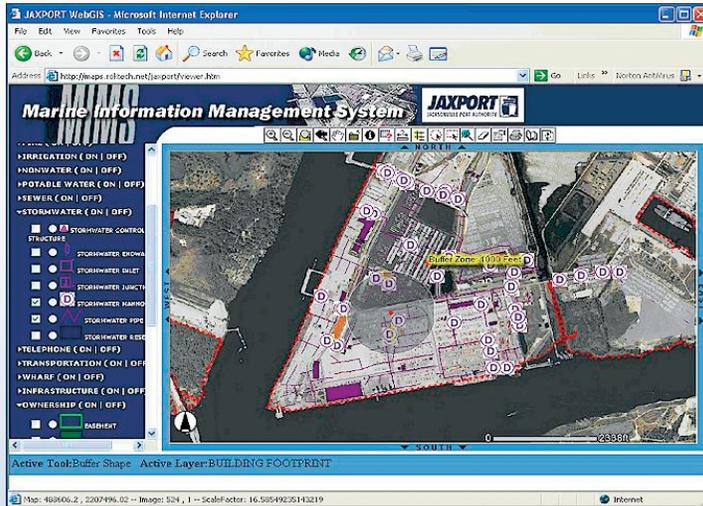
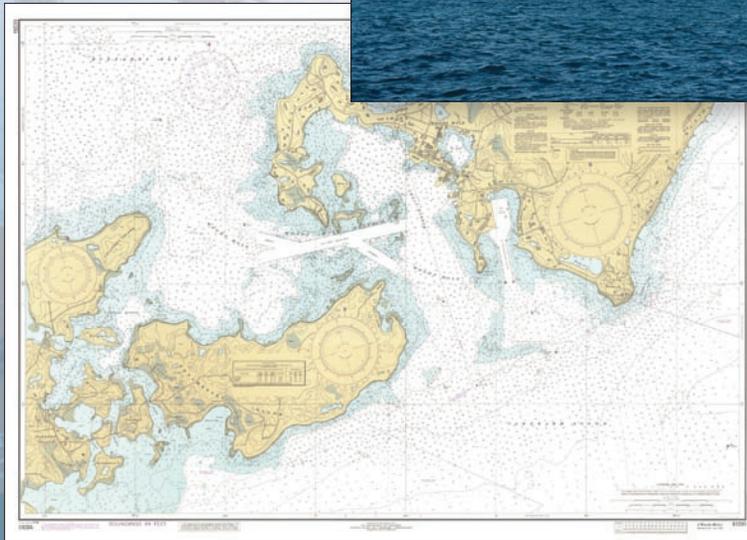
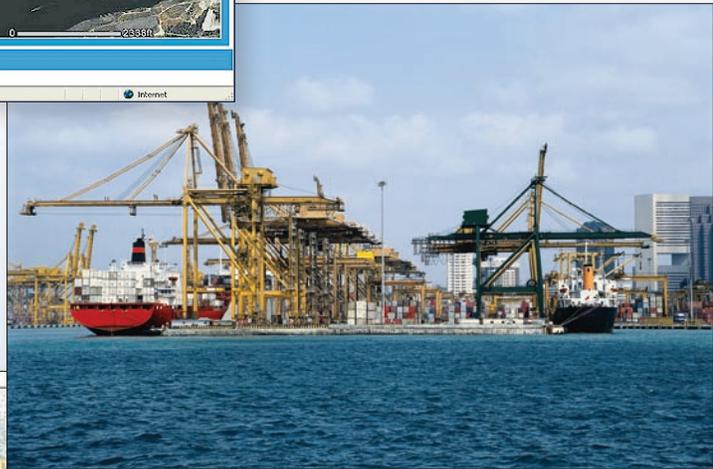


# GIS Solutions for Ports and Maritime Transport



ESRI® GIS for

- Environmental Management
- Facility Management
- Intermodal Management
- Operations
- Security



# GIS Solutions for Ports and Maritime Transport

## ESRI® GIS Solutions Drive Business Results

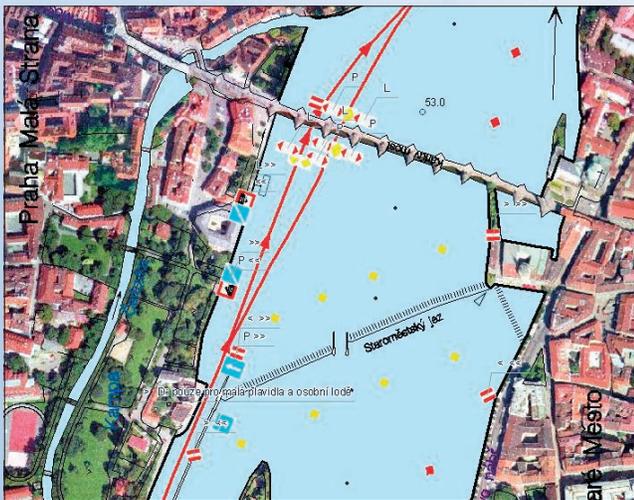
Port operators today face increased demands for operational efficiency, effective facility management, comprehensive security, and sensitive environmental management. These diverse challenges require access to detailed, up-to-date information and careful analysis to produce optimal results. Geographic information system (GIS) technology from ESRI provides management solutions that incorporate the location of your assets to give you a decisive competitive advantage.

## Use ESRI's ArcGIS® family of software products to

- Integrate information from all aspects of port operations.
- Track and analyze assets over space and time.
- Provide insight through visualization (mapping) of information and relationships.
- Support information sharing throughout your organization.

ESRI® GIS gives you the ability to integrate disparate information sources into a common operational picture of all port facilities, with greater power to control your operations and positively impact your bottom line.

**Discover the power of using location to connect and analyze your existing business processes so you can see—and control—the big picture.**



A Web-based GIS system enables viewing and distribution of customized waterway shipping maps for the Shipping Authority of the Czech Republic. Image courtesy of VARS BRNO Company and the Czech Shipping Authority.



GIS helps ports track their facilities including the location of hazardous materials.

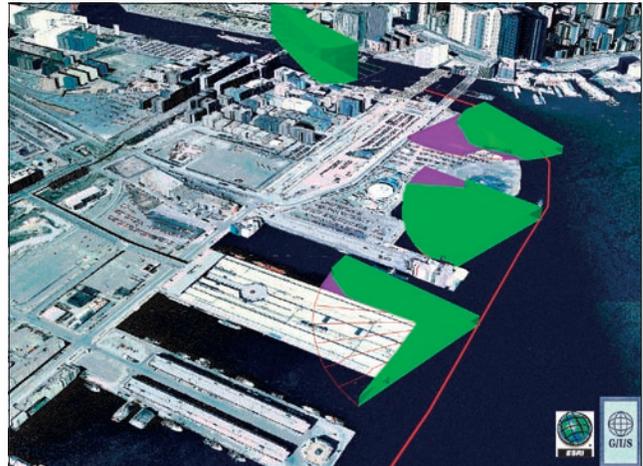
## GIS improves port and maritime efficiency in

- Infrastructure and Expansion Planning
- Port Design
- Environmental Management
  - Storm Water Management
  - Environmental Compliance
- Facility and Utility Management
  - Asset and Inventory Management
  - Maintenance/Work Order Management
  - Utility Operations and Control
- Property and Lease Management
- Security Operations
- Emergency Response and Management
  - Spill Response and Management
  - Incident Tracking
- Port Operations
  - Real-Time Vehicle and Asset Location
  - Vessel Routing and Tracking
  - Berth Occupancy and Assignment
  - Cargo and Berth Time Calculations
  - Dangerous Cargo Display
- Intermodal Management
- Meteorological Monitoring
- Water Depth Assessment and Visualization
- Nautical Charting
- Public Information
  - Shipping Channels Location
  - Restricted Area Awareness

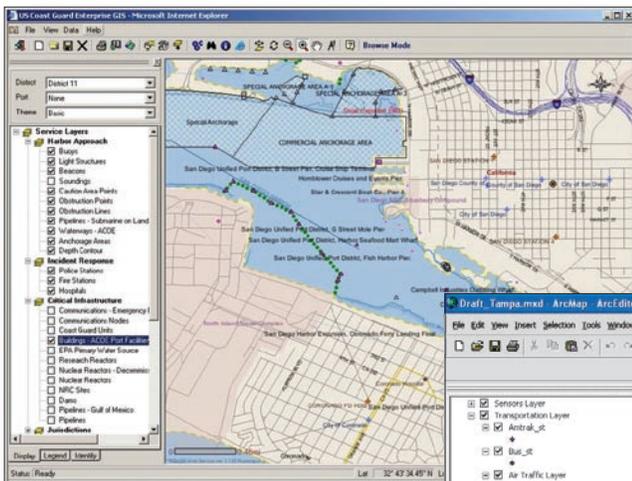
## Improve Port Security with GIS

Port security requirements increased considerably after September 11, 2001, and your comprehensive port protection requires cooperation and close coordination among different agencies. Use GIS technology to enable a shared common operational picture of port and supporting facilities, which promotes inter-agency communication and coordination of action.

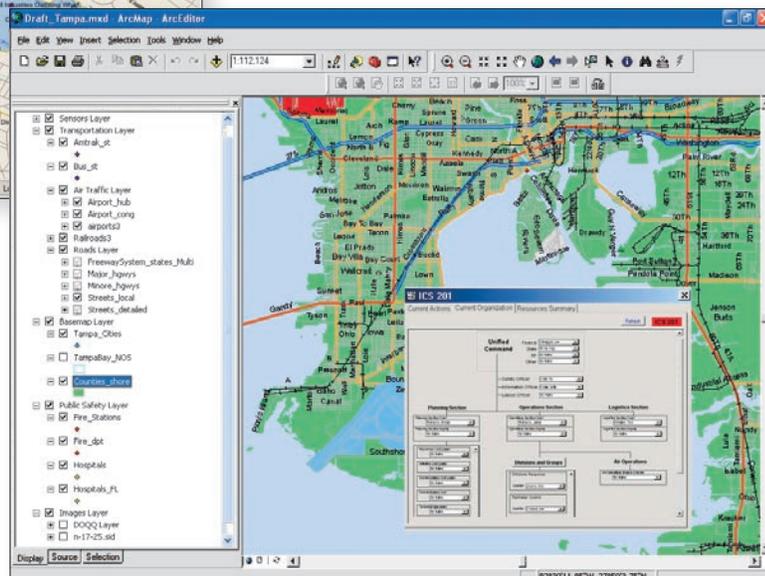
GIS integrates multiple sources of information, displays results on a map or satellite image, and delivers the resulting situational awareness on a secure network. You can combine real-time tracking of vessels and port-based vehicles with sources such as live CCTV cameras to deliver a real-time security view of your port facilities. These capabilities make GIS an essential technology for managing a port's security framework.



A 3D "viewshed" created with ESRI GIS technology helps port security managers visualize security camera coverage and plan the most efficient camera placement for security monitoring. Application image courtesy of Geographic Information Services Inc.



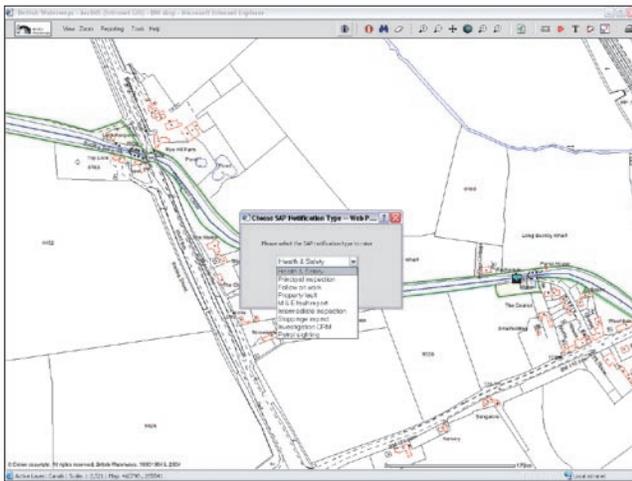
A common operational picture of the Port of San Diego uses Web-based GIS technology to map all critical facilities for incident response. Image courtesy of the U.S. Coast Guard's Enterprise GIS.



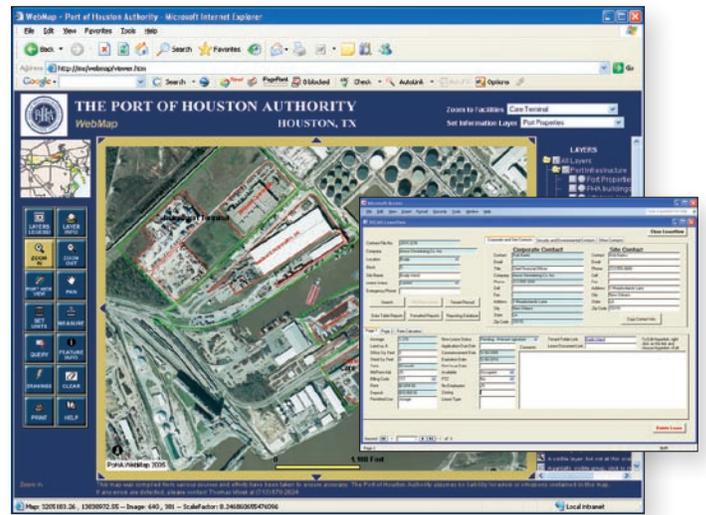
Applications built using ESRI ArcGIS provide information that assists emergency planners and responders such as this display of Tampa Bay, Florida, which includes the incident response command structure. This incident command system (ICS) was developed by Applied Science Associates for the U.S. Coast Guard.

## Increase Facility Management Efficiency with GIS

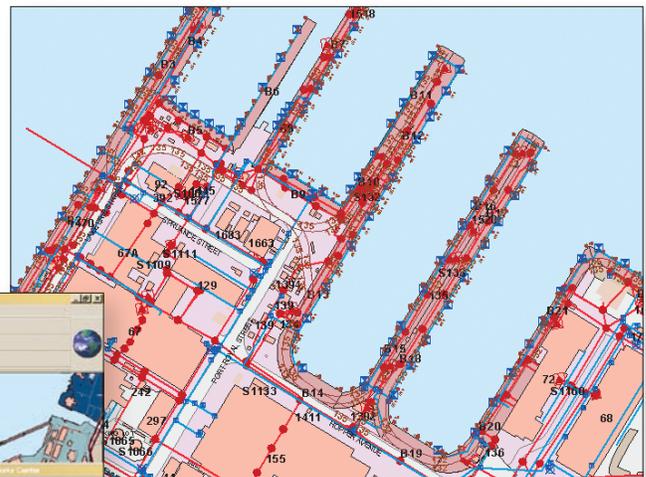
Use GIS to streamline coordination and management of a large collection of different facilities and achieve optimum efficiency. A GIS-based information system provides a powerful foundation for better port facility management by generating integrated information that helps you make better allocation decisions about limited port resources. You can achieve significant cost savings and ensure maximum operational efficiencies when you integrate your facility management solution with an ESRI GIS-based maintenance management solution.



ESRI GIS integrated with an enterprise resource planning solution from SAP improves British Waterways' management of a 2,000-mile water network and its associated infrastructure. Waterways managers gain a powerful online tool for visualizing and managing their asset information.



The Port of Houston uses a Web-based real estate lease management application to map all the port's property leases and attaches a Microsoft Access database of relevant leasehold information. Port employees view the GIS application over the corporate intranet.



Created by the Department of the Navy's Pacific Fleet, this application uses ArcGIS to map utilities and other infrastructure (above) and integrate facility photos, links to the facility information database, and maintenance records in Maximo, IBM's asset management solution (left).



## Model and Visualize Port Operations with GIS

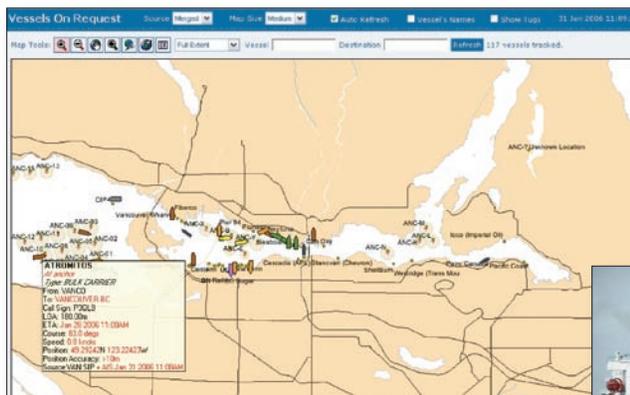
Managing your port's daily operations requires careful coordination of multiple activities within the port. A location-based information management solution helps you achieve greater efficiencies with tools for modeling, analysis, and visualization. Improve coordination of activities including ship traffic control, berth scheduling, ground-based utility provisioning, and container off-loading and tracking.



ESRI technology enables mapping and display of vessel locations for traffic control and safety management, as shown in this Municipal Port Authority of Rotterdam application.



Working in partnership with the U.S. National Oceanic and Atmospheric Administration Coastal Services Center, EarthData Solutions developed a prototype decision support tool for improved port operations. Based on ESRI technology and EarthData's SIMmetry system architecture, the prototype offers 2D GIS fully synchronized with 3D thematic mapping, query, analysis capabilities, and analytical modeling. Context-driven queries and data views support specific groups such as environmental, property, and port operations managers and security, marine, and emergency response personnel.



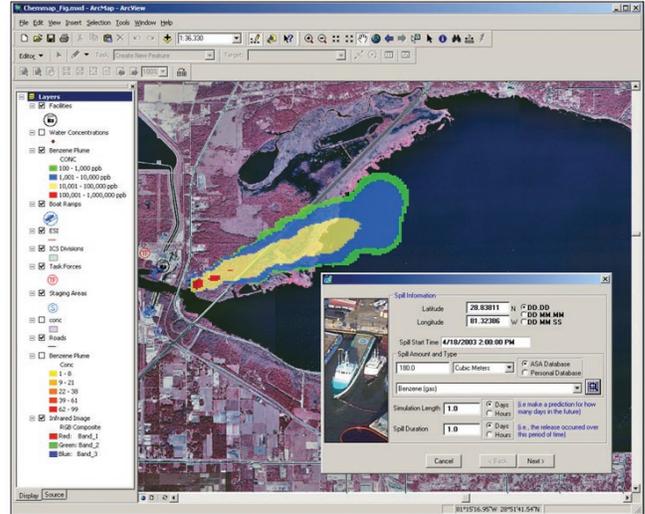
The Vancouver Port Authority uses ESRI technology to coordinate vessel automatic identification system (AIS) data for dynamic berth assignment. The port's application (Portview) color codes vessels by cargo type and records their location at each berth. A mouse click on the berth section retrieves information on vessel name, type, estimated time of arrival, position, registration, ownership, and more. Port operators use this information to calculate tariffs and generate billing invoices and various reports. Web-based GIS technology makes it possible for shippers to apply for parking and hazardous materials permits over the Internet.

## Coordinate Environmental Compliance with GIS

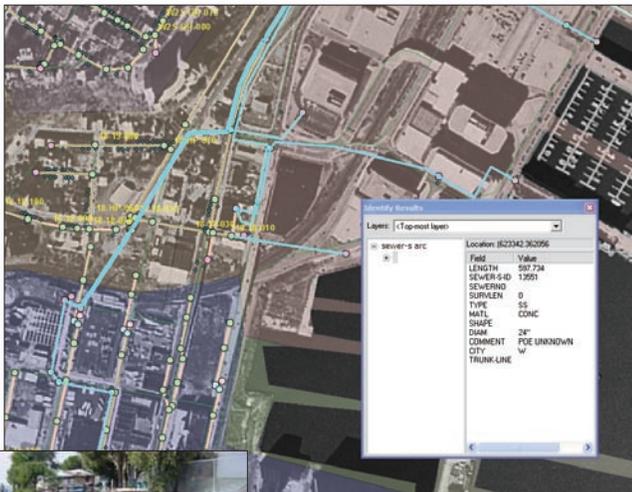
Location-based information management and visualization capabilities give you useful tools for environmental management including tools for meeting monitoring and compliance requirements for

- Storm water and other potential contaminants
- Dredging operations
- Wetlands restoration

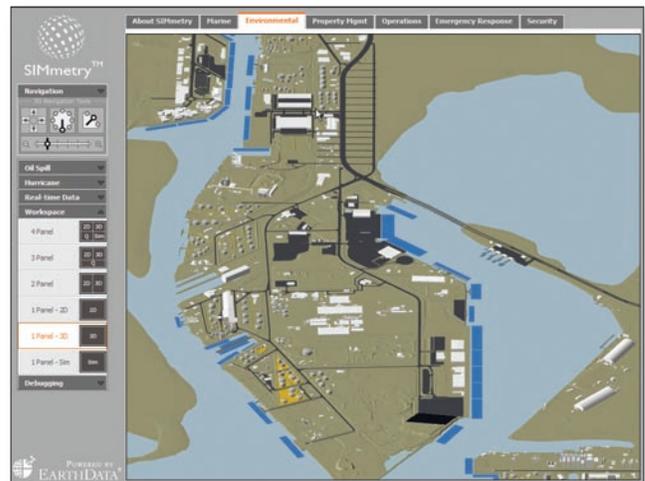
Use ArcGIS technology to create a comprehensive view of hazardous materials location and storage and analyze the potential impact of chemical, oil, or gas spills in the marine environment. You can create 3D views of aboveground port facilities or underwater features. Use bathymetric data to model channel depth for dredging operations and map underwater obstructions for safer navigation.



A modeling application uses weather and other data to help understand the potential plume footprint from an industrial facility in the event of a major chemical release. The Department of Health and Human Services, Bureau of Air Quality Control, Houston, Texas, uses existing enterprise GIS data to run this AIRMAP extension built by Applied Science Associates using ESRI ArcGIS technology.



GIS stores locations of impervious surfaces, potential contaminant sources, storm water collection systems, and treatment facilities to help managers monitor flows and plan improvements. Image courtesy of CH2M HILL.



The Tampa Port Authority uses GIS technology for environmental compliance to identify best management practices and better manage a network of drainage ditches, retention ponds, and wetlands that help improve water quality and coastal habitats.

## Power Port Throughput with GIS

The dynamic nature of intermodal cargo transfer too often leads to cargo traffic bottlenecks, increased waiting time, and lost efficiency. This can lead to higher costs, late deliveries, destruction of perishables, or even shipment cancellations.

Use ArcGIS technology to centralize your data and, in the process, give you and your personnel access to accurate and timely information. An essential feature in any decision support system, access to up-to-date information helps you effectively manage coordination of ship-to-rail or ship-to-truck transfers and shipments.

GIS integrated with real-time container and vehicle tracking makes it possible to schedule just-in-time arrivals for deliveries and increase port throughput. Increase security and efficiency with location tracking of containers and other port assets.

GIS supports the development of "executive dashboards" that display many types of information on a single screen. Facility and operations managers can view real-time video, maps, analytical graphs, aerial photographs, and detailed data in one place to enhance understanding of complex operations.



The Port of Tacoma Intranet Rail Management System integrates near real-time displays of rail car and container information received from Automatic Equipment Identification tags and sensors. The port uses this information for yard management and rail consist management. Images courtesy of Integral GIS and the Port of Tacoma.



Microsoft Excel - Microsoft Internet Explorer

Tacoma Westbound Plan  
As of 01/13/2003 08:27

Train I.D.	Date	Time	Feet	Units	Feet	Summary			Date	Time		
						Units	Feet	Units				
BLVDN109	01/09/2003	17:44	251	5	0	0	0	0	251	5	01/09/2003	17:44
Subtotal	01/09/2003		251	5	0	0	0	0	251	5	01/09/2003	17:07
HLWPA107	01/10/2003	16:07	0	0	0	0	0	0	0	0	01/10/2003	16:07
Subtotal	01/10/2003		0	0	0	0	0	0	0	0	01/10/2003	14:56
SBRTAC110	01/11/2003	14:56	480	23	5,614	0	0	0	0	0	01/11/2003	06:53
HLWET06110	01/11/2003	05:53	0	0	0	1	102	0	0	0	01/11/2003	06:53
Subtotal	01/11/2003		480	23	5,614	1	102	0	0	0	01/11/2003	06:53
BLWPA110	01/12/2003	19:26	0	0	0	14	2,372	0	0	0	01/12/2003	19:26
BLWPA111	01/12/2003	06:48	0	0	0	0	0	0	0	0	01/12/2003	06:48
BLWPA112	01/12/2003	07:09	565	27	5,339	29	3,992	87	0	0	01/12/2003	07:09
BLWPA113	01/12/2003	06:53	566	28	5,222	166	0	0	0	0	01/12/2003	06:53
BLWPA114	01/12/2003	05:07	154	12	2,862	76	591	100	0	0	01/12/2003	05:07
BLWPA115	01/12/2003	01:17	1,241	12	0	0	0	0	1,241	12	01/12/2003	01:17
Subtotal	01/12/2003		3,513	108	11,898	316	3,063	151	0	0	01/12/2003	06:48
BLWPA116	01/12/2003	13:04	1,149	21	472	18	116	14	0	0	01/12/2003	13:04
BLWPA117	01/12/2003	12:57	0	0	469	11	0	0	0	0	01/12/2003	12:57
BLWPA118	01/12/2003	04:59	0	0	0	0	0	0	0	0	01/12/2003	04:59
BLWPA119	01/12/2003	02:51	72	2	3,896	43	3,447	32	0	0	01/12/2003	02:51
BLWPA120	01/12/2003	01:54	3,649	16	5,120	139	76	1	0	0	01/12/2003	01:54
BLWPA121	01/12/2003	00:06	1,109	12	873	21	3,382	114	0	0	01/12/2003	00:06
Subtotal	01/12/2003		10,792	187	31,396	312	5,292	221	0	0	01/12/2003	06:48
BLWPA122	01/12/2003	19:26	366	18	424	13	71	0	0	0	01/12/2003	19:26
BLWPA123	01/12/2003	01:49	0	0	912	28	1,027	17	0	0	01/12/2003	01:49
Subtotal	01/12/2003		366	18	1,336	41	1,098	19	0	0	01/12/2003	01:49
BLWPA124	01/12/2003	19:26	592	5	1,015	29	866	21	0	0	01/12/2003	19:26
BLWPA125	01/12/2003	19:17	2,762	14	3,115	34	2,112	74	0	0	01/12/2003	19:17
BLWPA126	01/12/2003	07:28	0	0	707	20	458	18	0	0	01/12/2003	07:28
Subtotal	01/12/2003		5,086	14	5,290	81	3,295	102	0	0	01/12/2003	07:28
BLWPA127	01/12/2003	02:21	329	18	393	21	0	0	0	0	01/12/2003	02:21
BLWPA128	01/12/2003	07:07	0	0	882	16	472	18	0	0	01/12/2003	07:07
Subtotal	01/12/2003		292	18	792	37	472	18	0	0	01/12/2003	07:07
BLWPA129	01/12/2003	07:17	1,295	18	203	10	0	0	0	0	01/12/2003	07:17
Subtotal	01/12/2003		1,295	18	203	10	0	0	0	0	01/12/2003	07:17
Grand Total			14,527	304	46,981	618	15,791	401	0	0	01/12/2003	06:48





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*For more than 35 years, ESRI has been helping people make better decisions through management and analysis of geographic information. A full-service GIS company, ESRI offers a framework for implementing GIS technology and business logic in any organization from personal GIS on the desktop to enterprise-wide GIS servers (including the Web) and mobile devices. ESRI GIS solutions are flexible and can be customized to meet the needs of our users.*

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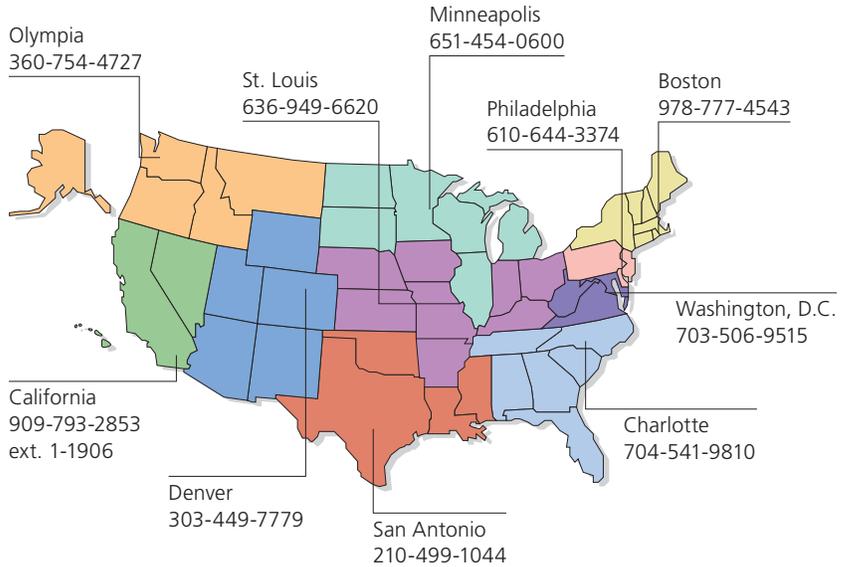
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