CITY OF **VANCOUVER**

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ADMINISTRATIVE REPORT

Report Date:	Oct 14 2005
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TO: Vancouver City Council

FROM: General Manager of Corporate Services

SUBJECT: Information Technology Infrastructure - 2005 Expansion and Replacement Program

RECOMMENDATION

THAT Council approve the 2005 Information Technology Infrastructure Expansion and Replacement Program, as described in this report, with capital costs of $6,180,000; source of funding to be unallocated Capital Budgets approved by Council AND THAT additional annual operating costs estimated at $190,000 be funded beginning in 2007, subject to the normal budget review process, through an increase in the operating budget.

CITY MANAGER'S COMMENTS

In support of this program, the City Manager notes that:

- *The City's delivery of its services is increasingly dependent on its information systems and supporting information technology infrastructure;*
- *This funding request, supporting an ongoing program established to ensure that this infrastructure is up to the task, is the first since 2003;*
- *Council has broadly approved funding through the Capital Plan for the initiatives described, with this report providing the specifics, and*
- *The scope of this program includes the managed replacement of computer technology, both hardware and software, used by all City departments and associated boards, including the Park Board, Vancouver Police Department (VPD) and Vancouver Public Library (VPL).*

COUNCIL POLICY

It has been Council policy since 1994 that information technology infrastructure be actively managed on a long term basis that reflects a life-cycle replacement strategy to ensure that the business needs of the City in providing public service can be met. Funding for this is provided as part of the annual Capital Budget and is allocated to specific projects by Council in periodic program reports.

Since 1997, Council has approved five major and two minor "Information Technology Infrastructure Expansion and Replacement" programs, the last of which was approved in November 2003.

SUMMARY

This report seeks approval for the replacement of obsolete information technology infrastructure which is considered mandatory, and for several expansions of existing infrastructure needed to maintain or improve service levels, in a number of areas throughout the City organization.

BACKGROUND

The City's information assets and communications resources are managed and made accessible through a complex IT infrastructure that consists broadly of:

- "Front-end" devices - desktop and laptop computers, handheld devices like Personal Digital Assistants (PDAs), and telephones;
- "Back-end" systems – data storage, application servers and telephone switches, and
- A communications network that connects the two and permits information retrieval by, and communication between, both staff and public.

These infrastructure components have limited lives, typically of 3-5 years, after which they become either physically or functionally obsolete.

The City manages replacement of obsolete IT infrastructure through a longer term, planned program. Annual programs, based on need, bring these long term requirements to a manageable scale. In recent years this "IT Infrastructure Expansion and Replacement Program" has focused on a major communications network upgrade (2000-2002), a major desktop "front-end" refresh (2002-2004), and a data storage systems replacement (2004-2005).

Typically, through advances in technology, obsolete equipment is replaced with equipment that has a higher capacity and increased functionality - hence the description "expansion and replacement". This process also serves to accommodate the increasing demands that the City, like other comparable organizations, places on its IT infrastructure.

A submission to the 2003-2005 Capital Plan, received by Council on June 25, 2002, described an anticipated need, during that period, to:

- Replace many of its local data storage (LAN) systems, which are both technologically and physically obsolete, with current technology. Where improved data connectivity between City facilities permits, these currently-distributed systems will be consolidated and replaced with a more enterprise-oriented shared storage system;
- Take the first steps towards integrating its data and voice systems;
- Increase the robustness of its information systems, including deployment of redundant telecommunications connections, mirrored application and data servers, and potentially out-of-province data replication;
- Upgrade other core systems, like e-mail, both public and private web servers, and security infrastructure.

A submission to the 2005 Basic Capital Budget, approved by Council on May 12 2005, identified a 2005 program consisting of:

- Replacement of 1,100 obsolete desktop and laptop computers and a similar number of monitors;
- Upgrade of obsolete e-mail systems and other corporate servers;
- Upgrade of storage systems to accommodate rapid growth in data volumes;
- Replacement of obsolete local area networking equipment;
- Replacement of leased telecommunication services with optical fibre;
- Software to improve systems' availability through improved management and monitoring;
- Upgrades to data centres and off-site server/telecommunications facilities for improved data protection and security;
- Contract resources to assist in development of a corporate telephony strategy;
- IT security enhancements to ensure adequate protection against ever-increasing threats to City information systems.

DISCUSSION

The 2005 program presented in this report consists of 7 sub-programs:

	Sub-Program	**Description**	**Capital Cost**	**Annual Cost Increase**
1	PC Replacement	Replace 850 obsolete (>4 years old) desktop and laptop computers and 1,100 monitors at VPL and VPD	$1,790,000	$ 0
2	Telecommunications Infrastructure	Replace VPL network infrastructure and continue expansion of corporate optical fibre network	$1,310,000	$(90,000)
3	E-mail & Server Replacement	Upgrade City & VPD e-mail systems; replace obsolete servers	$1,120,000	$70,000
4	Systems Management	Deploy systems management	$650,000	$70,000

	Implementation	framework to improve availability of systems and networks		
5	Tape Backup Systems	Upgrade existing tape management systems to accommodate growth in managed data; deploy backup VPD tape system	$500,000	$50,000
6	IT Security	Implement IT security measures to further protect City data and systems	$600,000	$70,000
7	Other	Phone upgrades and application development infrastructure review	$210,000	$20,000
	TOTAL		**$6,180,000**	**$190,000**

A brief description of each of these programs, identifying the business drivers and presenting an overview of the proposed technology implementation and the anticipated benefits, follows:

1. PC Replacement ($1,790,000)

The City has a policy of replacing desktop microcomputers and laptops after a useful life of 4 years. Monitors have a longer useful life of 5-6 years.

Most desktops in the City (excluding those at VPL and VPD) were replaced as part of the replacement program described in the 2002 Information Technology Infrastructure Expansion and Replacement report. As a 2-year program, this program replaced computers that became obsolete before the end of 2004.

City computers that had been acquired in 2001 and were not eligible for replacement under this program were redeployed to VPD, replacing the oldest computers in use there. Consequently the majority (~550) of replacements in this year's program are at VPD. The balance (~300) are at VPL.

The budget includes funding for replacement of 1,100 monitors either acquired before 2000 or acquired in 2000 where their replacement can alleviate ergonomic stress.

2. Telecommunications Infrastructure ($1,310,000)

This sub-program has three components:

i) VPL Network Infrastructure ($625,000):

Early in 2005, VPL issued an RFI (Request for Information) for replacement of the telecommunications infrastructure in Library Square and the 20 branch libraries. Scope included the switching and routing equipment that provides connectivity for staff and the public to access the Library's line-of-business and administrative systems, and reference services like the Internet; also the implementation of wireless services. This equipment will replace existing infrastructure that has served VPL's

needs since around 1997, but is now obsolete, constitutes a growing risk of failure, and is challenged to meet the security requirements of a mixed staff/public client base in today's increasingly threatening IT security environment.

ii) Metropolitan Area Network Expansion and Replacement ($605,000):

Over the last 2 years the City has been replacing the leased telecommunications services that connect its 100+ remote facilities. Optical fibre, with almost unlimited capacity, now serves around 50 of these facilities. Not only is this reducing the cost of leasing telecommunications services, it is also providing greatly improved access to corporate systems by staff at the remote sites, and the opportunity to consolidate servers in secure, hardened data centres. It will also make feasible the implementation of a City-wide phone system, which can potentially improve the City's ability to serve the public through shared contact centres and simultaneously reduce the costs of leasing phone services (reports to Council on these opportunities are anticipated in 2006).

This program anticipates the deployment of optical fibre to around 30 additional facilities, generating projected annual telecommunications lease savings of around $100,000.

Other components of this program include replacement of obsolete equipment and upgrading of in-building cabling to meet the more exacting demands of high-speed connectivity.

iii) Wireless Telecommunications Infrastructure ($80,000):

There is a significant latent demand in the City for mobile workers (e.g. streets maintenance crews, building inspectors, fire prevention officers) to have access to internal systems without having to return to their offices. The need to access e-mail, schedules and contact lists is almost universal, but there is also a frequent requirement to access line-of-business systems – for example, entering timesheets, creating work orders, entering inspection results, looking up building information, accessing infrastructure maps and schematics, and ordering materials.

While not all these applications demand wireless solutions, a number do. However, this necessitates a new layer of infrastructure, providing wireless access through either the commercial cellular data services or some form of City-owned wireless network. Aside from the use of mobile data terminals in police cars and a limited deployment of Blackberries, the City has not so far provided such a service for its staff, largely because of concerns over security, immaturity of the technology, and lack of a well-defined business case.

The technology has now reached a level of maturity that it seems likely a business case can be developed, and some initial pilot testing is confirming this.

A phased approach is addressing priority needs first. The first phase is well under way and will enable limited connectivity with little or no capital cost. The objective of this funding request is, as a second phase, to deploy wireless "middleware", which

will provide more reliable, faster, and more manageable wireless connectivity while maintaining a high level of security.

Estimated capital cost is for project management and acquisition of the wireless "middleware". The estimated operating cost increase of $10,000 is for software support and maintenance.

3. E-mail and Server Replacements ($1,120,000):

There are two components to this program:

i) E-mail System Upgrade ($650,000):

The City's current e-mail system, serving close to 3,000 staff, was last upgraded in 1999 at a cost of around $500,000. While the system has served the City well over the last 6 years, both the application (Exchange 5.5) and the underlying operating system (Windows NT) are obsolete. Microsoft dropped regular support for this version of the software in 2003, and it must be replaced with the current version (Exchange 2003). VPD, with an identical system serving over 1,000 staff, will be upgrading simultaneously (the two systems are linked).

In addition to the risks of depending on out-dated software for a core component of the City's operating infrastructure, the new version offers functional benefits including:

- Better storage management, enabling faster back-ups and restores in the event of failure;
- A web access interface that is comparable to the standard desktop Outlook client;
- The ability to work offline, and
- Improved support for mobile users.

Estimated capital costs include software licensing, hardware replacement, storage for mail, acquisition of an add-on storage-management capability, project management and training. The costs of the City and VPD implementations are respectively $410,000 and $240,000. Estimated operating cost increases of $50,000 are for software licensing and hardware maintenance.

ii) Other Server Replacements ($470,000):

The City manages around 200 servers, about 100 of which fall into the category of infrastructure servers. With a lifecycle that is not standardised but is between 3 and 5 years, depending on function, 20 - 30 need replacing annually, with associated costs including data centre upgrades that are almost exclusively hardware-related.

The largest of these servers is the City's mainframe, once the repository of almost all the City's core line-of-business applications. Consistent with the strategy established in 1997, many of these applications have been migrated to SAP and other platforms. However, the cost of operating the mainframe has been only marginally reduced, while the risks associated with continuing to run the remaining legacy applications on

an increasingly unsupportable platform are increasing. The strategy needs to be pursued to completion, migrating the remaining applications to other platforms and discontinuing the mainframe.

Estimated capital costs include:

- Project management to develop a plan to complete realization of the strategy established in 1997, and
- Acquisition of a replacement cable plant management system to track the City's underground cable plant, currently a mainframe-based system.

Estimated operating cost increases of $20,000 are for maintenance and support of the cable plant management software.

4. Systems Management Implementation ($650,000):

Business processes in the City are increasingly dependent on its information and telecommunications systems, the extent and complexity of which increase steadily. Beneath the simple "front-end"/"back-end"/network model described earlier in this report lies a complex web of interdependent systems, services and infrastructure that deliver information services to the public, businesses and staff. As the rest of this report illustrates, this operates in an environment of constant change as components are replaced and upgraded and new systems are implemented. As a failure in any one of these components can result in denial of one or multiple services, it is important to not only monitor for failures but also to monitor health in order to minimise failures.

Over the years the City has deployed some tools for monitoring servers and networks, but they are generally so-called "point solutions" that address specific technical areas, their implementation has focused on alerting the staff responsible for those areas, and they provide few quantitative measures that can be used to manage for better service.

This program will implement the first phase of an enterprise systems management and monitoring framework that will permit:

- Monitoring the entire environment and alerting IT staff when there is either a failure or an early warning of an impending failure;
- Providing a single health-check window that can be monitored more consistently and more easily (particularly out of regular hours);
- Providing quantitative measures of system availability and response so that service levels can be optimised, and
- Providing system outage history so that recurring failures can be managed more proactively.

Implementing such a framework is considered to be a best practice in today's complex and service-oriented IT environment.

Current projections of total capital costs, including software and hardware acquisition, software support, implementation services, project management and training, are around $1,000,000. This includes a separate implementation for VPD, necessitated by security constraints which largely preclude them sharing the same infrastructure, at a cost of around

$400,000, but does not currently include VPL; while they will be participating in the project, they have not yet determined the extent of their implementation.

The first phase, at an estimated cost of $650,000, will focus on the core systems and is projected to take through the end of 2006. After review of the first phase results, better estimates will be available of additional funding needed to complete the implementation. We expect to report back to Council on this in the next report late in 2006.

Estimated operating cost increases of $70,000 are for hardware and software maintenance.

5. Tape Backup Systems ($500,000):

Through an earlier IT infrastructure replacement and upgrade program, the City centralized (except for VPD and VPL, for operational reasons) its tape backup systems in 1998. In 2002 it added a secondary tape backup system as part of the "Improvement to Information Technology Business Continuity Capabilities" initiative to provide fall-back should the primary system fail or the primary data centre be lost.

Over the last few years, the City has experienced a higher than anticipated rate of growth in the volume of data managed, which was recently averaging 28 TeraBytes and peaking as high as 34 TeraBytes. This puts considerable stress on the tape storage infrastructure – not just the actual storage in the tape libraries, but also the network that can support the transfer of large volumes of data, generally in a "window" of several hours that shrinks steadily as the demands for evening, early morning and weekend availability increase.

As a result, it has become necessary to upgrade one of the City's two tape libraries and the supporting infrastructure – servers and disk pools that aggregate the data for transfer to tape - for both the tape libraries.

In a parallel situation at VPD, which for security reasons is unable to share the City's tape infrastructure, a second tape library is required for backup, the existing tape library needs upgrading to support higher-capacity tapes, and a storage area network needs additional capacity.

Data management and storage are costly, but the City's stored information is an irreplaceable asset. Investment at this level is necessary to provide this asset with adequate protection. Through analysis of data storage alternatives, staff are confident that growth is being accommodated as cost-effectively as possible.

Estimated capital costs include the replacement and additional hardware described above. Estimated operating cost increases of $50,000 are for hardware maintenance.

6. IT Security ($600,000):

The City is very conscious of the threats to its data and systems from malicious sources, potentially both inside and outside the organization, and of the need to provide improved protection through both technology and process. Most of the items that follow directly

address recommendations from the IT Security and Internal Audit divisions within Corporate Services:

i) Web Filtering ($200,000):

Web filtering software is designed to restrict access to inappropriate web sites. By classifying outside web sites by subject or content, it can be configured to restrict access by internal staff to, for example, hate or pornography sites.

The City's Corporate Management Team has asked that web filtering be implemented, and an RFP is being prepared.

Capital costs are for hardware and software. Additional operating costs estimated at $30,000 include software maintenance and the web site classification service.

ii) Intrusion Detection and Prevention System ($150,000):

An Intrusion Detection System (IDS), as the name implies, can monitor internal networks and recognize unnatural activity that may indicate some kind of compromise of the network – an intruder, an attack, or the activation of some kind of virus or malware. It can then alert IT staff to take appropriate action. An Intrusion Prevention System (IPS) takes this one step further and automates the response, relieving IT staff of the responsibility of continuously monitoring for IDS warnings, and potentially shutting down segments of the network or responding directly to the perceived threat.

Both IDS's and IPS's provide additional security, following a layered security approach that is generally considered best practice.

The cost is for network hardware designed specifically to perform this function. Operating costs for hardware maintenance are estimated at $20,000.

iii) Firewalls and Network Segmentation ($100,000):

An outstanding audit recommendation is that the City review the security of its entire network architecture. A probable outcome of this review is some "compartmentalization" of the network; staff will be provided with access to the systems they need, but no more. The goal of this is to contain either an outbreak of a virus or an intruder to a restricted segment of the network, in very similar fashion to fire breaks in a forest.

The scope of this review will include the internal network, external firewall and infrastructure for supporting remote (Virtual Private Network VPN) access, where it is anticipated some upgrades may be required.

Funding is for the resources to perform the review and for hardware and software to address the priority recommendations. Operating costs for hardware maintenance are estimated at $5,000.

iv) Other IT Security Measures ($150,000):

These include:

- Implementation of anti-spyware software;
- Deployment of personal firewalls on mobile computers;
- Investigation and limited deployment of encryption technology to further protect highly sensitive information;
- Deployment of centralized security event logging at both the City and VPD, and
- An external vulnerability assessment of the City's web applications.

Estimated operating cost increases of $15,000 are associated with software licensing and hardware maintenance.

7. Other ($210,000):

Two other items that involve infrastructure upgrade and replacement:

i) VPL Phone Upgrades ($60,000):

Many of the phones in the branch libraries are obsolete, no longer supportable by Telus, and lacking in now-universally expected features which are critical to meeting the service delivery expectations of the VPL's customers. Their replacement, and the upgrade of the underlying Centrex services, is a high priority for VPL's management team.

Estimated additional operating costs of $20,000 result from Centrex phone service upgrades.

ii) Application Development Infrastructure ($150,000):

As application development technologies evolve, it is important that the City's application development languages, frameworks, standards and practices evolve with them. Failure to do so can result in unsupportable legacy code, flawed security, and difficulty in finding employees with skill sets that were common 10 years ago but are now rare. Most application development is now web-based. The City must:

- Review its application development platform and establish new standards;
- Train staff in the new technologies, and
- Start migrating applications from the old platform to the new.

The City should also develop a strategy around web content management and web portals, as these are key technologies for supporting the web "face" that the City presents to the public as it services 25,000 visitors a day.

The funding in this area is to resource the investigative component of this work, the acquisition of new or updated development tools, and the subsequent migration of legacy code.

FINANCIAL IMPLICATIONS

Funding for the initiatives described in this report totals $6.18 million. This funding is available in existing capital budgets approved by Council subject to reporting on program specifics.

Completion of these projects is expected to increase operating cost by $290,000 annually as a result of increased hardware maintenance, software licensing and additional service costs. Offsetting savings from telecommunications leases are estimated at $100,000. Commencing in 2007, these net additional costs of $190,000 will be added to the Operating Budget subject to the normal operating budget review process.

CONCLUSION

The City is increasingly dependent on its electronically-stored information and associated delivery systems. These systems demand a technology infrastructure that extends to all parts of the organization, is fast, dependable and robust. The City must also protect itself and the public it represents against loss of data and interruptions in service, both of which risks can be mitigated. Finally, it has a duty to make reasonable efforts to ensure that in the event of a disaster, it is equipped with the information and communication resources that would be needed to quickly adopt the leadership and supportiveness that its public would expect of it.

The recommendations of this report attempt to address these goals.

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