

***Application for  
URISA 2010  
Exemplary Systems  
in Government  
(ESIG™) Award***

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**Entrant:** City of Bellingham, Washington  
**System Name:** CityIQ  
**ESIG Award Category:** Enterprise System  
**Submitted:** May 10, 2010



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## System

### Letter from Mayor Dan Pike



**MAYOR'S OFFICE**  
Dan Pike, Mayor  
City Hall, 210 Lottie Street  
Bellingham, WA 98225  
Telephone (360) 778-8100  
Fax (360) 778-8101

April 28, 2010

ESIG Review Committee  
701 Lee Street, Suite 680  
Des Plaines, IL 60016

Dear ESIG Review Committee:

I am pleased to bring to your attention the City of Bellingham's City Information Query (CityIQ) GIS mapping and business information look-up system for consideration in the Enterprise Systems category of the 2010 URISA Exemplary Systems in Government Award.

The CityIQ application acts a central dashboard for accessing location-based decision support information. A significant number of staff access CityIQ throughout their day-to-day work serving the residents of Bellingham and others. We have put the wealth of the City's GIS data into the hands of decision makers in an efficient, intelligent and interactive manner. The quality of our public services and our staff productivity have improved through the use of this application. We look forward to leveraging its open architecture to include future business systems.

Thank you for the opportunity to submit this application for consideration in the 2010 Enterprise Systems 2010 ESIG award. As you review our materials, please feel free to contact Don Burdick, GIS and Technical Services Manager, at [dburdick@cob.org](mailto:dburdick@cob.org) for any additional information you may need.

Sincerely

A handwritten signature in black ink that reads "Dan Pike". The signature is written in a cursive style.

Dan Pike, Mayor  
City of Bellingham

## Summary of System Accomplishments

For the past twenty years, the City of Bellingham has steadily built its spatial data infrastructure. As industry standards and practices evolve, the City improves accuracy and completeness, extends spatial coverage, and adds depth to its data collection. Primary system access has migrated out of back-room, Unix-driven workstation environments, and onto desktops or handheld devices with web-browsers. Once used exclusively by engineers and planners, across-the-board integration with City business systems such as utility billing, maintenance management, permit review, life safety, law enforcement, parks and finance has made GIS a critical resource for all City operations. Spatial interconnectivity between these systems transforms customer service, increases efficiencies, and fosters a data-driven, collaborative atmosphere between departments.

The CityIQ application takes advantage of all these GIS and business system integrations and provides them in an easy to use web-based interface. It was built to serve the novice user with auto-complete search options and simplified result filtering. It functions as a fully featured search engine for attributed spatial data and business process content with a sophisticated map interface. Additionally, it includes full text searching, high quality map production and data reporting capabilities. CityIQ was built as a one-stop information source for staff and the public to access critical customer and services information. The entire user interface was built to coincide with user intuition developed from web experiences with other systems such as Google maps, Yahoo, Amazon and Bing.

The strength of the CityIQ application, and what makes it exemplary, is that it is designed and built on a flexible and modular architecture as a JavaScript client application consuming web services for mapping and business information. The map interface is built on the ArcGIS Server JavaScript framework resulting in a very fast online map viewer that takes advantage of the rich cartographic standards already established by the City GIS staff. Other business information is delivered via web services through a standardized delivery format so that it can easily be queried, filtered and displayed through the application.

Combining spatial locations with business data in a predefined application framework makes it easy to add access to additional business information systems or geographic information. Future changes in business system software will be able to be included by accessing web services, a common architecture platform in modern business software. This expandable, adaptable, and agile development process protects the City's investment into the foreseeable future.

## Three User Testimonials

### Letter from Linday Kershner, Planning Department



#### PLANNING AND COMMUNITY DEVELOPMENT DEPARTMENT

210 Lottie Street, Bellingham, WA 98225  
Telephone: (360) 778-8300 Fax: (360) 778-8302 TTY: (360) 778-8382

May 5, 2010

Every day I use CityIQ to answer questions from the public about property in the City of Bellingham. It provides me with invaluable information when I review a building permit, land use permit, or enforcement case. CityIQ provides environmental data that is vital in protecting wetlands, fish and wildlife habitats, the City's drinking water source, and geologic features.

CityIQ enables me to do my job more efficiently and effectively. Rather than searching through paper maps, environmental reports, and county records for one property, all of the information is available to me in one format. Not only is it available to me, but it is also available to all departments in the City of Bellingham and the public. This assures everyone that the same information is being used by all departments, which has improved communication between departments and the public.

A handwritten signature in blue ink, appearing to read "Lindsay Kershner".

Lindsay Kershner, Planner  
City of Bellingham

## Letter from Mark Young, Bellingham Police



Daniel V. Pike, Mayor  
Todd G. Ramsay, Chief of Police

505 Grand Avenue, Bellingham, Washington 98225  
Telephone: (360) 778-8800  
Fax: (360) 778-8601 Administration  
Fax: (360) 778-8701 Records

April 28, 2010

In my duties as a Crime Prevention Officer, I answer questions concerning neighborhood issues for the citizens of our 24 neighborhoods. Almost all of these issues require knowledge of a particular address, its property boundaries, services and ownership. Using CityIQ, all I need to do is enter the address and all the information is available. Not only is the information at my fingertips, I can print or email the information to anyone that wants it. It is great when others have access to the same information that we have.

In many cases I need to know who owns a particular piece of property. With CityIQ, a simple click of a button directs me to the Whatcom County Assessor web site. The mailing address of the current owner pops up with the speed of light. This function alone saves me countless hours of research.

In my duties, I must try to solve problems in neighborhoods that traditional law enforcement efforts are not able to resolve. Being able to go to one application to get all the information I need is without a doubt a tremendous tool. I simply would not have the time to gather the information if CityIQ did not exist.

In this day of diminishing resources, employees are being asked to do more with less. Having CityIQ in my tool belt of resources allows me to continue to provide several services in a time-efficient manner, thus allowing me the opportunity to address other responsibilities without an interruption of services.

Sincerely,

A handwritten signature in blue ink, appearing to read "Mark Young".

Mark Young  
Public Information Officer  
Bellingham Police Department  
(360) 778-8815  
[myoung@cob.org](mailto:myoung@cob.org)

## Letter from Ryan Nelson, Public Works Department



### DEPARTMENT OF PUBLIC WORKS

210 Lottie Street, Bellingham, WA 98225  
Telephone (360) 778-7900 ♦ FAX (360) 778-7901

April 28, 2010

As a Planner for the City of Bellingham, utilizing CityIQ as a resource to provide clear, accurate and comprehensive information to citizens of our community in order to make sound financial decisions is an essential application. The City of Bellingham's CityIQ application provides access to applications ranging from spatial to technical with everything in between. This user-friendly application fosters improved communication between the government and community which is often an occupational obstacle.

As a Resource Conservation Management Specialist for the City of Bellingham, CityIQ has proven to accommodate tremendous organizational applications through the ability to access and store archives. Utilizing CityIQ's project tracking function has contributed to the evolution of comprehensive municipal facilities management by providing City-wide staff with immediate electronic access to interdepartmental municipal facility architectural and engineering drawings. This application has not only benefitted the City's archival system but also created significant efficiencies between public and private coordination of municipal projects.

I have worked for numerous governmental organizations ranging from tribal, county and cities large and small. From my experience I feel that the City of Bellingham's GIS Department and CityIQ program is continually incorporating limitless applications and navigating at the forefront of technological advancements. Bellingham's GIS Department and CityIQ program continues to consolidate crucial resources into a central location increasing my effectiveness and efficiency as a government employee and I could not imagine how to succeed in my career without it.

Sincerely,

A handwritten signature in black ink, appearing to read "Ryan Nelson".

Ryan Nelson  
Resource Conservation Management Specialist

## **Jurisdiction**

### **Name of Jurisdiction**

City of Bellingham

### **Population Served**

CityIQ serves the citizens of Bellingham with a population of 76,130 as of April 1, 2009

### **Annual total budget for jurisdiction**

\$257,768,260

### **Name, title, and address of chief elected official**

Mayor Dan Pike  
210 Lottie Street  
Bellingham, WA 98225

(360) 778-8000

### **Contact person for system**

Don Burdick  
GIS & Technical Services Manager  
2221 Pacific Street  
Bellingham, WA 98229

(360) 778-7835

(360) 778-7701 (fax)

[dburdick@cob.org](mailto:dburdick@cob.org)

## System Design

### What motivated the system development?

The CityIQ project is a collaborative effort between the City of Bellingham and Woolpert Inc. to build a web-based replacement for the City's older desktop-based information system. The original system was built through the Public Works department to serve the needs of the department staff and management in customer service and decision support. Many other departments were able to utilize the system with its business integration ties to property, utility and document management records. Unfortunately, the system as designed was limited to functionality required by Public Works, limiting its ability to serve the needs of other City departments.

The City reaped tremendous success and learned the basics of GIS and business systems integration from the original application built a decade ago using Microsoft Visual Basic and ESRI MapObjects technology. The original application, while popular, was built on legacy technology, utilized file based data sources for GIS data, and had become costly and labor-intensive to maintain. The legacy development environment and file based structure inhibited the utilization of the newly designed relational GIS datasets and integration with additional business systems throughout the City. The application was essentially a great product for supporting business processes of the time but was not able to expand or adjust to new requests and functionality.

The original application contained no security functionality so information was visible to all users. This made the tool inapplicable to restricted information for public safety, law enforcement and other sensitive data.

The City always desired to have an online presence with its GIS mapping information that included rich integration with business systems. Many solutions were viewed as incomplete in desired functionality due to the City's business integration expectations. Any solution that was developed needed to have similar functionality for staff and the public as well as provide access to some, if not a majority, of the same information. The solution also needed to be as intuitive and user-friendly as possible so that it could be utilized by all citizens, not just the technically adept.

### What specific service or services was the system intended to improve?

Across all departments, it is recognized that the majority of the business this municipal organization performs is location based. The primary goal of CityIQ is providing a one-stop mapping and information query tool available to all departments.

CityIQ is designed to provide improved functionality and performance over the older desktop information system. It provides enhanced access to GIS data from the enterprise geodatabase rather than file based data sources. Staff, at all skill levels, now have ready access to GIS data and use this information to link to and/or view documents and maintenance activities within the City. Also, CityIQ integrates GIS functionality with database query functionality. CityIQ provides the ability to spatially query traditionally non-spatial tabular source data.

The City of Bellingham values the investment that it has made in the GIS data and business information it has acquired and built. The architecture of the previous system was outdated, limiting functionality and expansion. CityIQ provides an expandable framework for easy integration of supported business systems that is easier to maintain and update over time.

### **What, if any, unexpected benefits did you achieve?**

With the design based on open architecture, bidirectional integration is now possible. Through this open integration, the City can use the CityIQ framework as the universal mapping display for all City applications. In other words, the City is able to incorporate CityIQ maps and data into other business information systems. This is accomplished by providing a URL to any map or data outputs, allowing other open architecture business systems to make data calls and receive maps and tables easily. This benefit was not initially planned for in the design of CityIQ, but has recently become apparent within other department systems. This reduces GIS staff time supporting different GIS viewer applications and data formats, as well as supports the City's standards for cartographic content delivery. The City is still in the early stages of maximizing this new benefit.

Through the cooperative development environment, new skills have been gained by our staff in leading edge technologies and include the ability to support the application with City staff. Additionally, staff acquired additional programming and SQL database management which supports ongoing development of CityIQ.

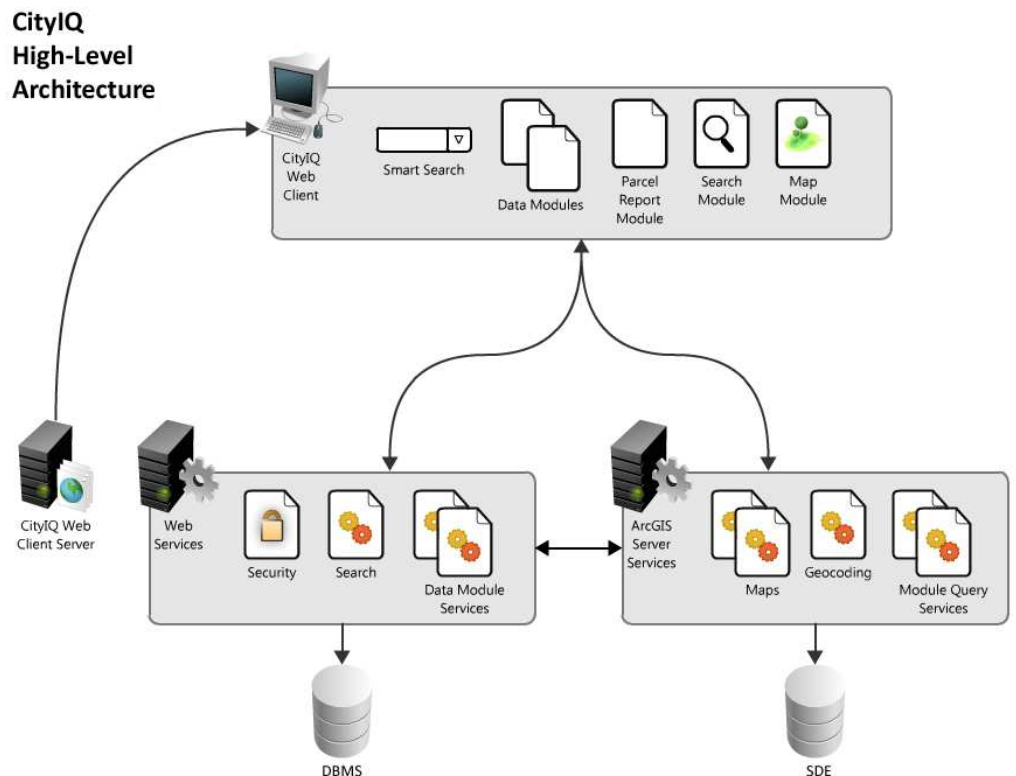
### **What system design problems were encountered?**

The ArcGIS Server JavaScript API (JSAPI) was chosen as the preferred environment based on the City's use of ESRI products and licensing options through the enterprise license agreement. Throughout the development of the application, desired JSAPI functionality was sometimes not available or did not perform as expected, delaying development progress. The agile development process, with continuous reviews of requirements, capabilities and resources made working around the evolution of JSAPI achievable.

The original application design relied extensively on right-click functionality for interfacing between the map and business data module information. It was quickly realized that the right-click was unintuitive, resulting in confused users requiring constant training. Through significant interface testing and feedback from a broad range of users, the application was redesigned using simplified toolbars, intuitive hyperlinks and background processing to anticipate user desired results and information reports.

### What differentiates this system from other similar systems?

CityIQ was designed from the beginning to use a highly flexible and modular architecture. Modular JavaScript components are combined into a rich user interface client which runs in the user's web browser, rendering data provided by map and data web services. Various data modules containing business information interact with each other as well as the map. For example, modules provide access to land and assessor parcel records, building projects, subdivisions and utility billing. These modules can be developed rapidly in-house using the CityIQ framework, integrating various City data sources into the application. This architecture also supports the City's plan to integrate other systems that support a services oriented architecture such as document management and maintenance management systems.



## Implementation

### What phases did you go through in developing the system?

The system has been developed in a process of three distinct phases. The first phase focused on developing the core application framework and template configuration for business information delivery. This primary development created the system shell that all business information would be built into and developed the mapping interface necessary to support the business information. Through that initial development some basic functionality was provided :

- Basic map navigation (pan, zoom, identify)
- Three core business modules
  - Assessor property records business information module
  - Subdivision information and plan images business information module
  - City Infrastructure information and plan documents through an interface to a City built document management system.
- Basic web printing of map and business information
- Smart Search auto-complete functionality for business information

Toward the end of the phase the City implemented a beta testing and application advisory team comprised of representatives from various departments knowledgeable in the use of GIS and City business workflow. The group tested and reviewed the application's functionality for efficiency, usability and information presentation. The development team and testing group worked iteratively to optimize the application.

The second phase continued with the core development and included the addition of new business information modules, mapping enhancements and security features. The same reiterative process between the testing group and development team created the following new functionality:

- Authorization as a guest or through Active Directory security
- Utility billing business information module
- Deeds and easements business information module
- Administrative encumbrance zones and impacts
- Parcel report module integrating map and all business information in one report

The third phase was the smallest of the three, leveraging the information built for internal staff and repackaging it with enhancements as well as deploying a publicly accessible Internet version (<http://www.cob.org/CityIQ>). The testing team expanded the evaluation to encompass all levels of users and initiated interface improvements to make a more intuitive user environment. These enhancements include:

- A revised map generator with custom properties and exporting to PDF
- Numerous user interface usability enhancements

- Support for GeorSS feeds

All future development will leverage the existing architecture and gradually add more business information systems to the CityIQ application to support business units throughout the City.

### **Were there any modifications to the original system design? Why? What?**

The original design called for building the application using only the .NET and C# development environments. However, the City and its development partner also chose to incorporate the ESRI ArcGIS Server JavaScript API. This takes advantage of modern web services architecture that the development environment offered through JSON data packages. This arrangement creates programming standards that allow for more cooperative agile development.

The original design called for direct access into business information data through API calls to the system. Most departments use legacy systems that do not support this kind of interaction. As a result, a process of extracting data through SQL Integration Services Scripts was developed to gather pertinent business data into a centralized data warehouse.

The original map was built around a simplistic public view of the data, eliminating some of the depth and richness of the City's GIS data. Through an interactive process with the City's beta testing group, the maps were redeveloped. Data automatically displays at differing thresholds in order to reflect all the pertinent information without overwhelming the user.

### **Organizational Impact**

#### **What user community does the system serve and how?**

CityIQ primarily supports the staff of the City of Bellingham in their day-to-day services to the citizens. This includes the staff at all levels, from administrator to field crew, and many different departments such as:

- Planning
- Community Development
- Permit Center
- Public Works
- Parks
- Engineering
- Environmental Resources
- Finance
- Police
- Fire
- Emergency Operations Center

Examples of how CityIQ serves these departments are listed in the next section . CityIQ provides access to many pieces of information in one source that previously would have required significant time to research and locate. The unifying aspect of the data is a location. Simplicity is attained in needing only a web browser to access all information.

The CityIQ application has only just been released to the public and so far we have had a very positive response from the community. We expect that with this release of CityIQ to the public the user community will expand to include any business that requires access to land, utility, planning, and environmental information. This will likely include realtors, surveyors, local homeowners and developers. Additional beneficiaries will include educators, community volunteers, and social service agencies that use geospatial tools in their efforts to inform people of their surroundings, to help at-risk populations, and to strategically leverage limited fiscal resources. Some of these beneficiaries, such as the Bellingham School District, have already established user case needs and plan to utilize the functionality of CityIQ to their business advantage.

For example, many Bellingham neighborhood associations, public schools, and non-profits have banded together over the past several years to form a community garden collective. This group acts as a clearinghouse for local groups that want to start community gardens. These gardens help reduce vehicle trips, provide affordable, healthy produce, and serve as a valuable science education tool. CityIQ has been used by staff to help these groups find candidate garden locations, to understand surrounding land use patterns, and to delineate population centers that might benefit from local gardens.

### **What are the ultimate decisions/operations/services being affected?**

*If appropriate, provide a few examples including, but not limited to: screen input/output forms, paper products, or other descriptive graphics.*

CityIQ is used at all levels of service within the City. Examples include:

- Administrators use CityIQ to help them understand the infrastructure they manage and to locate affected constituent populations.
- Executive and management staff have a vast amount of information about the services we provide at their finger tips as they interact with and respond to citizens.
- Utility field crews use CityIQ to assist with locating service addresses, general locations of utility networks, and elevations.
- The City utility locator accesses the system remotely through a WIFI connection to view GIS infrastructure locations near a locate vicinity and accesses construction plans for current construction that may be affected in the area.

- Code enforcement officers use CityIQ for researching planning and zoning information, verifying property ownership, and locating access easements.
- Permit counter staff use CityIQ to answer a myriad of questions including utility service districts, zoning, property ownership, permit status, City development zones such as historic districts or pedestrian oriented areas, environmental considerations such as steep slopes and wetlands, and neighborhood demographics.
- Street abatement officers research repetitive vegetation abatement issues through historical access to the City aerial photography and notify property owners easily through a simple export of selected property owner information into a mail merge.
- Engineers retrieve an overview of all public and private utilities in an area during the design process and also have access to as-builts in the area through the system's location based document management interface.
- All staff use CityIQ to generate mailing lists for notifications such as land use changes, capital projects, and mitigation actions.
- With CityIQ, a cartographic standard is enforced for many City-generated maps, improving the look and readability of maps used throughout the City. This allows any group to provide City standard map presentation materials in public meetings.
- The staff at the Public Library use CityIQ to verify patron addresses and plan special events.
- The Legal Department uses CityIQ for researching cases and assembling court exhibits. Of particular use are the property ownership reports, aerial photo overlays, and the as-built construction images.
- The Finance Department uses CityIQ to evaluate the fiscal impacts of providing City services to potential annexation areas.
- Staff supporting the Lake Whatcom Watershed Property Acquisition Program use property reports, topographic, and imagery overlays to complete reconnaissance-level inquiries prior to entering into purchase and sale negotiations.
- The Fire Department uses CityIQ to inform their response planning process, and in the event of a serious incident, as an integral part of the Emergency Operations Center. The Fire Department also uses CityIQ for code compliance research.

The true simplicity of the system is demonstrated in the Land Parcel Report generated by CityIQ. This report accumulates information from several City business systems into one easy-to-read report. The following screenshot depicts a sample report which includes hyperlinks allowing the user to navigate to associated detail pages and scanned documents.

**CityIQ** Welcome Stark, Ann M. Logout About CityIQ | CityIQ Online Help  
380320536385 Search

Search Results Map Properties Land Parcel Report: 380320536385 Update LPR Map

### Land Parcel Report

Land Parcel Number: 380320536385

Address: 2945 NEWMARKET ST

Mapped Parcel Area: 47023.72 square feet

Full Parcel Number(s): [3803205363850000](#)

Site Address(es): 2915 NEWMARKET ST 2945 NEWMARKET ST  
2925 NEWMARKET ST

Legal Description: LOT 8 AM RIMLAND PACIFIC BUSINESS PARK SHORT PLAT NO 4 AS REC BOOK 33 SHORT PLATS PG 14-TOG WI THAT PTN W 1/2 VAC NEWMARKET ST ABTG AS VAC ORD 2003-08-050 AF 2040102247

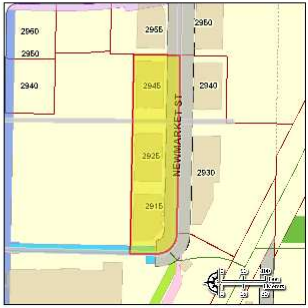
Neighborhood: [MOUNT BAKER](#)

Zoning: COMMERCIAL/INDUSTRIAL Subarea: 15A  
COMMERCIAL/INDUSTRIAL Subarea: 15  
[Neighborhood Plans and Zoning](#)

Subdivisions: [RIMLAND PACIFIC BUSINESS PARK SP NO 4 \(AMENDED\)](#) | Status: CURRENT  
[RIMLAND PACIFIC BUSINESS PARK SP NO 4](#) | Status: HISTORICAL  
[RIMLAND PACIFIC BUSINESS PARK LOT CONSOLIDATION](#) | Status: HISTORICAL

Utility Billing Accounts: [023323](#) | 2925 NEWMARKET ST | Status:  
[023588](#) | 2945 NEWMARKET ST | Status:  
[024309](#) | 2945 NEWMARKET ST | Status:  
[023324](#) | 2915 NEWMARKET ST | Status:  
[023585](#) | 2925 NEWMARKET ST | Status:

Documents: [950914029](#) - Easement  
[2040102247](#) - Easement  
[200308050](#) - Street Vacation  
[200308050](#) - Street Vacation  
[200308050](#) - Street Vacation  
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## What were the quantitative and qualitative impacts of the system?

With the implementation of CityIQ there has been a significant reduction in staff time spent researching facts or looking for documents. Scanned plats and plans are now available by clicking on a property. City capital improvement project plans are also available and searchable (all plans with "City Hall" in the title, for example). Related documents describing easement and other land parcel documents are also collected and shown in one easy-to-read report with links to each document.

Software purchasing and licensing costs are significantly reduced. The only required software for users to access CityIQ is a web browser and PDF viewer, both of which are readily available for free.

Information Technology (IT) staff time is significantly reduced in the installation of other software and the support of the application. Training approximately 300 staff over the course of 35 classes in a 4 month period resulted in a well trained staff that needs minimal support.

Access to sensitive data is restricted appropriately. City staff access CityIQ with a login tied to their City Active Directory account. Sensitive data is inaccessible without the appropriate credentials.

Important organizational and strategic decisions are now made with the most current and consistently formatted geospatial information. In the past, the risk of using out-of-date copies or inappropriately formatted data, meant some decisions took longer, or were made with incomplete information. CityIQ ensures all users see the same data. The consistent cartographic format, data links, and drill-down reports are helping staff become more familiar and proficient with City data resources.

The previous information system required significant GIS staff time updating and translating data files on a weekly or monthly basis. The current system uses standard GIS data formats along with daily automated updates, saving considerable staff time.

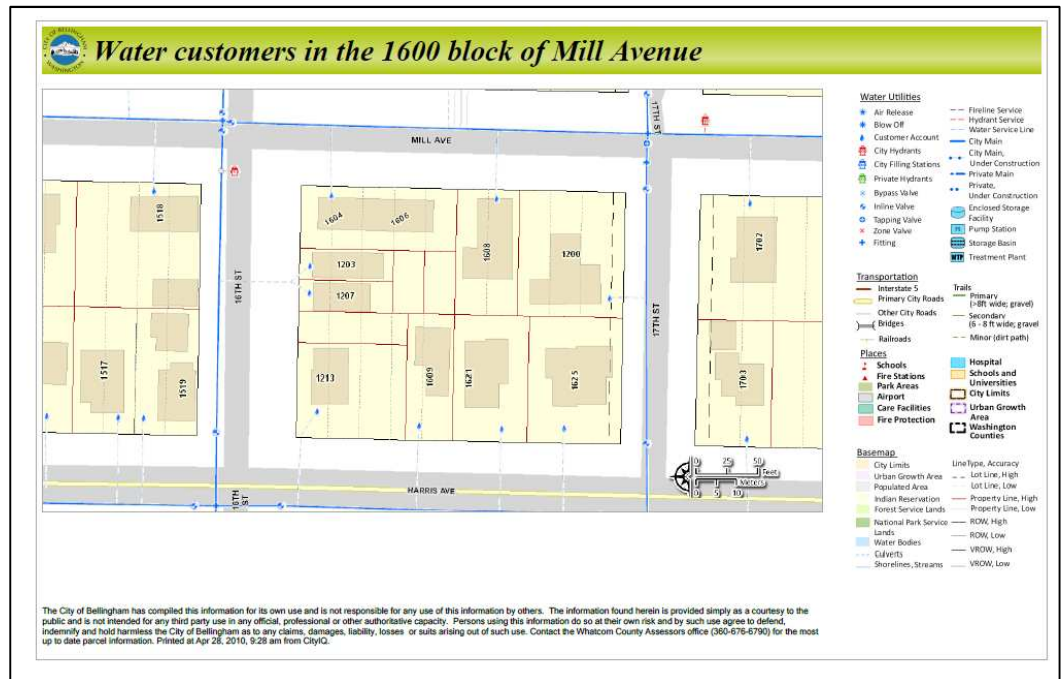
### **What effect has the system had on productivity?**

Front counter staff recognize increased productivity. A faster, more stable, web-based interface means quicker, more reliable responses to customer inquiries in the Permit Center and other customer service centers across City government.

The product development model based on publishing “map services” has meant that requests for additional layers or reports are accommodated much more quickly. Also, login-based access to the program allows departmental, workgroup, or individual staff-level interface customizations.

The lightweight, affordable (free!) application coupled with the well-structured training program has resulted in unprecedented numbers of staff using CityIQ in their daily work. Turnaround time for customer service requests, review of capital project impacts, staff reports for land use actions, utility locates and research for legislative agenda items have all benefited from the tools now available in CityIQ.

It is now quite easy to produce a high quality cartographically accurate map. An enhanced print feature allows users to customize scale, paper size, title, extra descriptive text and legend. The print output is a PDF file that can be emailed, saved, or directly printed. The maps conform to a cartographic standard, include the appropriate disclaimers and are all dated and time stamped. This standardization allows viewers to recognize a “City of Bellingham” map and they are assured of high quality information contained on the map. GIS staff are freed from simple map requests, allowing for more analysis and data development work. A sample of the print output is shown below.



## What, if any, other impacts has the system had?

Perhaps one of the less technical and more subtle impacts of CityIQ is the nurturing of interpersonal relationships, both in-house and community wide. The application has generated a new enthusiasm and excitement amongst staff and community that is refreshing during difficult economic times.

During the course of building CityIQ, cooperation between departments and peers was required. Beta testing volunteers from many departments met regularly regarding the availability of data, departmental needs, and screen display ideas. During brainstorming meetings people became creative, discovering the potential and possibilities of available City data while inspiring solutions to their various business needs.

For other employees, interacting with the new application and GIS staff motivated them to participate in the QA/QC of their own datasets. While using CityIQ they may see a data error, report the error to GIS staff, then see the error correction the next day. The more accurate the data, the more trust in the system. They have become enthused about being an integral part of the process and the success of the finished product.

While building the new application, partnerships were cultivated with other outside agencies; collaboration was required with Whatcom County, who worked to provide critical parcel data information from their database. Additionally, area schools recognized potential for utilizing CityIQ for their

business needs and GIS has responded providing district boundary module solutions, fostering cooperation and data sharing between the City and the schools administration.

CityIQ empowers people with information and knowledge while fostering lasting and critical relationships between individual staff, City departments, and our community. The potential exists for unlimited involvement and solutions with this robust “Information Query” tool now available to our public. Though the technical requirements to get here are vast, the vital component lies in the individuals collaborating behind the scenes and our immense user base.

### **How did the system change the way business is conducted with and/or service delivered to clients?**

*Give specific examples comparing the old way with the new.*

CityIQ has moved the City much closer to a “one-stop-shop” approach to customer service. The comprehensive variety of spatial data, customer accounts, and public records accessible in one interface provide staff with the resources to answer questions without having to refer customers to multiple departments. A customer can visit the Permit Center to check on the status of a building permit. In the same visit they can check the status of the water and sewer utility accounts for their project, locate adjacent parks and conservation easements, and generate a mailing list for a required neighborhood meeting.

The public release of CityIQ brings a new level of organizational transparency to the City. A citizen at home, reading an online City Council agenda can view schedules for hearings on upcoming public capital improvement projects or private developments. Rather than waiting to visit City Hall to inquire further about these projects, they can launch CityIQ right from the City’s web page. The geospatial overlays, measurement tools, reports and document links allow them to observe how projects impact their neighborhoods and communities.

Additionally the software itself is a vast improvement over the previous information query system. CityIQ is agile, flexible, scalable, quick, and light on the desktop. Previously, the software was cumbersome to install, relied on software licensing, difficult to modify or customize, extremely slow to start up, and unable to incorporate new City business systems. Additionally, it required separate workflow processes to prepare data specifically for the system. These processes were labor intensive and run only on a weekly basis. The current CityIQ uses a simple copy of the datasets placed on a server in an automated nightly process. Updates to GIS and business information data are now visible in CityIQ typically within 24 hours.

Additional changes include:

| Previous method   | Using CityIQ   |
|---|--|
| Research and gather data from multiple departments  | Use CityIQ to search for all relevant information relating to a place or project   |
| City staff sends public customers to multiple counters to gather information  | Citizens receive a majority of the information they need in one stop   |
| One department develops a very useful way of joining two data sources that becomes a key component of their business process. Over time, some departments discover how they are using this and replicate the process themselves. Others never learn of the new method and continue to do it the old way, or never even discover the relationship between the two sources  | New and innovative ways of combining data, or structuring queries are published in map services and immediately available to anybody in the City with a web-browser. The City's investment in employee training and education gets leveraged beyond their work-group or department, and shows immediate benefits across the entire organization. |
| Management-level staff rely on technical staff to provide basic spatial analysis, and summary statistics.   | Management-level staff can use CityIQ to perform simple spatial analysis and generate summary reports. Technical staff have more time to perform advanced modeling and develop more robust data sources.   |
| Install multiple copies of ESRI software to support various needs; maintain licenses; deal with rising costs  | Use free web browsers and PDF reader software to meet the needs of "lookup" GIS users  |
| Using multiple business systems to manually compile reports   | Automatically compile reports (LPR Report/Property Report) containing data from multiple systems with a single query   |
| City staff perform spatial queries using a variety of parcel, ownership, zoning, street, and utility datasets. Arc/Info coverages, shapefiles, and geodatabases are accessed from different network servers, drives, and folders depending upon whether staff use desktop GIS (ArcGIS), ArcView 3.x, or the ArcExplorer viewer. Many times, multiple copies of the same data can be found with differing dates. | City staff access a single web-based GIS interface, always pointing to the most up-to-date, most accurate copy of the data.  |
| Install and license specialized business applications on each machine, maintain logins  | Most of the City business applications are now accessible through CityIQ and additional software is not necessary  |
| Consult a paper copy of an Excel spreadsheet to find a project name and number, then request the as-built from the archives. Turnaround time of one week.   | Zoom to the area of interest or search on a key word, all project records returned. View PDFs instantly.   |
| Page through hard copy binders to find water connection sketches  | Type in a project number and related PDFs are available for viewing  |

## System Resources

### What are the system's primary hardware components?

*Give a brief list or description of the hardware configuration supporting the system.*

The system utilizes a single server hosting the web server, web application, ArcGIS Server, and SQL Server 2008. Server configuration:

- HP ProLiant DL360 G5 2.66Ghz server
- 2 dual core Intel Xeon 5150 2.66GHz processors
- 16GB RAM full buffered DIMM memory
- HP Smart Array P400 Controller
  - Array A: 140 GB, RAID 1+0 - Operating system
  - Array B: 280 GB, RAID 5 - Application and data storage
  - Array C: 572 GB, RAID5 - Database (SQL & SDE) storage
- External NAS connected via iSCSI
  - 1024 GB volume - ArcGIS Server map tile cache

### What are the system's primary software components?

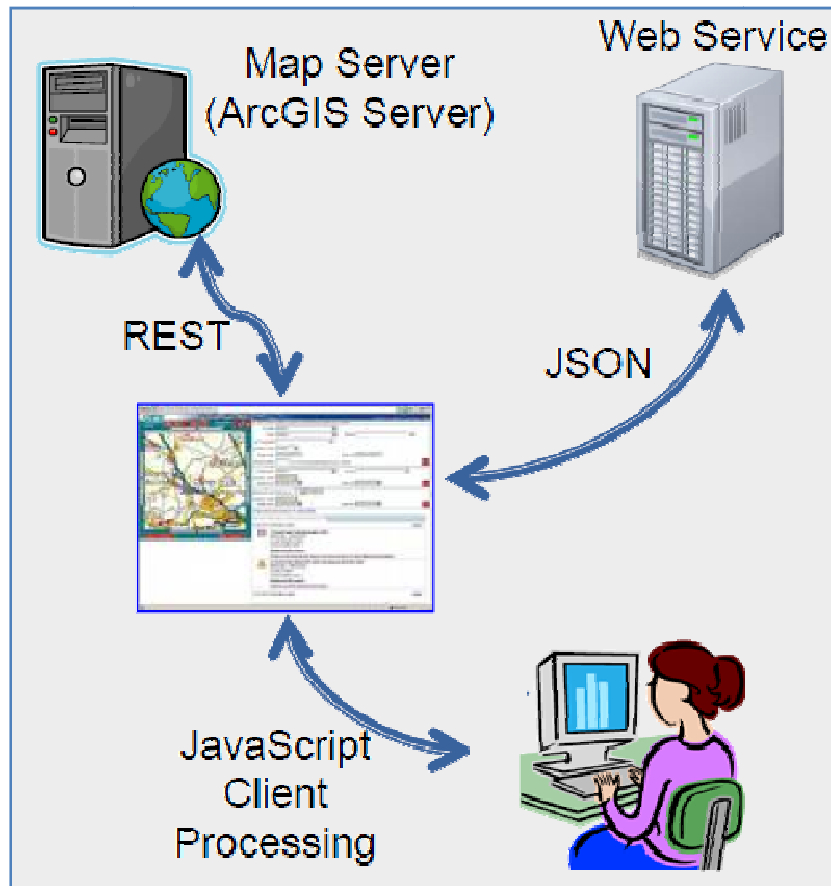
*Describe the primary software and, if a commercial package, any customizations required for the system.*

CityIQ relies on state of the art web development techniques to deliver impressive performance and scalability.

The server-side architecture is built on Windows Communication Foundation (WCF) web services exposing an SQL Server database, complementing cached map services in ESRI's ArcGIS Server. All the services are exposed via REST interfaces, facilitating flexible reuse in future applications without imposing restrictive technology platform requirements.

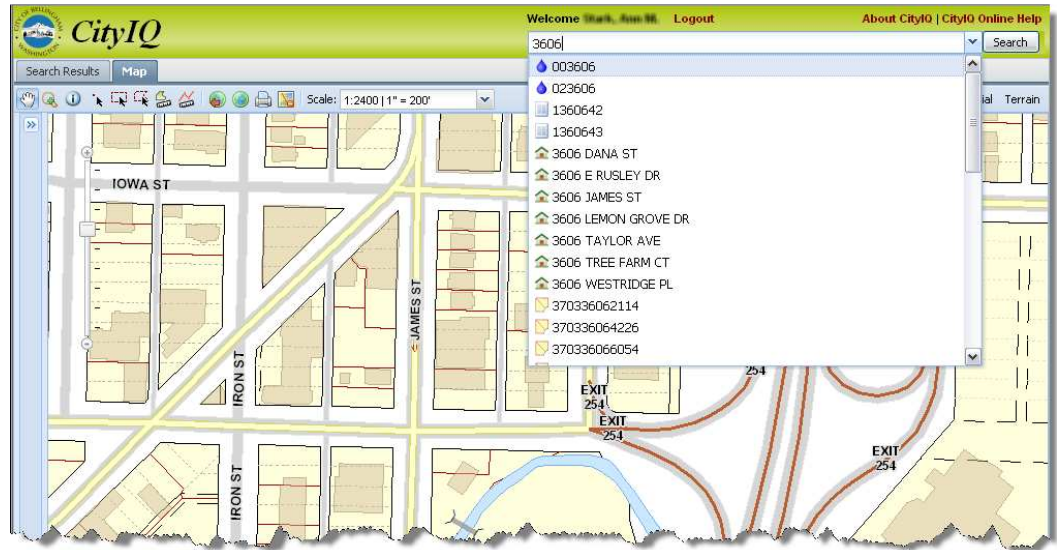
The client-side architecture is composed of an innovative object-oriented JavaScript framework providing an interface shell and integration between the various modules. The client supports multiple searching methods, a predictive text SmartSearch interface, spatial searches initiated in the map module, and a free text search querying all available data modules for any matches, all complemented by a powerful filtering interface to narrow result sets and identify specific records. Moving GUI rendering to the client minimizes the server load and frees it from memory and processor intensive session maintenance tasks while improving interface responsiveness.

This balance of computing workload allows the application to support many more simultaneous users than a traditional ASP.NET web application without the expense of additional servers.

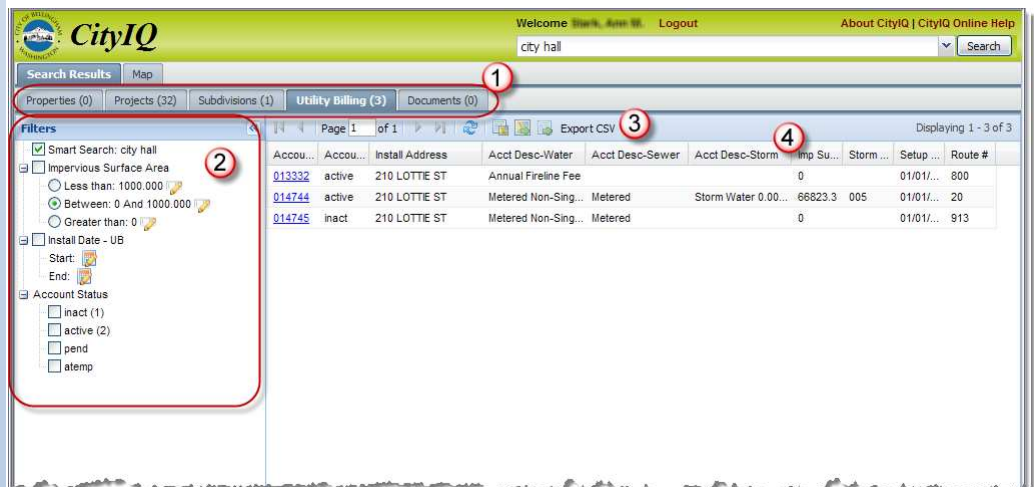


The following figures demonstrate a few of these client-side features.

*A predictive text Smart Search shows all possible matches within the data. Icons help users identify the type of match (utility billing account, document, parcel, address, project number, etc)*



*The search tool allows a word or phrase to be searched for across all data. In the example shown below, the phrase "City Hall" returns many items (shown in the row of tabs)(1). Further narrowing of the results is performed using the interactive filters (2) where users can type in their own values upon which to filter. The results are shown in a grid format and can also be shown on the map or exported to a format for generating mailing labels (3) using the buttons provided. The search results grid provides various sort options and allows the user to rearrange or hide columns as needed (4).*



An interactive map environment displays search results as a pop up box as the mouse hovers over selected data (1), or in a grid format below the map (2) where hyperlinks provide easy access to more detailed information(3).

The screenshot shows the CityIQ web application interface. At the top, there is a navigation bar with 'Welcome', 'Logout', and 'About CityIQ | CityIQ Online Help'. A search bar is located below the navigation bar. The main area is a map showing a residential neighborhood with streets labeled: DARCY, PATRIC, ROMA RD, SARA CT, ETHAN CT, MARIE CT, OLIVIA CT, TAMARA, TIMOTHY CT, and AARON CT. A red box highlights a specific area on the map, and a pop-up box (1) displays account information for Account # 022484:

- Account Status:
- Customer: HENRY OLBERG
- Water Status: Metered Single Family 25% Discount
- Sewer Status: Flat 25% Discount
- Storm Status:

Below the map is a table (2) titled 'Saved Search Results: Utility Billing'. The table has columns for Account #, Account St, Install Address, Acct Desc-Water, Acct Desc-Sewer, Acct Desc-Storm, Imp Surf Ar, Storm Fee, Setup Date, and Route #. The first row (3) is highlighted, showing Account # 021059, Account St active, Install Address 1350 OLIVIA CT, Acct Desc-Water Metered Single Family, Acct Desc-Sewer Flat, Acct Desc-Storm 0, Imp Surf Ar 0, Storm Fee 03/18/1991, and Route # 237.

| Account # | Account St | Install Address  | Acct Desc-Water       | Acct Desc-Sewer | Acct Desc-Storm | Imp Surf Ar | Storm Fee  | Setup Date | Route # |
|-----------|------------|------------------|-----------------------|-----------------|-----------------|-------------|------------|------------|---------|
| 021059    | active     | 1350 OLIVIA CT   | Metered Single Family | Flat            | 0               | 0           | 03/18/1991 | 237        |         |
| 021131    | active     | 1337 MARIE CT    | Metered Single Family | Flat            | 0               | 0           | 06/06/1991 | 237        |         |
| 021144    | active     | 1336 OLIVIA CT   | Metered Single Family | Flat            | 0               | 0           | 06/24/1991 | 237        |         |
| 021189    | active     | 1345 MARIE CT    | Metered Single Family | Flat            | 0               | 0           | 07/17/1991 | 237        |         |
| 021219    | active     | 1328 OLIVIA CT   | Metered Single Family | Flat            | 0               | 0           | 08/14/1991 | 237        |         |
| 021220    | active     | 1346 OLIVIA CT   | Metered Single Family | Flat            | 0               | 0           | 08/14/1991 | 237        |         |
| 021221    | active     | 1356 OLIVIA CT   | Metered Single Family | Flat            | 0               | 0           | 08/14/1991 | 237        |         |
| 021311    | active     | 1341 MARIE CT    | Metered Single Family | Flat            | 0               | 0           | 10/08/1991 | 237        |         |
| 021367    | active     | 3925 TAMARACK RD | Metered Single Family | Flat            | 0               | 0           | 11/26/1991 | 237        |         |

Quick buttons allow the user to quickly turn on and off relevant groups of information layers. In this example the terrain group is showing.

The screenshot shows the CityIQ web application interface with the 'Map Services' panel open on the left. The panel contains a list of map services with checkboxes: Parcel Labels, Sewer Utility Labels, Storm Utility Labels, Water Utility Labels, Street Name Labels (checked), Zoning Labels, Neighborhood Labels, Addresses, Survey Monuments, Street Lights & Signals, and City Fiber Optics. The main map area shows a terrain view of a residential area with a road labeled 'E SUNSET DR'. A red circle highlights the 'Parks Environment Utilities Map Aerial Terrain' buttons at the top right of the map area.

## What data does the system work with? *List and briefly describe the database(s).*

The City uses its wealth of GIS data to perform customer service, decision support and analysis of business services. The core application was built to support services in all departments throughout the City by using the following mapping and business data:

### Mapping information

- Parcel Base map
- Terrain base map
- Aerial photography
- Utilities (water, wastewater, storm water, traffic and communication)
- Streets
- Addressing
- Zoning and land use
- Administrative conditions
- Environmental and topography

### Business Information

- Property ownership and assessment through integration with the county assessor
- Utility customer and billing
- Parcel subdivision records and documents and plans
- City infrastructure projects, documents and plans
- Property deed, easement and administrative records and documents.
- Administrative encumbrance zones and impacts
- Utility asset information

This core information in one centralized location united through the geographic location allows City staff and the public to search, filter and disseminate a vast wealth of data in a fraction of the time. Increased availability of information allows for quicker, better informed and reliable decisions.

CityIQ's flexible architecture allows integration of data from many of the City GIS and business information systems. Utilization of web services allows CityIQ to work with data stored in SDE geodatabases, Oracle 9i, Oracle 10g, and SQL Server 2008.

To maximize CityIQ application performance and uptime as well as minimize reliance and availability of external systems, the CityIQ REST web services communicate with a SQL Server database containing copies of the data obtained from City business systems. This database is refreshed at least every 24 hours using SQL Server Integration Services. Optionally, the CityIQ REST-based web services framework allows direct integration with most business system databases. The following data sources are currently utilized by CityIQ:

| Application  | Database   |
|--|--|
| Spatial data   | SDE on Oracle 10g<br>SDE on SQL Server 2008 (Geometry storage)<br>ESRI file geodatabases |
| Infor Hansen IMS v7<br>(Work/asset management)                         | Oracle 9i  |
| Project Tracking<br>(custom application)                               | Oracle 10g<br>Network document file share  |
| Eden Utility Billing   | SQL Server 2008  |
| County Assessor<br>(text flat file import)                             | SQL Server 2008  |
| Subdivision Tracker  | Oracle 10g   |
| Property deed, easement<br>and administrative records<br>and documents | Oracle 10g<br>Network document file share  |
| Administrative<br>encumbrance zones and<br>impacts                     | Oracle 10g   |

### What staff resources were required to implement the system? (i.e., report approximate staff and consultant time as FTE's)

The CityIQ application was created through a agile combined development process of City of Bellingham Staff and Woolpert, Inc. staff. The creation of the application progressed over a period of close to two years from conceptual design to full implementation of all current functionality utilizing the following personnel resources.

| Position                          | FTE  |
|-----------------------------------|------|
| <b>Project Manager</b>            | 0.40 |
| <b>Business Analyst</b>           | 0.15 |
| <b>Senior Developer</b>           | 0.30 |
| <b>Database/SDE Administrator</b> | 0.50 |
| <b>Developer (3 people)</b>       | 2.35 |
| <b>GIS Analyst</b>                | 0.35 |
| <b>Technical Writer</b>           | 0.25 |
| <b>Trainer</b>                    | 0.20 |
| <b>Total FTE</b>                  | 4.50 |

**Comment on anything unusual about the resources used to develop your system, such as data, software, personnel and financing.**

City staff and a consultant work collaboratively using the Agile approach to software development - a first for the City and for the consultant. Using the Agile approach proves effective in developing software that meets user needs. Rapid and frequent software releases (nearly 700 revisions to date) have placed a working application into the hands of users that is continually evolving. Users have responded positively to this approach by providing feedback that continues to shape ongoing development of CityIQ. Additionally, an internal beta-testing team, made up of City staff from multiple departments, was created and met intensely in the early development of the software to direct the look and functionality of the software.