Appendix 1

Town of East Gwillimbury

Telecommunication: Gap Analysis and Future Directions

Canada

South Lake CFDC

Completed by: Actionable Intelligence Inc.

June 4, 2010

Executive Summary

The Town of East Gwillimbury will be experiencing a significant growth within the next several years in accordance with the Provincial Growth Plan. To encourage and support economic and business development within a municipality, robust telecommunication networks (both wired and wireless) are necessary; the Town of East Gwillimbury recognizes this need and looks to identify existing and potential opportunities available.

The Town had a study completed to review the current status of broadband coverage within the Municipality and to identify future opportunities or activities to support future communications systems. The Town recognizes that high speed communications services/applications are a foundation for businesses of all sizes in the 21st Century. Over the coming years the Town is expected to increase in population by almost 70% and employment population is expected to increase by more than 100%. This represents a large opportunity for the Town and understanding elements that are critical to businesses is essential. Today, high speed communications services are more fundamental then water and sewer needs. Computing has created an environment where all businesses require interactions and connections with customers and suppliers. The benefit for businesses to compete in a national and global market provides them with new opportunities.

In order to complete a fulsome gap analysis, Actionable Intelligence supported the Town in developing and implementing a survey to engage residents and businesses for feedback. This enabled the residents and businesses to indicate where they lived, if they had access to broadband services and if they were satisfied with the current service options/pricing. In addition, Internet Service Providers were contacted to ask where they currently had services, if there were areas they could not service and issues that prevented them from offering services.

The results of this data gathering indicate that there are several areas in the Town where services are not adequately available, especially from a resident and business perspective. Although areas where there are pockets of dense population (typically in villages, housing settlements and hamlets) there are many services especially wired options. There are several other options throughout the Town, including fixed wireless, mobile wireless and satellite. While these options exist in most of the rural areas of the Town, the coverage is spotty, variable and often more expensive then the wired options.

Many of the respondents indicated their only option was to dial up services, which as demonstrated in the document are completely inadequate for delivering 21st Century services and applications. The urban areas have reasonably good service today but the gap between the rural and urban areas is widening in terms of speeds and pricing. Without new capital in networks the rural areas will continue to be under served and remain without many options.

The Town has the opportunity to work with developers especially in the urban and growth areas to ensure that new infrastructure is placed while development occurs and that there are adequate facilities to accomodate future growth. For rural areas the Town has the opportunity to apply for funding support from the Province. These funds can be given to service provider (via a

fair procurement process) to implement more infrastructure in rural areas or to ensure more areas receive coverage.

Introduction

This report was developed for the Town of East Gwillimbury by Actionable Intelligence Inc (AI). The Town requested a report which would provide information related to broadband technology, gaps in service within the Town and future directions.

This report was developed using public sources, research reports and input from the Town. A gap survey was conducted through the Town and the locations have been plotted on the maps that accompany the document.

The document is broken into the following sections:

- Broadband Backgrounder
- Economic and Social Benefits of Broadband
- Town Telecommunication Gap analysis
- Future Directions

The Future Directions component includes policy opportunities for the Town to consider implementing relative to enabling broadband delivery throughout the Town.

Broadband Backgrounder

Broadband is the term used to describe a network that delivers Internet and other computing based services and applications. Broadband is an evolution of telecom networks. Traditional phone networks were designed to deliver voice services which are defined as narrowband (64 kilobits per second) users. The technical definitions vary, but it is standard to assume that a broadband networks minimum capability is 1.5 Megabits per second (mbps) to its users.

Broadband technologies initially evolved from telecom and cable networks. Both these service/network providers were interested in the development of these new technologies so they could deliver new services such as High Definition Video and computer communications (which includes Internet access).

The base concept of the Internet is that computers can communicate and exchange information between each other. This enables the human users to also interact and communicate. While computing technology was not common in the majority of homes in the 1980s, it is often the norm for homes to have more than one computer today. Not only have they become a household tool (providing spreadsheet access, information retrieval, shopping, banking etc.) but they are a necessary tool in almost every type of business. Businesses rely on computers for documentation, accounting, supply ordering, customer communications and many other activities. Even business that are not computer based (i.e. Tim Horton's or Canadian Tire) rely on computing technology to run their businesses. Many organizations (such as Tim Horton's) capture video and transmit it to off site locations for storage. There are many electronic tools that businesses want to implement. While the main business may be to provide coffee and doughnuts there are many operational processes which require computing and network connectivity. In order to enable small businesses in towns, hamlets and people's homes broadband networks will be a critical component in the 21st Century.

> Digital Equipment Corporation CEO Ken Olsen famously commented in 1977 that, "No one will ever want a computer in their home," setting off a long-standing trend in the history of information technology of underestimating consumer demand for faster computers with improved processing speeds, memory, and disk storage capacity. Repeatedly, increases in CPU processing speed, memory, and storage capacity have been met with new applications and programs leveraging that increased speed, memory, or capacity. This dynamic has also been equally true with regard to demand for faster transmission speeds across digital telecommunication networks. And just as even titans of the computing industry could not envision at the time the applications that would usher forth from dramatically faster computers with more storage capacity, so too can we only begin to envision the applications that next-generation broadband will make possible. Need for Speed – Information Technology & Innovation Foundation, March 2009

As we proceed into the 21st Century, new applications will be developed. The biggest change in the coming decade will be the addition of video to many services and applications. Video has rapidly become the defining component of the current Internet. Applications such as Youtube have altered the use of computing to a new dynamic. Not only can users retrieve content, but they have the ability to generate and share video. The reason this is important is because video is an easier mechanism for communicating then writing. A person has only to talk while

recording (which is now affordable for anyone) and they can add their content to the internet to share with the world.

While Youtube represents a real consumer application today, there are many other uses where video will become common. The addition of video to health applications (e.g. doctor to consumer consultation, remote video diagnostics, etc.), education applications, transit and security opportunities represent just a few of the services that are being implemented in areas around the globe. As we move forward into the second decade of this century users will need more bandwidth to ensure that these applications can be implemented across society. In order to accommodate such applications the standard 1.5Mbps will not be sufficient. The table below illustrates that intense video applications will need 5Mbps and above. It will be important that networks evolve and increase their bandwidth in the next ten years in order to keep up pace with other regions and countries.

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TABLE 1: BANDWIDTH REQUIREMENTS FOR BROADBAND APPLICATIONS

Application	Upstream Speed	Downstream Speed
Medium-Resolution Videoconferencing (640x480P)	384-1200 Kbps	384-1200 Kbps
Streaming Video (720P)		1.2 - Mbps
Standard-Definition Digital Television (720x480 Interlaced)		4 Mbps
Basic HD Videoconferencing (1280x720 resolution)	1.2 - 4 Mbps	1.2 - 4 Mbps
Telepresence: High-Resolution HD Videoconferencing (1920x1080 resolution)	5 Mbps	5 Mbps
Video Home Security Service	10 Mbps	
High-Definition (HD) Digital Television (1440x1080 Interlaced)		15 Mbps
Telepresence: Very High-Resolution HD Videoconferencing (5760x1080)	15 Mbps	15 Mbps

Need for Speed – Information Technology & Innovation Foundation, March 2009

Broadband Technologies

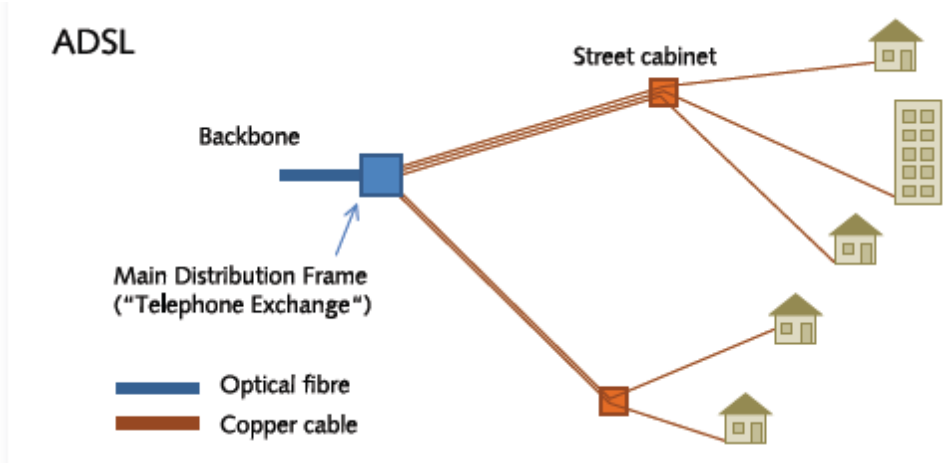
There are a number of different technology types which are capable of delivering broadband services to users. While each technology operates somewhat differently they are all capable of reaching speeds of 1.5 Mbps or more per user. Most of these technologies commenced development in the 1990s and have gone through generational evolutions in the first decade of the 21st Century.

Telephone networks

Phone networks leverage their investment of cables that delivered voice services to users homes for more then 65 years. To each home/building the most common cable is copper. Telecom manufacturers developed technology known as Digital Subscriber Loop (DSL) to deliver broadband services to users. By leveraging the copper base to deliver the services phone companies did not have to make an incremental investment in placing cable to individual homes (which would also require digging up streets, lawns, shoulders etc.)

In new housing/industrial developments the telephone company could opt to place fibre or copper cables to deliver all the services they desire as there is no base in those locations. However the cost to implement such infrastructure in existing locations is very high and difficult to justify in a competitive business environment.

While electronic technology has been developed to deliver the broadband services and applications over the copper cables there are limitations. These networks work by sending electronic signals down the cables. These signals diminish over distance. DSL technologies work optimally within 4 kilometers of the box that produces the signal. It is important to realize that this distance is measured over the length of the cable and cables run along streets. Thus, it is not a 4 km radius from the building (referred to as the crow flies).



If the homes lie more than 4 km away there is the alternate of placing an electronics box alongside of a road and then sending the signal from that point for the 4 km of cables. However, that requires a positive business case to justify the financial investment. This means a sufficient number of homes must be reachable from where that box is placed. In many instances, these roadside boxes required fibre to carry signals from them back to the main electronics building (usually located in towns in rural areas). The cost of that fibre connection (or even copper if it is available) has to be added into the business case economics and often results in the total business case being negative (which essentially means the cost of the capital technology is higher than the anticipated revenue).

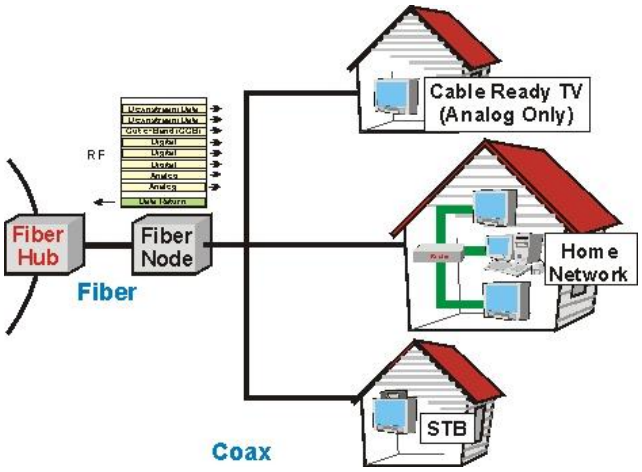
Based on the great number of locations that phone companies have not installed DSL services without government subsidy, it would appear that there is no business case for this technology in densities of less than 20-25 households per square kilometer.

It is this negative business case which often leaves the phone company at a loss to place more of these DSL services in areas that do not seem low in population density – such as the Town of East Gwillimbury.

Cable networks

Cable networks consist of coaxial cable and traditionally were used to deliver TV services. In rural areas cable companies typically only offered network and services in towns or areas where hundreds of homes were clustered. The alternatives for rural citizens were off air using antennas or in the more recent years, satellite dishes.

Cable networks required new electronics (while different from DSL the same concept) to alter their networks to be capable of delivering broadband services. These electronics are not as sensitive to distance (although the signal does degrade over distance similar to phone networks). This distance limitation coupled with the fact that existing cable infrastructure does not already reach every home, limit the business case for cable companies to provide services to large numbers of citizens that are not located in large clustered situations.



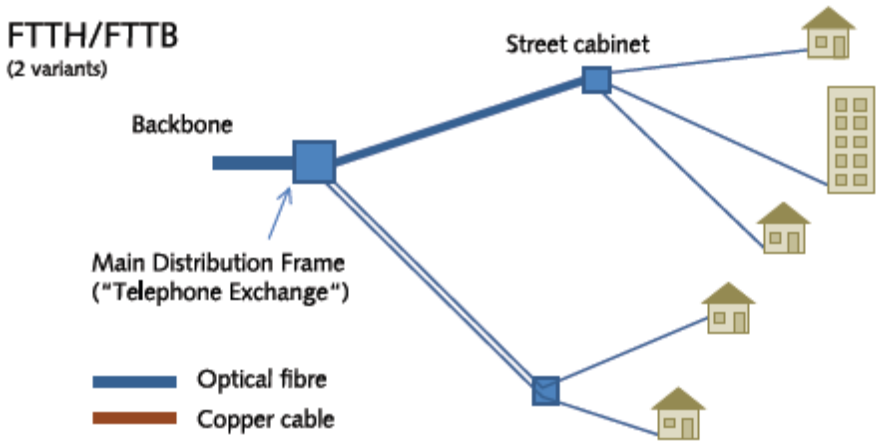
Cable companies tend to be very competitive where they do offer services and often have good services at reasonable prices.

However, the limitation to not extend the networks leaves many without access to the desired Internet and computer communications that are becoming essential. Traditionally cable companies do not bring their infrastructure outside of the towns where the household densities are higher. It is hard to know what the threshold in the business case is for cable providers, but when they will not bring their services 2 km beyond a town where there are visibly 7-9 homes per square kilometer, the densities appear to be relatively high.

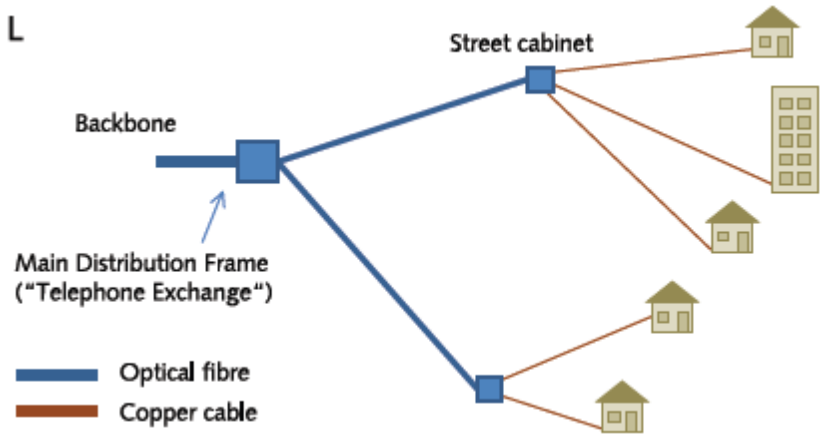
Fibre

While there are many different types of fibre services the one most often thought of by the citizens is the concept of fibre to the home. In these configurations a fibre comes directly to an individual home much the way the copper and coax do for telephone and cable. With a fibre to an individual home the amount of bandwidth is determined by the electronics connected to it. For the purposes of most users, a fibre has more capacity (bits per second) then most users can imagine using.

Fibre to the home is considered to be the only cable required and for new developments it will likely be considered by developers and or utility companies as a reasonable alternative. However, to place fibre to all existing homes presents a very significant financial challenge. The cost of trenching new wire (or pole attaching) to all existing homes is not viable. While the new medium offers many new services (for instance HD 100s of channels, video conferencing, multiple internet connections and voice can all be easily accommodated over such a connection).



There are options for existing providers to consider such as fibre to the curb (and then use short distances of copper or coax). However, in areas with household densities similar to East Gwillimbury, most major providers have indicated that even this option is not feasible.



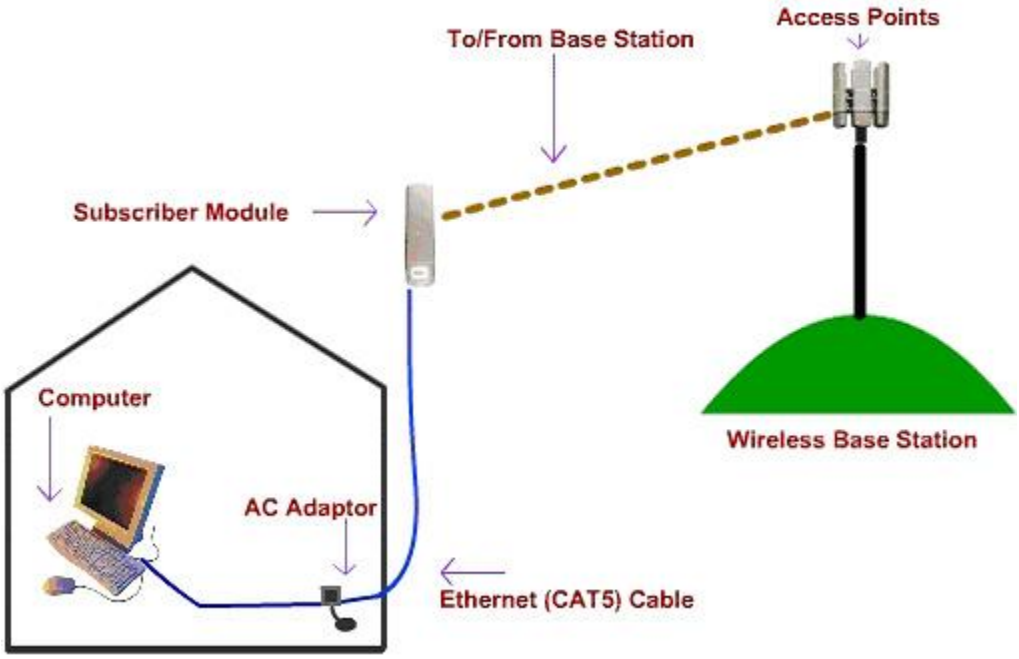
It is possible that with newer electronics and decreasing costs of electronics such solutions may be more financially viable in 20 years.

It is important to understand that there is fibre running along many routes today and while in some cases it is active (which means there are electronics attached to it and it is carrying signals), it generally runs from point to point. That means it runs from one major hub location to another – between network locations for a carrier. Anywhere a provider might aggregate many users traffic and then want to take it to another location (like to the location where they connect to the big Internet). This means that individual houses and businesses may not (and usually cannot) access the fibre for services to their location. In some cases a business may require the bandwidth that a fibre connection provides and they will pay a provider to take a fibre from that closest hub location to their location. However these services are not inexpensive and are often beyond the reach of many smaller businesses.

Wireless Technologies

There are two predominately different types of technologies related to delivering wireless services – fixed and mobile.

Both network types use antennas to transmit signals through the air. Fixed networks use antennas mounted on to buildings to receive the signals. Mobile networks use portable devices (cell phones or usb based sticks) to receive the signals.



From www.dupagewireless.net

Regardless of the type of wireless network both suffer from limitations in signal transmission. Wireless networks are subject to interference (or signal blocking) and loss of signal due to trees and terrain issues. Consider any radio signal (such as those that deliver music) they can often not work as well in areas where there are many rolling hills, cliffs and low points as the signal cannot be received. In addition, trees can block signals from passing through. In some cases the type of tree (coniferous versus deciduous) can be more difficult as can the height. The signal cannot penetrate pine trees easily and in addition if the height of the trees is close to the height of the tower the signal can be clipped.

Tower capital costs increase dramatically with the height of the tower so often ISPs try to use towers no more the 100 feet as the economics for low density areas do not make sense for more expensive towers.

Typically wireless providers can services household densities that are lower than DSL or cable. However, in most cases depending on terrain issues, the wireless providers' business case is difficult to serve areas of 5 or less households per square kilometer.

HSPA - Mobile Stick Technology

This section has been included as a special supplement to wireless technologies in general. HSPA stands for High Speed Packet Access technology.

This is a technology which uses wireless, specifically cellular type technology to deliver high speed internet. This is an evolution of older cell technology which was developed to transmit data instead of voice to "smart phone" devices. Essentially text, web browsing and other

data/computer like applications are delivered over a network which also delivers cell phone calls.

It is worth pointing out that although the networks do integrate at some electronic node, cellular phone services are separate from traditional landline phone services. That means, the cell phone call does not go to that Central Office we described. There is a location where they meet, but it is not in every little town.

HSPA was developed and implemented to target a market that was mobile – salesmen, students, business people, etc. Thus the design parameters are that users will only be using the network for a limited amount of time at any given hour and that they will only want to do a minimal set of activities/interactions. As such the design of the network (which is the link from the user to the tower and then the tower to the next node in the network) is not intended to handle users who are connecting for longer periods of time, or potentially remaining connected at all times. While this may sound unbelievable in the modern world there are many users who remain connected for many hours (email, web interactions for businesses, streaming video/video conferencing). Many users who have landline connections to the Internet or fixed wireless have these long connection times. As such there is a much different user contention ratio at the node similar to that tower connection point. Basically since this network is designed to support cellular voice services first, it is designed to handle more users who connect for shorter periods then other types of high speed internet networks (such as DSL, cable modem, or fixed wireless).

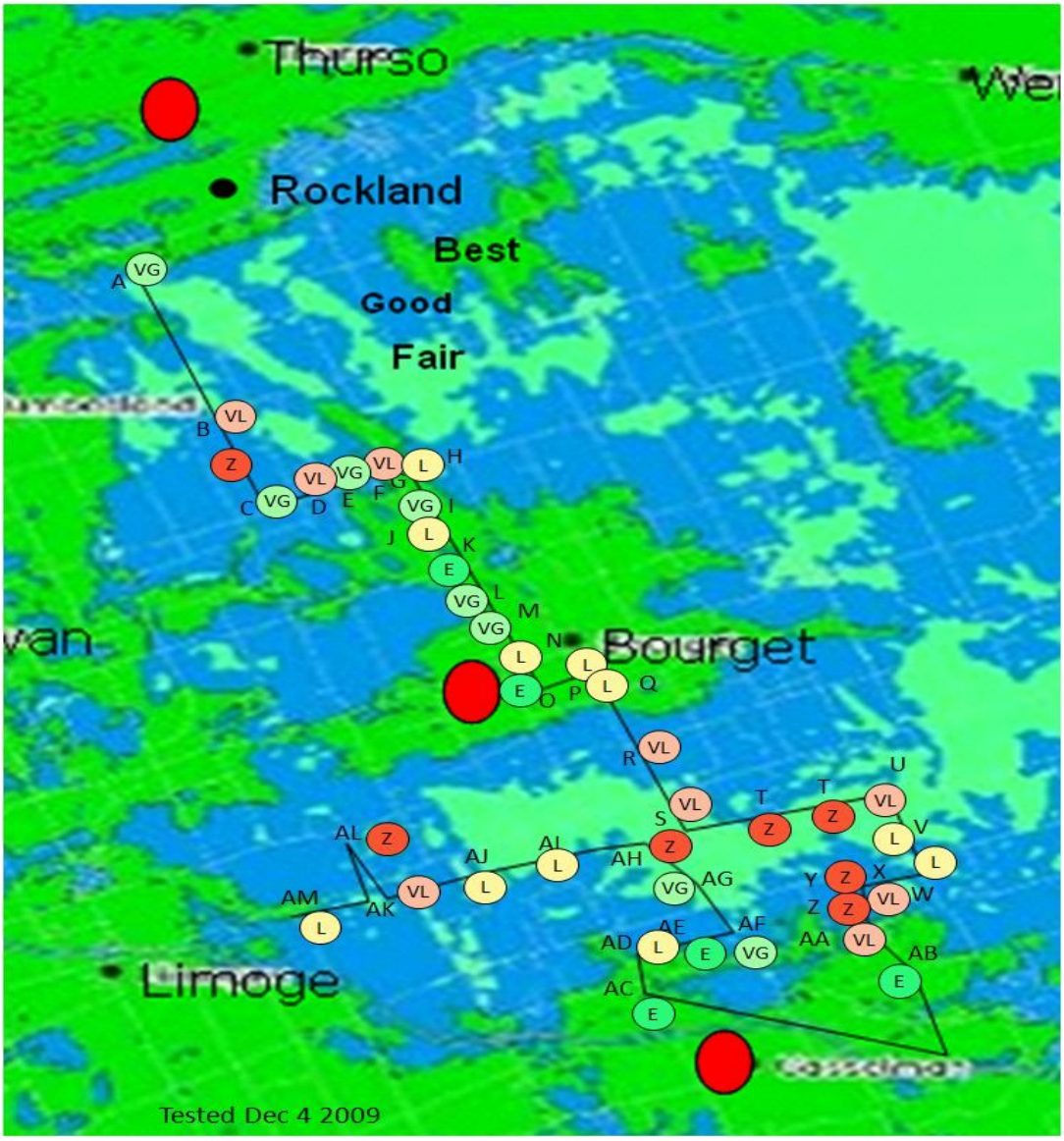
The design parameters of these networks are also to prioritize voice over data. What that means is that all voice calls are given the first chance to pass through the network and data connections are second. While this is not unreasonable in an environment (like a large city) where much more of the traffic on the network is likely voice, this is not the situation when potentially using such a network to service rural areas. As voice traffic increases (which could be seasonally or time of day related) then the data traffic will become a lower priority. The impact is that users will perceive their connection to be operating at a lower speed.

Another concern related to HSPA is the ability of users to actually connect to the network. In fixed wireless networks users sometimes require towers at their homes to capture the signal above the trees. This is because the trees interfere with the radio waves (especially pine trees) and have difficulty penetrating to reach the inside of the house. In fixed wireless scenarios it is typically the users who pay for that tower at their premises and it can be very costly (as high as $2000). HSPA is a little stick the plugs into the computer directly. That is the entire antenna. A test of this service using one of these sticks was completed by Actionable Intelligence in the United Counties of Prescott-Russell in December of 2009. The map below shows 40 data points where the stick was tested. The speed test was run 3 times in each of the 40 locations and the results were averaged to the table below.

While this map is of a different region in Eastern Ontario it has similar terrain and tree coverage to East Gwillimbury. While test results in the Town may prove different in terms of statistical results, the reality of wireless technology is that it is not predictable. The low power factor of the

actual stick technology decreases the chances that the signal will penetrate all building types (those with metal components are worse) and trees will always remain an issue.

The large red dots on the map are the towers where the radios transmitting the signal to the sticks are located. It is worth nothing that not all locations relatively close to the tower are actually receiving signal, or a strong signal. While a scale is not present, the linear distances between the farthest point in the north and the red tower near Bourget is less than 20 km. Point A in this map is receiving signal from tower at the top of the map. It is worth noting that many of the locations with poor or zero signal are often within 10 km from a tower.



In this map the following legend indicates the level of service acquired by the stick at that location.

- E – excellent
- VG – very good
- G – good
- L – Low
- VL – very low
- Z – zero

There were variations in terrain and tree coverage as noted in the last column. But it is important to note that 35% of the tests indicate speed results which are either on the boundary or below the 1.5Mbps defined by government broadband programs. These results were all taken in a vehicle which has fewer barriers to signal passage as compared to some houses/buildings. As mentioned above, the terrain is similar although not identical to East Gwillimbury. The tree coverage would be comparable, with East Gwillimbury having slightly denser tree coverage.

While it can be argued that many landline ISPs use similar wording (e.g. service up to 7 Mbps) in almost all those cases land line users are certain they will get at least 1.5 Mbps. While this technology, HSPA, is capable of delivering similar speeds, its predictability is much less accurate. Note that the colour coding on the map was supplied by Bell Aliant when these tests were being done. So that zones that are blue and pale green are supposed to be capable of receiving services they have wide variations as are demonstrated.

The following table compares this HSPA technology to the wired DSL services that the phone company offers.

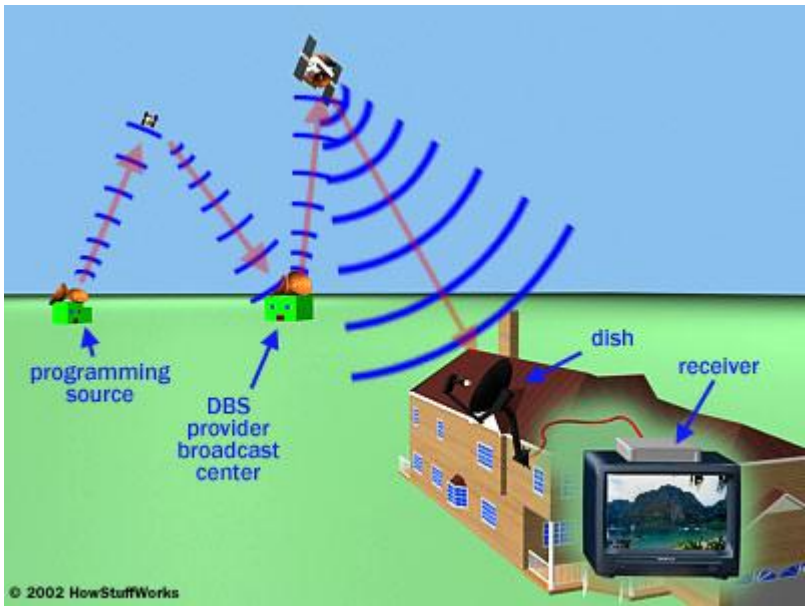
Feature	DSL	Stick
Speed	Up to 6 Mbps based on package and quality of copper (Bell can predict with electronic testing for every phoneline)	Up to 10Mbps but unpredictable
Throughput	25 Gbytes per month	2 Gigabytes up to 5 but prices rise dramatically
Coverage	Bell can predict in every serving area where services will operate with high degree of accuracy	Unpredictable
Scalability	Based on equipment up to the 6Mbps per customer – equipment scales to handle hundreds of users	Scaled to deal with short calls, short hold times not really for video interaction or staying connected endlessly
Traffic prioritization	Data & voice have equal priority	Voice over data
Price	$39.99 per month	$65 for comparable service (including throughput of 5 Gb)

Broadband via Satellite

In recent years there have been many initiatives which have utilized satellite connectivity as a means for delivering broadband to rural and remote users. Initially the intention was to use satellite connectivity for backhaul (aggregated traffic/users) from remote locations to areas where connectivity to a larger network could be reached and was more cost effective.

With the addition of the Anik E satellite in Canada, the opportunity to deliver broadband (usually starting at 1Mbps) to individual users became possible. This satellite was the first to enable transmission from the user back up to the satellite. Such services are generally called Direct to Home.

In recent years these services have seen tremendous uptake by users who have not been able to acquire alternate technology solutions, despite a much higher price. While the intent was to service rural citizens the capacity was thought to be used by only the most isolated/rural users. Stagnation of terrestrial network services has actually proven that this is not the case. Many users of this service exist in the Town and surrounding areas. This very large usage has actually contributed to the services being of lower quality they advertised/initially conceived. The issue being that the pipe that aggregates all the various users within an area is not big enough to support that many users.



The major satellite service company within Canada has recently announced a partnership and investment in the next generation of satellite technology. New satellites will be launching in 2011 and 2012 from the US. These satellites will be capable of providing services to Canadians.

These services will be able to support basic 1.5 Mbps much more efficiently and even offer speeds of 5 Mbps and 10 Mbps.

Direct to Home satellite is considered by many to be the only viable cost effective means of offering full broadband services to areas of less than 5 homes per square kilometer, especially if they are not adjacent to an area with a higher household density.

Social and Economic Benefits of Broadband

Social and Government

There are many benefits for social and government programs in utilizing communications technology. The cost of delivering services is rising and with rural areas there is added cost to provide services for low populations across large areas. The internet has provided a new communication tool for interactions of many variations.

From library/information resources, health care delivery, education and permits/applications internet technologies provide an entirely new channel of delivery to citizens. These technologies also provide the benefit that citizens can access some of them at times outside of standard business hours. This is a benefit for both the agency and the citizen.

While basic web pages can provide information on process and contact information they can also provide application mechanisms for government forms/permits (from Federal, Provincial and Municipal). This can help to reduce time to providing services as citizens can engage in self directed information access and forms processing. New security mechanisms can support payments and fraudulent submissions.

Municipalities are also engaging new information technology tools such as Geographic Information Systems (GIS). In some cases communities have combined the GIS system with building permit and severance applications, road work identification, other Municipal activities where citizen input or feedback may be required. Leveraging GIS in conjunction with applications such as building permits, local government can reduce the time that office staff have to interact supporting citizens in describing process and acquiring information records (such as property information).

Some local Municipalities have also engaged in video applications. Some use web casts to transmit Council meetings, committee meetings, public activities and other local events significant to the Municipality. These events can be stored in their video format and do not need to be viewed by citizens in real time. This is again a benefit to increasing information to citizens without them having to leave work or their homes (especially in bad weather).

However, in order to deliver such services effectively to the citizens they must have access to high capacity broadband services as well as Town/County offices. Attempting to deliver intense services such as video or GIS (to show property lines or maps etc.) is too inefficient on dial up internet service.

Health and Education services also can derive benefits out of broadband connections. The ability to transmit critical health files, x-rays, images and live video to specialists etc. in an alternate location for consultation or review is one of the most desired services in the medical industry. Combine such opportunities with the ability for medical personnel to interact with citizens in their homes directly (such as Health Nurse phone lines used today). This can aid in delivering better services and reducing unnecessary visits to emergency rooms and clinics. Such services could also enable medical professionals to visually see an injury or condition and advise citizens to seek advanced help instead of waiting until a condition worsens.

Again these services are desired in rural areas where the distances for a nurse/doctor/therapist or patient to travel can be longer. By reducing some visits there are direct savings in travel costs (gas etc) as well as the benefit of improving the quality and speed of services. A nurse could visit with more patients over a video link as opposed to travelling to each home, thus more citizens would be serviced without increasing staff. The time for the citizen to receive the advice/directions would also be faster, resulting in less frustration or incremental complications arising.

Education opportunities are another large area of benefit using broadband technologies. The opportunities and benefits can be derived from Kindergarten through to skills or lifelong learning stages. The benefit of the internet is that it can be used in a group/classroom setting or in an individual setting. While schools could benefit from interactions with students in different parts of the country/world, individuals can earn degrees; engage in new skills development or other personal interests' development. While the internet can be used at many speeds to deliver different types of learning modes, it is most effective to have video or even live 2 way video conferencing.

While these are just some of the examples of potential uses in social and government programs (more information can be found from a number of research sources or where communities have already put technology to use), the main benefits can be summed up as:

- Improving the time of services delivery
- Improving the quality of services delivered
- Reducing costs of services where travel is involved (and increasing the number of interactions per day)
- Enabling more citizen engagement/interaction
- Improving the availability of information and applications/permits for speedier fulfillment
- Reduce emissions through reduced travel related to business, shopping, health and education purposes

There are many other areas we have not even discussed, such as centralized records and databases with access for multiple agencies and Ministries. Co-ordination amongst different levels and departments of government has the potential for unquantifiable benefits related to cost savings, more accurate information and fraud reductions.

Economic

It is difficult to measure the possibilities for broadband to have positive impact on local economies. However a great number of studies have been completed in the past 5+ years. While some studies measure results in GDP or other economic terms, some try to assess the impact on businesses. What all the studies conclude is that there is a definable benefit to deploying broadband networks and enabling new services and applications to businesses and residents.

> Without broadband, communication is limited, innovation is stifled, productivity decreases, and quality of life is depressed. With broadband, the potential for economic development is an order of magnitude greater. The body of research now demonstrates that broadband has a substantial impact on individuals and on the economy. California Broadband Task Force Final Report 2008

The reality is that the internet and web based tools have become the most common form of communications leading into the 21st Century. With one decade of the century behind us it is evident that the reliance of businesses on connectivity services and computing tools is essential.

Businesses of all sizes need basic broadband connectivity. From ordering supplies to marketing their own services and products the internet is the foundation. Small businesses including artisans can show their products, interact with potential clients/buyers and offer order fulfillment and payment options. Amazon is a great example of how a company can enable interactions for consumers using technology. They started with books and now sell everything from books, music, toiletries, groceries/food products, etc. They not only allow shoppers to browse the products but they also offer ratings from industry sources and other consumers. They enable the shipment of the desired products and created a scheme of payment methods including one that did not rely on credit cards (paypal).

Connectivity is vital as new applications use video (including 2 way interactive) which, avatars/virtual rooms/offices, financial transactions, large quantities of information in some cases, are stored in central servers (i.e. not located at the premise of the business operations). Such services of selling server/computer capacity in alternate locations are often more economical for small businesses, especially those with less than 20 employees. As new applications become more integrated into fundamental communications such as peer to peer (often used in music and video file sharing today) they requirement for large capacity network connectivity everywhere will become critical.

It is important to consider that while many small businesses in rural areas appear in some instances to be serving the immediate local area (such as a hardware store) – that their commercial interactions can range almost globally. It is possible for them to source supplies from anywhere. In addition, based on an interview with a rural hardware business in recent years they indicated that they interact with their customers on line. They can exchange information related to orders for materials and products from small to large. The store can send files such as construction or blueprint directions for items such as decks, sheds, houses etc.

This enables them to receive an order, confirm it and negotiate delivery – without ever talking to the customer. While this may not seem like the main method of interaction, as younger generations age, it will be considered commonplace by them.

To remain regionally and globally competitive all Canadian businesses large and small need broadband connectivity. Businesses should not have to be precluded or disadvantaged based on their rural locations.

The following table demonstrates the impact that broadband networks can have. Several economic reports were commissioned by the OECD and they indicate the following impacts on productivity, innovation and value chain.

EFFECT	DESCRIPTION	EMPLOYMENT EXAMPLES
Productivity	• Improvement of productivity as a result of the adoption of more efficient business processes enabled by broadband	• Marketing of excess inventories • Optimization of supply chains
Innovation	• Acceleration of innovation resulting from the introduction of new broadband-enabled applications and services	• New applications and services (telemedicine, Internet search, e-commerce, online education, VOD and social networking) • New forms of commerce and financial intermediation
Value chain recomposition	• Attract employment from other regions as a result of the ability to process information and provide services remotely	• Outsourcing of services • Virtual call centers • Core economic development clusters

Broadband Stimulus in the Economy, Dr. R. Katz, May 2009

The main cause for concern is not simply that rural areas have insufficient access to full broadband (either 1.5Mbps or above) but that the lack of infrastructure places them at a global disadvantage. As indicated in the table above, there are externalities (indirect impacts related to the presence of the infrastructure) that are derived but difficult to quantify. However the economic studies have deduced that areas of high penetration of broadband have more economic activity as a result of broadband infrastructure and the enabled applications.

	High penetrated regions	Low penetrated regions
Impact on GDP growth	Very high in the short term and reducing over time	• Lower than high penetrated areas in the short term but catching up to a similar level as highly penetrated areas
Impact on employment	Very high in the short term and reducing over time	• Positive although with low significance
Implications	• An increase in broadband penetration in highly penetrated areas has a strong impact because the economy is so developed that it can immediately utilize the newly deployed technology • The fact that employment and GDP grow in parallel indicate that broadband is having a significant impact on innovation and business growth to overcome any employment reduction resulting from productivity effects	• In low penetrated areas, the increase in broadband penetration takes longer to materialize in economic growth because the economy requires a longer period of time to develop and fully utilize the technology • However, after three years the level of impact of broadband in low penetrated regions is as high as in high penetrated • The fact that employment growth is negative indicates that productivity increase is the most important network effect at work, resulting in employment reduction

Broadband Stimulus in the Economy, Dr. R. Katz, May 2009

Other countries and regions around the globe have significantly more infrastructure and connectivity services at lower costs then Canada. The quote below is from a leading US analyst regarding the US's position relative to other countries (which is similar to Canada's).

> "the already-deployed next-generation broadband networks in countries such as Japan, Singapore, South Korea, and Sweden are making possible innovative Web-based applications and services in business management, business models, research applications, telecommuting, telemedicine, public safety, education, and entertainment that are simply not possible in many areas of the United States that lack next-generation broadband networks. This is cause for concern." Need for speed

Town Telecommunication Gap Analysis

Current Providers

The Town currently has several different providers who offer various services. The following are some of the main providers:

- Bell & Bell Mobility
- Rogers
- Barrett Xplornet
- Galaxy
- Zing

As per the discussions above, Bell and Bell Mobility offer dial up, DSL and HSPA stick services described in the technology section. Rogers uses cable modem and HSPA stick infrastructure to deliver services. Barrett Xplornet offers some fixed wireless and satellite while Galaxy offers satellite and Zing fixed wireless.

Most of these providers offer comparable packages or service offerings. In some locations Rogers cable modem services maybe at higher speeds but Bell will be offering comparable services to meet the competition in areas where it is financially viable.

The stick services as described above, run off of cell towers. Therefore, coverage is comparable to cell phone coverage.

Currently the fixed wireless is limited to some areas, and others are not getting service speeds of 1.5 Mbps or higher.

Several of the providers were contacted for their input. In all cases those that talked with the Town indicated they have minimal plans to expand. Almost all expansion plans are cell phone based. Thus they will expand the coverage of some of the stick services, however as mentioned these tend to be more expensive for unpredictable services. While some providers are considering expansion, it is not in 2010 and will be dependent upon business case and revenue opportunity.

Many of the wireless providers indicated they prefer to use existing structures (such as silos) but have issues obtaining property use rights from land owners. In some cases they have not been pursued. They have indicated that the use of license exempt spectrum in most cases has caused interference issues and also coverage problems (due to trees and terrain). While these can be overcome it makes the solution more costly.

No providers indicated any plans to expand their networks using fibre to the home, or other cabled technologies.

Survey and Analysis

A gap analysis was conducted in co-operation with the Town. This analysis was based on surveys of residents and through interviews with Service Providers. AI inc. assisted with the survey construction and public announcement information. The Town used space in the local newspaper to advertise the survey and had information regarding the survey available at public locations (libraries, community centers and Town office). The survey had four response options:

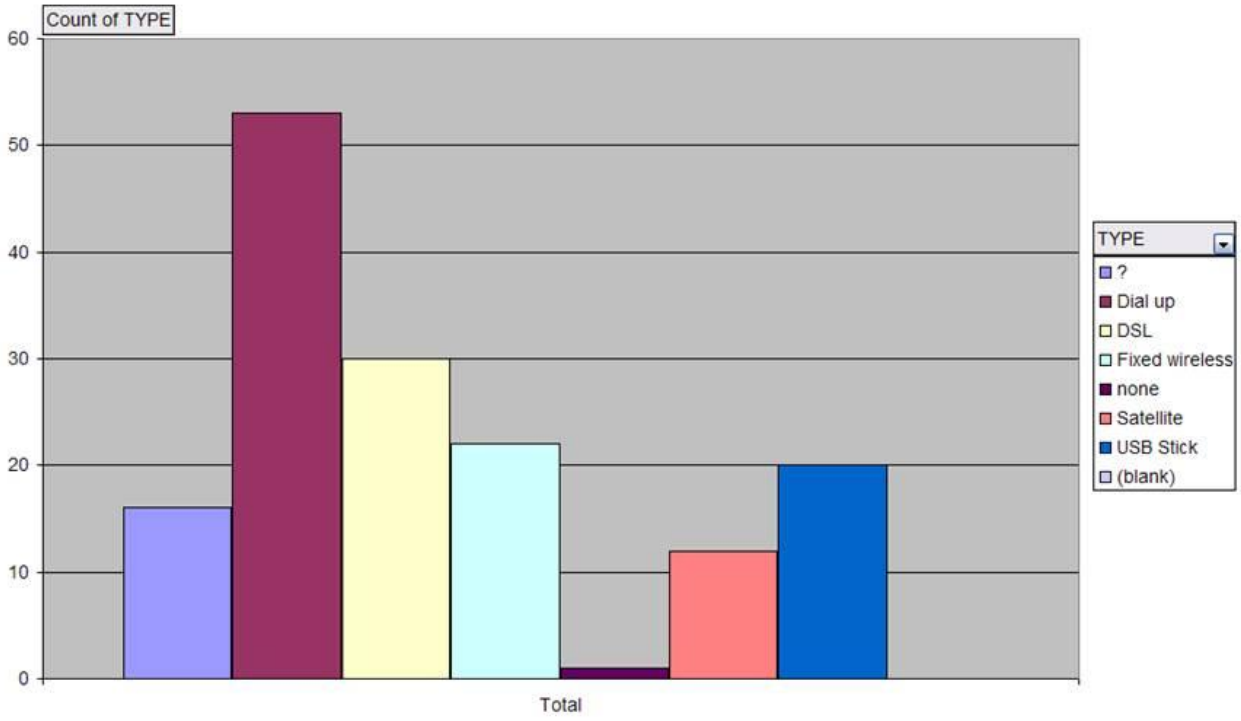
- Town website
- Email through Town
- Phone/voice mail at the Town office
- Paper survey (drop off)

The survey consisted of a standard set of data items which are helpful in identifying areas of a Town which may or may not have access to broadband services. Respondents are asked if they have access to high speed service and if yes, what type of network (phone, cable, wireless, satellite). In addition, respondents are requested to input their civic address so their home/business may be located on a map.

The survey data was collected over a period of approximately 5 weeks. The Town was initially targeting a 3-4 week timeline. The timeline was extended to ensure that all citizens had sufficient time to respond.

Once the data was collected it was collated into a single spreadsheet. This data was the source for completing the map plots herein. In total 149 respondents were captured (5 were repeats). As indicated in the maps below not all 149 were without services. However, there is a clear discrepancy in distinct areas (and hexagons) where services are non-existent or insufficient.

The chart below illustrates the diversity of answers related to the current type of service residents and businesses have today. The largest numbers of survey respondents are users who currently have dial up services. Many of these users indicated their lack of interest in other alternatives due to the fact that costs were high relative to their knowledge of service costs. However, they wanted some type of high speed service. It is common in many of the areas we have conducted surveys to find that most people do not want the cost of their rural service to be much higher than that of their “urban” counterparts. Also a number of users (20+) indicated they have high speed internet services from either Bell or Cable providers (listed all as DSL in this chart). All these respondents fall into areas which in your Town would be classified as more dense/urban. It is not a surprise that they have access to these services as they represent the common demographic described in the technology section relative to dense housing/businesses.


Count of TYPE
60
50
40
30
20
10
0
Total
TYPE
?
Dial up
DSL
Fixed wireless
none
Satellite
USB Stick
(blank)

As per the map below, many of the responses indicate that areas on the west side (Holland Landing and Sharon) of the Town have services from either Bell or Rogers, predominately wired (DSL or cable modem). This is a logical conclusion as many of those respondents who are plotted can be identified in clusters of homes. As mentioned above, the higher the density of homes per square kilometer the more likely that there will be a wired solution.

Most of the respondents in the north and east section (except one pocket in Mount Albert) are not capable of receiving services other then dial up – note the red circles. Some are currently subscribers of various fixed wireless (where an antenna is mounted at the house or on tower at house) but indicate they do not get adequate services. These people are often referred to as under-served. Many of the respondents in the North are on the edge or north of the Oak Ridges Moraine. This would lead to the conclusion that terrain is impacting the transmission of the wireless signal and thus decreasing its effectiveness.

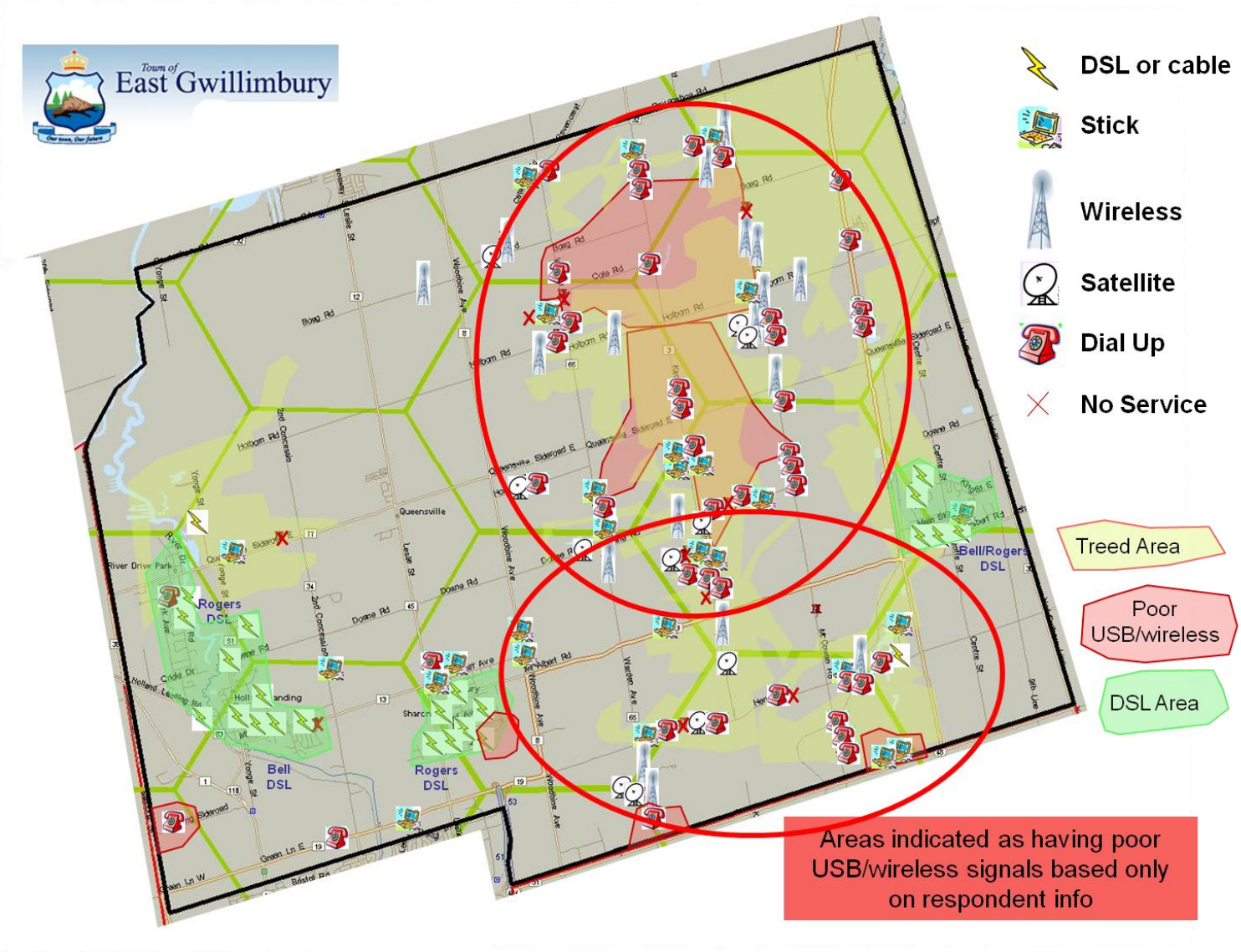
The southern portion also demonstrates significant indicators of un-served (or underserved) respondents are in the area along Kennedy Road, south of Doane Road. In addition the area bordering with Whitchurch-Stouffville, south of Hearld Road between Warden and McCowan reports mostly dial up services. Again the terrain issues and trees are likely the reason that wireless services are not reaching optimal functionality in this region.

While some respondents across the Town reported usage of the new wireless stick technology (which does not require an antenna on the outside of the house) there were issues. Some indicated that they did not receive the full benefit of the service – speeds of 10Mbps are achievable – but not for most of the residents here. Many in fact indicated that the speeds were not meeting their expectations. Another issue, which is notable is pricing. Fixed wireless services are generally priced at $50 or less per month (for anywhere from .5Mbps to 1.5MBps) with a usage capacity limit of 10-20 Gigabytes per month. In comparison, most stick services are priced at approximately $65 per month (and no guarantee of what speed you will receive) with a cap of only 5 Gigabytes. Users are then charged a considerable amount for every 1 Gigabyte in excess. Customers have reported bills in the hundreds of dollars per month. This is one of the main reasons, with its current pricing, that stick services are not considered a viable alternative for rural users when used as a substitute for fixed type services.

These areas would not likely represent a significant population for Bell to justify DSL services without potential financial aid. While this may seem illogical it is a large endeavor to provide the service and often in rural areas there are upgrades to physical plant (facilities like cable) which require replacement before the DSL service can operate. Thus it is not simply the cost of some new electronics; the true costs can be much higher.

In the following map you will see a series of hexagons plotted on the map, enclosing a number of geographic areas. These hexagons are a system of identification utilized by the Province and the Federal government related to broadband coverage. Ontario adopted this system first implemented by Industry Canada in 2007 when they commenced the Rural Connections Program. The hexagons all have identifying numbers and are different across the province. It is necessary to provide coverage information (who is served and who is not served with 1.5Mbps services) when working with the Province and applying for funding. We have overlaid those hexes as preparation for sharing information with the Province (as they have asked for the data) or for applying to the Rural Connections program.

The map below illustrates the survey responses, with a legend of the type of technology.



The appendix package includes these maps in Powerpoint and as well we have sent some files that can be viewed in Google Earth. The benefit of some of the views of Google Earth is that one can see the density of tree coverage and the type of trees. As discussed in the wireless technology section, trees create an issue when trying to receive signals from wireless systems.

General results of the survey indicate that many within the Town are knowledgeable about the types of services available and different types of technology. They are conversant in the areas of speed and performance and have clear expectations. Many respondents where services are poor feel they have to pay too much and are disadvantaged. Most recognize the term high speed but not all are familiar with the term broadband.

Residents expressed concerns that their property values would be negatively impacted by the lack of adequate high speed services. This is a major concern as they feel they are disadvantaged compared to their neighbors in other parts of the Town or in other communities – they cannot compete to sell their homes and properties with areas that have services. In addition we know that savvy citizens ensure that they can acquire services in a home before they will purchase. It is not only a perception; it is a reality that some homes will not sell if there is not broadband available.

In addition, there are many areas where the availability of high speed services (commercial grade services) has hindered the purchase of industrial or development properties. Developers ask for broadband or high speed internet when they are looking for new properties for development opportunities. There is not a business today that would purchase land and develop a new facility without high speed internet on commercial basis. The impact to any Town is that they cannot attract businesses and new economic development opportunities without high speed internet – both residential and commercial grade services.

Future Directions for the Town of East Gwillimbury

The Town has indicated a desire to support the citizens and businesses to become participants in the 21st Century society. The first step initiated was to conduct the gap analysis above to understand what gaps exist currently within the area. In addition to that the Town has commissioned this study to provide insight into the future needs.

To build the most robust, high capacity and functionally diverse network possible, fibre is required. While fibre to the home may not be an achievable goal for the entire Town it may be a possibility for some of the more dense/urban areas where population is concentrated (hamlets and villages). However, providers will typically decide this when the business opportunity presents itself, which maybe a number of years given the overall density of the Town.

If we consider the Town as having two main geographical areas – dense/urban and rural we have grouped recommendations accordingly.

Dense/Urban Areas

These areas are the targets for potential fibre deployments. Areas where there is an existing population or where there are planned developments are opportunities to have more or even new fibre placed. New businesses often are looking for fibre connections when they are reviewing areas for land/development for new offices/facilities. The Town should consider the following actions:

- Town Planners work with developers/industry to identify areas where businesses/users are looking for more advanced services/higher speeds then they have today. The Town may have to develop a system for flagging such opportunities and establishing contacts with the Service Providers.

- Town Planners ensure that all future development (commercial and residential) incorporate fibre distribution services (Fibre to the Curb is possibility). This can be incorporated as a policy of the Town. The Town may need to develop a list of service requirements and descriptions to indicate their expectations to appropriate developers.

- Formulate a policy to place conduit whenever road work or sewer/water work is completed on major transportation routes within the Town. The incremental cost of the conduit pipe is insignificant compared to the cost of the overall work and can be placed in segments – this is sometimes referred to as joint trenching policy.

Rural Areas

These areas consist of scattered population and business locations. Many businesses are in fact located on or next to residential premises. These areas are difficult for service providers to justify high expenses for service delivery. The town could implement the following:

- Work with Service Providers to identify priority areas according to the gap analysis. Some service providers may think the identified areas are adequately covered or that users are satisfied with the alternatives. Service Providers often indicate they need funding assistance – The Town may have to work with CFDC's or other potential funding sources for assistance as Service Providers are likely to want funding assistance.

- Consider applying for funding opportunities such as Ontario's Rural Connections program – which offers Municipalities up to 1/3 investment on eligible costs to extend networks and bring high speed to citizens. Rural Connections has one last intake planned for August 3, 2010 (originally July 8). Ontario has no plans to run a new program and staff will be occupied until late 2012 with current projects.

- Work with neighboring Towns and Region to develop a plan for their rural/urban areas relative to communications strategy, needs and future plans. This plan could work with Provincial government, institutions, local businesses, and developers to understand what the current needs relative to services, infrastructure and skills are for developing businesses and skills for short term and long term.

An option that has been deployed by some other Municipalities is to share the cost of erecting a tower or to pay for the tower with municipal funds. Money can come from reserves, taxes or from other sources (some have sought CFDC support). Most ISPs are interested in reaching citizens but they need to find alternatives which make it economically viable. Knowing the Municipalities do not have lots of cash to invest makes this a difficult choice.

However, it is important to bear in mind that an investment by the Town in broadband should not be considered simply as passing funds to private industry. Rather, it is an investment. High speed internet as indicated is a major source of economic activity. Without fundamental access businesses will seek to locate elsewhere. This impacts the Town's opportunities for jobs, personal prosperity and the societal/Municipal benefits that accrue from those. It is clear that no business of the 21st century will be operating without access to high speed internet and connectivity for computing. The worker of the 21st Century does not always need to travel to work, providing more opportunity for them to spend their dollars in their local Municipality supporting local services and business owners. Investing in broadband should be considered to be investing in the railroad of the 19th century or roads in the 20th century. Those investments were made to ensure that the Municipality could offer citizens the access to the rest of the world, the opportunity to receive supplies/goods and to move their products to the rest of the world. Broadband is that network for the 21st century.

Options for working with wireless providers can include discussing the possibility of sharing the cost of new towers required to cover the area. There are many instances where Municipalities

have made the investment of the tower and contract with providers for the space to offer services. Ownership of towers does carry with it responsibilities which may be shared with providers, however ensure that contracts cover those issues (such as potential liabilities, maintenance costs, insurance coverage etc.). In addition, there are tower policies and guidelines from Industry Canada which must be adhered to when erecting towers. However, most ISPs are conversant in these rules and obligations.

In conclusion, broadband represents an infrastructure which will be a foundation for the economy of the 21st Century. The services and applications that are enabled by broadband will transform services for businesses, government, health and education to mention a few. An investment in broadband infrastructure should be considered as much an investment for society as it is for the economy. Unfortunately, private industry does not measure success in social benefits, only in profits.