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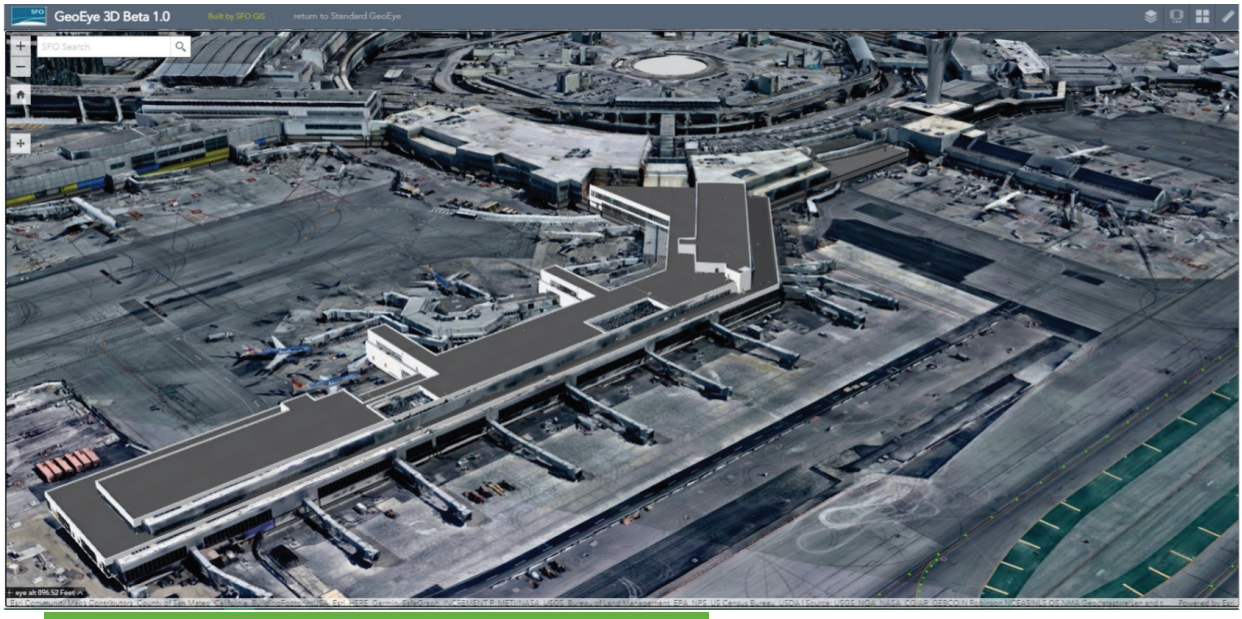
GIS SOLUTIONS

A Flying Start for Data Integration



LEARN MORE VIA WEBCAST

For more information, don't miss the accompanying webcast on the topic, "The Value of GIS + BIM for AEC Owners: San Francisco Airport Profile," sponsored by Autodesk and Esri.

You can watch the live version on May 6, 2021, at 12 pm ET or view the archived video at any time after that. To register for either, visit *bit.ly/3mOfKGI* or scan the accompanying QR code. Both versions are accredited for continuing education hours.

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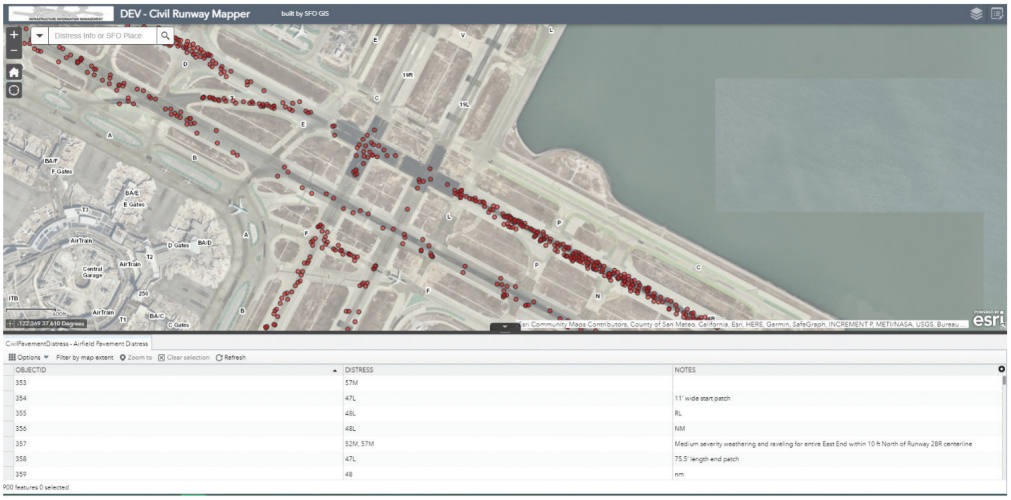
San Francisco International Airport's multi-billion-dollar capital improvement is not only improving a world-class international airport, but they are similarly blazing a new trail with the combination of Geographic Information Systems (GIS), Computer-Aided Design (CAD) and Building Information Modeling (BIM) to transform infrastructure data management, operations and, ultimately, the traveler experience.

San Francisco International Airport (SFO) serves as the fourth-largest international gateway airport in the United States and a leading gateway airport to Asia Pacific, handling more than 58 million passengers in a normal year. To capitalize and expand on that position, SFO embarked on a multi-billion-dollar capital-improvement program that, when complete, will transform operations and the travel experience at San Francisco International Airport. At the same time, the way spatial data to support

those improvements and the redesigned airport is being created and managed will similarly set a new standard for airports in the future.

Encompassing more than 100 individual projects of all sizes, including the centerpiece—a redesign of the new Harvey Milk Terminal 1—along with the opening of a new flagship Grand Hyatt Hotel and changes to long-term parking facilities as well as two new SFO AirTrain stations, the improvement program will position the airport for a bright future.



SFO's Runway Assessment Viewer and Mobile Application

A keystone of the data side of that program, however, is getting everything absolutely right from the outset, and having that philosophy endure throughout the entire building and infrastructure lifecycle. To make this happen, SFO's Infrastructure Information Management, which includes the GIS team, is pioneering work to ally geospatial and CAD data with BIM data across the entire airport's built environment.

The new capital improvements are part of a much larger existing set of facilities and assets that make up the entire airport landscape of more than 5,000 acres and 8 square miles. In essence, airports operate as highly complex small cities. They have their own multimodal transportation and utilities networks, emergency services and populations—whether permanent or transient—which number in the thousands. They also are laser-focused on safety and security, with operations on the ground or air affording no room for error.

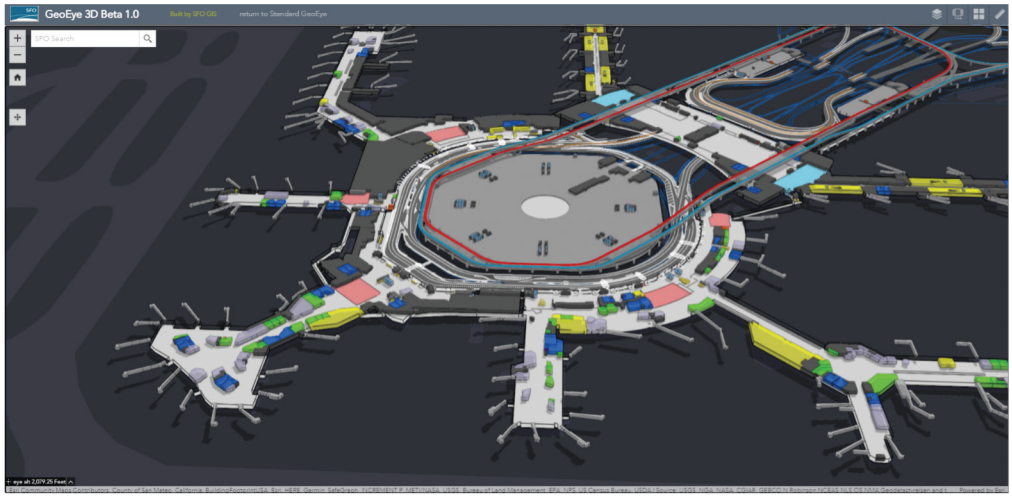
Data and information at an airport is central to efficiency as well as safety. A challenge is the multiplicity of data environments that can exist—not just the languages and protocols but also the numerous independent repositories that grow through time across a large organization. SFO's GIS team has set itself the goal of unifying infrastructure-related data across its substantial campus and many stakeholders, and it's using Esri-supplied GIS to provide an outward-facing window to all the various spatial data types to facilitate easy access and updates to that data.

Common Goals

"This is a multi-billion-dollar capital project with numerous different project teams," says Josephine Pofsky, SFO's Director of Infrastructure Information Management. "We want those teams to follow common data standards, which will allow us to bring all that information together in one easily accessible place.

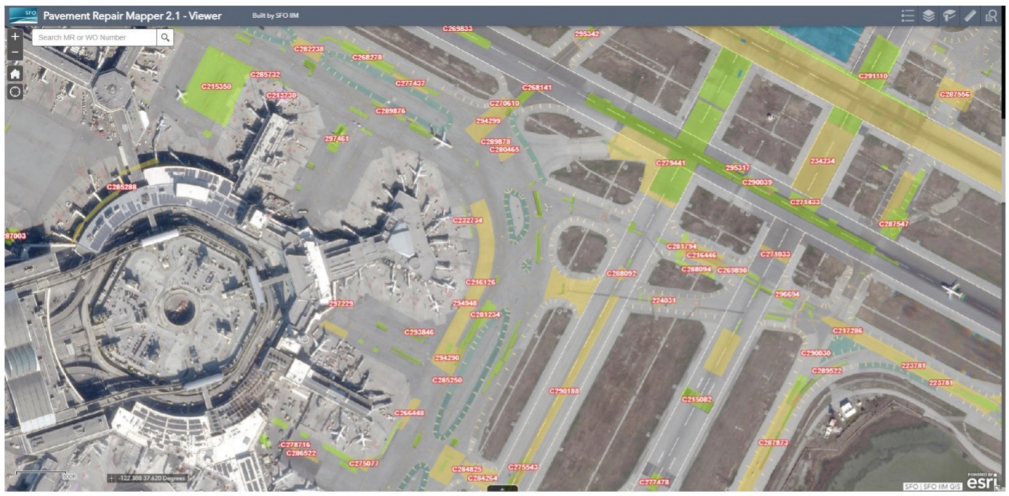
"Our story is about securing that process," she adds. "This will be true data covering the entire campus, from airspace to ground space to underground. It means that, from Day One, facilities, maintenance and other stakeholders such as emergency services will be able to go in and find attributes, data and locations; at the same time, some of that initial data will still be used a decade and more up the road."

"It's not just about the money or time savings," notes Pofsky. "We believe our approach and model can conquer the scope, cost and schedule of the project all in one. Some people are still looking at those



SFO's 3D Airport Viewer

dimensions individually, but our message is that by the time the build is finished, using GIS and BIM together will be the working model that carries the resilience and sustainability of our facilities for 40 to 50 years."



The Airport Pavement Condition and Repair Viewer

On-Screen and On-Trend

SFO is on trend, moving to an enterprise-shared environment that allows greater transparency and information sharing among departments. Where detailed structural information was previously only readily accessible to a small number of engineers, GIS—through the series of tools provided by Esri—is enabling a large and growing number of people to access, use and update data. Field engineers, for example, can take an iPad to a remote point on the campus, locate and click on an asset, and be provided all types of relevant, related information with very little GIS training or knowledge.

GIS and portable devices are enabling the SFO team to address the high volume and pace of information requests from many different stakeholders as well as for tasks that range from a day or two in duration up to several months.

Sizeable Matters

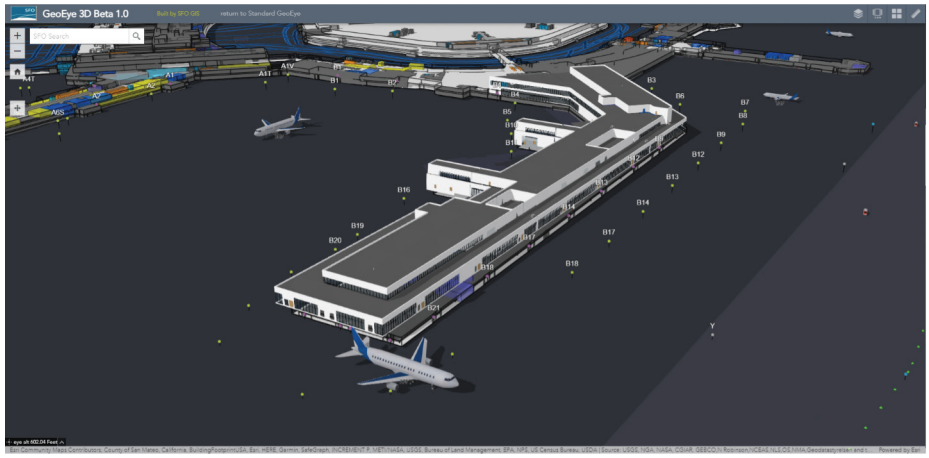
GIS provides a natural fit for what SFO is trying to do, explains GIS Analyst Guy Michael.

"Around here, all data is spatial," he says. "Tradespeople are being tasked and dispatched all over the airport campus, and we want to enable them with spatial information and capture updates to the infrastructure in near real-time. GIS allows us to do that in ways we simply couldn't before."

A challenge is magnitude: "We have 15,000-plus rooms, 15-million-plus square feet and 11,000-plus doors mapped in GIS, and with readily available location information, it benefits airport staff whether they are new or have worked at the airport for decades," notes Michael. "Now, they can tap a room or door number into an iPad and go find it. Tradespeople can now use the GIS to help plan their route to complete tasks—to not be zig-zagging across the site, to not have to constantly pass in and out of secure areas. That's useful for someone who, for example, has to change the locks on 10 different doors spread across the campus. Internal way-finding is proving to be a great success."

Airfield-side, similar successes are being exploited. An example, according to GIS Analyst Agie Gilmore, is Airfield Operations tracking pavement condition and repairs to aid with FAA Part 139 certification.

"SFO Civil Engineers are able to attach image information and document a whole range of other distress conditions in the field," says Gilmore. "Concrete pavement for aircraft parking is laid in 20- by 20-foot slabs, and we can see if some slabs are having to be repaired uncommonly often and prioritize trouble areas. Using GIS, we can stand onsite, take a look at what's underneath us and see if we have to do something different to stop a problem recurring.



3D Airside and Landside Viewer

"Now that we're in an enterprise environment, we can provide dashboards that cover the whole campus, and even some departments that don't see their data as spatial are buying in," he continues. "HR, for instance, can provide maps when onboarding new people to a very complex campus.

"It can take years for people to ramp up in terms of locational knowledge in a place as big as an airport. There are one-way doors, secure-area access and so on. There's also a lot of 'revolving door' knowledge—the police and fire services rotate staff between the airport and other stations quite regularly, and all of them need to know how to get to places quickly.

"HR can even make use of off-campus spatial data," adds Gilmore. "For instance, during the wildfire season, they need to know which staff may be affected by an evacuation order or warning so they can reach out and provide appropriate resources."

Speed and Agility

Sheer speed combined with accuracy is a distinct characteristic. Annual production of a 250-page map book of internal spaces by SFO's Space Planning Group, previously a task that ate up several months, now is accomplished in minutes using automated features within an ArcGIS Pro template. The result is a far better end-product than was ever achievable in CAD, according to Michael.

The GIS team deals with a lot of "hot topics" that can range from the mundane, such as queries about cleanliness, to the arcane and locating very specific types of assets. Helping to map safe social distancing is a recent application but, more widely, GIS has been instrumental in mapping things that have previously been institutional knowledge locked in one person's head; that knowledge can be taken into a database environment and served up in a web app.

Under all of this are standards and what Pofsky describes as the "grunt work" of GIS. Precise definitions of data and the gathering and normalization of it are time-consuming but well worth the effort, she says.

A major factor is engagement and involving at the earliest stages the widest range of stakeholders. The same thinking also drives the education process, which is very much based on relationships.

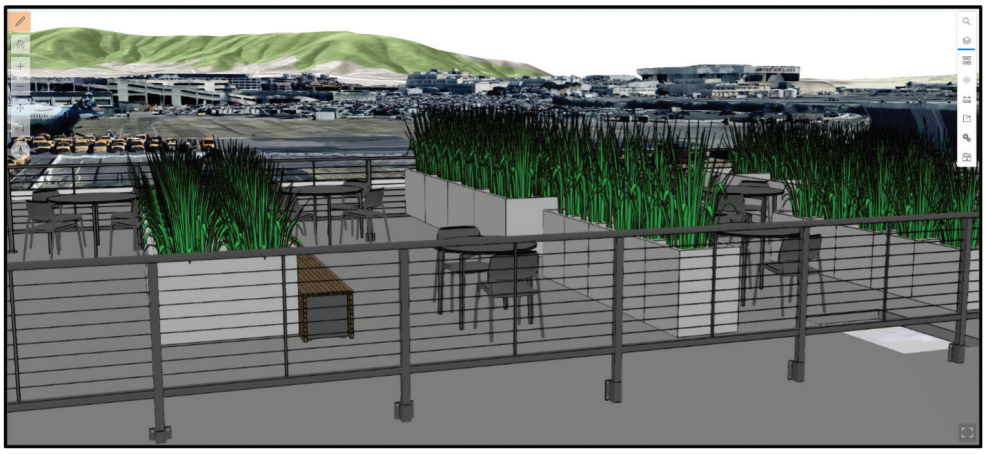
Michael again: "It's about seeing people's needs and fitting them to the right GIS product—we don't just 'data dump.' The Esri ecosystem is immense, but, for any given project, you probably need only a couple of solutions. It's all about communication; we sit in on a lot of weekly meetings—utilities, the sign shop, operations and so on. We're on first-name terms with our stakeholders."

Gilmore agrees: "Airfield GIS grows from the bottom up. We now have people asking their supervisors for their own iPads and access. We're normalizing use that way."

Wider Influences

The way-finding solutions that currently benefit maintenance workers also can benefit individual travelers.

The complexity and time-criticality of air travel can make navigation from drop-off point to gate an emotionally fraught experience, especially in an age where travelers are very much used to the availability of Street View and other real-time mapping products.



3D Design Data Displayed in GIS

GIS benefits both service user and provider. From the user perspective, there is the ability to navigate quickly through a complex indoor environment while taking account of directional flows, current social-distancing restrictions, security choke points, food or retail concessions, and, ultimately, time at gate. The provider, meanwhile, can gauge ahead of time staffing requirements, mundane-but-essential issues such as whether refuse removal needs to take place, if terrestrial transportation provision is adequate, and so on. As Michael emphasized, "We really think GIS is going to be critical to improving the passenger experience at SFO."

Even more widely, SFO's work, and the profound levels of detail it encompasses, is already influencing data efforts and methods of working at other aviation facilities around the world. They have demonstrated how effective infrastructure data management can establish the foundation to help the airport run smoothly and safely for a very long time. II