



**CANADIAN GEOSPATIAL DATA INFRASTRUCTURE
INFORMATION PRODUCT 14**

**GeoConnections
Geospatial Return on Investment Case Study:
PRISM-GIS and PRISM-911**

M. A. Stewart

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GeoConnections

Geospatial Return on Investment Case Study:

PRISM-GIS and PRISM-911

Applications developed by the City of Quinte West

Financial analysis performed by Mary Ann Stewart, Nova Blue Inc.

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Executive Summary

In late 2009 GeoConnections commissioned a Geospatial Return on Investment Case Study to add to the body of knowledge of case studies based on the GITA ROI methodology for financial analysis of geospatial projects. The study focuses on the PRISM-GIS and PRISM-911 applications developed by the City of Quinte West in Southern Ontario. PRISM-GIS, launched in 2007, assists First Responders during emergency situations in the field and at the Central Command Centre and facilitates communication between the field and the Command Centre. PRISM-911, launched in 2008, provides emergency notification by telephone.

Backward-looking five-year analysis of Quinte West PRISM: Total investment has been \$130,757 (2006 \$CA). Cumulative benefits are \$405,972 (2006 \$CA). Net Present Value is \$275,215 (2006 \$CA), with an annualized Return on Investment of 42.1%. Breakeven point was reached in 2008, two years into the project. The greatest tangible benefit is lowered risk to public health. Considerable benefits were also found from efficiencies in transferring manual notification to automated notification.

Forward-looking 15-year analysis of Quinte West PRISM: Cumulative benefits are \$3.5M. Net Present Value is \$3.1M with an annualized Return on Investment of 54.33%. Payback period is under one year as a result of startup costs being externalized into the backward-looking study. This high rate of return and short payback period reflects the dramatic benefits realized through leveraging the initial work done by the City of Quinte West.

Sensitivity analysis: A combined 19-year analysis of Quinte West PRISM showed Net Present Value of \$3.109M. ROI is 31.66%. Sensitivity analysis was also performed on the combined 19-year business case showing only benefits to the City of Quinte West, by removing public benefits. Net Present Value to the city alone is \$1.261M, with an ROI of 12.84%.

Huron County is Quinte West's first external client for PRISM. Huron recently leased PRISM from the City of Quinte West, launching it in November 2009.

Forward-looking 16-year analysis of Huron County PRISM: Cumulative benefits are \$4,154,920 with a Net Present Value of \$3,503,431 and an annualized Return on Investment of 33.61%. Payback period is one year. Huron County's Net Present Value is approximately \$400,000 higher than the Quinte West combined study NPV, predominantly a result of greater public benefits from automated notification of Boil Water Advisories.

A province-wide analysis illustrates potential costs and benefits if 50 municipalities, counties or regions adopt the system. Cumulative benefits are \$163M over the 15-year analysis. Net Present Value is \$132M with an annualized Return on Investment of 28.52%. Payback period is one year.

Sensitivity analysis was performed to show the effect of slow ramp-up of 50 agency implementations of PRISM over the lifetime of the analysis. This forward-looking 15-year analysis showed Net Present Value of \$79.3M. ROI for the ramped study is 26.03%. Cumulative benefits for the ramped study are \$100M.

Résumé

Vers la fin de 2009, GéoConnexions a demandé la réalisation d'une étude de cas sur le rendement du capital investi dans la technologie de l'information géospatiale pour ajouter au savoir en la matière. L'étude était basée sur la méthode que la GITA utilise pour l'analyse financière des projets géospatiaux. Elle met l'accent sur les applications PRISM-GIS et PRISM-911 élaborées par la ville de Quinte West, dans le Sud de l'Ontario. Implantée en 2007, l'application PRISM-GIS aide les premiers intervenants en cas d'urgence sur le terrain et au centre de commandement principal et facilite la communication entre eux. PRISM-911, qui a suivi en 2008, est un système téléphonique de communication des urgences.

Analyse rétrospective quinquennale de l'application PRISM à Quinte West : Le total des investissements s'est chiffré à 130 757 \$ (\$ CAN de 2006), et les bénéfices cumulatifs, à 405 972 \$ (\$ CAN de 2006). La valeur actualisée nette de 275 215 \$ (\$CAN de 2006) affiche un rendement du capital investi calculé sur une année de 42,1 %. Le seuil de rentabilité a été atteint en 2008, deux ans après le début du projet. Le bénéfice tangible principal est la diminution des risques pour la santé publique. Des avantages considérables ont également été tirés de l'efficacité permise par l'automatisation de la communication des urgences.

Analyse prospective sur 15 ans de l'application PRISM à Quinte West : Les bénéfices cumulatifs s'élèvent à 3,5 M\$, et la valeur actualisée nette de 3,1 M\$ affiche un rendement du capital investi calculé sur une année de 54,33 %. La période de récupération est inférieure à un an puisque les coûts de démarrage ont été pris en compte lors de l'étude rétrospective. Le taux de rendement élevé et la brièveté de la période de récupération illustrent les avantages majeurs qui découlent du travail initial effectué par la ville.

Analyse de sensibilité : Selon une analyse combinée sur 19 ans, l'application affiche une valeur actualisée nette de 3,109 M\$ et un RCI de 31,66 %. Une analyse de sensibilité a également été effectuée concernant l'étude de rentabilité combinée sur 19 ans des avantages exclusifs pour la ville une fois les avantages publics soustraits. Pour la ville seule, la valeur actualisée nette est de 1,261 M\$ et le RCI, de 12,84 %.

Le comté de Huron est le premier client externe à utiliser l'application PRISM de Quinte West. En effet, le comté a loué l'application et l'utilise depuis novembre 2009.

Analyse prospective sur 16 ans de l'application PRISM dans le comté de Huron : Les bénéfices cumulatifs s'élèvent à 4 154 920 \$, la valeur actualisée nette, à 3 503 431 \$ et le rendement du capital investi calculé sur une année, à 33,61 %. La période de récupération est d'un an. La valeur actualisée nette pour le comté est plus élevée d'environ 400 000 \$ que la valeur actualisée nette combinée pour Quinte West, surtout à cause des avantages supérieurs, pour le public, qui découlent de l'automatisation de la communication des avis d'ébullition de l'eau.

Une analyse provinciale illustre les coûts et avantages possibles de l'adoption du système par 50 municipalités, comtés ou régions. Selon l'analyse effectuée sur 15 ans, les bénéfices cumulatifs s'élèvent à 163 M\$. La valeur actualisée nette de 132 M\$ affiche un rendement du capital investi calculé sur une année de 28,52 %, et la période de récupération est d'un an.

Une analyse de sensibilité a été effectuée pour évaluer les effets d'une mise en oeuvre progressive lente de l'application par 50 organismes, sur la période visée. Cette analyse prospective sur 15 ans révèle une valeur actualisée nette de 79,3 M\$, un RCI de 26,03 % et des bénéfices cumulatifs de 100 M\$.

Introduction

GeoConnections was a partner in the development of the GITA ROI methodology, sponsoring a portion of the original case studies, three of which were conducted in Alberta in early 2006. As the methodology continued to develop and more U.S. case studies were conducted, GeoConnections became interested in sponsoring additional case studies suited to its mission in Canada. It issued an RFP in August, 2009, for consulting services to create a Geospatial Return on Investment Project and awarded a contract to Mary Ann Stewart at Nova Blue Inc. of Kansas City, MO, to perform this work.

The original scope of the project was reduced from the anticipated three case studies to one study, to accommodate time constraints created by a late start to the project. GeoConnections determined that its needs would be best met by focusing a concentrated effort on a single project. Fortunately, they had a case study in mind – the City of Quinte West’s PRISM-GIS and PRISM-911 applications for emergency management field applications and automated emergency notification. GeoConnections funded a component of these applications in 2008-2009 and was well acquainted with the project.

Arrangements were made with Ed Woods, Manager of GIS & IT Services for the City of Quinte West, for a four-day visit by Ms. Stewart to provide ROI training and to conduct on-site interviews to collect metrics for the financial analysis. This visit took place February 16-19, 2010. Matt Rankin, project manager for GeoConnections, attended the first day of the visit and participated in ROI training as well as the beginning of the interview process. The project proceeded rapidly to completion in the following six weeks, with final delivery on March 31, 2010. Dave Lew, Chief of Emergency Services, was interviewed by phone during the week of the Quinte West visit, with all subsequent Huron County interviews and discussions conducted by phone. Data for the analysis was collected by phone and email dialogue, with active participation by Quinte West and Huron County staff, by Ed Woods and Dave Lew in particular, and with the assistance of provincial-level agency staff providing metrics for use in the analysis.

The City of Quinte West PRISM Program

PRISM, *Protective Response Interactive Services Management*, is a web-based GIS application for emergency management built by the GIS staff of the City of Quinte West beginning in October, 2006. PRISM-GIS assists First Responders (fire and police) during emergency situations in the field and at the Central Command Centre and facilitates communication between the field and the Command Centre. PRISM-911 was subsequently developed to provide emergency notification by telephone.

PRISM-GIS was formally launched in May, 2007, during the annual Emergency Management Exercise of the City of Quinte West. This application leverages the City's existing ArcIMS (ESRI), ArcSDE GIS (ESRI), and GeoCortex IMF (Latitude Geographics, Victoria, B.C.) framework. The web GIS applications are housed on a server at City Hall and maintained by the GIS Division.

PRISM-GIS provides many land-based data layers, including: property ownership information, digital elevation models, one metre contour elevations, high resolution orthophotography (2002), and DRAPE imagery (2008). Floor plans of schools, retirement homes, commercial buildings and other major buildings are hyperlinked to the map. The city fire department maintains a fire response times layer. Other layers include: city services (water, sanitary, fire hydrants, traffic lights), flood plain boundaries, and base mapping layers from the Ontario Geospatial Database exchange.

PRISM-GIS has a regional mapping component which incorporates live precipitation imagery and location information on hospitals, airports and transportation networks. ERGO (Emergency Response Guide Ontario) is made available in its most current version. Staff created a Table of Initial Isolation and Protective Action Distances (TIIPAD) tool that maps isolation and evacuation areas based on chemical, time of day, spill size, and wind direction. A list of emergency contact numbers is also provided.

PRISM-GIS users may input sketches to the system to provide information about accident sites, evacuation routes, road closures, staging areas, helicopter landing sites and triage areas. User sessions can be saved to provide a historical record of events while working an emergency. PDF maps can be created easily, saved and emailed.

In the fall of 2007 a live communication tool for PRISM-GIS was developed using Microsoft's Live Meeting application. This allows Central Command to have direct audio/visual communication with emergency field staff. Maps and information displayed at the Command Centre can be viewed by staff using wireless laptops. The entire Live Meeting can be recorded and retained, reducing liability to the City by providing a physical record of the event.

In 2007, Quinte West Council directed staff to investigate the possibility of implementing a public emergency telephone notification system. This request followed a series of boil water advisories requiring significant manpower to provide manual door-to-door notification. The City

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secured \$57,000 in funding through the GeoConnections Program in 2007 and used this to develop additional components of PRISM-GIS and PRISM-911. Project partners include ESRI Canada, Land Information Ontario (Ontario Ministry of Natural Resources) and Emergency Management Ontario.

PRISM-911 works with PRISM-GIS to make a graphic selection of an area to be notified. A PRISM-911 alert is then originated by recording a message and initiating transmission from within PRISM-911. The system leverages a VoiceGate multi-trunk dialer to dial and play the message to all residential phone numbers pre-configured in the system's database lying within the specified region.

PRISM-911 was officially launched on March 4, 2008. It has been used for 12 callout campaigns (four flooding events on the Trent River, five boil water advisories and three blue-green algae notifications). More recently, it has been used for a missing persons notification and a neighborhood police notification. During an April 2009 flood event, PRISM capability was advanced to allow staff to initiate the system from a remote location.

PRISM is also offering a service to residents who may require special assistance in an emergency. This feature, PRISM-Care, is a layer that maps these residents and provides a listing to emergency officials.

Another recent development is PRISM-Station, a stand-alone desktop application providing the functionality of PRISM at reduced startup and operational cost.

Backward-Looking Five-Year Financial Analysis of PRISM

Total investment in PRISM to date has been \$130,757 (2006 \$CA). Cumulative benefits to date are \$405,972 (2006 \$CA). Net Present Value is \$275,215 (2006 \$CA), with a return on investment of 42.1%. Breakeven point was reached in 2008, two years into the project. This project clearly demonstrates the potential for significant return on investment for geospatially-enabled emergency response projects, particularly in the area of benefits provided to the public.

Backward-looking analysis of the PRISM project shows the greatest tangible benefit is lowered risk to public health. One hazardous materials fire worked in Spring 2008 using PRISM-GIS capabilities resulted in avoidance of inhalation of toxic chemicals by 35 City staff and 500 citizens in the area of an industrial creosote fire. A conservative estimate of savings to the public from use of PRISM-GIS to draw correct perimeter boundaries at the event shows \$22,164 savings (2008, 2009 \$CA) from avoidance of illness from respiratory exposure, with significant additional benefits continuing into the forward-looking 15-year analysis. Various boil water advisory notices made by PRISM-911 in 2008 and 2009 show savings to the public of \$212,800 (2008, 2009 \$CA) from rapid notification leading to avoidance of illness from drinking water exposure to *e coli* as well as rapid notification of the lifting notice saving citizens from unnecessary effort in observing boil water advisories.

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Considerable benefits were also found from efficiencies in use of public services for public notifications. Reduction in staff time through use of PRISM-911 for notifications for 2008 and 2009 events yielded \$8,158 savings in 2008 and \$37,501 savings in 2009. In addition, savings in vehicle time previously used to make notifications yielded \$11,180 savings in 2008 and \$28,880 savings in 2009. Police were able to avoid deploying officers and cruisers when PRISM-911 was used for a 2009 missing person event, a \$10,000 savings.

The City of Quinte West licensed the PRISM products to Huron County in 2009, providing \$15,000 in licensing fees.

Forward-Looking 15-Year Financial Analysis of PRISM

Annual costs to maintain the PRISM application going forward range from \$22,000 to \$39,000, fluctuating with the cycle of hardware replacement costs, with cumulative costs of \$383,424. Cost categories include: staff labor for development and maintenance of the application and hardware upgrade costs. Cumulative benefits are \$3.5M over the 15-year analysis. Net Present Value is \$3.1M with an annualized Return on Investment of 54.33%. Payback period is under one year as a result of startup costs being externalized into the backward-looking study. This high rate of return and short payback period reflect the dramatic benefits realized through leveraging the initial work done by the City of Quinte West to develop municipal GIS capabilities and the PRISM application.

Forward-looking analysis of the PRISM applications shows greatest benefits in the area of reduced risk to public health. Cumulative public health benefits are \$2.133M. Cumulative benefits to the City of Quinte West are \$991,612, comprised of \$365,875 in direct productivity benefits and \$625,737 in additional internal benefits related to vehicle use, police teaming efforts, and software maintenance purchases. Benefits from avoidance of respiratory damage continue, for a cumulative public benefit of \$196,264. Cumulative benefits from avoidance of sickness due to improved notification are \$1.485M, with an additional \$451,992 benefit to the public in reduced boil water activities through improved lifting notification.

PRISM maintenance fees related to Huron County licensing will yield \$75,702 in revenue to the City.

Sensitivity Analysis, a Combined 19-Year Analysis

Sensitivity analysis was performed to show the combined results of the backward-looking five-year business case and forward-looking 15-year business case. The rationale for performing this analysis was to show the dampening effect on the forward-looking analysis if startup costs are included in the analysis, as well as to depict the project in its entirety.

The combined 19-year analysis showed Net Present Value of \$3.109M, which can be compared to the \$3.124M of the 15-year forward-looking study. This reflects the exclusion of startup costs

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from the 15-year forward-looking study. ROI for the combined study is 31.66%. This contrasts sharply with the 54.33% ROI of the 15-year forward-looking study and is primarily affected by the difference in present value of costs (ROI = Net Present Value/ Present Value of Costs, annualized). Present Value of Costs for the combined study is \$516,932 but for the 15-year forward-looking study it is only \$383,424, as startup costs are external to this analysis. This sensitivity analysis demonstrates that ROI of the combined analysis is a more reasonable reflection of Return on Investment for the City of Quinte West PRISM project. However, ROI is a ratio and as such is never able to accurately depict true value of a project. Net Present Value comparisons, as always, provide the most accurate metric to describe the worth of a project.

Sensitivity analysis was then performed on the combined 19-year business case showing only benefits to the City of Quinte West, by removing public benefits. This was done to provide a business case for city operations, should that be desirable for certain types of decision making. Net Present Value to the city alone is \$1.261M, with an ROI of 12.84%. This demonstrates that the project provides significant internal process improvement benefits to the City, even if external benefits are disregarded.

Huron County, Ontario, PRISM Program

Huron County, Ontario's West Coast, is located along the shores of Lake Huron. The county seat is Goderich. Goderich is also the largest community in the county. This is the most agriculturally productive county in Ontario and a leader in numerous areas of agricultural technology and innovation.

Huron County is Quinte West's first external client for PRISM. Huron recently leased PRISM from the City of Quinte West, launching it in November, 2009.

Trial calls for Boil Water Advisories and lifting notices were made in the county on November 20, 2009. The county began a verification test call-out for the Emergency Notification component, PRISM-911, the week of March 1st, 2010. This test allowed residents and businesses to confirm they have provided accurate and complete contact information and can be reached during an emergency situation. It was also an opportunity to encourage all residents to make sure they are registered.

When activated, PRISM-911 uses its telephone database to send phone messages to Huron County residents and businesses in situations of urgency, such as boil water notifications, chemical and flooding disasters, and information on lost children or missing persons. It allows the entire County to be quickly and efficiently notified with an emergency phone message, or to send targeted alert messages to residents in a specific municipality or area.

Since its launch last fall, residents who wish to be contacted in the event of an emergency have been providing PRISM with their civic address and telephone numbers. The PRISM-911 telephone database currently contains home, business and/or cell phone numbers for approximately 35% of properties within Huron County.

Huron County is exploring the feasibility of obtaining Bell Canada's Reverse 911 database for a fee for use by PRISM. Obtaining current, complete and accurate reverse phone database is a critical component of the PRISM system and if the transaction with Bell Canada is successful, it may significantly reduce startup costs and time for any agency licensing PRISM. However, it should be noted that the CRTC regulations regarding use of telephone company 911 data are quite complex and that the outcome of the Huron County approach is uncertain at this time.

Huron County also has plans for the application of PRISM-GIS, including importing its GIS data describing the water distribution system for use as a field mobility application. This will be a new application for PRISM-GIS. Huron County also plans to install PRISM applications on mobile units in all police cars. Currently only senior police officers have mobile tablets which are able to run PRISM. All Huron County fire department vehicles were provided with mobile tablets within the past year and thus will be able to leverage this asset.

Forward-Looking 16-Year Financial Analysis of Huron County PRISM

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Total 2009 startup costs for PRISM were \$106,507 (2009 CA\$). Cost categories include: staff labor for development and maintenance of the application, staff costs for data entry, contract data entry and programming, hardware, and licensing fees. Annual costs to maintain the application going forward average \$37,000 annually, with cumulative costs of \$651,490 for the 16-year project. Cost categories include: staff labor for development and maintenance of the application, contract programming, PRISM and VoiceGate maintenance fees, telecommunications costs, and contract IT support costs.

Cumulative benefits are \$4,154,920 with a Net Present Value of \$3,503,431 and an annualized Return on Investment of 33.61%. Payback period is one year. Huron County's installation shows a Return of Investment comparable to the Quinte West combined analysis of the past and future studies. However, Huron County's Net Present Value is approximately \$400,000 higher than the Quinte West combined study NPV, predominantly a result of greater public benefits from automated notification of Boil Water Advisories. Huron County averages 6845 households to be notified annually, while Quinte West averages only 4201 household notifications annually.

This difference in Net Present Value illustrates the dominant effect of benefits of notification to the public on the analysis of a PRISM installation. We note that Huron County's annual costs are greater than Quinte West costs and Huron County has only begun to examine its uses for PRISM capabilities and has not yet had the opportunity to use PRISM for a large-scale emergency. This further indicates that areas in the province with a substantial number of households requiring notification will likely receive significant benefits from a similar installation.

The Potential for Province-Wide Deployment of PRISM

There are a number of potential benefits from province-wide use of PRISM for emergency response and notification. Emergencies frequently cover a wider area than the typical municipality or region. For example, police using PRISM in both Quinte West and Huron County have noted that notifications requesting citizens to watch for a crime suspect were not made due to the suspect leaving their area of jurisdiction. However, OPP would still be concerned with bringing the situation to justice and the province would benefit from unified notification capabilities. Natural disasters frequently extend beyond the boundaries of a municipality or a county and staff working the emergency as well as citizens seeking information could benefit from unified capabilities.

For the purpose of this analysis, we will assume adoption of PRISM by individual municipalities, counties or regions rather than a central deployment from the province. The reasoning behind this approach is that we have collected metrics to describe a municipal and a county deployment and have this readily available to use this to scale up an analysis to the province level. This analysis illustrates potential costs and benefits if 50 municipalities, counties or regions adopt the system.

This approach is not intended to endorse the adoption of PRISM from either the lowest or highest level of government, as we recognize that either approach or a mixture of the two could be effective in meeting Ontario's needs. We note that there are benefits to maintaining a centralized support function and possible benefits of scale in licensing agreements that could best be realized through a centralized deployment. On the other hand, analyses of the City of Quinte West and Huron County PRISM applications clearly indicate that local involvement by participating agencies and population served is crucial for optimal use of PRISM.

Forward-Looking 15-Year Analysis of Province-Wide PRISM

Startup costs for 50 PRISM applications are \$5.325M. Cost categories include: staff labor for development and maintenance of the application, staff costs for data entry, contract data entry and programming, hardware, and licensing fees. Annual costs to maintain the application going forward average \$1.8M annually, with cumulative costs of \$31M for the 15-year project. Cost categories include: staff labor for development and maintenance of the application, contract programming, PRISM and VoiceGate maintenance fees, telecommunications costs, and contract IT support costs.

Cumulative benefits are \$163M over the 15-year analysis. Net Present Value is \$132M with an annualized Return on Investment of 28.52%. Payback period is one year.

Forward-looking analysis of the PRISM applications shows large benefits in the area of reduced risk to public health. Cumulative public health benefits are \$63M. Cumulative benefits to the local government agencies are \$100M in direct productivity benefits and additional internal

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benefits related to vehicle use, police teaming efforts, health benefits to staff and software maintenance purchases. Benefits from avoidance of respiratory damage from hazardous chemicals fires account for a cumulative public benefit of \$5M. Cumulative benefits from avoidance of sickness due to improved notification are \$46M, with an additional \$12M benefit to the public in reduced boil water activities through improved lifting notification.

Sensitivity Analysis, Ramping up Agencies over Time

Sensitivity analysis was performed to show the effect of ramping up 50 agency implementations of PRISM over the lifetime of the analysis. It appears more realistic to make the assumption that four agencies a year would adopt PRISM, with full benefits for province-wide deployment not realized until near the end of the analysis.

This forward-looking 15-year analysis showed Net Present Value of \$79.7M, which can be compared to the \$132.6M of the study without ramping effect. ROI for the ramped study is 26.03%, compared to 28.52% for the unramped study. Cumulative benefits for the ramped study are \$100M, compared to \$163M for the unramped study. We note once again that ROI is a ratio and as such is never able to accurately depict true value of a project. Net Present Value comparisons provide the most accurate metric to describe the worth of a project.

The sensitivity analysis shows that breakeven point could be reached very quickly, within one-year of startup, as phased deployment of PRISM would be accompanied by phased benefits offsetting the costs. However, ramping effects significantly decrease Net Present Value of the project, due to delayed benefits over the lifetime of the project. In instances where project costs are higher, there would be less difference in Net Present Value. In any event, this analysis is a more realistic depiction of how PRISM could unfold throughout the province and the business case remains strong. One possible inference from this analysis is that it could be beneficial to provide a centralized provincial deployment, so as to minimize costs while pushing the application out to the agencies as quickly as possible.

PRISM-Amika Business Case

About Amika Mobile:

Amika Mobile is privately held and specializes in WiFi and SMS emergency alerts, ideal for those concerned with public safety as per FEMA's FPC 65 directive for emergency mass notification systems. Amika Mobile also delivers critical email-to-SMS mobile content alerts. Its mobile content solutions are independent of device, platform or carrier. Amika Mobile sells its products through partners, system integrators, service providers and platform vendors initially focusing on North America, India, and Europe with later expansion to Asia.

Awards:

Amika Mobile has won twelve awards thus far for its innovative technology as well as its business management and acumen since its inception in March 2007. Key awards include:

- Amika Mobile was selected Most Innovative Company in the Category of Communications Interoperability & Hastily Formed Networks for emergency communication at the San Diego Security Summit. Judges included representatives from government, military, first responder, emergency management, and border security from organizations such as DHS, DRDC, US Navy, etc.
- Amika Mobile was chosen for an ASIS 09 Accolades award as one of 2009's most innovative for its use of technology. Having the only solution that can send out a notification to any wired or wireless device is what distinguished Amika Mobile.
- IDC has picked Amika Mobile as a fast rising company and one of Top 10 Companies to Watch for Innovation in Emergency Mass Notification and Alerting and Market Opportunity in Mobile Solutions.
- Amika Mobile selected as having the best communication solution out of 100 early stage companies. The Telecom Council's Global Service Provider members voted to honour Amika Mobile's technology with the Alexander Graham Bell Communication Award at their annual SPIFFY Award Gala, held in San Jose, CA.
- Amika Mobile was named to the Branham 300 Top 25 Up and Comers that recognizes leaders of tomorrow within the ICT industry for innovation, uniqueness and long-term potential.
- Amika Mobile wins 2 Mobile Village Awards for Emergency Notification over WiFi and Email-SMS Critical Alerting Products.
- Ottawa Chamber of Commerce honours Amika Mobile with Best Small Business Award based on growth opportunities, job creation, innovation, customer focus, community corporate responsibility.
- Amika Mobile CEO recognized with Canada's Leading Woman Entrepreneur and Technology Innovator award presented to the woman who has shown the most outstanding technological innovation and corporate leadership that significantly expands the frontiers of high technology.

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PRISM-Amika

This proposed project would integrate the capabilities of PRISM-911 developed by the city of Quinte West and the Amika Mobile Emergency Alerting Solution. This solution would be first deployed in Quinte West and then taken to other communities in Ontario. This project leverages the results of recently completed work with Algonquin College, the Ottawa Police and Amika Mobile on the use of Emergency Alerting in a campus situation. The capabilities would be also be demonstrated within the Loyalist College environment, which does not currently have any emergency notification capability and is under the jurisdiction of the Quinte West OPP.

This project would demonstrate a single robust, reliable, fully scalable, and interoperable GIS

enabled mass notification solution that can send alerts over Wi-Fi hotspots, SMS, Email, Voice

and the web. This would be useful for emergency alerts such as boil water advisories as well as

more targeted notification of break-ins or criminal activity within an area of the community.

During natural and man-made disasters, multi-channel interoperable communication is key to

alerting and informing the affected parties of what has happened and what they are to do next. Incidents such as Virginia Tech and Dawson College have highlighted the same need for critical emergency notification solutions at the campus level. Amika Mobile is a patented emergency

solution featuring the ability to auto-discover wired and wireless network devices in a LAN or

WiFi environment. This is critical in campus and community environments where hundreds to thousands of unique users are mobile on laptops and mobile devices and are often not registered in any database.

The Amika Mobility solution allows for better targeting of messages to First Responders, separating them from citizens who do not need the same information. This project will evaluate what is needed to scale this solution to be a part of Canada's National Alerting System currently under discussion by various departments and provinces.

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The solution will support Common Alerting Protocol (CAP) based notification origination and cancellation. CAP is becoming the standard for emergency alerting and notification in Canada. The solution will provide a lower-cost voice solution through the use of the Pika patented technology rather than PRISM's current VoiceGate capability.

In Canada there are over 400 municipalities that would benefit from the work of Quinte-West

with Amika Mobile and the OPP. Huron County has recently licensed and deployed PRISM and would be able to expand it to multiple alerting capabilities.

Currently PRISM cannot auto-discover people who have walked into a facility with a mobile

device to advise or alert them. Household computers would be reachable with PRISM/Amika Mobile. PRISM/Amika Mobile could be set up as a hosted solution, providing a business opportunity for local Industry in the community and across Ontario.

The research component of this project would include an evaluation of how well a mass alerting solution with geo-fencing capability will improve First Responder operations and effectiveness. The conclusions drawn can be used to develop standards, best practices, policies and procedures and how-to guides for alerting communities.

Financial Analysis of PRISM-Amika:

We engaged in conversation with Sue Abu-Hakima, Co-Founder, President/CEO of Amika Mobile Corporation. She provided metrics from two previous unfunded proposals for development of PRISM-Amika. These are "*Geo-Fenced Emergency Mass Notification for Community Alerts*," submitted September 11, 2009, to the Canadian Police Research Centre and "*Emergency Alerting for Canada's Municipalities*" submitted November 26, 2009, to the Southern Ontario Development Program. Although details of costs were provided for our analysis, we were not able to quantify tangible benefits for the City of Quinte West or for Huron County during the limited time frame of this project.

In conversation with Ed Woods, who led the City of Quinte West's partnership in these proposals, we determined that the Amika application currently addresses emerging requirements for text and other mobile device communications in the U.S., particularly for emergency notifications on college campuses and in government buildings. There are no requirements in place in Canada for providing this type of notification service, although requirements may be developed in the future.

The City of Quinte West and Huron County support the concept of multiple paths of public communication, ranging from individual door-to-door notification to announcements using mass

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media, and currently include cell phone registration as a citizen option in their databases. However, the major enhancements that Amika would bring to PRISM do not appear to provide significant improvements to PRISM to warrant a business case at this time. The Amika auto-discovery capability within buildings does not appear to provide significant notification enhancements in predominantly rural or suburban settings. The suggested option for a lower-cost voice solution than the current VoiceGate technology has not been proven in the PRISM environment and Quinte West developers have concerns that adapting a different technology could prove more costly than the current implementation, which has been well tested. Quinte West emergency responders, such as OPP and the fire department, have procedures to thoroughly review a proposed new method of official communication to be used by their agencies and may not choose to adopt new communication channels without their thorough testing.

Thus, our conclusion is that it is not yet the right time to perform a financial analysis of PRISM-Amika. We provide this documentation in hopes that the information may prove useful at a time in the future when business requirements for this type of application have become more mature in southern Ontario or Canada as a whole.

Canadian Forces Base 8 Wing Trenton PRISM Business Case

From delivering supplies to the high Arctic to airlifting troops and equipment worldwide, 8 Wing is the heart of Canada's air mobility forces. It is responsible for search and rescue in central Canada and home to the famous Skyhawks with the Canadian Forces Land Advanced Warfare Centre.

8 Wing / CFB Trenton is at the forefront of Canadian military aviation with its fleet of tactical transport and search and rescue aircraft. Daily flights to the four corners of the globe tie this community into the mainstream of international events.

Located on the shores of Lake Ontario, the base's history begins in the interwar period - building here started in the early 1930's, and expanded during the Second World War. Many of the original buildings still stand. Base Trenton and several lodger units are located here.

Over the years, the base has seen many changes and has fulfilled several different roles. Today, 8 Wing/CFB Trenton is one of the largest and busiest air force bases in Canada. The hub of air transport operations it is involved in virtually every Canadian Forces operation. Most personnel and equipment deployed to places such as Afghanistan pass through Trenton at some point.

Along with higher-profile deployments, aircraft and personnel from 8 Wing are often involved with resupplying Canadian Forces Station Alert, the world's northernmost inhabited location. Also, 8 Wing's 424 Squadron is responsible for providing search and rescue coverage to a million square-kilometer area in central Canada.

Along with its air transport and Search & Rescue roles, 8 Wing/CFB Trenton maintains the equipment warehouse for the Disaster Assistance Response Team (DART) which provided humanitarian aid to Pakistan following a devastating earthquake in 2005 (Operation Plateau), to Sri Lanka in 2005 following the tsunami that hit the region (operation Structure), and to Turkey in 1999 after a severe earthquake (Operation Torrent).

8 Wing's main transport effort is handled by its fleet of 20 CC-130 Hercules and five Airbus CC-150 Polaris transport Aircraft. Both can usually be found front and centre in any operation where Canada has interests.

Strategic airlift involves the movement of personnel and equipment from Canada to overseas and is the primary role of the Polaris, operated solely by 437 Transport Squadron at 8 Wing.

For outsized loads, the Air Force relies on the Hercules, the "backbone" of Canada's airlift requirements. Given the number of taskings they are called to perform, Canadian CC-130s are the most heavily used Hercules Aircraft in the world.

CC-130 Hercules also equip 424 Search and Rescue/Transport Squadron as a SAR platform though their main search and rescue Aircraft is the CH-149 Cormorant.

8 Wing is also responsible for four executive-configured transports or CC-144 Challengers. Based in Ottawa, 412 Squadron Challengers provide VIP transport for the prime minister, cabinet ministers, royalty, foreign heads of state and dignitaries.

Opportunities for PRISM Installation

The City of Quinte West is interested in having CFB Trenton engaged in a PRISM deployment, either operating as a component of the City system or as a standalone installation. City emergency response leadership from fire and police departments noted that the number of takeoffs, landings and touch-and-go operations conducted by military aircraft on property immediately adjacent to the City is a source of increased risk from aviation accidents. City staff believe that integrating PRISM operations between the City and CFB Trenton would help mitigate that risk by improving response capabilities in a disaster, using the emergency response capabilities and procedures of CFB Trenton.

At the initiation of this project, we anticipated completing a financial analysis of a potential PRISM deployment at CFB Trenton. We engaged in conversation with Major Brendon Abram of A3 Readiness Training Flight. A critical point of our discussion was Major Abram's understanding that PRISM notifications must be deployed from City offices. Major Abram stated that the military would need to control its notifications from its 24/7 Duty Centre and that any other approach would be a deal killer for their PRISM installation. Ed Woods indicated that he was certain they could find a way for CFB Trenton to issue notifications from its Duty Centre.

Major Abram explained that CFB Trenton is primarily interested in employing a system such as PRISM to improve the time effectiveness of their response. He believes they could reduce the time for notifications from 120 minutes to 20 minutes, potentially decreasing loss of life or property. He believes this reduction in response time would provide their primary benefit from the notification system.

Dialogue to collect metrics for the financial analysis continued but ultimately Major Abram determined that he did not have sufficient time to participate in this undertaking. He has a background in financial analysis from his MBA education and understands the level of time and effort required to develop accurate measurement metrics.

We are hopeful that this initial dialogue may help pave the way for a PRISM installation at CFB Trenton, for greater emergency response communication between the City and CFB Trenton, and perhaps even for a financial analysis of a PRISM installation on the Base at a later date.

Strategic Benefits

From the standpoint of financial analysis, a strategic benefit is any benefit not yet quantified. In our experience, many strategic benefits go on to become quantifiable benefits once suitable metrics are discovered or further experience has been gained with the application under analysis. It may never be appropriate to quantify certain types of public benefits, but our general tendency is to take note of strategic benefits so they may be quantified in the future.

Noteworthy strategic benefits discovered during the PRISM financial analysis include:

- Continued insurability of the City of Quinte West. Their insurer indicates that proactive systems such as PRISM clearly reduce litigation and claims to municipalities. Cities with frequent or large claims find their premiums increasing dramatically and may develop difficult finding suitable insurers. Typical litigation against Canadian municipalities involves issues with prompt snow removal and associated vehicular accidents.
- Improved communication among participating agencies, resulting in expedited notification (this is anticipated in particular for BWA notification).
- Reassurance provided to aging population during emergencies and better monitoring of their health conditions (agencies note this may result in reduced ambulance calls).
- Improved deployment and notification regarding warming stations during power outages.
- Ability to analyze past responses to emergencies, for use in training exercises and for analysis to improve future response.
- Safer communities from improved police activity and notification (note last week's use of PRISM during stand down in a neighborhood).
- Improved safety for police and fire staff through automated notifications. Less direct public contact during an emergency reduces risk and frees staff to work the emergency.
- Faster locates of missing persons leads to greater success rates.
- Crime reduction due to public perception of technology applications. Cite example of cameras in downtown Trenton affecting crime rate.
- For province-wide PRISM, improved response to emergencies of all types, as natural disasters and crime do not respect government boundaries.

Noteworthy Solutions provided by the PRISM System

Huron County has recently initiated a business relationship with Bell Canada to provide phone numbers to the county for a fee. This will be for emergency notification only, but as that is scope of the PRISM-911 system, it is anticipated that this will provide an ideal solution to the County's efforts to obtain phone number data. The experience of the city of Quinte West and of Huron County is that obtaining the numbers manually is a labor intensive process. Further, it has been noted by market researchers that the primary hurdle to automated notification in Canada appears to be the application process to gain access to the 911 databases necessary to implement such a system. It is anticipated that Huron County's success with Bell Canada will be able to be leveraged by other government agencies in Canada.

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Additionally, in the Telecom Decision CRTC 2007-13, dated 2/28/2007, the Canadian Radio-television and Telecommunications Commission determined that it is in the public interest to allow incumbent local exchange carriers to provide enhanced 9-1-1 information for a telephone-based community notification service, subject to limitations to its circumstances of use, with appropriate safeguards, notification requirements and other constraints. Reference: 8665-C12-200507212 and 8665-S62-200405888.

A complex application process was provided by the decision. To get around this hurdle, some companies buy commercial telephone lists. However, most of those lists do not include people who are on National Do Not Call lists or numbers that have recently changed. The City of Quinte West has manually entered and verified the phone numbers of its population, beginning with publicly available information from the telephone white pages in order to expedite population of its database. It has been noted that even if negotiations with telecommunications carriers for access to their 911 databases are unsuccessful, the Quinte West approach is legally sound and cannot be contested. The Quinte West verification process further handles issues with recently changed numbers or numbers not in the phone directory.

Another noteworthy feature of PRISM is its ability to serve as a platform upon which government entities can build additional applications. Huron County plans to add its water distribution network to the database, allowing PRISM to serve as a platform for field mobility in routine daily use. Huron County also plans to add callback features to PRISM-911 in order to better serve its aging and special needs populations.

The City of Quinte West staff recently developed PRISM-Station, a stand-alone desktop application providing the functionality of PRISM at reduced startup and operational cost. PRISM-Station works by allowing a small municipality without expensive Arc IMS licenses to run PRISM with only ArcView and VoiceGate licenses

Quinte West staff envision a PRISM network that would allow individual municipalities to share their PRISM systems to enhance communication during emergencies. By sharing these resources, the cost of setting up new PRISM systems would be lowered while the ability to perform emergency notifications would be increased. This networked capability, combined with the use of Live Meeting, would facilitate communication between multiple EOCs in cases where an emergency covers a wider area than a single PRISM installation.

Quinte West further notes that establishing a PRISM network comprised of individual municipalities would permit the sharing of resources (telephone lines) during an emergency at one municipality. For example, a 16-port VoiceGate System can execute one call per minute per port, 960 calls per hour. At that rate, it would take 3.1 hours to deliver a message to 3000 homes. By using the resources of other municipalities, 64 ports could execute 3840 calls per hour. The time to deliver a message to 3000 homes would be reduced to 47 minutes. Quinte West envisions nearby communities such as Cobourg, Belleville and Kingston participating in this type of resource sharing for Quinte West PRISM.

Innovations in ROI Analysis/Best Practices

This project has provided an opportunity to extend the GITA ROI methodology to an intensive study of the tangible costs and benefits, as well as strategic benefits, of emergency management and notification systems. Previous emergency response analysis (see “*Financial Analysis of the Use of GIS, Imagery and Modeling for the 2008 Iowa Flood*,” June 26, 2009, Mary Ann Stewart for the Iowa Geographic Information Council) revealed that emergency responders and managers associated with the massive flood event did not have records that were easily adapted to return on investment analysis. They worked in a culture of ad hoc response and did not expect their response activities to be repeatable or quantifiable. Clearly, financial records for the activities were maintained at some organizational level, but these did not translate well to the GITA ROI process of building up benefits from the tangible activities of individuals working in specific job categories. It was often difficult to find individuals who could explain their response activities and the effect of geospatial technology on those activities.

The PRISM analysis was able to break through the cultural impediment described above by working with long-standing emergency management leadership at the municipal and county level. These managers know their communities well and may wear many hats within organizations as they work to ensure effective planning and response. They have long memories, in one case citing the costs of fighting a fire that took place in 1973. They have a deep understanding of the work processes that are being affected by the new PRISM technology. The communities studied are somewhat small, Quinte West population is approximately 43,000 and Huron County population is about 59,000. This provides a nearly ideal environment for modeling the effects of a new technology, as it is possible to speak with the majority of staff members directly affected. As the GITA ROI methodology emphasizes the collection of metrics related to specific job classifications, having the opportunity to interview the majority of relevant staff made for an excellent study. One way to explain this beneficial effect would be to say that the study areas were just the right size – neither too large nor too small. Further, the communities had the good fortune of not being impacted by a major disaster, and thus the emergency response activities studied were generally at the calmer, more repeatable, end of the spectrum.

One of the other challenges of this type of ROI analysis is getting staff to envision change that may come in the future, as use of the technology matures. Projecting future financial consequences is always a tricky business and previous ROI case studies have noted some resistance from management and staff to the uncertainty around envisioning future applications.

Envisioning change was not a problem for the PRISM analysis. Quinte West developed PRISM in-house, using staff creativity to solve a problem identified by its City Council, and has invested sweat equity in this set of applications. Staff were quick to gain a working understanding of the ROI process and rose to the challenge of assisting in metrics collection. As a result, the financial analysis of PRISM’s future costs and benefits is a result of collaborative thinking by many departments engaged in emergency response and notification activities. Additionally,

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Quinte West and Huron County were able to exchange ideas regarding use of the technology as they learned of the other organization's plans and borrowed quantifiable benefits from each other. The ROI analysis became a brainstorming event which fed back into the analysis with improved quantification of benefits as well as additional benefits imagined.

Perhaps the greatest extension of the GITA ROI methodology for the PRISM project was in the calculation of benefits to the public. Public benefits calculation was done to some extent for the Iowa flood analysis but was extended to a much broader effort for PRISM. As internal process improvements from PRISM-911 notifications began to show dominant benefits in the financial analysis, it was natural to consider examining benefits to the public from these automated notifications. We took the experiences of staff in making manual notifications and their perceptions of the difficulties their citizens have with notifications and combined this with the body of research on the costs of water-borne disease. Having estimated the savings to the public from avoidance of water-borne disease through faster notification, as well as their savings from stopping boil water activity once an automatic lifting notice was received, we proceeded to estimate other types of public health benefits. PRISM-GIS hazardous materials and modeling capability provided benefits to firefighters and citizens through setting correct boundaries at a creosote fire, reducing their risk of respiratory disease from coming too close to toxic fumes. We collected metrics in other areas of risk, such as cost to citizens from specific categories of crime and risk of airport runway incursions, but have not yet determined appropriate use of all metrics developed.

In short, the PRISM study has made significant steps toward meaningful quantification of public benefits and provides an example of appropriate methodology for developing benefits metrics in many other areas of public risk. As public benefits for the Quinte West analysis were more than double the internal organization benefits, we believe the development of an approach to quantification of public benefits provides a significant addition to the GITA ROI methodology.

Conclusions

The City of Quinte West's PRISM application touches on a number of important issues for emergency management and notification, geospatial data standards, and interoperability. Some of the more significant areas addressed are:

- Selection of communication venues for automated community notification
- Community participation in community notification projects
- Communication between agencies involved in community notification
- Benefits of two-way communication between government and the public during notification
- Customization of notification procedures for special needs populations
- Low-cost GIS platform for communities without GIS
- Privacy issues with 911 data and recent CRTC rulings
- Interoperability of GIS data and applications throughout municipal or county agencies
- Application of mobile hazardous materials information and modeling capabilities for emergency response
- Response partnerships between government, utilities, and the military
- Use of emergency response metrics in public works capital expense planning

PRISM provides a GIS emergency response and notification platform communities can use to solve problems and improve processes. Quinte West and Huron County have applied great creativity over a short period of time to customize PRISM-GIS and PRISM-911 to meet the needs of their agencies and communities.

Huron County is rural, has a high population of retired people and experiences a number of power outages, particularly during the winter heating season. The county's average annual number of households notified for a BWA is significantly higher than households notified in Quinte West. Thus, benefits areas of particular concern to Huron County are BWA notifications and dealing with special needs populations during power outages.

Quinte West has used PRISM-GIS in response to a hazardous materials fire and PRISM-911 for a missing persons notification as well as a recent community notification regarding police activity. The areas of police notification and mobile analysis capabilities for emergency response appear to be emerging as significant issues in this community with increased risk due to concentrated population and proximity to Highway 401.

In general, core level of PRISM benefits is driven by the level of manual notification experienced by the implementing community. These benefits come from savings to the agencies that performed manual notification and from improved health/lowered risk to the public served by the notifications. Thus, communities with significant manual notification requirements would be likely to have a particularly strong business case for implementation of PRISM.

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Recent experiences with PRISM-911 notifications indicate that police may find a variety of uses for the tool. Automated notifications may be effective and feasible in situations where manual notification would take too long, be unsafe, or otherwise unfeasible. Use of PRISM by other municipalities or counties would assist police activity, as there have been recent events where a suspect escaped PRISM boundaries before a notification could be issued. We anticipate that once PRISM-GIS is installed in all Quinte West and Huron County police and fire vehicles, many additional uses for these tools will be discovered.

Another area where PRISM growth is anticipated is in partnerships with other organizations involved in emergency response and notification. CFB Trenton has an interest in using PRISM to make notifications to staff during emergencies. Quinte West recognizes a need to facilitate communication with the base given the heavy use of its runways which are adjacent to the City boundaries. Huron County recognizes an opportunity to collaborate with its electric utility to manage notifications during power outages. As PRISM is used by increasing numbers of city and county staff, more ideas for organizational collaboration may evolve.

Finally, PRISM may have an opportunity to grow through community involvement. The challenge of getting full participation in phone registration has resulted in community outreach efforts and widespread publicity regarding the new notification capabilities. Other North American communities with notification systems have had positive experiences in integration with community policing efforts and informal groups responding to community emergencies. Research indicates that citizens may be more responsive to notification when there is provision for two-way communication. It will be interesting to see how community engagement and multiple communication modes may affect PRISM in the future.