

Autodesk® Infrastructure
Solutions

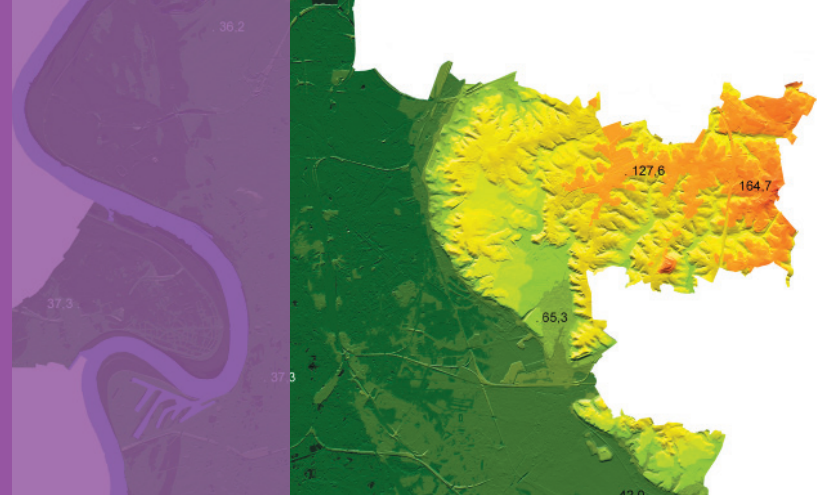
Autodesk Map® 3D
Autodesk® Raster Design
Autodesk MapGuide®



The Integrated Mapping
Solution from Autodesk:
Enhancing the Value of
Geospatial Information

Autodesk®

Introduction



GIS-dependent organizations, such as municipalities, utilities and government agencies, need integrated access to complex geospatial information. Integrated access allows field and customer service staff to carry out their work and help customers quickly and efficiently. GIS staff can create and edit large amounts of geospatial data with precision and accuracy. And engineering staff can use that data to streamline the inclusion of location-based information in asset planning and maintenance. On the business side, executives can leverage geospatial analysis to inform strategic decision-making.

Without integrated geospatial data, workflow suffers at virtually every point at which location-based information is used. Employees are forced to bridge gaps between technologies—such as engineering applications, customer relationship management (CRM) and GIS—manually, which prevents them from devoting their time to higher value tasks. In addition, GIS specialists often lack the tools they need to easily incorporate all relevant spatial information into their own system. And most employees are unable to leverage timely geospatial data and analysis in day-to-day activities and decision-making.

Specifically, organizations commonly encounter three key problems. First, because many GIS tools employ proprietary data formats, GIS and engineering staff must update their respective systems separately, resulting in duplicate data and poor spatial data flow. Second, without ready access to geospatial information, field and customer service employees are forced to rely on unwieldy and outdated paper maps for location-based data, causing operational inefficiencies and delays. Finally, the translation of relevant features from archived paper maps and raster images into the active GIS is time-consuming, making the use of rich raster data and analysis prohibitively costly for many organizations.

In order to overcome these problems, organizations must replace their disconnected workflows with a complete, fully integrated mapping solution that:

- Eliminates the need to enter the same data into multiple systems in order to create, maintain, and analyze geospatial data
- Integrates paper-based and other types of raster information with vector data with ease and precision
- Makes valuable location-based information and analysis instantly available to employees or constituents

Three Powerful Tools—One Integrated Solution

With Autodesk Map 3D, Autodesk Raster Design, and Autodesk MapGuide, Autodesk offers such a complete mapping solution. The Autodesk solution includes all the capabilities organizations need to improve their GIS processes and realize higher returns on their investment in geospatial information. By looking more closely at a typical GIS workflow, we can clearly see the costly inefficiencies caused by incomplete and non-integrated mapping solutions.

The Integrated Mapping Challenge in Detail

The following scenario illustrates the challenges that result from using a hodgepodge of technologies, manual processes, and paper to complete GIS processes.

Before residents move into a new subdivision, the power company serving the area must add the new homes and customers to its network. Upon completion of its design tasks, the power company's engineering department sends the project information to the company's GIS department to be included in the utility's network mapping system.

The following six-step process highlights the obstacles the utility's GIS specialists and field staff face because of the company's incomplete solution:

Step One: Because the GIS department's resources are stretched to the limit by the area's rapid growth, it often takes several weeks for minor updates to enter the GIS. However, the final work on this subdivision is scheduled to begin soon, and it is immediately assigned to a GIS specialist.

Step Two: Although the engineering department completed its portion of the plans using engineering tools that employ open data standards, the GIS specialist is unable to simply upload the engineering data into the company's GIS because the data is stored in an incompatible, proprietary data format. This forces the specialist to manually create and edit the data, duplicating much of the engineering team's efforts.

Step Three: After checking the data for accuracy, the specialist realizes that the affected area includes roads and geographic features that are not in the company's GIS. Instead, the most detailed information about the area is only available on paper maps and more recent aerial photographic surveys. In order to include the information, the specialist must convert the raster information to vector data.

Step Four: To glean the critical roadway information, the specialist digitizes the maps and traces the relevant details by hand. However, the process is extremely tedious, and time constraints force the specialist to leave critical details un-digitized. As a result, the power company's system does not reflect potentially valuable details about land grades and vegetation density.

Step Five: The specialist updates the GIS with the new information.

Step Six: In order to add the new subdivision to the network, a field crew arrives at the housing development with paper maps of the immediate area. In the course of their work, the crew encounters dense vegetation, which was not reflected on the maps, and the crew is delayed while the proper equipment is sent to the worksite.

More than simply tedious, the above workflow costs the utility money by turning a straightforward system update into a lengthy, manual process for the GIS specialist. What's more, the tedious process is potentially even more costly from both operational and customer service perspectives: As the field crew waits for the correct equipment, they waste valuable time. And if similarly incorrect or incomplete maps impede the utility's ability to quickly restore power during outages, customers are left in the dark, which negatively impacts customer satisfaction—and safety.

In contrast, an effective, integrated solution can help organizations—such as the hypothetical utility in the example above—create, edit, access, and share location-based information. With such a solution in place, organizations can

FirstEnergy Streamlines Processes with Autodesk Solutions

“When your technology limits you and requires a large team in the back office shuffling data between systems, it makes everything more labor and time intensive. We look for technologies that support our business processes. Because of its scalable, open architecture, we find that Autodesk's enterprise solution for electric utilities adapts to our processes and our business needs, not the other way around.”

Kevin Miller,
Business Systems Manager,
FirstEnergy Corporation

realize unimpeded flow of geospatial data, which, in turn, helps streamline location-based workflow within their GIS departments and beyond. The advantages of such a workflow translate into time savings, reduced costs, and improved service to customers.

Autodesk: Extending the Value of Geospatial Data

Autodesk is helping to overcome the challenges facing GIS-dependent organizations with a suite of solutions for creating, editing, accessing, and sharing geospatial information. With a fully integrated suite of applications, the Autodesk solution forms a complete GIS environment, making GIS processes and workflow faster, more efficient, and more cost-effective. Because it is designed to support integration with other enterprise systems, the Autodesk solution allows location-based information to flow throughout organizations with momentum, extending the value of geospatial data.

The Autodesk solution combines all the capabilities organization need in three integrated applications:

- **Autodesk Map 3D**—Allows CAD, GIS, and engineering professionals to create, edit, maintain, and analyze spatial data
- **Autodesk Raster Design**—Enables the integration of scanned documents, photographic and satellite imagery, and other types of raster data into vector-based designs and maps
- **Autodesk MapGuide**—Delivers real-time geospatial data in dynamic maps to users over the internet or a organization's intranet

The applications within the Autodesk solution help eliminate duplicate data entry and deliver geospatial data directly to the required applications, streamlining GIS workflow. Organizations can also use the Autodesk solution to conduct deeper analysis using the full spectrum of available geographic information, thereby enabling better decision-making.

The following sections describe each application in the Autodesk solution and the functionality it contributes to the solution as a whole.

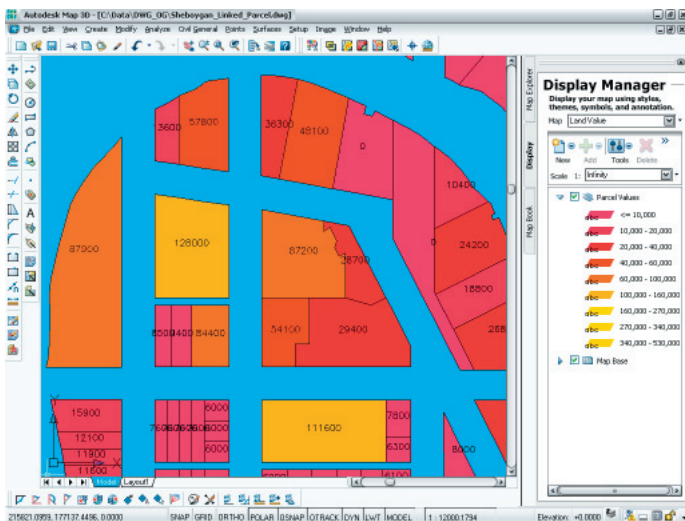
Autodesk Map 3D: Create and Edit Geospatial Data

As the data creation, editing, and maintenance backbone of the Autodesk solution, Autodesk Map 3D combines precision mapping and powerful data analysis capabilities. Based on the AutoCAD platform, Autodesk Map 3D is widely used for integrating and editing GIS and CAD data. However, Autodesk Map 3D does more than simply bring the precision of CAD into GIS

Autodesk GIS Saves Garden Grove Time and Money

The City of Garden Grove, California, creates, edits, and shares geospatial data using a system based entirely on Autodesk solutions. Since infrastructure and geospatial data are interdependent, the city wanted to avoid maintaining separate databases for each type of data. So it turned to Autodesk Map 3D to map, plan, and analyze everything from street designs to utility projects to traffic signal plans.

By leveraging the data flow capabilities of the Autodesk solution, Garden Grove has achieved a goal common to government entities: getting more done for less money. "Our engineers keep the GIS up-to-date in the course of their regular work with Autodesk Map 3D," explains Deyo. "With other solutions, we would have had to hire at least one GIS specialist and probably many more to manage the database. Conservatively, we're saving \$60,000 for each person we aren't forced to hire."



Autodesk Map 3D combines sophisticated GIS functionality and precision.

environments; it also incorporates the advanced functionality organizations expect to find in a sophisticated GIS application.

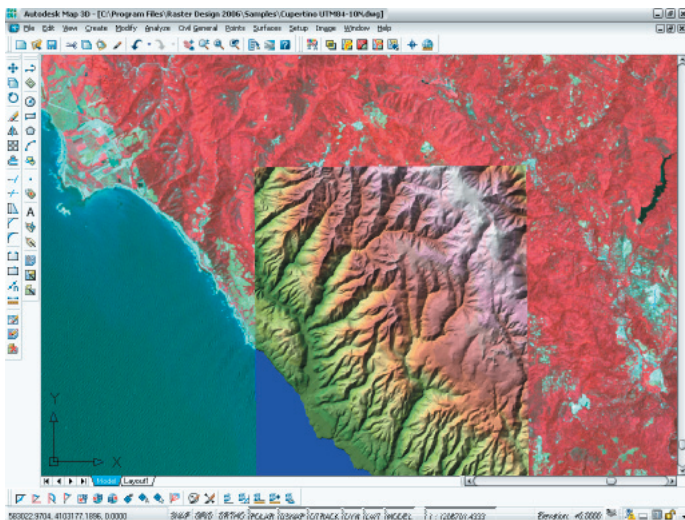
Autodesk Map 3D gives organizations the ability to:

- Conduct data creation and editing in a multi-user file-based environment, saving time and improving productivity
- Manage multiple data formats and sources simultaneously, enhancing data integrity and eliminating data conversion
- Produce maps using the largest available library of coordinate systems, automated drawing cleanup, and multiple layer overlay, ensuring precision and readability
- View and manipulate actual data from multiple sources and formats interactively, increasing the usability of all geospatial data
- Automate the creation of map books, reducing the cost of keeping information current
- Analyze information using a variety of functions, such as thematic displays, surface analysis, and watershed delineation, improving location-related decision-making, planning, and asset management

Because Autodesk Map 3D is based on open data standards, organizations gain the flexibility to work with virtually any data. Whether data is stored in DWG, SHP, or other standard geospatial formats, Autodesk Map 3D can access and edit the data, protecting an organization's investment in existing information. And because the Autodesk mapping solution works seamlessly with Oracle Spatial, the leading spatial database technology, organizations can manage and store geospatial data as easily as they can create, edit, and maintain it.

Autodesk Raster Design: Leverage the Richness of Raster Information

The raster-centric piece of the Autodesk solution, Autodesk Raster Design, integrates seamlessly with Autodesk Map 3D, allowing organizations to view, manipulate, and analyze raster data. Faster and more flexible than traditional digitizing, Autodesk Raster Design allows GIS specialists and engineers to convert portions of or entire raster documents into vector data.



Autodesk Raster Design enables organizations to analyze raster imagery.

WMATA Quickly Converts Paper to Vector

The District of Columbia asked the Washington Metropolitan Area Transit Authority (WMATA) to design and construct a light rail demonstration project in the Anacostia section of Washington, DC. At the outset of the project, WMATA anticipated a potential time drain: the local utilities provided their underground and above ground line information in hardcopy format.

However, thanks to Autodesk Raster Design, the WMATA project team was able to capture the information it needed quickly and easily. After scanning the paper maps, WMATA used the software's rubbersheeting functionality to position features according to the project's coordinate system and then converted the raster data into vector format. Next, the team integrated that data with the rest of its Autodesk Map project data.

"Once you become familiar with the process, scanning, rubbersheeting, and converting paper maps to digital data can be done fairly quickly," reports Don Falken, WMATA's survey manager and a licensed professional surveyor. "Because the text was quite blurry on the paper maps we scanned, we didn't think we would be able to use Raster Design's optical text recognition capabilities on this project. But it worked; it's a slick feature."

In addition, Autodesk Raster Design enables organizations to analyze raster data, such as digital elevation models (DEM) and satellite imagery, in order to extract and highlight relevant geographic information. With Autodesk Raster Design, GIS specialists and engineers can:

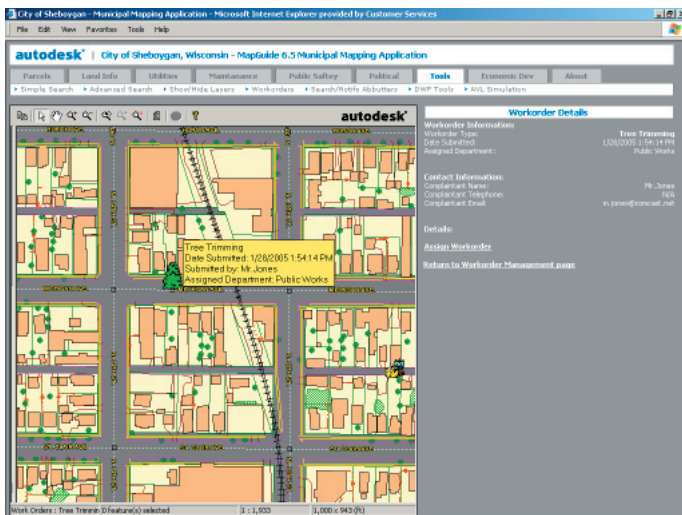
- Scan, rubbersheet, and integrate raster information with vector data easily, maximizing the value of raster data
- Capture written information locked on paper maps and plans with powerful text-recognition capabilities, virtually eliminating manual data entry
- Add color, relief, contrast, and brightness to raster images, enhancing their use-value and understandability
- Analyze raster data, such as photographs, satellite imagery, DEM and multispectral imagery, leveraging raster information to improve decision-making
- Create sophisticated maps by combining rich raster images with intelligent vector data, making presentations, proposals, and internal communications more compelling and informative

As an extension of Autodesk Map 3D, Autodesk Raster Design leverages the power of AutoCAD to accelerate editing and data clean-up. For instance, Autodesk Raster Design allows users to rubbersheet exactly to control points. Autodesk Raster Design then makes adjustments between points automatically, saving time as it translates images into precise vector data.

Autodesk Raster Design, like all the components of the Autodesk complete mapping solution, is designed to work with a broad-range of data formats, including DOQ, DEM, JPG2000, and 16-bit GeoTiff. This allows organizations to purchase images from leading vendors confident that the information will be compatible with their mapping solution.

Autodesk MapGuide: Share Geospatial Information

Rounding out the integrated Autodesk solution, Autodesk MapGuide dynamically builds and displays maps over the Web. Using Autodesk MapGuide and a Web browser, authorized users can request the information they need from the host's GIS and view it—whenever and wherever they need—without the expense and delay of requesting the information from busy specialists or combing through paper map books.



The City of Sheboygan uses Autodesk MapGuide to share location-based information with staff and citizens.

Autodesk MapGuide Saves Thousands of Dollars Annually

While just a few city employees use Autodesk Map to create GIS data, each of the City of Garden Grove's 625 employees has access to location-based information through the city's intranet with Autodesk MapGuide. Many employees, such as clerks in the map department and police dispatchers, use the data constantly.

According to Charles Kalil, Garden Grove's information systems manager, "Creating a mailing list of residents in a specific area used to take 20 minutes, but it now takes about a minute. And our map counter clerks are instantly accessing the information they need to serve residents. We estimate that Autodesk MapGuide saves about \$20,000 a year in man hours on just those two processes."

Making the dissemination of geospatial information seamless, Autodesk MapGuide enables organizations to:

- Give all employees fast access to the geospatial information they need, increasing employee productivity
- Eliminate manual and paper-based distribution of geospatial information, saving both time and money
- Blend geospatial information with relevant tabular data from other databases on dynamic maps, enhancing the clarity and usefulness of both types of information
- Share real-time data across organizations with built-in Open GIS Consortium Web Map Service compatibility, increasing the cost-effectiveness of collaboration

Because it supports common Web development standards and includes the Autodesk Dynamic Authoring Toolkit, Autodesk MapGuide provides an out-of-the-box environment for application development. This allows organizations to build any number of online applications and custom user-interfaces quickly while including tabular information, such as property values, on the same map.

Autodesk MapGuide can also blend data layers from multiple file formats—and multiple servers—since it is designed to work well with a variety of data sources. This means that if an organization needs to blend road data residing on state government servers with drainage information from a local server, Autodesk MapGuide can combine and display the information on a single map.

Working in concert, the applications that make up the Autodesk solution streamline the movement of data between CAD and GIS, enhance the usability of rich raster imagery, and distribute timely geospatial information throughout organizations. By eliminating the common obstacles facing organizations that depend on geospatial data, the complete Autodesk mapping solution can help organizations, like the utility in our hypothetical example, to transform their GIS processes.

Autodesk in Action: Unimpeded GIS Workflow

By revisiting the earlier example of a typical workflow at a utility without an integrated solution, we will illustrate how Autodesk Map 3D, Raster Design, and MapGuide work in concert to streamline the creation and dissemination of geospatial data. Again, the process begins when the engineering department sends its completed work for a new subdivision to the GIS department for entry into the company's network mapping system:

Step One: The GIS specialist receives the relevant project files from the engineering department. Because Autodesk Map 3D works with

GIS, CAD and Raster Data Flows Seamlessly in Seattle

Seattle Public Utilities (SPU), a public agency responsible for Seattle's water, sewage, drainage, and resource management, uses Autodesk Map 3D and Autodesk Raster Design to create, edit, and maintain its geospatial data. To increase the value of that data, it distributes its location-based information throughout its organization using Autodesk MapGuide.

The Autodesk solution's data flow capabilities make it possible to use data from multiple sources and move it seamlessly between engineers and GIS specialists. To make information even more accessible, SPU converted 300,000 utility plan sheets—some dating back 100 years or longer—from raster to vector data using Autodesk Raster Design.

According to Brian Patton, SPU's director of engineering support, "I think an integrated system that can move data between CAD and GIS fluidly is an important step toward eliminating inconsistencies. The software lets teams work concurrently, we don't lose data, and everyone is always on the same page."

the open data format used by the utility for engineering work, the specialist is able to upload the data without duplicating the engineer's efforts.

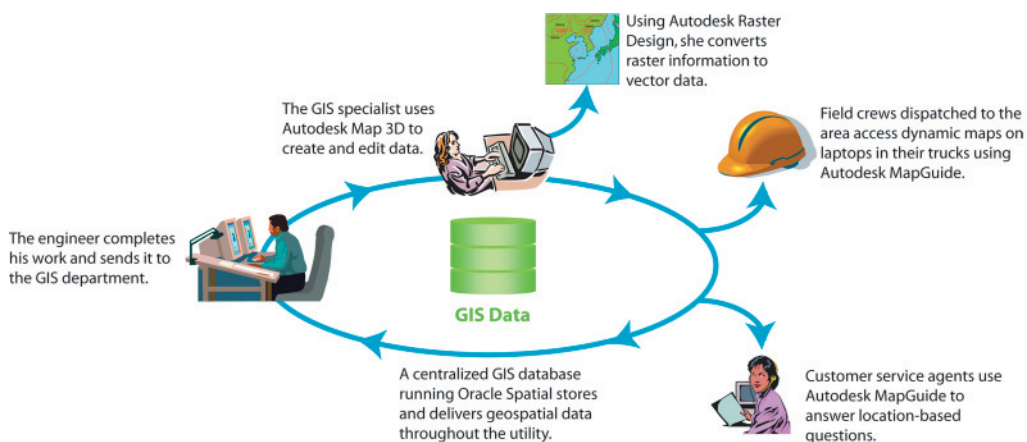
Step Two: Using Autodesk Map 3D, the specialist edits the data and creates any necessary additional features. Because Autodesk Map 3D supports large numbers of points, the specialist is able to generate points from existing database files and text. This allows the quick inclusion of precise land use and asset information, improving productivity while reducing the risk of errors.

Step Three: Realizing that current road and geographic feature information, such as vegetation density, are not fully covered in the company's GIS, the specialist finds the needed details on paper maps, engineering drawings, and aerial photographs.

Step Four: With Autodesk Raster Design, the specialist selects the needed information from the paper maps and engineering documents and converts the information to intelligent vector data, rubbersheeting it to match the company's coordinate system. The entire process is significantly faster than digitizing by hand, giving the specialist time to incorporate additional information, including vegetation density and land grades.

Step Five: The specialist updates the company's Oracle Spatial database with the new information.

Step Six: When field crews are dispatched to add the subdivision to the network, they access dynamic maps containing all the location-related information they need on laptops in their trucks using Autodesk MapGuide. If they need additional details while carrying out their work order, such as the locations of nearby transformers, they can use MapGuide to create a map highlighting the information. Just as critically, they can plan ahead for dense vegetation—and arrive with the right equipment.



Throughout the process, Autodesk solutions help the utility's employees accomplish more in less time.

Once created and entered into the system, GIS data flows seamlessly to the field crews who need it, helping them to work more productively while reducing the risk of errors and delays. And when customers in the completed subdivision call with simple questions or to check the status of outages, the company's customer service staff is able to access any location-based information they need quickly using Autodesk MapGuide. With the complete mapping solution from Autodesk, the utility is able to save time, reduce costs and errors, and improve customer service—all while leveraging its investment in GIS data more effectively.

Three Powerful Tools—One Integrated Solution

With Autodesk's complete mapping solution, organizations that depend on geospatial information no longer have to struggle with solutions that trap their data in proprietary formats, prevent the cost-effective use of raster information, and fail to support enterprise-wide, real-time access to maps. All the tools organizations need to create, edit, access, and share geospatial information are available from a single source: Autodesk.

Based on open standards, the complete Autodesk solution supports data integration and flow across all GIS processes, helping organizations to use geospatial information more effectively. By turning to the complete mapping solution from Autodesk, organizations can save time and money by:

- Eliminating the need to enter the same data into multiple systems while creating, maintaining, and analyzing geospatial data efficiently
- Integrating paper maps, designs, and other types of raster information with vector data more automatically
- Making valuable location-based information and analysis instantly available throughout their organization and beyond

The complete Autodesk mapping solution, including Autodesk Map 3D, Autodesk Raster Design, and Autodesk MapGuide, is improving the way organizations work with geospatial data, helping those organizations to reduce costs, work more efficiently, and improve service to customers and citizens. Contact your Autodesk representative today to find out how Autodesk Map 3D, Autodesk Raster Design, and Autodesk MapGuide can help your organization extend the value of its geospatial data.

