Winnipeg

Business Resumption Planning Audit

January 2010

Leaders in building public trust in civic government

Audit Department

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EXECUTIVE SUMMARY

The continuing increase in the use and reliance on technology to provide critical services has resulted in increased efficiencies and improved operations. Technology is used to such a degree that in the event a system was temporarily unavailable, it could significantly impede the ability of the City to continue to deliver a service. This potential risk from reliance on technology must be mitigated through proper planning to recover systems affected by a service disruption.

IT has become key to supporting many City services and to communicating, both internally and externally with a myriad of suppliers, partners, customers, and citizens. Depending upon the system(s) affected, the potential risks could include: a negative impact to the services which protect the health and safety of citizens, delays in communication with the public and employees and increased financial costs to restore the systems. To manage these risks, organizations develop and implement business resumption planning programs and detailed business resumption plans to ensure processes and procedures are in place to recover the critical IT systems in a minimal time period.

Business resumption plans are documents which detail the processes and procedures that will be followed to recover the critical systems. Good management practices in the development of these plans include:

- Senior management must fully support the development and implementation of the program by identifying a program leader and developing a business resumption planning policy.
- The essential services and the critical systems associated with providing those services must be identified.
- Detailed and documented plans should be developed to restore the critical systems in the case of a business disruption.
- The plans must be maintained and tested on a periodic basis to ensure all staff have a full understanding of their roles and responsibilities.

Senior Management has identified the importance of planning for a business disruption by supporting the pandemic planning initiatives as well as through their support and development of the City of Winnipeg Emergency Plan. While aspects of this initiative can be leveraged towards the development of a business resumption planning program, further actions must be taken to ensure a consistent approach in the development of these critical plans. The Director of Corporate Support Services has been tasked with the responsibility to develop IT policy in the IT Governance Standard. This responsibility should be expanded to explicitly include the role of program leader for business resumption planning. The IT Governance Standard should also define the roles and responsibilities of other parties.

Through the pandemic planning initiatives, the City has begun identifying the essential services and the critical systems associated with those services. All systems are being identified on a department by department basis, but are not being reviewed or prioritized on a City wide basis. To ensure a successful restoration of all critical systems, management must first identify the critical services and then prioritize the order the supporting systems would be restored. The analysis should be

based on a consistently applied risk assessment or business impact analysis methodology on all key systems. Business resumption plans must then be developed to restore the systems with minimal impact to service delivery.

Corporate Support Services has responsibility for the main corporate systems such as PeopleSoft, email and the City's website. Various redundancies have been established throughout the systems to ensure the hardware, software and networking have back-ups and either will continue to function or be restored in the case of a business disruption. Contact lists have been developed with the alternate contact information of all key employees. Although the capabilities to restore the systems are in place, there is a need to expand BRP efforts to the enterprise-wide level to ensure documented procedures and roles and responsibilities are in place to restore all key systems in the case of a significant business disruption.

Corporate Support Services tests the key risk areas such as the server back-ups, network capabilities and infrastructure components on a regular basis and with the implementation of any new hardware or software. The Department is also undertaking an initiative to maintain 30% of server capacity at an alternate site. This will further enhance the City's ability to recover from a service disruption and continue to provide critical services.

In addition to the review of the efforts undertaken in Corporate Support Services, we reviewed the IT business resumption plans in place for an additional four services provided by the City:

- The Handi-Transit scheduling system
- The Wastewater Treatment system
- The Water Treatment Process
- 311

We found that management of the services has expended considerable effort towards planning for a significant business disruption. Each have implemented plans to mitigate the impact of a business disruption and restore the critical systems that support the service within a minimal time period. The plans developed address the critical areas of preparing for a business disruption: the hardware, software, networking and physical infrastructure. As well the roles and responsibilities within each area had been established. Testing of all four critical areas of business resumption planning are conducted by each department.

The current corporate governance structure needs to be updated to clearly define the roles and responsibilities of a program leader and other departmental management and staff. The key systems need to be identified and prioritized according to their criticality and impact on the organization and the City. Business resumption plans will then need to be developed and periodically tested to ensure the systems are restored in a timely manner following a business disruption. The risk of not developing these plans, in an environment where technology is a fundamental pillar in the delivery of many City services, will not be realized until a major business disruption occurs. Waiting to act until then, will be too late.

MANDATE OF THE CITY AUDITOR

The City Auditor is a statutory officer appointed by City Council under the *City of Winnipeg Charter Act*. The City Auditor reports to Council through the Audit Committee (Executive Policy Committee) and is independent of the City's Public Service. The City Auditor conducts examinations of the operations of the City and its affiliated bodies to assist Council in its governance role of ensuring the Public Service's accountability for the quality of stewardship over public funds and for the achievement of value for money in City operations. Once an audit report has been communicated to Council, it becomes a public document.

AUDIT BACKGROUND

The audit was identified in the City Auditor's Audit Plan for 2009 to 2010. Information technology services for the City of Winnipeg are provided and organized on a decentralized basis (within departments and special operating agencies) and also on a centralized basis (through Business Technology Services). Most departments and special operating agencies have IT staff who support systems that are unique to the services delivered. Business Technology Services provides service for the entire organization through three major IT and communication areas:

- Business Solutions (e.g., PeopleSoft system, tax system)
- Managed Hosting (e.g., web sites, databases)
- Connectivity Services (e.g., email, remote access, roaming wireless)

AUDIT OBJECTIVES

The objectives of the audit were:

- to determine the adequacy of the current corporate governance structure and coordination of business resumption planning (BRP) and disaster recovery planning for the City's computer facilities, critical systems and applications;
- to determine if business resumption plans exist and were developed based on a risk analysis to determine the criticality of each system;
- to assess the adequacy of the business resumption plans and processes in place to ensure that the critical systems are restored in the event of a significant business disruption;

AUDIT APPROACH

We have conducted the audit in accordance with generally accepted auditing standards. Appendix 1 provides a flowchart of the audit process.

- We conducted interviews with staff in the Corporate Support Services Department to gain an understanding of the corporate governance structure and guidance that is provided to departments regarding the development of business resumption plans.

- We interviewed management responsible for the following systems: PeopleSoft, Handi-Transit, 311, the wastewater treatment process, and the water treatment process to determine what plans and procedures are in place to restore their critical systems in the case of a disruption to their systems.
- We reviewed business resumption planning guidelines, standards, procedures, and other relevant background documentation on business resumption planning, disaster recovery, and business continuity planning.
- We reviewed the IT Standards to determine what roles and responsibilities have been established regarding business resumption planning and disaster recovery.
- We conducted interviews with the Emergency Preparedness Coordinator to gain an understanding of the City Emergency Plans that have been developed and to gain a better understanding of the pandemic planning initiatives. We reviewed these plans to identify any work that could be leveraged for the development of business resumption plans.

AUDIT CONCLUSIONS

The audit work performed led us to the following conclusions:

- The current corporate governance structure related to the coordination of business resumption planning and disaster recovery planning for the City's computer facilities, critical systems and applications is inadequate. The roles and responsibilities related to business resumption planning need to be clearly defined and a program leader identified to coordinate plan development.
- The City has not identified what are the critical systems that support the delivery of the essential services or developed criteria to assess the risk and impact on the City and citizens in the event a system is unavailable due to a business disruption. While we did observe that considerable effort has been expended towards business resumption planning, there was no clear indication of the priority of systems to be restored in the event of a significant business disruption.
- The systems we reviewed were supported by business resumption plans that were formalized to varying degrees. The lack of consistency and documentation creates risks in the event certain key individuals are unavailable when a plan needs to be implemented. This could result in unnecessary delays in restoring key systems.

ACKNOWLEDGEMENT

The Audit Department wants to extend its appreciation to the management and staff of Corporate Support Services, Transit Department and the Water and Waste Department for their cooperation.

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January 2010
Date

KEY RISKS AND IMPACTS

Over the years, the City's reliance on IT has continued to increase to the extent where IT is considered a vital asset to the success of the organization. The use of technology is key to connecting internal departments with each other and with suppliers, partners, customers and citizens. In today's environment, the key critical systems, which support the essential services provided by the City, are expected to be available 24 hours a day, 7 days a week. Any loss of the system's capabilities could be devastating to the operations and have a significant impact on the City and the citizens.

The *potential* key risks associated with a lack of Business Resumption Planning include:

- Increased financial costs to restore the IT systems that support the delivery of City services.
- Delays in communication with the public and employees.
- An inability, in the short-term, to effectively provide essential public services that impact the health and safety of the citizens of Winnipeg due to the inability to resume the key critical functions within a minimal time period.
- A negative impact to the reputation of the City due to the increased costs and delays in restoring critical City services.

With the increasing reliance on technology and the City's unique position of offering essential services to its citizens, the ability to recover the critical IT systems and restore the essential services provided by the City following a significant business disruption are imperative.

CRITERIA

Through our review of this process, we referred to guidelines which have been established by various organizations in the industry:

- Business Continuity Institute – Good Practice Guidelines 2008
- Manitoba Emergency Measures Organization – Business Resumption Planning, A Development Guide 1996
- COBIT – Governance, Control and Audit for Information and Related Technology – High Level Control Objectives

Using these guidelines, we developed the following criteria that we used to evaluate the Business Resumption Planning strategies and plans currently in place within the City of Winnipeg:

1. *Business Resumption Planning Program, Policy & Project Coordination* - A program and policy regarding business resumption planning should be developed which details the high-level roles and responsibilities regarding BRP. A leader should be identified and assigned the task of heading up the planning program as well participation from various managerial, operational, administrative and technical disciplines is required to be coordinated through the BRP lifecycle. Management needs to support these efforts and provide resources for the development and maintenance of plans.

2. *Understanding the Organization and Identifying the Critical Systems and Essential Services* - The Organization needs to determine what the critical applications and key IT systems are and prioritize the order in which systems would need to come back on line in the case of a business disruption. A risk based methodology such as a risk assessment or a business impact assessment should be used to identify the key systems and critical services. Recovery time objectives should be established based on the business owners assessments.

3. *Develop and Implement Detailed Business Resumption Plans* - IT should develop appropriate detailed action plans which ensure the continuity of the key IT systems and effective incident management. The information technology business resumption plans should be in line with the overall business continuity requirements of each essential/critical service to ensure consistency. The plans should address: hardware, software, networking and infrastructure (office space). Procedures should be documented within the plans for communicating with the necessary stakeholders: employees, key customers, critical suppliers and management.

4. *Maintaining, Testing and Reviewing Business Resumption Plans – Training and Embedding Business Resumption Planning in the Organization's Culture* – business resumption planning strategies and plans are validated by testing and reviewing and should be kept up to date. To ensure the plans are up to date, procedures should be established for maintaining and updating the plans. A plan cannot be considered reliable until it is tested. Testing the plans can take various forms such as technical testing, walk through, and full live exercises.

OBSERVATIONS AND RECOMMENDATIONS

Our observations and recommendations are divided into four sections separated by the four above-mentioned criteria. We reviewed the PeopleSoft system to evaluate the governance structure and coordination of business resumption planning at the corporate level. In addition to our focus on PeopleSoft, we reviewed the overall processes and procedures in place for the IT related functions within Corporate Support Services to respond to a business disruption.

Specific to the last two criteria, we also reviewed the IT business resumption plans and planning efforts in place for an additional four services provided by other departments in the City. The services were selected based on their criticality and the potential impact on the City and the citizens if these services were disrupted. The services selected were:

- The Handi-Transit scheduling system
- The Wastewater Treatment System
- The Water Treatment Process
- 311

A review and summary of the business resumption planning strategies and plans for these four services has been summarized at the end of the Observations and Recommendations section.

Business Resumption Planning Program

The key to the successful development of a business resumption planning (BRP) program is to first demonstrate senior management's commitment to the program by clearly defining the roles and responsibilities related to the high-level management of the program and assigning overall accountability to a member of senior management. The support of senior management ensures that the program is given the correct level of importance within the organization and provides a greater chance of effective implementation. The following tasks should be assigned to the program leader:

- heading up the planning team,
- facilitating overall planning,
- providing ongoing liaison with senior management,
- ensuring the plans are reviewed and maintained, and
- coordinating activities following the occurrence of a significant business disruption

Upon the commitment of senior management and the designation of a program leader, an IT business resumption planning policy should be developed. The policy outlines the high-level guidelines related to business resumption planning and defines the key roles and responsibilities. The establishment of a business resumption planning policy further demonstrates management's commitment to the business resumption planning program and clearly defines management's expectations.

Business Resumption Planning roles and responsibilities have not been defined and assigned

Through interviews conducted with management and staff from Corporate Support Services (CSS) and a review of the IT Governance Standard, we determined that a program and a policy have not been developed, as well the BRP roles and responsibilities have not been formally assigned. Under the current governance structure, the Director of Corporate Support Services is responsible for corporate systems and departmental directors are responsible for the systems within their departments.

The absence of formally articulating BRP roles and responsibilities in the IT Governance Standard could result in inconsistent commitment toward business resumption planning. With the organization's increased reliance on technology to support service delivery this gap must be addressed. Without a program leader, full support from senior management, and clearly defined roles and responsibilities, successfully implementing a business resumption planning program becomes an almost impossible task.

The Director of Corporate Support Services has been assigned several responsibilities related to IT including:

- developing and recommending City IT policy,
- developing and approving administrative directives related to IT, as well as
- recommending improvements with respect to the governance structure, organization structure and/or policies and/or implement any necessary changes in overall direction, plans, and/or directives.

We believe the IT Governance Standard should be amended to identify the Director of Corporate Support Services as the program leader to initiate the development of an enterprise-wide business resumption planning program. The next step would be the development of a business resumption planning administrative standard. The standard further demonstrates

management's commitment, outlines the high-level guidelines related to business resumption planning and defines the key roles and responsibilities.

Through pandemic planning and the development of the City of Winnipeg Emergency Plan, the City has educated management and staff of the risks surrounding a pandemic as well as a disaster and how they can prepare and respond. The Emergency Preparedness and Coordinating Committee and the Emergency Public Information Team have been established to discuss and prepare for emergencies. These teams are comprised of staff from various departments and functions, including IT, who meet regularly to discuss arising issues and current plan status. The results of the planning efforts are then communicated to senior management. The work that has been done through these initiatives related to IT should be leveraged in the development of a business resumption planning program. These initiatives have been successful, due in part to the endorsement of the importance of the programs by the CAO. They have expressed their support of the programs by formally communicating the importance through a letter to all department heads as well as through the development of the Emergency Plan.

Recommendation 1*:*
The Director of Corporate Support Services amends the Governance Structure – Information Technology Administrative Standard No. IT-001, and assign responsibility for the development of a Business Resumption Planning Program and Business Resumption Plans.

Management Response*:*
1. Agree. Administrative Standard No. IT-001 will be revised to identify appropriate roles and responsibilities necessary for the development of a Business Resumption Planning Program and Business Resumption Plans. Timing: Q3 2010

Recommendation 2:
The Director of Corporate Support Services support the development of a Business Resumption Planning Program by clearly defining the roles and responsibilities of departmental senior management and their staff and communicating the program's goals and objectives.

Management Response:
2. Agree. A formal program will be developed in collaboration with IS leaders across the organization. A new Administrative Standard will be developed to outline the appropriate roles and responsibilities and a communications strategy will be developed to ensure all relevant stakeholders are aware. Timing: Q4 2010

Understanding the Organization and Identifying the Critical Systems and the Essential Services

To ensure that the impact to an organization is minimized in the case of a significant business disruption, a risk-based methodology, such as a business impact analysis or a risk assessment, should be used to identify the essential services and associated key systems. An essential service is an activity whose continued operation is considered essential by management - non-performance of this function could be significantly detrimental to citizens and have a large financial and non-financial impact on the organization.

Based on the systems impact during a prolonged disruption of their services, the critical systems need to be prioritized and the order in which each system will be recovered needs to

be clearly documented. With a list of the essential services and critical systems, senior management and IT are able to determine and plan for what systems to restore first, how quickly and to what level of service. The business impact analysis or risk assessment should be conducted by the business owners in consultation with the business resumption planning program leader or BRP team.

When completing the risk assessment or business impact analysis the business owners should consider a number of items including the following[1]:

- Would the safety or security of personnel, citizens and property be jeopardized if your operations were interrupted?
- How long can your essential business functions be inoperative?
- Are there regulatory requirements or penalties that must be considered if you cannot fulfill your obligations due to an unplanned business disruption?
- What is the financial impact of non-performance of a business function? How significant is this impact? Is it measurable?
- What legal or contractual liabilities would arise if the activities were curtailed or shut down?
- Which of your essential operations are dependent on computer support?
- What are the pre-set arrangements that need to be on "stand-by" in order to get the essential services operating again with as little delay as possible?

The City of Winnipeg has begun identifying the essential services and critical systems
With the City of Winnipeg's Pandemic Planning initiative lead by the Disaster Preparedness & Response Division, City departments have begun the process of determining and prioritizing their essential services and the supporting critical systems. Furthermore, City departments have begun considering the minimum number of staff required to carry out the critical services and identifying those employees capable of supporting these services during a pandemic. The information that has been collected for pandemic planning can be leveraged in the development of business resumption plans.

In 2006, business impact analyses were completed by various departments as part of an initiative undertaken by CSS. At the time, CSS was looking at ensuring their IT strategies were in line with the requirements of the business units. This initiative was mainly for information purposes and further review of the analyses was not conducted. Subsequent to this initiative, the business impact analyses have not been further reviewed or updated and for the systems that have been added subsequent to this initiative, business impact analyses have not been conducted.

In addition to this, CSS has initiated their own assessment of the critical systems to determine which systems would need to be restored first in the case of a business disruption. Corporate Support Services is also completing a server consolidation project with the intent of maintaining 70% of the corporate systems at a main site and 30% at a secondary location. This would allow 30% of the City systems to continue in the case a business disruption where the main site becomes inaccessible. This project is anticipated to be completed by 2011.

A key component of business resumption planning is conducting and maintaining risk assessments or business impact analyses on every major system. Without this assessment, IT

[1] SANS Institute InfoSec Reading Room, Business Resumption Planning: A Progressive Approach. SANS Institute 2002.

cannot ensure that all the critical systems that support essential services will be available as required in the case of a significant business disruption.

To date, the governance structure in place did not facilitate an enterprise wide approach to undertaking risk assessments. As a result, the City does not have a listing of what are the essential services or defined timeframes for systems to be restored in the event of a significant business disruption. This information is required as an input into the risk assessment process. Council and management need to determine and agree on what their definition of an essential service is and what criteria should be used in the risk assessment to evaluate the criticality of each service and system. This will allow all City systems to be evaluated using a consistent approach and prioritized accordingly. For the development of the emergency plans and pandemic plans, the following criteria were used to determine and prioritize the importance of each service:

- impact on the health and safety of citizens and employees,
- impact on public perception,
- financial impact
- legislative requirements

Upon completion of this task, the next step will be the plan development.

Recommendation 3:
The Director of Corporate Support Services, in consultation with the CAO and senior management, develop a list of the critical systems which support the essential services provided by the City. The systems should be prioritized according to their criticality and impact on the organization and the citizens. The list should be reviewed by the Director of Corporate Support Services to ensure that it is consistent with the overall needs of the organization and the providers of the essential services.

Management Response:
3. Agree. A list of critical systems will be developed using the risk assessment, business impact analysis and priority criteria recommended**.** Initial work has already started as part of our IT consolidation efforts and a previous Audit (re: vulnerability assessments) and will continue in collaboration with the IS Leaders group, business owners within departments and the Emergency Preparedness Coordinator. Timing: Q4 2011.

Develop and Implement Detailed Business Resumption Plans

Business resumption plans are developed to enable an organization to quickly react to a significant business disruption and minimize the consequences and impact resulting from a disruption in service. Furthermore, the information technology business resumption plans should be in line with the overall business requirements of each essential service to ensure consistency. A business resumption plan is a temporary stage during which specific activities are undertaken to allow the organization to remain viable to its stakeholders.

Through the plan development process a number of decisions will be made and documented, including:

- at what point during a business disruption the plan should be activated,
- the detailed roles and responsibilities of key employees in the business unit during a business disruption,
- communication strategies,

- contact lists,
- documented and detailed procedures for restoring the critical systems that support the essential services.

The detailed plans will ensure that the employees have a complete understanding of who is responsible for what, what they need to do, how, where, why, and when. To ensure a successful resumption of critical systems, the plans should address the following IT components:

- hardware,
- software,
- networking, and
- physical infrastructure such as office space, electrical systems, mechanical systems, and fire protection

Through various IT projects over the years, CSS has begun the process of establishing various capabilities that will facilitate the restoration of some critical City systems such as:

- establishing system redundancies,
- back-ups of all corporate data are done on a daily basis,
- network capabilities have been duplicated, as well
- secondary power supplies have been established

Lack of documented plans in place to ensure restoration of the corporate systems

Through interviews conducted with management and staff from CSS we determined that the capabilities to restore some corporate systems, such as PeopleSoft, Outlook and the City's website, in the case of a significant business disruption are in place. Roles and responsibilities are generally understood and contact lists of key staff have been developed and are regularly updated and distributed. Back-ups of data produced are performed on a daily basis and are automatically stored at an alternate location. Redundancies in the network capabilities have been established between the main IT site and an alternate location. In addition, dual power connections to system servers are in place minimizing the risk of a loss of power to a system. The City of Winnipeg owns numerous buildings throughout the City and in the case of a business disruption at any site, relocating to an alternate building and using their hardware and office space is a possibility for resuming operations.

To effectively enact a BRP, the plan must also include communication procedures for communicating with other stakeholders such as general management and staff, critical suppliers and citizens during a business disruption. A City of Winnipeg emergency webpage – Emerg-Web, has been developed and is accessible through the City of Winnipeg public webpage. The intent of this webpage is to provide critical information during a business disruption such as a flood, to all citizens and employees. This initiative can be utilized in the communication strategy of the business resumption plans for communicating with all stakeholder groups during a business disruption.

CSS has successfully mitigated a number of small business disruptions; however, in the event the main IT site would be inaccessible, the roles, responsibilities and communication plans have not been formally defined, assigned or documented. In our review of the other services provided by the Transit Department (Handi-Transit), Corporate Support Services Department (311) and the Water & Waste Department (Wastewater and Water Treatment process), we identified that considerable effort has been expended towards planning for a significant business disruption. These services have identified the risks related to a disruption in their business and have prepared plans to mitigate the impact and restore the service. The plans

address the four key areas of hardware, software, networking and infrastructure and include roles and responsibilities, supporting procedures and contact lists for key staff. A further description of the plans in place is discussed later in the report.

Business resumption plans need to be activated during or immediately after a significant business disruption. Ensuring all major decisions are properly documented within the plans will enable the rapid and cost effective resumption of an organization's essential services during and following a significant business disruption.

Recommendation 4:
The Director of Corporate Support Services should work in cooperation with the owners of the critical systems to formally document business resumption plans. The plans should include:

- identifying at what point during a business disruption the plan should be activated,
- defining detailed roles and responsibilities of key employees,
- communication strategies,
- contact lists of employees identified as critical to the restoration of the system along with procedures to distribute and regularly update those lists

Management Response*:*

4. Agree. Working with IS Leaders from across the organization and departmental business owners, we will formally document business resumptions plans and communicate to key stakeholders on an enterprise wide basis. Timing: Q4 2011

Maintaining, Testing and Reviewing Business Resumption Plans – Training and Embedding Business Resumption Planning in the Organization's Culture

Upon final approval by management of the plans, the next step is to ensure successful implementation through staff training as well as periodically exercising and testing the developed plans. All employees should be familiar with their roles and responsibilities and should have a general knowledge of how the overall organization will function when the plan is activated.

The plans must be maintained and regularly reviewed to ensure that any changes in staffing, business processes or systems are updated within the plans. The plans should be tested at least annually in order to determine the strengths and weaknesses of the plan as well as allowing staff to practice their roles. A full exercise of the plans does not need to be conducted, alternative testing techniques exist which minimize the cost and extent of the testing. Such methods include tabletop exercises and testing only certain components of the plans. These methods can be used to ensure the plan will work and staff is aware of their roles and responsibilities.

Testing of systems is conducted
Although CSS does not have any documented business resumption plans to test, through discussions with management various tests are conducted which test key risk areas. Server back-ups, network capabilities and infrastructure components are regularly tested. As well, when system changes occur, discussions are held to determine what impact the changes have on the system and the ability to restore the system.

The 311 service is provided by CSS staff and is the main contact point between the City and the citizens and could have a significant impact on services and communications if it were disabled. CSS has taken steps to ensure continuity of the system by testing the phone systems and switching service delivery to an alternate back-up site. As well, two uninterruptible power supply connections have been established in the event of a loss of power.

For the Handi-Transit service, the hardware and software have full redundancy that is tested periodically. As well, there is an agreement with 311 to share terminals in the event of a service disruption. For the wastewater and water treatment systems, these systems are designed with several layers of redundancy. This has permitted the periodic testing of the systems including the hardware and software, network capabilities and infrastructure. With the implementation of any new systems hardware and/or software, tests are conducted to ensure full restoration of the system. Roles and responsibilities have been tested and updated as a result of these tests.

The City also participates, as a whole or just certain departments, in broader emergency exercises such as “Citywide in the field LIVE” in May 2007. Exercises are also conducted with external groups such as CN Rail, CP Rail, Winnipeg Airports Authority, Winnipeg Regional Health Authority, the universities and the Manitoba Emergency Measures Organization. These exercises illustrate the experience the City has in emergency plan testing and could be expanded to include or leveraged in the design of business resumption plan testing.

Recommendation 5*:*
The Director of Corporate Support Services should develop processes to ensure that business resumption plans are regularly reviewed, updated and tested to identify areas for improvement. The Director of Corporate Support Services should define the degree and frequency of plan review and testing.

Management Response*:*
5. Agree. The department will develop an administrative protocol to define the process and timing for regular testing and to identify areas for improvement on an enterprise-wide basis. This activity fits within the mandate of the Project Management Office (PMO) in CSS and as such, the PMO will be responsible for undertaking the periodic reviews. Timing: Q4 2011 (to coincide with Recommendation 4)

REVIEW OF SELECTED KEY SYSTEMS

Handi-Transit Scheduling System

Service Description
Handi-Transit is a service of the City's Transit Department that provides door-to-door transportation for people who are unable to regularly use the City's fixed route transit system because they are legally blind or have a physical disability that significantly impairs their mobility. The service is pre-booked and is a shared ride service.

The Operations
Handi-Transit is expected to grow significantly over the next decade as the population ages. Currently there are over 9,000 active registrants in the system and each year there are over 3,000 new applications received and processed. The call volume for Handi-Transit ranges from approximately 3,000 to 3,500 calls daily, 1,500 of which are handled by a self service interactive voice response system for trip confirmations and cancellations. The average weekday passengers carried is 1,800 increasing to 2,300 in the winter months. The service is provided 7 days a week with a contract fleet of approximately 100 vehicles providing service.

Clients can request their trips up to a week in advance by calling into an operator who enters the trip information into the system. The cutoff to request a trip for the next day is 11am. A priority scale between one and three is used to prioritize and schedule the trips to ensure all first priority trips such as medical appointments and rides to work and post secondary school are scheduled.

Once all trip requests are entered into the system, the system generates a schedule between 11am and 2pm. An automated interactive voice response system that detects voice and keyboard inputs allows customers to call into the system after 2pm to retrieve their trip times.

The Systems
Several IT systems are used for delivering all aspects of the service at all times. This includes Internet Protocol telephony, reservation booking, scheduling, dispatch and complaint handling.

The following four systems make up the application software:

- *iRide* – Handi-Transit Data Management System
    - Winnipeg Transit locally developed and supported application including:
        - Client records
        - Contractor resources
        - Trip booking
        - Manual Scheduling
        - Dispatch optimization
- *iRide Automated Handi-Transit Scheduling System*
    - Optimized request to resource allocation
    - Dynamic schedule adjustment
- *iRide Incidents* for customer relationship management of complaints and commendations (log, investigate and resolve)
- *Confirm/Cancel* – Handi-Transit IVR (Interactive Voice Response)

All requests are entered into a system which generates a schedule using an algorithm that takes into account a number of different variables such as the different vehicle types, mobility aids, the vehicle capacity, the trip times, the destination and the priority. The system creates a schedule by allocating the contracted resources of specialized vehicles and drivers to the demand for rides by authorized clients in an optimum fashion.

The Department keeps a copy of the schedule and a second copy is sent electronically to the drivers. Throughout the day the system automatically adjusts the schedule due to cancellations and the email system has become the key system used to communicate the changes to the drivers.

The Impact of a Failure to the Systems

The processes within Handi-Transit to create the schedules and communicate with the drivers are completely automated and the Department does not have the ability to deliver the service to the same level manually. The critical hours of operations are between 11am and 2pm while the system is generating the next day's schedule. A system failure prior to finalization of a schedule would virtually halt service delivery for the next day; clients would need to source alternate transportation to attend their appointments. This would severely impact citizens who are unable to find alternate methods of transportation.

The Ability to Restore the System

Hardware & Software

The hardware that supports the Handi-Transit service is maintained at the main data centre location, all data is backed-up daily at a secondary alternate location. The software has been installed in parallel on four separate systems thereby establishing a hot back-up in the event that one of the platforms fail.

If a system were to fail, it would take approximately an hour and a half to two hours to restore the system to the last transaction (trip request) that was processed before the system failed. The scheduling software has been developed in house; therefore, the department has the expertise and knowledge to restore the system in the case of a failure.

Networking

Two fiber network connections have been established between the primary data site and the secondary back-up location. In the case that one of the fiber connections is severed or fails the data is transferred on the second network connection.

The only network connection Handi-transit has to the City of Winnipeg's main data centre is for the email system. Currently the majority of communication between Handi-Transit and the drivers is by email sent through the corporate email system. If the operations were to lose the connection to the downtown office they would lose the ability to email the drivers, however they could revert to using the telephones to contact the drivers with the schedule information.

Physical Infrastructure and Internet Protocol (IP) Telephony

A significant risk to the operations of Handi-Transit is if the service lost the use of the building where Handi-Transit operations are conducted. To mitigate this risk, there is an agreement with 311 to gain access to phones and terminals that could be used to continue service delivery. Handi-Transit and 311 share the same IP telephony and a back up contact centre has recently been established at 510 Main. Business Technology Services has instructions documented for the transfer of licenses for the phones and the iRide system has been installed on the

workstations. The site has been tested and Handi-Transit can begin taking calls within minutes once relocated, eliminating physical infrastructure risk.

Emergency Operating Procedures
The department has established roles and responsibilities for employees in the case of a business disruption and all critical employees are on call 24 hours a day, 7 days a week. The back-up and restore procedures are documented and manual procedures have been developed to address an IT system failure. Employees in the department rotate their jobs and responsibilities and are familiar with all the processes within Handi-Transit and would be able to respond to a business disruption and provide the necessary resources where they are required.

In the case of a system failure or a business disruption, the Department has developed pre-recorded messages for incoming calls to inform clients of the disruption in service and that they should call back at a later time to obtain further information on the disruption.

Conclusion
Overall, the Handi-Transit Division has adequate business resumption plans in place that include back-up procedures, manual procedures and IT system redundancies to mitigate the impacts of a business disruption or system failure.

Wastewater Treatment System – Distributed Control System (DCS) & Supervisory Control and Data Acquisition (SCADA)

Service Description
The role of the Water Pollution Control Centre is to help control the pollution of the City's rivers. This is done by treating the wastewater collected from homes and businesses to remove inorganic solids such as sand and gravel, and by reducing the amount of organic material before it is released into the City's rivers system. The City has three separate treatment plants that each handle the following capacity: North: 70%, West: 10% and South: 20%.

The Operations
The Wastewater collection system operation is comprised of a series of sewers, pumps and lift stations:

- *Combined sewers* - 1,280 km of single pipes that collect both water and wastewater from homes, businesses and industries and surface runoff from rainstorms and snow melt.
- *Interceptor sewers* – 130 km pipe system that carries sewage in the combined sewer system to the North End Treatment Plant. Weirs, or small dams, have been installed in all combined sewers to divert sewage to the interceptor sewer system.
- *Separate Sewers* – 1,182 km of two dedicated pipes, one pipe carries the wastewater from homes, businesses and industries to the treatment plant and the other carries land drainage and surface runoff from rainstorms and snow melt to the river.
- *Land Drainage sewers* – 1,372 km of single pipes that carry rainfall and snow melt off from urban areas to the river system.
- *Lift Stations and diversion structures* - there are 76 wastewater pumping stations and 10 gravity-based wastewater diversion facilities throughout the city which are used to pump wastewater using lift stations to raise sewage to a higher level to the interceptor sewers or to the water pollution control.

This system collects the wastewater and delivers it to the interceptor sewers and then to the water pollution control centres. The water flows through the system through the use of pump stations, lift stations and the use of gravity. The entire operation throughout the City is monitored and controlled by two types of systems – the SCADA (Supervisory Control and Data Acquisition) system and DCS (Distributed Control System).

In 2008 the following amounts of wastewater were treated:

- North plant: 71.953 billion litres (Population approximately: 395,000)
- South plant: 21.231 billion litres (Population approximately: 169,000)
- West Plant: 10.123 billion litres (Population approximately: 98,000)

In total, 103.397 billion litres of wastewater was treated in 2008; that is enough to fill 486 Richardson Buildings.

The Industrial Control Systems
SCADA (Supervisory Control and Data Acquisition) and DCS (Distributed Control System) are industrial control systems which are designed to automate industrial processes and maintain high reliability. The SCADA system is used to monitor the data collected at the wastewater collection sites and the DCS is used to control all processes within the wastewater treatment plant.

SCADA (Supervisory Control and Data Acquisition)
The SCADA system is used in the wastewater collection system, which is a series of pipes and lift stations. This system monitors the data collected from the lift stations throughout the field and triggers an alarm if discrepancies or issues are identified. SCADA has two parts:

1) the field equipment running the processing and communicating back to the servers;
2) the servers with interfaces for the operators called HMIs (Human-Machine Interface).

Issues identified by the SCADA system trigger an alarm and an operator at the collection station will send a person to the lift station to investigate. The person dispatched to investigate manually deals with problems identified by the SCADA system.

DCS (Distributed Control System)
The system used to control processes at the three wastewater treatment plants is DCS (Distributed Control System). The DCS is an intricate network of specialized computers monitored by fully trained operators. The operators decide on a process strategy, input setpoints into the system which are the target value that an automatic control system will aim to reach. The DCS then operates the valves, pumps, mixers, fans, controls, etc. throughout the plant to maintain the setpoints on a continuous basis. The DCS controls this process by monitoring thousands of sensors, making adjustments as necessary and alerting operators to problem conditions. Operators are able to monitor and control a plant from any workstation located within it. The North End plant also monitors critical alarms of the South and West plants during their unmanned hours.

The Impact of a Failure to the Systems
The impact of a failure in the DCS system could be mitigated with the deployment of staff to manually operate the various pumps and valves where possible. The impact of an inability of the SCADA system to operate could be critical and the longer the system is down, the greater the impact. An inoperable SCADA system would result in a back up in processing of wastewater and this would eventually overload the sewer system, potentially backing up in people's homes and could ultimately lead to releasing untreated wastewater into the river system. This would impact the health and safety of the citizens, pollute the river system and lead to significant financial costs.

The Ability to Restore the System
Hardware & Software
Due to the criticality of the process and the systems, SCADA and DCS have been set up so that they are completely redundant. Both systems have multiple layers of redundancies built into the system to ensure they could experience multiple failures at multiple points in the process without the system failing.

<u>SCADA</u>
The SCADA system is connected to a phone line which is connected to each lift station. The server end has multiple phone lines and if one of the phone lines is damaged or communication is interrupted, the server can use another line. The department has begun a wireless pilot that would add a second route to a station. If the system were to go down completely and the collector stations stopped receiving data from the lift station, procedures have been developed where system operators would be sent to each lift station to manually monitor the processes.

<u>DCS – Distributed Control System</u>
All processes within the three treatment plants are run by DCS. To protect the system from a business disruption, multiple redundancies have been built into the system and it is connected

to dual power supplies. The redundant systems run simultaneously so that if one of the controls fails, operations will transparently continue by the redundant controller. Within the treatment plant there are monitoring stations for each process area, each able to control the plant and communicate with the others via an Ethernet network. The largest plant, the North End plant, has a network ring where information is sent in both directions so if there is a break the monitoring stations continue to have the ability to communicate with each other. Operators are on call 24 hours a day, 7 days a week and respond immediately if an alarm is triggered.

Inter-Plant Networking
Triplicate redundant network routes are used to communicate information between the three treatment plants; as well, there is a third network to communicate with the main City network. These networks are used to communicate data from each plant and, in addition, could allow operators the ability to control the operations of the three plants from either plant. The North plant is manned 24hrs/7days a week, the South and West plant are manned 8hrs/5 days a week.

All computers and networks are password protected and firewalls are used. As well, the different computer systems operate on different operating systems such us LINUX and QNX that add to the complexity of accessing the systems.

Physical Infrastructure
The biggest risk is physical damage to the systems or to the plant. This would result in the plant or system being inoperable for an extended period of time creating a back up in the treatment of the wastewater. Obsolescence of the equipment is another risk that the Department handles. To address this risk, recently, a major infrastructure renewal process has begun. The Department monitors new developments in the field and equipment and will upgrade the equipment as required.

The Department has taken steps to protect the physical infrastructure at the plants as well as protecting the systems. The rooms which house the equipment are password protected by doors with key pads as well selected windows have been protected to withstand gunshots.

The longest power failure that has occurred to date has been approximately one hour. In the case of a complete power failure to the entire North plant, the plant is connected to an uninterrupted power supply that will provide power for selected controls equipment in the plant for up to four hours. The South and West plants have some raw pumping capacity using natural gas during power outages, while the North plant has none. A long enough power failure would result in a gradual back-up in the wastewater system.

Emergency Response Procedures
Emergency response procedures are in place and documented. Plans have been developed which outline the procedures to restore the hardware, software and the networking for the SCADA system and the DCS system. The City follows environmental procedures and complies with ISO 14000, which specifies guidelines for interacting with the environment. Emergency contact lists have been developed and are used by the Department.

Conclusion
Overall, there is an adequate business resumption plan in place with a number of redundancies and back-up procedures that mitigate the risk of a system failure. Furthermore, the Department has documented the emergency response procedures for responding to a system disruption.

Water Treatment Plant and the Regional Water Distribution System - Supervisory Control and Data Acquisition (SCADA)

Service Description
Winnipeg's water system is made up of a complex, but integrated group of parts that deliver water from Shoal Lake to Winnipeg's homes and businesses. Since completion in 1919, the aqueduct between Shoal Lake and Winnipeg has provided a reliable water supply. Winnipeg's waterworks system has expanded to deliver each day an average of 221 million litres of water to approximately 270,000 Winnipeg households and businesses across approximately 297 square kilometres (114 square miles) of the developed portion of Winnipeg.

The Operations
Water flows from Shoal Lake on the Manitoba and Ontario border to Winnipeg by gravity through a 135 kilometre long aqueduct. The water is stored in the Deacon Reservoir, a large reservoir that can hold 8.8 billion litres, enough water to supply Winnipeg for about 20 days. The water then passes through the new water treatment plant that began operations in December 2009. The water undergoes UV treatment and the addition of fluoride and orthophosphates after leaving the plant and prior to distribution to three smaller in-town reservoirs and pumping stations located throughout the City.

The Systems
The Water Services SCADA systems are used to monitor the treatment and distribution process as well as to control a series of pumps and valves. The water treatment plant is highly automated and includes 40 processors, 140 pumps, 2300 valves, and 1400 instruments that are monitored and controlled by the SCADA system. The water treatment plant has the capability to treat 400 million litres of water per day. Throughout the entire process, the water is intensively monitored to ensure that the water is safe and that regulatory requirements are met. Furthermore, the SCADA system is used to monitor the volume and pressure of water flowing through the pipes.

The SCADA system also is capable of identifying and reacting to process failures. For example, in the case that one or multiple pumps fail to operate, the system will automatically adjust the pressure and speed of the water flowing through the other pumps to accommodate the change in the flow of water.

The Impact of a Failure to the System
The impact of a failure to the SCADA system would be significant; however, there is the possibility to continue the operations of all the processes manually as was done for Y2K. This would require a significant amount of human resources and could have a significant financial impact depending on the length of the outage and the number of resources required to operate the pumps 24 hours a day, 7 days a week. The likelihood of a SCADA failure is small due to the levels of redundancy that are in place (servers, network structure, workstations, and power supplies).

The impact of a business disruption to the quality of the water would not be significant. Procedures exist for treating the water, such as adding chlorine to the water before it is distributed to the City to ensure that it is safe to drink. In the event of a prolonged power outage, the water treatment plant can utilize a dedicated 6MW capacity generator set that can provide adequate power to run the plant at a minimum of half capacity for extended periods.

The Ability to Restore the System
SCADA is an industrial system and has multiple levels of redundancies built into the system to ensure that the processes continue to operate in the case of a significant business disruption.

Hardware & Software
The water treatment plant control system utilizes redundant hot/standby controllers and servers to increase reliability and ensure that the quality of water is maintained and that water will continue to flow, as well as duty/standby configurations for equipment such as pumps, analyzers, sensors, chemical feeds to help minimize any process disruptions associated with equipment failures. Where a duty/standby configuration has been implemented, when there is a failure of the duty component, the standby will automatically assume the duty role while the other equipment is out of service. For other instruments, such as a programmable logic controller, if one were to fail, the system would automatically switch over to a unit on standby and continue the process.

Network
A fiber optic cable ring provides network connectivity between the servers, controllers and workstations throughout the water treatment plant facility. The cable has the capability to communicate in both directions so a cut in the cable will not result in service disruption.

Network security is enhanced by utilizing subnet segregation, layered firewalls and encryption. To further protect the security of the network, the water treatment plant operates on dedicated networks that are isolated from other City networks and the internet.

Physical Infrastructure
The biggest risk to the operation of the water treatment plant would be a localized disaster that physically damages the water treatment plant facility. Entry into the facility is restricted to authorized personal only by requiring passwords and identification. Surveillance cameras will also be installed to monitor the facility.

The Department has installed three 2MW diesel generators at the water treatment plant, which will protect the systems, pumps and buildings from a loss of power. All systems and servers are on an uninterrupted power supply system which will automatically failover and provide power until the generator is activated. For example, in the case of an ice storm where the power could be out for a number of days or weeks, as long as there is diesel fuel, the generators would supply power to the water treatment plant and Deacon pumping station.

To ensure that the pumps have the capability to continue operating in the case of a power failure to the regional distribution system, a combination of natural gas engines and electric motors are used to drive the pumps. This ensures that if the electricity is down the gas pumps will continue to operate. In addition, one pump operates on natural gas as a further layer of backup.

Three operators staff the water treatment facilities 24 hours a day, 7 days a week to monitor and operate the water treatment facility and respond to any emergencies. Call out lists with the contact information for all critical employees have been distributed. Furthermore, standby schedules have been developed which list the critical employees on call with all their alternate contact information.

Emergency Operating Procedures
The Department has developed and implemented emergency standard operating procedures to ensure the timely and effective process management during short-term loss of the water treatment plant or SCADA system. The procedures identify the indicators that a disruption has occurred and the detailed procedures to respond to the disruption. A number of different types of system disruptions are identified in the emergency response procedures. Also, procedures for treating the water with chlorine have been documented to ensure that the quality of water distributed to the City is maintained.

The Department plans to convert the existing regional SCADA system control centre into a back-up facility that would have the ability to control all the systems in the new water treatment facility. In the case that the main water treatment facility is inaccessible, operators would then be able to control the SCADA system from the back up facility. Redundant networks will be established between the back up site and the new facility ensuring continuity of operations.

Conclusion
Overall, there is an adequate business resumption plan in place with a number of redundancies and back-up procedures that mitigate the risk of a SCADA failure. Furthermore, the Department has documented the emergency response procedures for responding to a system disruption.

311 Contact Centre

Service Description
Winnipeg's new 311 contact centre provides citizens the opportunity to ask questions about, or to request city services at their convenience. Customer service representatives are available 24 hours a day, 365 days a year. Inquiries can be dealt with in English, French as well as a number of other languages. The 311 Contact Centre has become the face of the City assisting citizens with the following types of requests, excluding emergency services (Fire, Paramedic and Police services):

- request for service (such as sewer back-up, water main break, bulky garbage collection).
- request for information (such as permit processing, animal control, building inspections, traffic/parking issues, transit schedules).
- concern (such as parking tickets, property condition, street maintenance, snow clearing, noise complaints).
- request to register for city programs (e.g. Leisure Guide)

The Operations
The 311 contact centre has been operational since January 2009. On average, approximately 6,000 calls are received on weekdays, 4,000 calls per day on a weekend as well as 100 to 200 emails. The volume of calls received fluctuates by season and is affected by seasonal weather and events such as floods and snow storms. During the flood in 2009, 311 was used to distribute information regarding which homes needed volunteers for sandbagging and was also used to receive information from citizens regarding developments in the flood. There are sixty operator seats available at the contact centre with thirteen seats for training. During peak business hours, approximately forty to fifty PC's are in use and during the evening fifteen to twenty are used.

The call centre operates entirely by computers using a Voice Over Internet Protocol (VOIP) system which delivers voice communication over Internet Protocol (IP) networks. The contact centre uses the City's internet site to access departmental information. To process various information or service requests the contact centre has the ability to link into the unique systems supported by the different departments using a Lagan system specifically designed to support 311 contact centre. All calls are routed real time to the appropriate departments. The servers supporting the 311 call centre are supported by CSS staff at the City's main IT site.

The Systems
The 311 contact centre is supported by a telephony and a non-telephony environment. The telephony environment is comprised of the systems and controls used to intake the calls and the non-telephony environment comprises all the other systems used to support the contact centre, including the Lagan software system. This system allows information to be captured only once and then routed to the appropriate departments for resolution.

The Impact of a Failure to the System
The 311 contact centre has become the main method for citizens to contact the City, making it critical to effective, on-going communication. Most departmental phone numbers are no longer published thereby routing communication through to 311. Any disruption in the 311 service would create difficulty for those citizens needing to contact the City. The quality and consistency of information provided to the public would also be impacted. Ultimately, the reputation of the City would be at risk.

The Ability to Restore the System
In the case of a significant business disruption, the City has established that the first priority is to ensure that the telephony environment is functioning and the City has the ability to receive calls. The second priority is to restore the non-telephony environment. Processes and procedures are in place to ensure both environments continue to operate in the case of a business disruption.

Telephony
To ensure that the City is prepared to continue receiving calls, a back-up call centre has been set up at the City's main IT site that is complete with headsets and computers. The site is currently set up with fifteen full functionality PC's and could be functioning within minutes. Technical staff are prepared to commence expansion of the back-up facility to increase the number of PC's to the full complement of 50 if required. This process would begin immediately upon the request from 311 management. Existing contact centres in other departments (Handi-Transit, Water & Waste, IT Help desk) are available to temporarily assist 311 in the case of a business disruption. Since implementation of 311 the contact centre has transferred operations to the back-up location to accommodate maintenance work that was being conducted at the main location. The transition and the rerouting of the telephone calls to the back-up facility is almost instant and has gone smoothly with no disruption to the business or the public.

Redundancies have been built into the telephony system by having a back-up server that remains active so the system will automatically flip over in the case of a business disruption. In addition, firewalls have been put in place to protect the telephony systems and redundant network links connecting the contact centre to the main IT site have been established and are each provided through different service providers. As well, the telephone lines are connected to three gateways and have the capability to switch between each in the case of a failure in one of the connections.

Non-Telephony
The 311 contact centre is supported by the City of Winnipeg IT data centre and relies on the City's webpage to access information and Lagan software to process information and service requests.

Hardware & Software
The 311 contact centre is connected to one server which allows 311 to link into the corporate and individual departmental systems. All data is stored centrally at the main data centre and is backed up daily and stored at an offsite location. In the case of a logical disruption, such as corruption to the data, Corporate IT has the ability to restore the data to a point in time within an hour of the disruption. In the case of a failure to the server, an alternate server would be brought in and the full functionality and connections would be restored. The CSS's server consolidation initiative will provide for a back-up server at an alternate location. A fiber ring with the capability to communicate in both directions is in place between the main IT site and the back-up location. Procedures have been developed to restore the Lagan software in the case of a business disruption.

The departmental systems that 311 accesses are the responsibility of each department and considered outside of the scope of this audit.

Networking
The contact centre is connected to the main IT site by two separate, high-speed network connections maintained by separate providers. The connections are redundant and if there is a disruption in the primary connection, the City will immediately switch over to the second

connection. Both providers are on call 24 hours a day, 7 days a week. Since 311 began operations, the network has not been switched over. Once connected to the main data centre the 311 servers link into the departmental information servers.

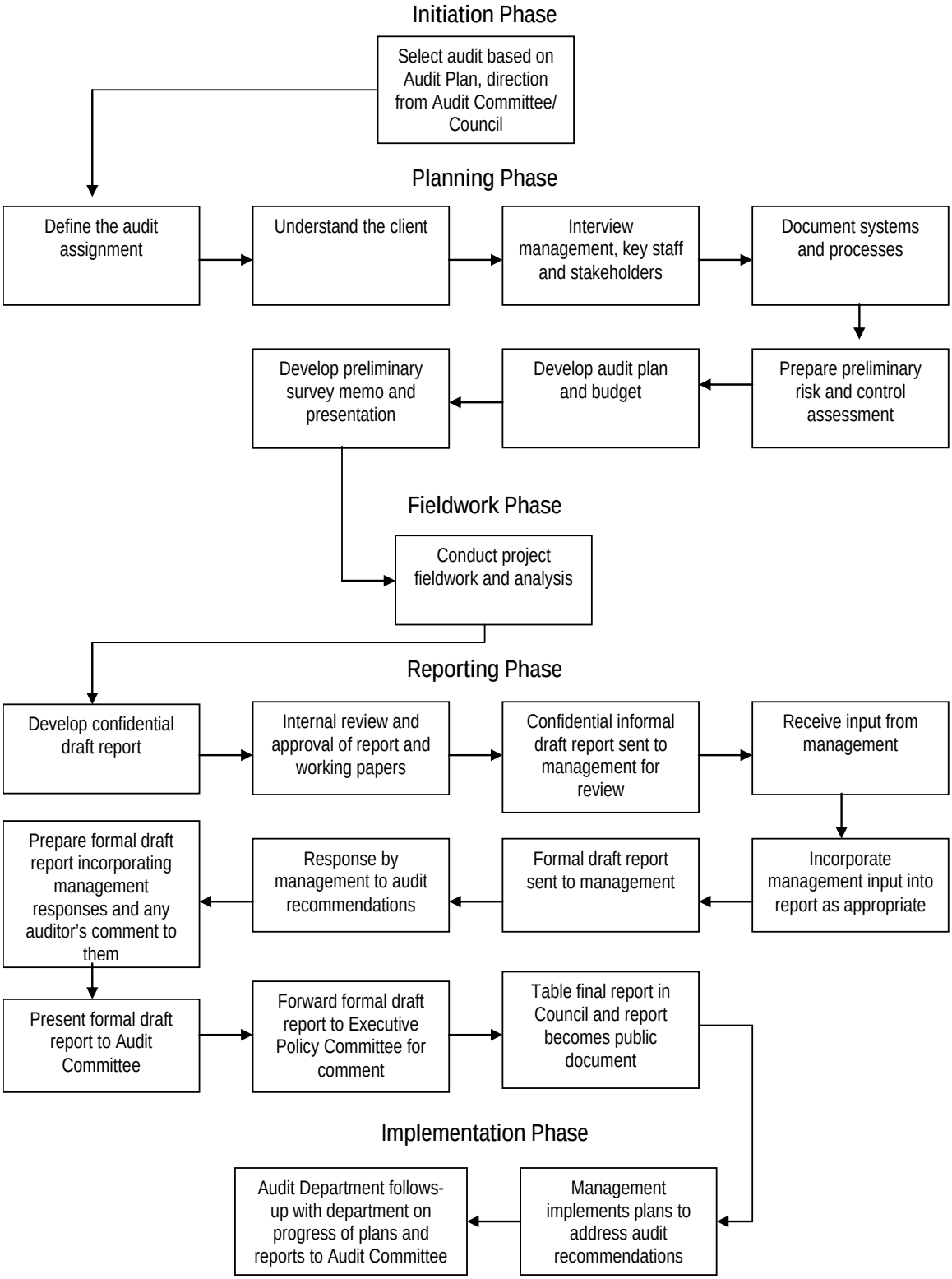
Physical Infrastructure
A risk which would cause a significant business disruption for an extended period of time to 311 and other City services is if there was a total loss of the building in which the City's main IT data centre is located. All the data is backed up, however operations would need to be set up at an alternate location and the operations of the data centre would need to be brought back on line. This could take approximately one week to complete. As mentioned previously, CSS is working on establishing a back-up location that could maintain 30% of the systems. Once operational, this would greatly reduce the timeframe to restore critical systems. In the interim, 311 has been identified as critical and would be deemed a high priority to reestablish the service. The City is currently upgrading their data centre with two uninterrupted power supply connections and building services is working on installing a large generator.

The 311 contact centre has developed procedures for responding to a business disruption. Contact centre management would determine at what point the call centre would relocate to the alternate location in the event they were not able to access the contact centre. Procedures are in place to reroute calls and the back-up call centre would be operational in minutes.

Emergency Operating Procedures
Emergency procedures have been developed for responding to a business disruption such as a fire. The procedures detail roles and responsibilities including identifying the key individuals responsible for initiating the plans. Manual back-up procedures have been established to continue business in the case that the systems or servers fail. These procedures include alternate operating procedures such as faxing information to departments, calling and emailing regarding specific issues. The IT service desk is available to support 311, 24 hours a day, 7 days a week. Furthermore, the department has developed contact lists with all employees' alternate contact information.

Conclusion
Adequate business resumption plans have been developed that include procedures for restoring the service and responding to numerous types of business disruptions. Redundancies have been built into the systems to ensure that the entire contact centre environment is able to restore operations as quickly as possible. The server consolidation and creation of a back-up site will further enhance the 311 contact centres ability to continue operations in the case of a significant business disruption.

APPENDIX 1 - AUDIT PROCESS



APPENDIX 2 – SUMMARY OF RECOMMENDATIONS

Recommendation 1:
The Director of Corporate Support Services amends the Governance Structure – Information Technology Administrative Standard No. IT-001, and assign responsibility for the development of a Business Resumption Planning Program and Business Resumption Plans.

Recommendation 2:
The Director of Corporate Support Services support the development of a Business Resumption Planning Program by clearly defining the roles and responsibilities of departmental senior management and their staff and communicating the program's goals and objectives.

Recommendation 3:
The Director of Corporate Support Services, in consultation with the CAO and senior management, develop a list of the critical systems which support the essential services provided by the City. The systems should be prioritized according to their criticality and impact on the organization and the citizens. The list should be reviewed by the Director of Corporate Support Services to ensure that it is consistent with the overall needs of the organization and the providers of the essential services.

Recommendation 4:
The Director of Corporate Support Services should work in cooperation with the owners of the critical systems to formally document business resumption plans. The plans should include:

- identifying at what point during a business disruption the plan should be activated,
- defining detailed roles and responsibilities of key employees,
- communication strategies,
- contact lists of employees identified as critical to the restoration of the system along with procedures to distribute and regularly update those lists

Recommendation 5:
The Director of Corporate Support Services should develop processes to ensure that business resumption plans are regularly reviewed, updated and tested to identify areas for improvement. The Director of Corporate Support Services should define the degree and frequency of plan review and testing.