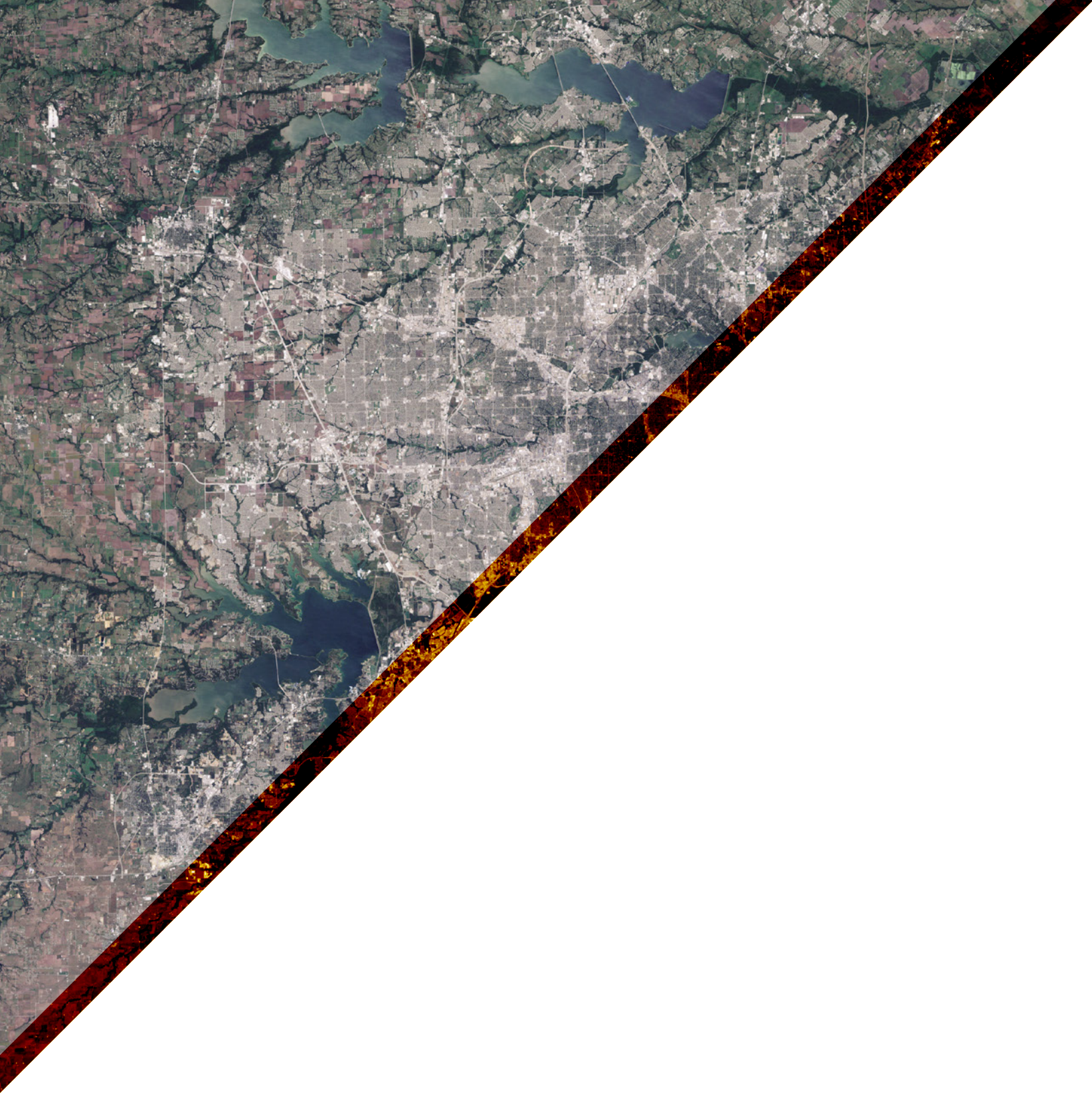


The background of the entire page is a diagonal aerial satellite photograph of a city coastline. The top-left corner is white, and the bottom-right corner is the satellite image. A thick, shimmering gold border runs along the diagonal edge. The main title is centered in the white area.

PEOPLE, PLACES, & PROCESS:

THE IMPACT OF GIS &
FACILITIES MANAGEMENT



EXECUTIVE SUMMARY

Because we Americans spend almost 90 percent of our time indoors and because the government owns, manages or occupies roughly 500,000 facilities, the role of a facilities manager is becoming increasingly important for government. The federal government also operates more than 600,000 vehicles and employs 1.8 million civilians. Buildings have now become our primary habitats.

Facility managers believe that “ecosystem” is now the right word to describe a building portfolio. But what does it mean to manage a building ecosystem? Think back to your biology courses. Ecosystems are biological communities containing both living and non-living inhabitants. An ecosystem could be anything — a lake, forest or your favorite national park. When you study ecosystems, you are trying to find processes that link everything together, breaking down each element and understanding how each component affects the whole. And no two ecosystems are alike; each is unique and requires careful study, just like the buildings in facilities manager’s portfolio.

Today’s facilities managers play the role of building ecologists, studying an environment, piecing together data points to understand the whole. Like a scientist, they must understand the who, what, where and why of the environment. And by connecting all the dots, they can figure out how to improve the ecosystem, providing a desired state for its inhabitants.

But as a facilities manager, you don’t have microscopes and field notes in your toolkit like an ecologist would.. Instead, you’re equipped with a powerful facilities management tool: geographic information systems (GIS). GIS presents the ability to show information visually, helping you spot new trends, patterns and relationships across your building portfolio. By leveraging GIS technology, facilities managers can manage the entire life cycle of their facilities. This means everything from site selection to decommissioning buildings.

Esri, the global leader in GIS, has partnered with GovLoop to create this guide. Together, we:

- /// Identify the current landscape of facilities management and GIS.
- /// Provide an overview of federal mandates impacting facilities management.
- /// Show specific applications of GIS and facilities management, including examples from the Architect of the Capitol, North Carolina University at Charlotte and the New York City Fire Department.
- /// Explore components of facilities management such as portfolio planning, operations management, safety and security.

This guide will also show how Esri’s ArcGIS platform brings together maps, apps, data and people, enabling facilities managers to make smarter decisions. From the initial site selection and throughout the entire life cycle of a building, GIS is an important tool.

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THE CURRENT STATE OF FACILITIES MANAGEMENT & GIS

Before we discuss the many benefits of GIS for improved facilities management, it's important to start by providing a brief overview of the tool. GIS presents the ability to show information visually, helping the public or key decision-makers spot new trends, patterns and relationships. By leveraging GIS technology, government agencies are preparing for the future style of governance, which will rely on real-time insights, data-driven decisions and the use of maps as a means of improved communications and information sharing with constituents.

"A geographic information system (GIS) lets us visualize, question, analyze, and interpret data to understand relationships, patterns, and trends," says Esri. And now, GIS is being used to manage facilities. GIS and facilities management applications have evolved beyond traditional approaches, in which GIS was used to measure only the environmental impact of a facility within a community. Now, managers are using GIS to make site location and security decisions and to select materials for construction. GIS also has applications inside buildings, such as space utilization and emergency management.

As technology advances at a seemingly exponential rate, buildings are becoming more complex. Critical decisions need to be made about materials, infrastructure and space, and officials need to understand the cost structures, in the near and long terms, to make proper decisions. GIS helps them do that.

Using GIS, these decisions can now be based on the trove of facilities data that agencies are now collecting, managing and storing. Facilities managers have more access to data than ever before — everything from HVAC systems, occupancy, source materials and temperature to tracking workflows or video feeds. GIS can turn this data into actionable information and empower facilities managers to take raw data and make it meaningful, driving better investment and facilities decisions.

Using GIS for facilities management, organizations can also achieve compliance with state, local and federal mandates. The federal government has issued a variety of Executive Orders designed to create more sustainable facilities and communities by, for instance, reducing carbon emissions and energy usage.

One example is Executive Order 13514, which President Obama signed Oct. 5, 2009. "The Federal Government occupies nearly 500,000 buildings, operates more than 600,000 vehicles, employs more than 1.8 million civilians, and purchases more than \$500 billion per year in goods and services," the White House said.

GIS & Facilities Management in Action: *The University of Rochester*


One case study from a recent Esri report, [GIS in Education: Across Campuses, Inside Facilities](#), highlights the University of Rochester (UR) as a leader in facilities management and GIS. Located in Rochester, New York, the university has approximately 4,600 undergraduate and 3,900 graduate students.

UR is also affiliated with Strong Memorial Hospital, which is the sixth largest employer in New York state and the largest in the greater Rochester area. The university is also growing fast. The Esri report states that the campus has grown by about 1 million square feet every decade.

"Rapid expansion has led to a complex and often difficult to manage matrix of utilities located throughout the university campus," the report states. "The university has responsibility for domestic water, chilled water, hot water, steam, condensate return, fiber-optic, telephone, natural gas, storm sewer, sanitary sewer, electric distribution, street lighting systems, and medical gases inside the hospital and research complex."

Since the university includes a medical facility, all of these systems need to be functioning and reliable all day. UR hired a local Esri partner to develop a solution using ArcGIS Desktop and ArcGIS 3D Analyst. The university was able to convert drawings into georeferenced datasets and host them within a geodatabase for access. This allowed broader accessibility and helped managers identify spots where maintenance might have an adverse affect on services.





In an effort to better manage the variety of government assets, the order also creates sustainability goals for all federal agencies. It sets forth the following energy consumption reduction targets:

- /// 30 percent reduction in vehicle fleet petroleum use by 2020.
- /// 26 percent improvement in water efficiency by 2020.
- /// 50 percent recycling and waste diversion by 2015.
- /// 95 percent of all applicable contracts will meet sustainability requirements.
- /// Implementation of the 2030 net-zero energy building requirement.
- /// Implementation of the storm water provisions of the Energy Independence and Security Act of 2007, Section 438.

The mandate also required that all agencies submit a 2020 greenhouse pollution reduction target within 90 days of the order's issuance, and identify ways to become more energy efficient through reduced use of oil and water, all while reducing waste.

To meet these goals, organizations have reformed their facilities management strategies, and GIS has been a critical part of that. With GIS, agencies can understand their data at an entirely new level, enabling them to meet the requirements of the Executive Order.

Facilities managers can also understand how people and things relate to their environment. With GIS, they can then view data on an integrated platform and start to link together processes to improve the overall efficiency of a building portfolio.

There are many benefits of GIS and facilities management, but here are 10 examples. Pairing them, you can:

1. Manage the full life cycle of buildings.
2. Leverage and consolidate data.
3. Obtain real-time insights on building status and operations.
4. Quickly respond to facility, security or operational emergencies.
5. Manage assets such as land and infrastructure for improved budget decisions.
6. Reduce costs of maintenance and quicker resolutions to work orders.
7. Improve energy efficiency of facilities.
8. Increase operational efficiency and remove paper-based processes.
9. Meet government mandates on energy reduction.
10. Provide a holistic view of the entire building portfolio.

These are just the start for facilities management. And with Esri's ArcGIS Platform, which helps government officials understand their facilities management data, organizations can more efficiently manage their buildings.

Esri's technology is uniquely suited to help government operate facilities from a single and authoritative database. Esri offers facility-specific templates and applications that can be used with common facilities software — integrated workplace management systems (IWMS), computerized maintenance management systems, Computer-Aided Facility Management and enterprise resource planning — helping to provide new insights on building management.

To meet government mandates and create resilient communities, facilities management plays a critical role for government. Our building ecosystems must have a symbiotic relationship with the natural world to create sustainable communities, and GIS can help facilitate that partnership.

In our next section, we explore three applications of GIS and facilities management, and discuss how Esri is helping agencies identify value from facilities data.

Extending the Value of Facilities Data with GIS

GovLoop and Esri recently hosted a MeetUp for GIS professionals to learn how to extend the value of GIS investments by leveraging facilities management data. One of the biggest costs for any organization is asset and facilities management, making proper applications crucial to reducing costs.

But to effectively manage facilities, organizations need to understand important data points about where offices, vehicles, property, people, pipelines, desks, computers and even power outlets are located.

The MeetUp featured Stu Rich, Chief Technology Officer at PenBay Solutions, who described how computer-aided design (CAD) and business information modeling (BIM) are being integrated into GIS solutions for space and occupancy, asset location, work management, and public safety in the public sector.

"Facilities information systems [managers] need to understand your entire portfolio, because that's the scale of the business problem you're operating in," Rich said, adding that GIS should be a cornerstone of facilities information strategy.

The second presentation was by Craig Cleveland, Solution Engineer at Esri, on how to use 3-D tools and app templates to maintain buildings and interior spaces found on a campus or facility grounds. Cleveland's presentation focused on educating ArcGIS users about the available templates — such as the Campus Place Finder — and resources for facilities management.

Cleveland demonstrated how easy it is to use the template to locate people on a campus, find an office, move between floors and use the information for space and occupancy planning. Campus Place Finder allows organizations to know how much space is available across an entire facility and makes information easily accessible to users, not just programmers or traditional GIS users.





3 APPLICATIONS OF GIS & FACILITIES MANAGEMENT

GIS can help organizations manage their facilities in many ways. In this guide, we focus on three specific areas: portfolio planning, operations management, and safety and security of facilities. Within this section you will find an overview of each application area, along with a case study highlighting GIS and facility management applications.





Area 1: Portfolio Planning

Government organizations often manage a wide inventory of real property. Take, for instance, a school district, in which administrators are managing land, stadiums, infrastructure and multiple school buildings. What happens when it's time to replace aging buildings and infrastructure? How do administrators know they are using space adequately? With ArcGIS and spatial analysis, they can find the answers and have the confidence that they are optimizing facilities management. Below we identify three elements of portfolio planning: site selection, resource allocation and space utilization.

Site Selection

With GIS, you are empowered to make the best data-based decisions about where to locate an office building or campus. For instance, instead of relying on instincts or guessing that one street corner has more foot traffic than another, you can use data to be sure to select the right site for your needs.

Resource Allocation

As we've already indicated in this guide, government agencies are facing pressures to improve functionality and reduce energy use in buildings. To meet these objectives, facilities managers must understand a vast amount of data to make proper investments. This means understanding which buildings use more energy, why, during what times and what the operational need is. Knowing how to optimize resources can play a significant role in achieving goals.

Space Utilization

GIS can help government agencies manage space to produce the most productive office. This could mean managing a workflow that spans multiple locations, floors or regions, but with GIS, everything can be consolidated into one location to make it easy for agencies to use.

Portfolio Planning in Focus: The Architect of the Capitol

In a recent issue of Esri News for Facilities, the Esri team highlighted how the U.S. Capitol has used GIS technology to help members of the House select their offices and to manage the grounds.

"The United States Capitol and its grounds are maintained by its own architect, the Architect of the Capitol (AOC)," according to Esri's newsletter. "The US Capitol and Visitor Center, Senate and House office buildings, Supreme Court, and Library of Congress, 17.4 million square feet of buildings, are cared for by nearly 2,600 AOC staff. They also are responsible for keeping the more than 460 acres of Capitol grounds in impeccable condition."

In addition to hosting more than 2 million visitors per year, one of AOC's most important duties is helping members of the House choose their offices after an election. They participate in a lottery system that is based on seniority.

"During the November 2012 transition, however, the 113th time the House has been elected into office, instead of selecting office space from paper maps and photographs, members were presented with an interactive map app that provided access to photos; complete information on the suites, such as window views, access to elevators, and committee hearing rooms; and even a 360-degree panoramic view of the available offices," the newsletter states.

The map app could run on mobile devices, making it easy for AOC officials to work with House staff. AOC officials could simply enter an office number and receive a layout of the office for House members to explore. They could see various details of the office, such as square footage and even the condition of drapes and

carpets. Delivering all this information to them in one location made it easy for legislators to choose an office.

"We couldn't possibly do this on a paper map," said Christopher Smith, Director of Technical Support Division, Planning and Project Management at AOC, in the Esri article. "GIS brought these capabilities to them, all while supporting the existing lottery system that was in place."

Today, the use of GIS for facilities management at AOC extends beyond office selection. "Besides the lottery app, AOC staff, those responsible for the upkeep and care of the buildings and grounds, can log in to the system via another app that accesses different workflows to help them keep the facilities running smoothly," Esri's newsletter states. This streamlining is the result of workers' new ability to share code, so developers do not have to create custom code for each application or user.

The AOC example is one way that agencies can more effectively plan and manage their building portfolio and become more efficient at building management.



Operations Management in Focus: University of North Carolina at Charlotte

GIS and facilities management can play an important role on company and university campuses. Any kind of campus can benefit from improved facilities management, in part because campuses are similar to a small city. They both have various buildings, transportation, regulations and people to protect.

A facilities management solution can better equip campuses to help their inhabitants.

For example, the University of North Carolina at Charlotte (UNCC) has deployed an integrated facilities management solution to provide improved awareness of workflows and asset management.

With ArcGIS, UNCC was able to create a system “that stores and displays data based on the facilities’ geographic location. The system makes it easier to identify employee locations in buildings and at floor levels, visualize work requests on a map, and determine the status of assets such as emergency phone locations,” according to an Esri case study.

With the ArcGIS tool, the university has been able to gain spatial insights on work processes and asset life cycles, which will let it more quickly conduct work orders, improve insights and better manage assets.

Area 2: Operations Management

If an organization is looking to reduce energy consumption, improve its ability to act in emergency situations and efficiently manage assets, it must create a common operating picture across its entire facilities portfolio. This section will explore how GIS fills that role. GIS can assist with space management, energy and sustainability, and work order management.

Space Management

Demonstrating the most optimal way to design an office, rearrange departments or group business teams is best done visually. With GIS, leaders can map their existing data to help them make more informed decisions and improve the agency’s effectiveness.

Energy and Sustainability

Using GIS, leaders can leverage a platform designed for real-time visual access to energy usage about a building. This can help them meet their energy goals and be more environmentally conscious.

Work Order Management

GIS can play a critical role in managing the maintenance and work orders for building managers. With GIS, agencies can track work orders, understand where supplies are and be efficient with sourcing materials.

Area 3: Safety and Security

The safety and security of facilities are becoming more regulated — and more important. If you have a building that requires restricted access or are looking to monitor safety and keep employees protected, GIS is an essential tool to help you meet those goals. In this section we discuss GIS and facilities management for emergency management, environmental health and physical security.

Emergency Management

If a disaster strikes your community, you need to know that your continuity of operations programs will occur without incident. This means knowing the location of backup sites, employees and critical infrastructure within your community. With GIS, you can quickly identify these resources and understand areas affected by the crisis. GIS can also help plan for crises because it lets you run scenarios to assess potential impact and set up procedures to best protect and mitigate a crisis' effect on your community.

Environmental Health

With GIS, you can manage and monitor a variety of environmental and health concerns. You can spot clusters of disease, identify building materials containing known carcinogens for removal and purchase materials that meet environmental standards. It can also help you assess your infrastructure and know what utilities to upgrade to improve occupants' well-being.

Physical Security

The physical security of building occupants is one the most important concerns for facilities managers. With GIS, you can improve the management of your safety operations by incorporating line-of-sight analysis, tracking entry points and analyzing high-traffic areas to quickly thwart any safety risks.



Safety and Security in Action: FDNY during the Super Bowl

The Fire Department of New York City (FDNY) is tasked with protecting New York City's 322 square miles and more than 8 million residents. If this mission alone wasn't big enough, in 2014, the most televised and popular sporting event in America, the Super Bowl, came to MetLife Stadium in nearby East Rutherford, N.J., as the Denver Broncos faced the Seattle Seahawks.

For most of us, the Super Bowl is an hours-long event during which we gather with friends and family to watch the game. But for FDNY, the Super Bowl involved months of planning and preparation. The department had the task of safeguarding residents and the tourists who went to the city for the game.

That presented many security challenges. But thanks to emerging technology, and fast deployment options, FDNY had the people, processes and technology in place to retain security during the event.

Leading up to the game, nearly 300 events required public safety attention. These events spanned 200 square miles and crossed two states, 15 counties and 22 cities. And because many were part of festivals or temporary environments, officers had to operate in new kinds of environments.

One of the most important and most trafficked areas was Super Bowl Boulevard. For a five-day period, this temporary thoroughfare on Broadway from 34th to 47th streets was the epicenter for the fan experience during Super

Bowl XLVIII. Super Bowl Boulevard had countless events, high-profile guest appearances and tourist foot traffic.

Leading up to the big game, FDNY partnered with PenBay Solutions and Esri to develop a new solution to help address the complexity and volume of these security challenges. FDNY leveraged the InVision platform from PenBay, adding the Event Planning Module to support the creation and approval of Event pre-plans. FDNY had used InVision previously in its Operations Center, but this new module brought an additional set of planning capabilities that the department and partner agencies could use.

FDNY also used ArcGIS Online, powered by Esri, to deliver approved pre-plans and intelligence data via maps and mobile apps that could be shared anywhere, anytime. FDNY was able to deploy a mobile solution to help inform field users, making information readily available, whether accessed on a tablet, desktop, browser or smart phone.

Using InVision and ArcGIS Online, FDNY was able to quickly plan out operations throughout the week and ensure the safety of thousands. This solution brought a whole new dimension to planning and operations personnel across the city, providing a cross-agency view of up-to-date information. "The thought leadership of FDNY and the strength and versatility of InVision came together to effectively address the complex safety and security challenges of not just the Super Bowl itself, but for all the events during the week leading up to it," said Benton Yetman, Director of Solutions at PenBay.

YOUR FACILITIES MANAGEMENT CHEAT SHEET

Looking for a quick overview of facilities management? Here's a rundown of our report and what you need to know.

Overcoming Common Obstacles

To truly capitalize on GIS and facilities management, your agency will need to first overcome a host of challenges. Below we identify five common obstacles and how GIS can help you overcome them.

- 1. Obtaining access to the right data:** For proper facilities management, you will need to link data from a variety of sources. With Esri ArcGIS Online, you get an online portal by which you can seamlessly connect and share data with other facility managers, teams and units. This will give you access to the right data, all in one platform, making it easy for you to gain visibility into your entire building portfolio.
- 2. Monitoring & measuring the right data:** Sometimes it's hard to know what you need to measure. But with ArcGIS Online, you can create customized metrics and dashboards to help you understand your buildings and facilities at as nuanced a level as you desire or as is mandated.
- 3. Navigating culture change:** Without a doubt, introducing GIS as a tool to manage your facilities could lead to some challenges within your agency's culture. But with GIS it's easy to show data visually in a new ways. The key is to focus on outcomes.
- 4. Using existing management tools:** Chances are your agency already is using tools to manage your facilities, probably tools such as CAD and BIM, along with GIS. You can integrate all those tools with the ArcGIS platform.
- 5. Avoiding scope creep:** Because you can do so much with GIS, you might feel overwhelmed. To avoid that, start by setting some key metrics you must hit and focus on gaining some quick wins. As you begin to integrate GIS across your team and see its value, then you can start to define more programs and help your team focus on more initiatives.

Your Facilities Management & GIS Elevator Pitch

Need to convince your boss or peers about the power of GIS for facilities management? Try using this elevator pitch we created for you.

GIS can help us gather new perspectives on organizational challenges to improve mission needs. GIS provides the opportunities for us to map quantities and densities, and manage our facilities more effectively. With the technology, anything can be mapped, generating easy-to-use and visually compelling maps. So how does GIS come into play for facilities management? Here are a few examples:

- 1. Portfolio & real estate management:** Managing assets such as land, office space and infrastructure.
- 2. Sustainability efforts:** Measuring output of data such as carbon emissions and water quality to improve the environment.
- 3. Emergency preparedness:** Keeping first responders safe by providing better information about building layouts and surrounding areas during a crisis.
- 4. Integrating Management software:** GIS can integrate with leading facilities management software we have already adopted, such as IWMS, CMMS, CAFM and ERP. This will help provide insights into both the inside and outside of buildings.

These four examples are just a few of dozens of applications of GIS in facilities management. Public-sector organizations operate and maintain thousands of facilities, and with GIS, facility managers can gain new insights throughout the entire life cycle of a facility, and witness significant cost savings.

With GIS we can make smart decisions on site selections and space optimization, and we can keep improving the business continuity of our facilities.



Glossary of Terms

Computer-Aided Design (CAD): A computer-based system for the design, drafting and display of graphical information. Also known as computer-aided drafting, such systems are most commonly used to support engineering, planning and illustrating activities.

Definition from Esri: <http://support.esri.com/en/knowledgebase/GISDictionary/search>

Building Information Modeling (BIM): A process involving the generation and management of digital representations of physical and functional characteristics of places. Current BIM software is used by individuals, businesses and government agencies who plan, design, construct, operate and maintain diverse physical infrastructures, such as water, wastewater, electricity, gas, refuse and communication utilities, roads, bridges and ports, houses, apartments, schools and shops, offices, factories, warehouses, and prisons.

Definition from Wikipedia: http://en.wikipedia.org/wiki/Building_information_modeling

Integrated Workplace Management System (IWMS):

A software platform for businesses that integrates five functional components, operated from a single technology platform and database repository. IWMS assists organizations in optimizing the use of workplace resources, including the management of a company's real estate portfolio, infrastructure and facilities assets.

Definition from Wikipedia: http://en.wikipedia.org/wiki/Integrated_workplace_management_system

Computerized Maintenance Management System (CMMS):

A CMMS software package maintains a computer database of information about an organization's maintenance operations, i.e., computerized maintenance management information systems. This information is intended to help maintenance workers do their jobs more effectively — for example, determining which machines require maintenance and which storerooms contain the spare parts they need — and to help management make informed decisions — for example, calculating the cost of machine breakdown repair versus preventive maintenance for each machine, possibly leading to better allocation of resources).

Definition from Wikipedia: http://en.wikipedia.org/wiki/Computerized_maintenance_management_system

Computer-Aided Facility Management (CAFM):

The support of facility management by information technology. The supply of information about facilities is the center of attention. The tools of CAFM are called CAFM software, CAFM applications or CAFM systems.

Definition from Wikipedia: http://en.wikipedia.org/wiki/Computer-aided_facility_management

Enterprise resource planning (ERP): Business management software — usually a suite of integrated applications — that a company can use to collect, store, manage and interpret data from many business activities, including: product planning, cost, manufacturing or service delivery, marketing and sales, inventory management, shipping, and payment.

Definition from Wikipedia: http://en.wikipedia.org/wiki/Enterprise_resource_planning



Benefits of GIS & Facilities Management

(See more on page X.)

1. Full life cycle management of buildings.
2. Better use and consolidation of data.
3. Real-time insights on buildings' status.
4. Quicker responses to emergencies.
5. Management of assets such as land and infrastructure for improved budget decisions.
6. Reduced maintenance costs and quicker resolutions to work orders.
7. Improved energy efficiency.
8. Increased operational efficiency and fewer paper-based processes.
9. Adherence to government mandates on energy reduction.
10. A holistic view of an entire building portfolio.



Resources

- GIS for Facilities, Esri Overview: <http://www.esri.com/industries/government/facilities>
- Hear Esri Staff Highlight ArcGIS for Facilities Resources: <http://video.esri.com/iframe/2732/000000/width/960/0/00:00:00>
- Esri Facilities Services Offering: <http://www.esri.com/~media/Files/Pdfs/industries/government/facilities/esri-facilities-services-offering.pdf>
- The Role of GIS Technology in Sustaining the Built Environment: <http://www.esri.com/~media/Files/Pdfs/library/ebooks/sustaining-the-built-environment.pdf>
- Templates for Facilities: <http://www.esri.com/industries/government/facilities/templates>
- Facilities Information Spatial Data Model: http://www.esri.com/industries/government/facilities/brochures_whitepapers

ABOUT GOVLOOP

GovLoop's mission is to "connect government to improve government." We aim to inspire public-sector professionals by serving as the knowledge network for government. GovLoop connects more than 140,000 members, fostering cross-government collaboration, solving common problems and advancing government careers. GovLoop is headquartered in Washington, D.C., with a team of dedicated professionals who share a commitment to connect and improve government.

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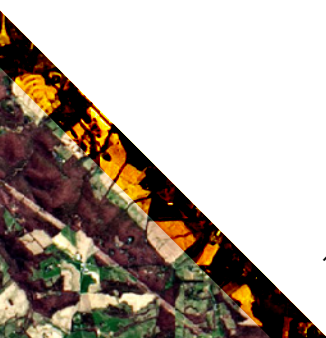
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