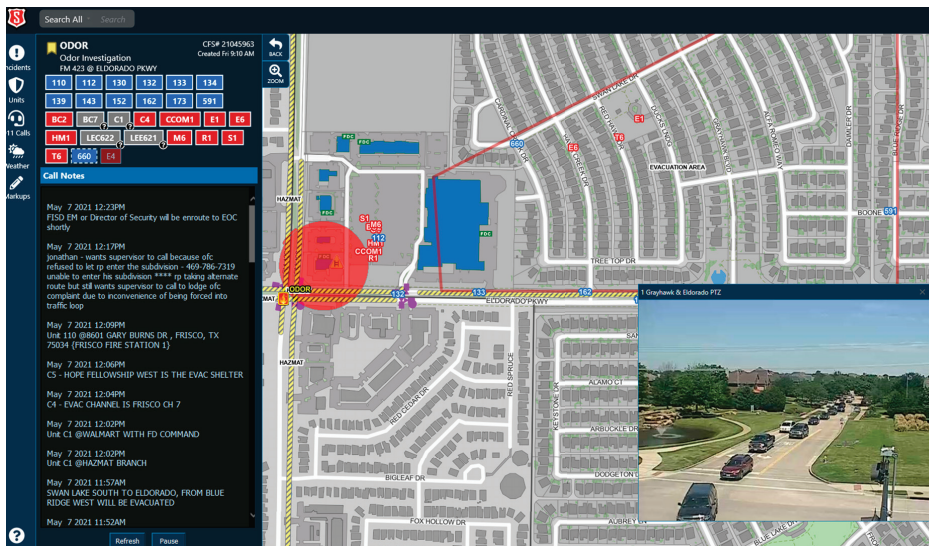
With every call for service, having the right location improved response times and outcomes. Olson then spent years delivering on the original vision of SAFER to create one shared system to respond

to all calls. The system accrued a long wish list: requirements to add, data to capture, systems to integrate, staff to train, partnerships to forge.

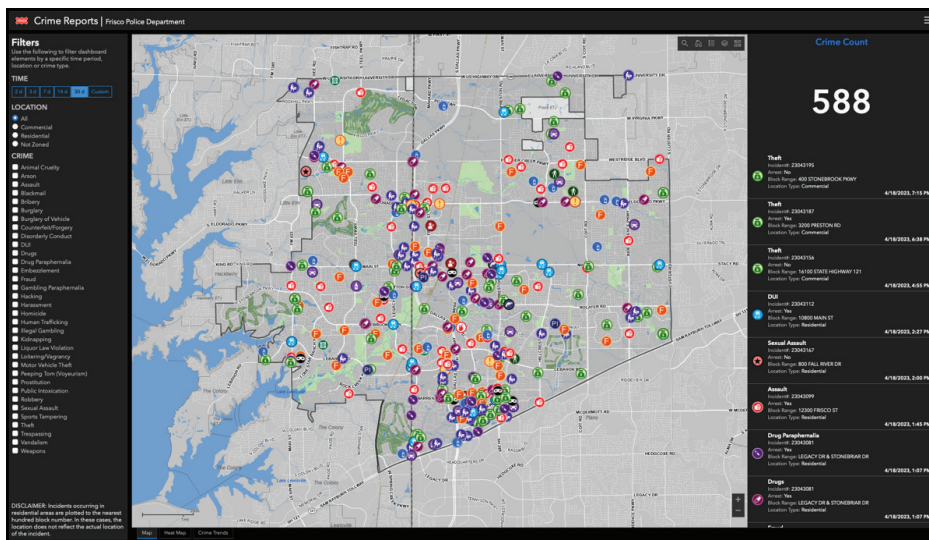
Recently, the SAFER team members refreshed and modernized the user interface and application code. They worked with other city IT staff to improve responsiveness and sustainability.

SAFER is used at all 78 Frisco schools, serving more than 66,000 students. Jon Bodie, the director of emergency management for Frisco Independent School District (FISD), compares first responders using SAFER to an orchestra working from the same sheet of music. "Campus incidents and emergencies range from routine calls to lockdowns and threat investigations," he said. "With access to over 4,000 FISD camera feeds and floor plans, SAFER allows Frisco agencies to coordinate resource support for these emergencies in real time, ensuring students and staff stay safe."

The Frisco Fire Department schedules yearly visits to every school to ensure that school information is up-to-date in SAFER. "The firefighters and school administrative staff work together during a fire drill to critique and identify areas of improvement," said William Clay Carpenter, deputy chief of Frisco Fire Department. "Through this collaboration, staff from both agencies get to know one another better and strategize student safety."



↑ When a six-inch gas line was ruptured by a construction crew near a school, SAFER was used to coordinate first responder actions—including evacuation of several hundred homes in the surrounding neighborhood.



↑ Frisco crime reports are mapped and made available to citizens.

Always Updating, Adapting, Integrating

Scaling SAFER to keep pace with the city's massive growth has required diligent attention and communication across departments. The system now integrates with more than 30 other systems, including live links to traffic cameras throughout the city, and real-time traffic from HERE. Also, SAFER holds dozens of GIS data layers.

"We built the reliance on SAFER over time on a foundation of accurate data, strong integrations, and being responsive to needs," Olson said.

Daily, city residents use a crime map app (go.esri.com/friscocrime) that's an offshoot of the SAFER system. "Our residents are very engaged and aware of their surroundings, and they let us know if the data doesn't look right," Olson said.

The success GIS has produced hasn't been limited to public safety—it has also helped fuel Frisco's growth and entice corporations to make the city their home. "When our Economic Development Corporation staff are trying to attract a company, they work with our GIS team," Olson said. "We've built web apps for companies to show them all Frisco has to

offer."

Frisco has many amenities that appeal to residents and businesses looking for a place to relocate:

- Sporting venues include Ford Center at the Star, the Dallas Cowboys' headquarters and practice facility; Toyota Stadium, home to the FC Dallas soccer team, which will host FIFA World Cup events in 2026; the practice ice for the Dallas Stars hockey team; and Riders Field, home of the Frisco RoughRiders Minor League Baseball team.
- PGA headquarters recently opened, surrounded by two championship golf courses that will host 27 championship tournaments over the next 12 years. This development also includes a 10-hole lighted par 3 short course, a retail village, and the new 500-room Omni PGA Frisco Resort.
- The Frisco North Platinum Corridor forms a seven-mile spine of economic development in the city with a focus on headquarters, tech, sports, tourism, and entertainment.
- Universal Studios is building a theme park in Frisco, with a planned opening in 2026, that will include rides and attractions aimed at young children.
- The Frisco Discovery Center combines a theater, art gallery, science museum, and the National Videogame Museum.

The city pioneered the public safety digital twin concept. The city's public works and engineering groups see the value of SAFER and would like to apply the same digital twin approach to city work orders, maintenance vehicles, permitting workflows, and more.

"We've built this platform and it wouldn't be that hard to duplicate for others," Olson said.



To learn how communities are kept safe with real-time GIS technology and solutions, scan the QR Code.



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