



Office of the Auditor General

Audit of Infrastructure Services Department – Technical Management

Tabled at Audit Committee – November 26, 2015

Table of Contents

EXECUTIVE SUMMARY 1

 Introduction..... 1

 Background 1

 Audit Scope and Objectives 2

 Audit Approach 4

 Summary of Key Findings 4

 Potential Savings..... 27

 Conclusion..... 27

 Acknowledgement 28

Detailed Audit Report..... 29

 Introduction..... 29

 Background 29

 Scope 31

 Objectives..... 32

 Audit Approach 34

 Findings and Recommendations 38

 Potential Savings..... 86

 Conclusion..... 86

 Acknowledgement 86

EXECUTIVE SUMMARY

Introduction

The Audit of the Infrastructure Services Department (ISD) was included in the 2013 Audit Plan of the Office of the Auditor General and approved by Council on October 12, 2012. The audit was conducted in two distinct streams – the audit of the technical management of ISD, and the audit of the administrative management of ISD. This is the executive summary of the audit of the technical management of ISD.

Background

The Infrastructure Services department (ISD) is responsible for asset management of the City's roads, sidewalks, sewers, water mains, bridges, culverts, buildings, parks and other structures. It is also responsible for the design, construction and administration of the work required for new construction and the rehabilitation and renewal of:

- The City's infrastructure
- Transit facilities
- Pumping stations, water reservoirs and elevated tanks
- Sewage and water treatment facilities
- Stormwater management facilities
- Solid waste facilities.

ISD consists of the following branches:

- Asset Management – planning of infrastructure works, including renewal and coordination of capital projects identified by client departments
- Design and Construction: East, West and Buildings and Parks (three branches) – implementation of renewal work and new infrastructure
- Business and Technical Support – Right Of Way Information and Approvals, Surveys & Mapping, Standards and Contract services, Quality Assurance, Business Support.

The functions undertaken by ISD are:

- Asset inventory, inspections, renewal planning
- Design of rehabilitation, replacement and new infrastructure works
- Construction, contract administration and inspection of construction;
- Surveys
- Right of Way information approvals
- Design and construction standards

- Quality Assurance services.

A number of audits have been conducted on specific areas of ISD, namely the 2009 Audit of Bridge Maintenance Process and the Audit of a Specific Bridge, the 2010 Audit of the Mackenzie King Bridge Contracts, and the 2012 Audit of Construction Supervision Services. This Audit encompasses the overall processes of ISD, but at a higher level of detail.

Audit Scope and Objectives

The scope of the audit included the technical operation of the Infrastructure Services department. The audit objectives are:

Audit Objective No. 1 – Compliance with applicable Federal and Provincial Guidelines and Regulations

Criteria:

- Confirmation of compliance with the various Provincial and Federal requirements (e.g. Public Transportation and Highway Improvement Act, Municipal Act, Capital Investment Plan Act, Fish and Wildlife Conservation Act, Planning Act, Public Lands Act, Environmental Protection Act, Ontario Water Resources Act, Occupational Health and Safety Act, Environmental Assessment Act,
- Evaluation of the programs for Structure Inspections and Renewal, Watermain and Sewer Inspections

Audit Objective No. 2 – Compliance with the objectives of the Comprehensive Asset Management Program set by the City.

Criteria:

- Effectiveness of the Infrastructure inventories and inspections, design of renewal works, cost of renewal construction.
- Completeness of reporting of results to Committee and Council

Audit Objective No. 3 - Structure of ISD within the City in terms of responsibilities.

Criteria:

Ensure there is no duplication of responsibilities with Planning and Growth Management, Drinking Water Services, and Drainage and Wastewater Services and other City departments

Audit Objective No. 4 - The process and methodologies used for selection of consultants and contractors

Criteria:

- Ensure appropriate interaction with Supply branch
- Adequacy and completeness of process for direct assignments, requests for quotation, requests for proposals, requests for tender

Audit Objective No. 5 - The effectiveness of program management and project monitoring

Criteria:

- Ensure appropriate processes for review and approvals of study report and designs
- Ensure adequate processes for construction inspections

Audit Objective No. 6 - The control systems used for delivery of the projects within budget and schedule

Criteria:

- Ensure appropriate program management
- Ensure Project Managers and Inspectors responsibilities and reporting are complete
- Adequate design process, standards, reviews, control
- Adequate construction supervision, process, standards, reviews, control

Audit Objective No. 7 - The processes and methodologies used for control of change orders and costs in design and construction.

Criteria:

- Evaluate process:
- Change order methods
- Approval of change orders
- Recording of change orders

Audit Objective No. 8 - Identify areas of potential savings for the City in the technical management and operations of ISD

Criteria:

- Determine if potential savings are possible through a more efficient and effective technical management and operation of ISD
- Issues related to ISD were identified in previous audits, namely responsibility for redesign costs, recovery of change orders due to errors, exercising of contract liquidated damages, project oversight and others. This audit did specifically follow-up on the status of recommendations made in these audits. The audit also

did not compare the costs of renewal work to the costs being paid by other municipalities in Ontario.

Audit Approach

The audit included the following tasks:

- Review legislative framework
- Review City’s policies, procedures, standards and practices.
- Review industry procedures, standards and practices.
- Review background data.
- Obtain and review files for 20 selected projects for compliance to applicable policies, procedures and standards.
- Conduct interviews with individuals involved in the various aspects of the operation of the ISD.
- Prepare Draft Report for fact verification.
- Conduct additional interviews for confirmation of issues, if necessary.
- Submit Draft Report for Management Review.

Summary of Key Findings

The Financial Services unit indicated that in 2012, ISD had 359 Municipal Capital Projects and 577 Buildings and Parks Capital Projects. The total 2012 Capital Project budget for ISD was \$497,880,000, with Budget Adjustments of \$52,192,000, for total Authority of \$550,072,000. These amounts represent additions made to the pre-existing list of approved capital projects as the City does not budget its capital projects by year.

As part of the audit, 20 projects were selected for examination, as listed in Table 1. The budget values in Table 1 are the overall budget values for each project, including adjustments, as provided by the Financial Services unit – Planning and Infrastructure.

Table 1 : Projects Selected for Audit Examination

Project Description	Budget (\$000s)	Status as of November 2013
Irving-Laurentian-Carling-Lynwood-Oakville	940	Project design underway since September 2013
Hurdman-St Laurent Watermain Relocation	24,808	Construction started August 2013.
Belfast (Trainyards - 120 m north)	600	Construction was being completed in November 2013.

Project Description	Budget (\$000s)	Status as of November 2013
Olmstead (Jeanne Mance-McArthur)	400	Tendered Nov. 4, 2013, closing November 21, 2013. Construction was postponed to 2014 due to time of the year.
ORAP- Combined Sewer Overflow Storage	17,500	Project under design. Construction in 2017 will be coordinated with the 2017 sesquicentennial celebrations.
Acres Pump Station Overflow	2,000	Tendered 10 October 2013. Originally scheduled for February 2013 tender
Rideau River O-Train Bridge	3,000	Project on hold since March/April 2013, due to risk of not being able to complete the work in the window allowed.
Chapman Mills Station and Park & Ride	10,000	Substantial completion
Transitway Rehab. - East Transitway, St. Laurent Blvd. Overpass Transitway & Transitway Structures - East Transitway, St. Laurent Sta. Central & East Tunnels	1,860	Completed
Bronson Ave., Phase 1 (Laurier to Arlington) incl. Bronson Ave. Emergency Retaining Wall Repair (NE Corner of Laurier)	30,000	Completed
Minto Bridges (Phase1)	2,200	Substantial Completion
Rideau St. Reconstruction Phase 1 (Dalhousie to Chapel)	14,510	Substantial Completion
Youville Storm Sewer Lining & Headwall	6,000	Completed
Holland Avenue Watermain (Scott St to Tyndall St)	3,400	Completed
Clarendon Ave / Harmer Ave / Ruskin St / Inglewood PI – Road, Sewer and Watermain Renewal	10,590	Substantial Completion

Project Description	Budget (\$000s)	Status as of November 2013
Champagne O-Train Corridor Multi-Use Pathway (PH1)	3,000	Completed
Woodroffe Ave (Hwy 417 to 170m N. of Baseline) Sanitary Sewer & Watermain Construction	8,000	Completed
Bulk ICD / Floatables (Trap installation in downtown core)	3,550	Completed
Moodie Dr. and Robertson Rd Intersection Modification	16,122	Completed
Reconstruction of Meadowlands Dr. (Inverness to Tiverton) Phase III	16,200	Substantial Completion
Total Budget Value	174,680	

The projects listed in Table 1 are in various stages of the project delivery process. Some of them are in preliminary design, others are in detail design, and others are completed or substantially completed in 2013. No projects from Design and Construction Buildings and Parks were selected for review because only two of them fit the criteria. There was no indication of budget concerns for these two projects.

The findings relating to these projects are summarized below by Audit Objective.

Audit Objective No. 1 - Compliance with applicable Federal and Provincial Guidelines and Regulations

The ISD operates with due compliance with the Federal and Provincial guidelines and regulations that directly pertain to its activities.

Although we did not exhaustively examine the 20 projects for compliance in this regard, our review of the 20 projects confirmed that ISD carries out project delivery in general compliance with these guidelines and regulations.

The program for Structure Inspection and Renewal and for Watermain and Sewer inspections is managed by Asset Management branch (AMB). As part of the Comprehensive Asset Management Program, the City determined the status of the infrastructure and its condition in 2012.

Review of the methodology used to determine the condition of the infrastructure showed that it was being performed in a rational way. The methodology used to establish the condition rating of bridges and bridge-culverts, buildings, and parks is well established

and is relatively straightforward to apply, since in most cases the infrastructure can be readily inspected and its condition assessed consistent with industry standards. For watermains and sewers direct inspections are more difficult and costly, since in many cases the infrastructure needs to be taken out of service to inspect it and they are not readily visible. Review of the methodology used to establish the condition and inspection needs for watermains and sewers shows that it followed a rational measurable process, based on various proxy indicators (for example, age, material, soils, etc.). The City has indicated that they will improve the methodology used for watermains and sewers as more information becomes available from the condition of watermains and sewers as they are replaced. The processes are consistent with current standards.

Audit Objective No. 2 - Compliance with the objectives of the Comprehensive Asset Management Program set by the City.

The Comprehensive Asset Management (CAM) Program was approved by Council in October 2012, including the CAM Policy, the State of the Asset Report, and the CAM Strategy.

The CAM Framework used to develop the CAM Program and Policy requires that the City undertakes Demand Management, Lifecycle Management, and Financial Management programs, culminating in Asset Management Plans for all departments.

Since the CAM Program and Policy were approved by Council, the City has completed the Infrastructure Master Plan and the Transportation Master Plan. In both instances, the components of the plan have been developed taking into account the principles of the CAM Policy.

At present the CAM Strategy is being implemented, as such not all Departmental Asset Management Plans are yet complete. Furthermore, the Levels of Service to be established as per the CAM Strategy are also not complete.

The last report on the CAM Program was provided in October 2012. ISD indicated at the time that an update would be provided at the same time as the refresh to the Long Range Financial Plan (LRFP) so that the CAM report would provide the basis for the LRFP update. As such, no updated CAM Program was given to Council in 2013 because the City was still working on the LRFP.

Audit Objective No. 3 - Structure of ISD within the City in Terms of Responsibilities

The Infrastructure Services department (ISD) is responsible for Asset Management and for Design and Construction, including new infrastructure required to accommodate

growth, the infrastructure and transportation master plans, and renewal of the existing infrastructure. The examination of the responsibilities of ISD and other departments found little chance of duplication of responsibilities.

The mandate and scope of responsibilities of ISD is not duplicated in other departments within the City. ISD makes a significant effort to communicate within it and with other City departments. The involvement of ISD representatives in committees and task forces composed of staff from ISD and other departments indicates that the level of communication at manager and program manager level is such that duplication of responsibilities appears unlikely.

An aspect of this audit was to determine whether duplication of responsibilities could be eliminated. Review of the information provided by the City and interviews with staff did not show that there are any gaps in responsibilities.

Audit Objective No. 4 - The Process and Methodologies Used for Selection of Consultants and Contractors

The Project Delivery Manual and Appendices (PDM) prepared by ISD contain specific procedures and documentation to make sure that all procurement of services and construction is carried out with the full knowledge of, and based on standards set by, the Supply branch.

The process used to select consultants is based on the estimated cost of the services required. If the cost is below the dollar amount threshold, the ISD Project Manager selects one consultant from a roster of consultants who have been pre-qualified using a Request for Standing Offer process, directed by Supply branch. The City indicated that in May 2012 the cost of services threshold for Engineering Services was raised to \$250,000 from \$150,000. The Purchasing By-law states that the limit is \$150,000 and that Supply branch can authorize exceptions, which it did in this case.

Table 2 summarizes the number of projects (assignments) where the consultants were selected from the Standing Offer, the number of projects that exceeded the threshold at completion of the project and the corresponding value of the services.

Table 2: Number of Standing Offer Assignments Exceeding \$250,000 Threshold

Year	Number of Contracts Assigned (Issued) Using Standing Offer	Total Value of Consulting Services Standing Offer	Number of Assignments	Total Fee Value	Percentage of Total Value of Consulting Services Standing Offer
2012	336	\$ 22,863,662	5	\$2,221,302	9.7%
2013	340	\$ 18,500,504	3	\$933,926	5.0%

The “Number of Contracts Assigned Using Standing Offer” column includes amendments which are not considered new contracts. The total number of new contracts was 248 in 2012 and 232 in 2013.

The “Total Value of Consulting Services Standing Offer” and “Percentage of Total Value of Consulting Services Standing Offer” columns include call ups made by ISD against two separate standing offers - Professional Engineering Services and Infrastructure Design Services, which includes professional engineering and architectural services.

The total value (including Standing Offer contracts) of professional and consulting services for ISD (including amendments each year) were:

Table 3: Total Value of Professional and Consulting Services for ISD (including amendments)

Year	Number of Contracts Awarded including RFP and Standing Offer	Total Value of Professional and Consulting Services	Number of Contracts Assigned (Issued) Using Standing Offer	Total Value of Consulting Services Standing Offer	Percentage of Value Awarded Using Standing Offer
2012	443	\$53,469,101	336	\$22,863,662	43%
2013	488	\$55,652,525	340	\$18,500,504	33%

The “Number of Contracts Awarded including RFP and Standing Offer” column includes amendments which are not considered separate contract awards.

The total value of contracts for professional and consulting services awarded using the Standing Offer represent an average of 37% of the total value of consulting services for 2012 and 2013.

The City indicated that the intention is to use the \$250,000 as the threshold for services that included design and contract administration services. However, some ISD project managers enter into a standing offer contract for design only (under the threshold) and then amend the contract at a later date to include the contract administration component. These amendments increase the dollar value of the contracts over the threshold. In effect, the Standing Offer was used for projects that should have been procured using a Request for Proposal, not the Standing Offer process. This contravenes the intent of the Purchasing By-law. Had the RFP process been followed, a greater emphasis on the price component of the proposals would have resulted, with added assurance that the City was receiving best value.

Selecting one consultant only for each assignment processed under the terms of the Standing Offer removes price competition from the process at that point, since Standing Offer assignments are awarded at rates approved when the consultant’s Standing Offer was accepted by the City. Requesting quotations under the Standing Offer from two or three consultants is expected to have a significant effect on the cost of consulting services. The procurement process should be modified to require more than one quotation.

The potential for savings in the use of Standing Offers is consistent with our findings in the 2005 Audit of the Procurement Process. That audit found that there should be better management of Standing Offers with a greater emphasis on price. This was still the case in 2009 when the follow-up to the 2005 audit was completed. The 2009 follow-up audit found that in the issuance of the Standing Offers for engineering services, there was no real ranking to reflect best value and call-ups were not being made in relation to price.

For projects costing more than the dollar threshold for Standing Offer selection, ISD prepares a Terms of Reference, and the Supply branch issues a Request for Qualifications and/or a Request for Proposals, as the case may merit. Evaluation of the proposals and selection of the consultant based on this method is done under the direction and supervision of Supply branch.

For Standing Offers call-ups, the Project Manager provides the consultant with Scoping Documents and other documentation that allows the consultant to provide a proposal. The Terms of Reference for consultant selection are prepared by the Project Manager for both Requests for Quotations and Requests for Proposals. Only if the project is unusual or high profile does the Program Manager review the Terms of Reference. In our opinion, the Program Manager should routinely review the Terms of Reference. If that had been the case in the Standing Offer contracts noted above, several of them might have been procured using an RFP potentially resulting in cost savings.

The City has indicated that call-ups valued at greater than \$100,000 are reviewed and recommended for approval by Supply and the General Manager, ISD to the Deputy City Manager, Planning and Infrastructure. Call-ups less than \$100,000 are approved by Supply on behalf of the General Manager, ISD.

During the review of files it was noted that in one project the City's project manager, who was responsible for the selection of the supplier from the Standing Offer and approval of the project budget, left the City's employment approximately two months after letting the contract. The former City employee then went to work for the supplier as its project manager on the same project. This is a potential conflict of interest. The value of the consulting services contract was \$304,000 and the total budget for this project is \$3.55 Million.

Although the supplier did not seek formal authorization from the City for this individual to work on the project; the City was aware of the situation and accepted it. Although the City requires in Requests for Qualifications and Requests for Proposals that suppliers disclose and resolve to the satisfaction of the City any potential conflicts of interest, the City procedures for Standing Offer call-ups do not require formal notification of potential conflict of interest; however, they should be amended to require formal notification.

For the construction phase of the projects, the ISD Project Manager supervises the preparation of the construction drawings and the corresponding specifications and special provisions. Once the design documentation is complete and it has received approval of the client department, the ISD Project Manager transmits the documentation to Supply branch, who then takes the project through the tender process, receipt of bids, evaluation of bids, assessment of contractor references, and award of contract. The ISD Project Manager is involved in the bid evaluation process. In the files examined during this audit there was an appropriate bidding process.

Table 4 summarizes the total value of construction contracts for ISD (including amendments each year):

Table 4: Total Value of Construction Contracts for ISD (including amendments)

Year	Number of Construction Contracts Awarded	Total Value of Contracts
2012	538	\$321,471,187
2013	502	\$271,833,785

Audit Objective No. 5 - The Effectiveness of Program Management and Project Monitoring

ISD reports on project budget and schedule status using Project Status Update (PSU) reports which are issued monthly by each Project Manager. These reports are intended to inform the Program Managers, branch Managers and General Managers of the project status. PSUs are also issued to councillors every month.

The PSUs are part the City's Program Management and Project Monitoring regime. In 2006 the Infrastructure Services department prepared a Project Management Manual (PMM001) which was used until 2012 by the City for the delivery of projects. The manual was updated in 2012 and was rolled out in the Spring of 2013, titled the Project Delivery Manual (PDM). The PDM provides an overview of the basic project management delivery concepts that guide project management for the Infrastructure Services department at the City. The manual supports all ISD staff in the delivery of capital projects. It is also a reference for those departments who receive capital project delivery services from ISD.

The PDM provides detailed step-by-step direction to the ISD Design and Construction branches for the delivery of projects, including sample documentation for the various tasks that Project Managers must execute. The processes encompass the range of projects that are undertaken by ISD and are sufficiently detailed to enable the branch Manager to confirm that the Program Managers and Project Managers are delivering their responsibilities. However, our review of the 20 project files listed in Table 1 indicates that while processes are in place, they are not being consistently followed (see Tables 5 and 6 below).

Training documents provided by ISD show that introductory sessions were presented to ISD staff in 2012. The PDM was also provided to consultants working for the City at that time. However, it is not referenced in the Terms of Reference that form part of the procurement process, and therefore its use is not a formal requirement for consultants.

The PDM should be referenced in the Terms of Reference as a requirement to be followed by consultants.

Twenty projects were examined to determine the extent to which the PMM001 and PDM were applied by City Project Managers. Some of the projects selected started when the PMM001 was in force, but were completed in 2013, when the PDM was in force.

From the requirements of the PMM001 and PDM manuals, the key aspects listed in Table 5 were examined for all projects.

Table 5: PMM001/PDM Requirements Reviewed

Item No.	Item	Description
1.	Project scoping report or project intake form	Document that describes the project scope, work plan, project schedule, budget and cash flow.
2.	Project schedule prepared by project manager	The Project Manager (PM) prepares a Project Task Breakdown and a Project Schedule. In most cases, as discussed below, the PM relies on the project schedules prepared by the consultant and the contractor.
3.	Project budget, cash flow and invoice approvals	The PM determines cost estimates for the project budget, provides to the Program Manager at start of project and once a year a project cash flow; reviews and approves invoices from suppliers.
4.	Monthly project review and reporting	The PM is required to submit monthly reports to the Program Manager.
5.	Project team initiation meeting	Meeting with internal and external project teams.
6.	Consultant selection process data	Information on how the consultant was selected (Standing Offer selection, Request for Qualifications, Request for Proposal).
7.	Preliminary design documentation	Preliminary design report and drawings
8.	External stakeholder meetings	Meeting with stakeholders (defined as those who have interest in the project, e.g. BIA, NCC, Community Associations, etc.)

Item No.	Item	Description
9.	Update scope, budget and schedule	Upon completion of preliminary design, PM to update the project scope, budget and schedule, if necessary. Inform the Program Manager or Manager of the changes.
10.	Preliminary design review	The PM to review the preliminary design, modify as necessary to meet requirements.
11.	Public communications	Consult with Ward Councillor to determine if public notification or meeting is required.
12.	Sign-off for approval to proceed to detail design (not required for smaller projects)	PM to secure sign-off from program manager and client representative, using form. Sign-off is not required in clearly defined municipal rehabilitation or structure renewal projects.
13.	Review at 50% and 75% value points	Review work progress vs. fees paid and ability to complete with remaining fees. This is not a requirement in the PDM.
14.	Invoice and fee status summary	Maintaining and updating of invoice and fee status summary
15.	Consultant appraisal for each completed assignment	For projects greater than \$500,000, complete appraisal at end of each phase.
16.	Detail design Terms of Reference (ToR), scope, budget, schedule	PM confirm project scope, prepare terms of reference, update budget and schedule.
17.	Review of detail design	Formal review of detail design
18.	Utility circulations	PM requests an Utility circulation
19.	Approvals submissions	PM prepares applications and documents for approvals.
20.	Public notifications	PM to arrange a public notification or public meeting for the detail design.
21.	Detail design review	Review detail design based on results of utility circulations and public meeting.
22.	Design approval form	PM to secure sign-off using form.
23.	Contract tender package	Contract tender package to be prepared consistent with City's standards.
24.	Bid analysis	PM to review bids, do a tender bid comparison.

Item No.	Item	Description
25.	Commence work order	Letter authorizing the contractor to start work upon notification from Supply branch that all contract requirements are met.
26.	Pre-construction inspections	Photos, video of site, video inspections of existing buildings, seismic monitoring, noise and air quality monitoring (if required).
27.	Preconstruction meeting	Meeting of PM, Contractor, Consultant, and stakeholders.
28.	Updated status/schedule and final cost forecast	PM to provide an updated status report to Program Manager, including a Final Forecast cost.
29.	Weekly site visits	PM to visit the site weekly, normally with the inspector.
30.	Payment certificates	PM to issue payment certificates on a regular basis.
31.	Change orders and documentation	PM to manage changes to the contract, including requests for changes in the work and extra work, and approval of change orders up to the limits set by management.
32.	Quality assurance testing	PM to arrange for and review quality assurance testing
33.	Inform the division manager if significant budget variations are expected.	Self-explanatory.
34.	Project management reports – monthly project review and reporting	Before the Project Status Reports were instituted, this was done using Appendix D3 of the PMM001.
35.	Contractor performance appraisal	Complete form at end of contract
36.	Project close-out documentation and report	PM to review the project with the aim to determine potential improvements for future projects. PM to review the project file and ensure that all the required documentation is included.

Table 6 summarizes the findings for the 20 projects reviewed.

It is noted that in the initial review of the project files the results of the application of the requirements of the PDM was far from acceptable. For several requirements the level of compliance was quite low. It was acknowledged that in some cases the results are due to the files reviewed not being complete since some of the projects were on-going; therefore, during the audit the City was provided in both cases with a second opportunity for the project managers to complete the file documentation. Where additional information was provided it was included in the evaluation. During the fact verification phase of the audit the City provided the information that was missing from the files, resulting in the outcome in Table 6.

Table 6: Summary of Findings from Project Reviews – 20 Projects reviewed

Item No.	PMM001/PDM Requirement	No. of Compliant Projects	No. of Applicable Projects	Compliance (Based on Applicable Projects)
1.	Project scoping report or project intake form	20	20	100%
2.	Project schedule prepared by project manager	20	20	100%
3.	Project budget, cash flow and invoice approvals	20	20	100%
4.	Monthly project review and reporting	20	20	100%
5.	Project team initiation meeting	19	20	95%
6.	Consultant selection process data	20	20	100%
7.	Preliminary design documentation	19	19	100%
8.	External stakeholder meetings	17	18	94%
9.	Update scope, budget and schedule	19	19	100%
10.	Preliminary design review	18	19	95%
11.	Public communications	15	16	94%
12.	Sign-off for approval to proceed to detail design (not required for smaller projects)	11	15	73%
13.	Review at 50% and 75% value points	14	18	78%
14.	Invoice and status summary	18	18	100%
15.	Consultant appraisal for each completed assignment	4	8	50%
16.	Detail design ToR, scope, budget, schedule	18	18	100%
17.	Review of detail design	18	18	100%
18.	Utility circulations	18	18	100%
19.	Approvals submissions	15	15	100%
20.	Public notifications	15	15	100%
21.	Detail design review	17	17	100%
22.	Design approval form	12	15	80%
23.	Contract tender package	18	18	100%

Item No.	PMM001/PDM Requirement	No. of Compliant Projects	No. of Applicable Projects	Compliance (Based on Applicable Projects)
24.	Bid analysis	17	17	100%
25.	Commence work order	16	17	94%
26.	Pre-construction inspections	15	15	100%
27.	Preconstruction meeting	15	15	100%
28.	Updated status/schedule and final cost forecast – monthly	15	15	100%
29.	Weekly site visits	15	15	100%
30.	Payment certificates	15	15	100%
31.	Change orders and documentation	14	14	100%
32.	Quality assurance testing	14	14	100%
33.	Inform the division manager if significant budget variations are expected.	12	13	92%
34.	Project management reports – monthly project review and reporting	15	15	100%
35.	Contractor performance appraisal	2	4	50%
36.	Project close-out documentation and report	5	5	100%

Note: Applicable Projects are those that had advanced sufficiently to have the requirement applicable to them.

Table 7 below provides further information of the findings with respect to PDM compliance (summarized in Table 6 above) that have percentage of compliance lower than 100%.

Table 7: Discussion of PMM001/PDM Requirement with Compliance < 100%

Item No.	PMM001/PDM Requirement	% Compliance	Discussion
5.	Project team initiation meeting	95%	The initiation meeting is an opportunity for the project team to meet and to discuss issues and concerns, obtain clarification on issues and requirements.
8.	External stakeholder meetings	94%	These meetings assist in communicating the project to the stakeholders and in understanding stakeholder issues and concerns.
10.	Preliminary design review	95%	The preliminary design sets the overall configuration of the project. A formal design review helps to identify and disclose any issues.
11.	Public communications	94%	Some communications are at the Councillor's discretion; the direction given by the Councillor should be recorded fully.
12.	Sign-off for approval to proceed to detail design (not required for smaller projects)	73%	Should be completed to ensure that the Client department has agreed explicitly to the preliminary design concepts.
13.	Review at 50% and 75% value points	78%	This is a formal step that is not being completed explicitly. It should be done formally to confirm that there is sufficient budget left to complete the work remaining The preliminary design review sets the overall configuration of the project. A formal design review helps disclose any issues.

Item No.	PMM001/PDM Requirement	% Compliance	Discussion
15.	Consultant appraisal for each completed assignment	50%	The consultant appraisal provides a record for other PMs to use when selecting consultants.
22.	Design approval form	80%	The PM is required to secure sign-off from the Client and others prior to proceeding to tender.
25.	Commence work order	94%	The CWO is issued after Supply confirms that the contract requirements have been met; it is a milestone that clearly records the project start date.
33.	Inform the division manager if significant budget variations are expected.	92%	This is partially covered by PSU. A copy of the PSU should be kept in the file.
35.	Contractor performance appraisal	50%	This is important for reference by other PMs

Budget Control

Budget control requirements have good compliance. The requirement to review the budget and schedule at the 50% and 75% value points in relation to the deliverables was a requirement of the 2006 Project Manager Manual, but not the current Project Delivery Manual. It was listed as it was a requirement when the project started. There is a compliance rate of 78% compliance. ISD has indicated that the use of the Project Status Updates provides a tool for project managers and program managers to be aware of the status of the budget and schedule throughout the project, rather than at two finite points during project development.

The review of budget at 50% and 75% value points helps the PM review the fees paid vs the deliverables and work completed, and to take corrective action if necessary to make sure that the budget is not exceeded.

The current reporting tool is the PSU. However, the PSU does not necessarily provide the detail information the PM needs to review the status of expenditures vs. budget and project progress including status of deliverables.

The PSU is intended for overall status updates. Financial status, budgets and expenditures are recorded in the City SAP system, which is the source of budget and expenditure data. Management noted that Project Managers, Program Managers and Managers do monitor and control project budgets on a regular basis through a variety of mechanisms. Managers check SAP, Ozone or have regular discussions with the Financial Services unit (FSU) to review and monitor financial data.

Project Schedule

Project Managers are using project design schedules provided by the consultants and construction schedules prepared by contractors.

Requirement No. 13 provides the PM with a milestone that lets them review the overall project schedule and budget to take any corrective action, and should be done consistently by all project managers. However, this is no longer a requirement of the Project Delivery Manual.

Communications

Communications within the Project Team and external stakeholders and the public have good compliance. Items No. 5, 8 and 11 have the potential for some improvements to bring the items to 100% compliance.

Project Reviews

The low compliance rate for required formal sign-offs, such as at completion of preliminary design and detail design could result in misunderstandings with respect to scope and acceptability of the solutions to the client, leading to potential cost overruns and delays.

Although there is evidence that the projects are being reviewed during preliminary design and detail design, the formal sign-off should serve as a clear notification to the Client and the program managers and managers that the project is moving to the next phase.

Quality Assurance

Discussions with Managers and Program Managers showed that the selection and assignment of Project Managers is based on workloads and the competencies of the Project Managers. However, ISD does not maintain a database of the skills, experience and specialized training of the program and project managers. This means that the Branch Manager does not have the means to confirm that the Program Manager and the Project Manager selected for a given project are indeed the most suitable. A database of program manager and project manager training and experience would be

useful in assigning the most appropriate project manager. We estimate that approximately 50 staff would be put into such a database.

The PDM contains a number of milestones where the projects are to be reviewed by Program Managers, the Branch Manager, the General Manager, and the client (i.e. the originating department or branch such as Real Estate or Environmental Services). We found that the required reviews are occurring consistently, but in some cases they are not being documented properly. The PDM requires two formal sign-off instances and provides forms to record the formal sign-off to be completed prior to proceeding to detail design and prior to proceeding to tender. Although there is evidence in the files that the project managers are following a process to obtain feedback from the Client and the Program Managers, the form is not being formally completed consistently.

Construction inspections are being undertaken by City inspectors or consultants, depending on the availability and the workload of City inspectors. The Project Delivery Manual states that inspections of work in specialties that are not within the ISD's core competencies must be assigned to a qualified engineering consultant. This direction is appropriate and prudent. This audit did not examine construction services or inspections, as they were audited in the 2012 Audit of Construction Supervision.

Consultant Appraisal and Contractor Appraisal forms for each completed assignment are not being completed consistently. ISD has explained that the forms at present do not have any effect on the evaluation of consultants and contractors for award of subsequent assignment or contracts. With the development of the supplier evaluation process with Supply branch, these forms will become an important component of the evaluation of suppliers for future projects.

Audit Objective No. 6 - The Control Systems Used for Delivery of the Projects within Budget and Schedule

Control of costs and schedules during the life of the project is the primary responsibility of the Project Manager, backed up and supervised by the Program Manager. Through its PDM, the City has provisions for the required steps to be taken during the project to control costs and maintain the schedule. For example, the PDM requires that the Project Manager submits a budget and cost forecast to the Financial Services unit every three months. We found however that there was no documentation in the files to confirm if this was done in any of the projects reviewed.

The PDM also requires that the financial situation of the projects be reported to the General Manager on a monthly basis. The reports that are being used to do this are the Project Status Update (PSU) reports. They are issued monthly by each Project Manager and are intended to inform the Program Managers, Branch Managers and

General Managers of the project status. Until December 2013, the Branch Managers and the General Manager received a list of projects and the PSUs, but without a summary of the projects that had any concerns. Since then, they are also receiving a Dashboard sheet which summarizes at a glance the status of all the projects.

The PSUs are intended to help inform the corresponding councillors of the projects within their wards. However, review of the documentation provided to councillors showed that it consists of a table of PSUs and a link to a site in the City Council network where each councillor must navigate through the site to retrieve the required information. Councillors do not receive the Dashboard information that is provided to the General Manager. In the sample set of PSUs provided to Councillors the date of completion of the contract listed in the table was not the actual expected date of completion. In some cases, even though the project was known to be delayed, the City left the earlier contractual completion date in the PSU. The date shown in the PSU should be the most current estimate of the expected completion date.

Design process, standards, reviews, and control are well explained in the PDM, and are commensurate with standard process that would be used in design offices for project delivery. Similar conclusion applies to construction supervision, process, standards, reviews, and control.

The reported overall performance of delivery of the construction projects indicates that over 90% of the projects are tendered as scheduled. However, review of the twenty files showed that control of the schedule may be a reason for concern within ISD. Based on the review of the projects, we concluded that the processes are being followed in general terms. However, some of the projects have fallen substantially behind their original schedule and this has impacted the ability to implement them when planned.

Audit Objective No. 7 - The Processes and Methodologies Used for Control of Change Orders and Costs in Design and Construction.

Change orders are generally required to accommodate a change in field conditions relative to those expected in the design.

Approval of change orders in the City follows a specific procedure: Once the need for the change is confirmed, the Project Manager requests a formal cost estimate from the contractor. If the cost estimate is acceptable and the amount is below the Delegated Authority sum (generally the contingency allowance for the project), the Project Manager can authorize the change order. If the value of the change order exceeds the delegated authority level, the change orders must be reviewed by the Program Manager.

Recording of change orders is done by the Project Manager in the progress payment certificates. A record of all documentation pertinent to the change order is filed.

Program Managers and managers have access to the change order data for a specific project. However, there is no centralized summary of change order amounts that summarizes the total sum of change orders per project that can be reviewed by the Managers and General Manager. Providing an overall summary of the original contract value and the change order total for each active project would allow the General Manager to review the overall health of the projects by using a dashboard. The procedure should be modified to provide the Branch Manager and the General Manager with a monthly summary of change orders to allow them to monitor and review the change orders.

At present, the Project Manager has authority to approve change orders up to the value of the project contingency, except that change orders with a value of \$25,000 or more must be approved by the Program Manager. There is no upper limit to the Program Manager authority, unless the project contingency is exceeded.

Audit Objective No. 8 - Identify Areas of Potential Savings for the City in the Technical Management and Operations of ISD

Review of the technical management and operations of ISD revealed the following opportunities for Potential Savings:

Selection of consultants from the Standing Offer should be modified to require obtaining submissions from three suppliers. If the cost of services procured by the Standing Offer is reduced by 5% based on cost competition, the City could save roughly \$1.0 million per year.

In cases where the initial RFP for services included only design and tender services, any subsequent contracts or amendments for contract administration services should be subject to requesting proposals from at least three suppliers. In two of the projects we reviewed, the value of contract administration services totalled roughly \$1.0 million. These contracts were awarded essentially as sole source contracts to the suppliers that were originally selected to provide design and tender services.

The City could undertake a review to determine if there could be cost savings by adding construction supervisors and inspectors to undertake contract administration and inspection of a larger proportion of projects, in lieu of consultants. This would apply to bridges, roads, watermains, and sewers. However, there is not sufficient data at present to enable this audit to quantify any potential savings from this recommendation.

Recommendations and Management Responses

Recommendation 1

That the City complete the service based Asset Management Plans and Levels of Service as soon as possible.

Management Response

Management agrees with this recommendation.

As part of the City's draft 2015-2018 Strategic Priorities, advancing the Comprehensive Asset Management (CAM) Program has been identified as a Term of Council priority. This includes undertaking Service-Based Asset Management Plans and Levels of Service for all service areas by the end of Q4 2018.

Recommendation 2

That for the hiring of consultants the City modify its procedures and/or the contract terms and conditions to include wording that the hourly, per diem or other unit rates offered by the proponent for call-ups greater than \$150,000, the hourly, per diem or other unit rates will be discounted by a minimum of ten percent (10%).

Management Response

Management agrees with the recommendation. Finance department/Supply branch will revise the standing offer effective Q2 2016.

Recommendation 3

That ISD ensure that the procurement process for consultants includes the requirement that the Project Delivery Manual be followed.

Management Response

Management agrees with this recommendation.

ISD, in consultation with Finance department/Supply branch, will amend the procurement process to emphasize the requirement for consultants to follow the department's policies, procedures and guidelines that relate to ISD project delivery.

This will be completed by Q4 2015.

Recommendation 4

That ISD ensure that the requirements of the Project Delivery Manual are being completed.

Management Response

Management agrees with this recommendation.

Through the department's Integrated Departmental Management Plan (IDMP) Program, there will be a continued effort to enhance compliance with the requirements of the Project Delivery Manual (PDM). The PDM will be going through another significant update by Q2 2017.

Recommendation 5

That ISD develop and maintain a database of training, skills and experience for the program managers and project managers.

Management Response

Management agrees with this recommendation.

ISD will continue to leverage SAP as the database for training. Through the Competency Development Project as part of the department's Integrated Departmental Management Plan (IDMP) Program, processes will be enhanced to track skills and experience of project delivery staff. The Competency Development Project will be completed by Q2 2017.

Recommendation 6

That the City arrange for the Project Status Update and Dashboard to be provided to Councillors on a monthly basis, highlighting any areas of concern.

Management Response

Management agrees with this recommendation.

Project status updates have been provided monthly to councillors since Q2 2012. The dashboard document was originally used as an internal management tool. The project status update will be amended to highlight any areas of concern currently contained in the dashboard by Q2 2016.

In addition, there is greater oversight by Executive Committee (EC) due to the requirements under the 'Project Status Report for EC' to report on a quarterly basis.

Recommendation 7

That the City modify the project control system to permit the General Manager and the Managers to obtain summaries at department and branch level of all the change orders and their potential impact on project budgets.

Management Response

Management agrees with this recommendation.

Project controls will be amended in SAP to enhance the ability of the General Manager and Managers to obtain summaries of project change orders. The amendments will be completed by Q4 2015.

Recommendation 8

That the City undertake an evaluation of the potential cost savings of increasing the inspection staff to meet City needs for inspections, in lieu of using consulting firm staff.

Management Response

Management agrees with this recommendation.

In 2008, ISD completed a Competitive Service Delivery Review (CSDR). This review has guided the department in terms of services most effectively delivered by internal staff versus external consultants. The CSDR will be refreshed by Q4 2018 after completion of the department's Integrated Departmental Management Plan Project.

Potential Savings

Engineering service contracts have been in the range of \$7 to \$10 million annually. The modifications to the procedures and/or the contract terms requiring a reduction of 10% on the rates will deliver a saving of around \$350,000 annually. There may be further opportunities for savings by revising the application of the Standing Offer limits, by requiring proposals for contract administration services when the estimated cost exceeds the Standing Offer limits, and by using more in-house construction inspectors.

Conclusion

The City's Infrastructure Services department has in place the project management and construction inspection processes required to deliver the services required of the department. However, review of sample files disclosed that those processes are not being applied consistently by all project managers. There are specific areas that require further attention of management. These include project schedule, budget control, communications, quality assurance and project reviews. Other issues were identified in previous audits, namely responsibility for redesign costs, recovery of change orders due to errors, exercising of contract liquidated damages, project oversight and others.

Acknowledgement

We wish to express our appreciation for the cooperation and assistance afforded the audit team by management.

The following section is the detailed audit report.

Detailed Audit Report

Introduction

The Audit of the Infrastructure Services department was included in the 2013 Audit Plan of the Office of the Auditor General and approved by Council on October 12, 2012. The audit was conducted in two distinct streams – the audit of the technical management of ISD, and the audit of the administrative management of ISD. This is the detailed report of the audit of the technical management of ISD.

Background

The Infrastructure Services department (ISD) is responsible for asset management of the City’s roads, sidewalks, sewers, watermains, bridges, culverts, buildings, parks and other structures. It is also responsible for the design, construction and administration of the works required for new construction and the rehabilitation and renewal of:

- The City’s infrastructure (described above)
- Transit facilities
- Pumping stations, water reservoirs and elevated tanks
- Sewage and water treatment facilities
- Stormwater management facilities
- Solid waste facilities.

The following table summarizes the infrastructure currently owned by the City:

Table 8: Infrastructure Currently Owned by the City

Infrastructure Type	Description	Quantity	Unit
Buildings	Buildings 40 years and older	93	each
Buildings	Buildings less than 40 years old	890	each
Buildings	Buildings with large span roofs (included in above inventory numbers)	87	each
Parks	Property elements	3,348	each
Parks	Play structures	716	each

Infrastructure Type	Description	Quantity	Unit
Bridges and Bridge-Culverts	Span between 3m and under 6m	317	each
Bridge and Bridge-Culverts	Span greater or equal to 6m	507	each
Culverts	Medium culverts in sizes 1m to under 3m	1220	each
Culverts	Small culverts in sizes under 1m	4511	each
Noise Barriers		398	each
Gateway/Entrance Features		317	each
Retaining Walls		283	each
Watermains	Distribution mains (diameter less than 600mm)	2691.1	km
Watermains	Transmission mains (diameter equal to or greater than 600 mm)	216.6	km
Sewers	Sanitary Collection Sewers	2,284.6	km
Sewers	Sanitary Trunk Sewers	310.7	km
Sewers	Combined Collection Sewers	104.4	km
Sewers	Combined Trunk Sewers	10.6	km
Sewers	Storm Collection Sewers	2,423.0	km
Sewers	Storm Trunk Sewers	166.0	km
Paved Roads	OR174 (freeway)	40.7	km
Paved Roads	Arterials	1434.4	km
Paved Roads	Major Collectors	126.6	km

Infrastructure Type	Description	Quantity	Unit
Paved Roads	Collectors	1235.9	km
Paved Roads	Local	2186.0	km
Paved Roads	Lanes	11.9	km
Paved Roads	Transitway	80.3	km
Gravel Roads		591	km
Park and Ride Lots		12	km
Guide rails		2,210	km
Sidewalks and Pathways	Sidewalks	1930.0	km
Sidewalks and Pathways	Pathways	498.0	km

The total value of the City's infrastructure, based on asset replacement value as presented in The State of the Asset report (part of the Comprehensive Asset Management Program) is \$32.8 Billion in 2012 dollars.

The current functions of the ISD are separated into the following branches:

- Asset Management – planning of infrastructure works, including renewal and coordination of capital projects identified by client departments
- Design and Construction: East, West and Buildings and Parks – implementation of renewal work and new infrastructure
- Business and Technical Support – Right Of Way Information and Approvals, Surveys & Mapping, Standards and Contract services, Quality Assurance, Business Support

Scope

The scope of the Audit comprised the Infrastructure Services department's technical management. The scope of the audit did not include an exhaustive examination of all aspects of the operation of ISD. The Audit examined ISD technical processes in light of the responsibilities that it must deliver for the City.

Issues related to ISD were identified in previous audits, namely responsibility for redesign costs, recovery of change orders due to errors, exercising of contract

liquidated damages, project oversight and others. This audit did specifically follow-up on the status of recommendations made in these audits. The audit also did not compare the costs of renewal work to the costs being paid by other municipalities in Ontario.

Objectives

On the basis of the information gathered during the preliminary assessment, and the corresponding analysis of that information, the scope of the audit was synthesized in the Audit Objectives. The Criteria attached to each Audit Objective explain the scope of the review. The Audit Objectives and Criteria were presented in the Audit Plan, which was reviewed by the City.

Audit Objective No. 1 – Compliance with applicable Federal and Provincial Guidelines and Regulations

Criteria:

- Confirmation of compliance with the various Provincial and Federal requirements (e.g. Public Transportation and Highway Improvement Act, Municipal Act, Capital Investment Plan Act, Fish and Wildlife Conservation Act, Planning Act, Public Lands Act, Environmental Protection Act, Ontario Water Resources Act, Occupational Health and Safety Act, Environmental Assessment Act,
- Evaluation of the programs for Structure Inspections and Renewal, Watermain and Sewer Inspections

Audit Objective No. 2 – Compliance with the objectives of the Comprehensive Asset Management Program set by the City.

Criteria:

- Effectiveness of the Infrastructure inventories and inspections, design of renewal works, cost of renewal construction.
- Completeness of reporting of results to Committee and Council

Audit Objective No. 3 - Structure of ISD within the City in terms of responsibilities.

Criteria:

- Ensure there is no duplication of responsibilities with Planning and Growth Management, Drinking Water Services, and Drainage and Wastewater Services and other City departments

Audit Objective No. 4 - The process and methodologies used for selection of consultants and contractors

Criteria:

Ensure appropriate interaction with Supply branch

Adequacy and completeness of process for direct assignments, requests for quotation, requests for proposals, requests for tender

Audit Objective No. 5 - The effectiveness of program management and project monitoring

Criteria:

- Ensure appropriate processes for review and approvals of study report and designs
- Ensure adequate processes for construction inspections

Audit Objective No. 6 - The control systems used for delivery of the projects within budget and schedule

Criteria:

- Ensure appropriate program management
- Ensure Project Managers and Inspectors responsibilities and reporting are complete
- Adequate design process, standards, reviews, control
- Adequate construction supervision, process, standards, reviews, control

Audit Objective No. 7 - The processes and methodologies used for control of change orders and costs in design and construction.

Criteria:

- Evaluate process:
- Change order methods
- Approval of change orders
- Recording of change orders

Audit Objective No. 8 - Identify areas of potential savings for the City in the technical management and operations of ISD

Criteria:

- Determine if potential savings are possible through a more efficient and effective technical management and operation of ISD

Audit Approach

Review Legislative Framework

The audit began by reviewing the legislative framework for the scope of services and activities provided by the Infrastructure Services department. Legislation and regulations that pertain to the work done by ISD include the following:

- Occupational Health and Safety Act and Ontario Regulation 213/91 Construction Projects
- Construction Lien Act
- Ontario Building Code Act
- Ontario Water Resources Act
- Canadian Highway Bridge Design Code
- Public Transportation and Highway Improvement Act
- Municipal Act
- Highway Traffic Act
- Professional Engineers Act
- Architects Act
- Public Lands Act
- Environmental Assessment Act
- Environmental Protection Act
- Planning Act

Review Background Data

Background data available from the City was collected and reviewed. In general terms this included policies and procedures, standards, reports, design files, tender documents, bid analysis data, construction administration files, construction inspection data and quality assurance data.

Review City's Policies, Procedures, Standards and Practices

Pertinent City's policies, procedures, manuals, standards, and practices were examined and reviewed, including:

- Project Manager Procedures Manual, 2006
- Project Delivery Manual, 2013
- Inspection Manual for City's Construction Contracts, May 2003
- Standard Tender Documents for Unit Price Contracts, Volumes No. 1 and 2
- Learning and Training Policy
- Project Status Update Forms
- Project Intake forms

- Asset Inventory
- Structure Inspections and Renewal
- Watermain and Sewer Inspections
- Risk Assessment and Management

Review Industry Policies, Procedures, Standards and Practices

The City's Policies, Procedures, Standards, and Practices are similar to the policies, procedures, standards and practices used by other municipalities and ministries in Ontario.

- Standard Tender Documents
- Technical Bulletins
- ISD Contract Forms
- ISD Contract Administration Forms and Procedures
- Standard Drawings
- Project Delivery Manual
- Design Guidelines
- Accessibility Guidelines
- Provincial Standards and Guidelines
- Ontario Building Code
- Canadian Green Building Council
- Ontario Provincial Standards
- National Master Specifications
- Canadian Standards Association
- American Society of Heating, Refrigerating and Air-Conditioning Engineers
- Underwriters Laboratories of Canada
- Electrical Safety Authority
- Technical Standards & Safety Authority

Review Project Files

Obtain and review files for 20 selected projects for compliance to applicable policies, procedures and standards as listed in Table 9. The budget values in Table 9 are the overall budget values for each project, including budget adjustments, as provided by the Financial Services unit – Planning and Infrastructure.

Table 9: Projects Selected for Examination

Description	Budget (\$000s)	Status as of November 2013
Irving-Laurentian-Carling-Lynwood-Oakville	940	Project design underway since September 2013
Hurdman-St Laurent watermain relocation	24,808	Construction started August 2013.
Belfast (Trainyards - 120 m north)	600	Construction postponed to 2014 due to time of year
Olmstead (Jeanne Mance-McArthur)	400	Tendered Nov. 4, 2013, closing November 21, 2013. Construction was postponed to 2014 due to time of the year. This project originally was to be tendered in August 2013.
ORAP- combined sewer overflow storage	17,500	Project under design. Construction in 2017 will be coordinated with the 2017 sesquicentennial celebrations.
Acres pump station overflow	2,000	Tendered 10 October 2013. Originally scheduled for February 2013 tender, but delayed due to Environmental Services additional requirements.
Rideau river O-Train bridge	3,000	Project on hold since March/April 2013, due to risk of not being able to complete the work in the window allowed.
Chapman Mills station and park & ride	10,000	Substantial completion
Transitway Rehab. - East Transitway, St. Laurent Blvd. overpass Transitway & Transitway structures - East Transitway, St. Laurent Sta. Central & East tunnels	1,860	Completed
Bronson Ave., phase 1 (Laurier to Arlington) incl. Bronson Ave. emergency retaining wall repair (NE corner of Laurier)	30,000	Completed
Minto bridges (phase1)	2,200	Substantial completion

Description	Budget (\$000s)	Status as of November 2013
Rideau St. reconstruction phase 1 (Dalhousie to Chapel)	14,510	Substantial completion
Youville storm sewer lining & headwall	6,000	Completed
Holland Avenue watermain (Scott St to Tyndall St)	3,400	Completed
Clarendon Ave / Harmer Ave / Ruskin St / Inglewood PI – road, sewer and watermain renewal	10,590	Substantial completion
Champagne O-Train corridor multi-use pathway (PH1)	3,000	Completed
Woodroffe Ave (Hwy 417 to 170m N. of Baseline) sanitary sewer & watermain construction	8,000	Completed
Bulk ICD / Floatables (trap installation in downtown core)	3,550	Completed
Moodie Dr. and Robertson Rd intersection modification	16,122	Completed
Reconstruction of Meadowlands Dr. (Inverness to Tiverton) phase III	16,200	Substantial completion
Total Budget Value	174,680	

The projects listed in Table 9 are in various stages of the project delivery process. Some of them are in preliminary design, others are in detail design, and others are completed or substantially completed in 2013. No projects from Design and Construction Buildings and Parks were selected for review because only two of them fit the criteria. There was no indication of budget concerns for these two projects.

The review of the projects was carried out within the scope of this audit, which did not require a detail review of each file. Detailed reviews are programmed to take place in 2014, according to the Audit Plan approved by Council.

The Financial Services unit indicated that in 2012, ISD had 359 Municipal Capital Projects and 577 Buildings and Parks Capital Projects. The total 2012 Capital Project budget for ISD was \$497,880,000, with Budget Adjustments of \$52,192,000, for total Authority of \$550,072,000.

No projects from Design and Construction Buildings and Parks were selected for review because only two of them fit the criteria. There was no indication of budget concerns for these two projects.

Interviews

Interviews were held with ISD Branch Managers and Program Managers.

Findings and Recommendations

The results of the analysis and the findings of the audit are presented in this section. The discussion that follows is organized on the basis of the Audit Objectives presented in Section 1.3.

Audit Objective No. 1: Compliance with applicable Federal and Provincial Guidelines and Regulations

Criteria:

- Confirmation of compliance with the various Provincial and Federal requirements (e.g. Public Transportation and Highway Improvement Act, Municipal Act, Capital Investment Plan Act, Fish and Wildlife Conservation Act, Planning Act, Public Lands Act, Environmental Protection Act, Ontario Water Resources Act, Occupational Health and Safety Act, Environmental Assessment Act,
- Evaluation of the programs for structure inspections and renewal, watermain and sewer inspections

The ISD operates with due compliance with the Federal and Provincial guidelines and regulations that directly pertain to its activities. The following table summarizes the specific guidelines and regulations that pertain to ISD.

Table 10: Guidelines and Regulations

Infrastructure Services department	Guidelines / Regulations
Asset management program	Ministry of Infrastructure Municipal Asset Management Strategy

Infrastructure Services department	Guidelines / Regulations
	ISO 55000
Bridge inspections	Public Transportation and Highway Improvement Act, Ontario Regulation 104/97 as amended
Watermain and sewer inspections	There are no specific regulations Provincial Asset Management Strategy
Design & Construction	Accessibility for Ontarians with Disabilities Act Fisheries Act Environmental Assessment Act Ontario Water Resources Act Canadian Highway Bridge Design Code Ontario Building Code Ministry of Transportation Ontario Manuals and Guidelines Ministry of the Environment Manuals and Guidelines Ministry of Natural Resources Manuals and Guidelines Conservation Authorities Act Navigable Waters Protection Act Occupational Health and Safety Act Ontario Provincial Standards Species at Risk Act Geometric Design Standards Traffic Control Manual

Review of the 20 projects selected for examination, as described in Section 1.4, confirmed that ISD carries out project delivery in general compliance with these guidelines and regulations. We clarify that the projects were not examined exhaustively for compliance in this regard.

References, Guidelines and Standards that apply to the work of all ISD branches include the Project Delivery Manual, Standard Tender Documents, Technical Bulletins, ISD Contract Forms, ISD Contract Administration Forms and Procedures, Standard Drawings, Design Guidelines, Accessibility Guidelines, and Provincial Standards and Guidelines.

Standards and Regulations that apply to ISD include the Ontario Building Code, Canadian Green Building Council, Ontario Provincial Standards, National Master

Specifications, Canadian Standards Association, American Society of Heating, Refrigerating and Air Conditioning Engineers, Underwriters Laboratories of Canada, the Electrical Safety Authority, and the Technical Standards & Safety Authority.

This audit was focussed on the extent that the ISD follows the various references, guidelines, standards, regulations that apply for each project.

The Project Delivery Manual (PDM) provides an overview of the basic project management delivery concepts that guide project management for the Infrastructure Services department at the City. This audit reviewed the PDM and its application by ISD project managers.

ISD has a Standards unit that is responsible for development, implementation, and maintenance of standards, specifications, and design guidelines for design and construction of municipal infrastructure. This audit reviewed the process used for updating the ISD Standards and how ISD is undertaking the process. In general terms, the process is aimed at improving the ISD Standards based on the experience of the City staff, consultants, and contractors during the previous year. Each year, the Business and Technical Services branch, which is responsible for maintaining the Standards, contacts all users for feedback on the use of the current standards in the previous year; after receiving the feedback in this manner, the ISD Standards unit undertakes a review of the pertinent standards, holds meetings with the various users, and decides on whether to update the pertinent standard; the results are communicated to the change proponents; the changes are made if they are required.

The program for Structure Inspections and Renewal is managed by the Asset Management branch. Currently, structures are inspected in accordance with the regulatory requirements of Ontario Regulation 104/97 as amended. The City follows the requirements of the regulation. The City has implemented the recommendations of the 2008 Audit of the Bridge Maintenance Program. In the current audit, review of projects related to bridges was limited to verifying that the renewal process conformed to the regulation and the best practices established by the City.

Inspections of buildings, watermains, sanitary sewers and storm sewers are not covered by regulatory requirements. The City currently carries out condition assessments for the existing infrastructure in accordance with the following schedule.

Table 11: Condition Assessment Schedule

Asset Type	Condition Assessment Frequency
Buildings	<p>As of 2012, buildings 40 years and older that have not gone through a major renewal are assessed on a 5-year cycle using a Type 2 Audit. The frequency may be higher for buildings that have exceeded their service life when specific concerns have been identified.</p> <p>Remaining buildings are assessed on a 10-year cycle using a Type 2 Audit. The frequency may be higher for buildings where specific concerns have been identified.</p> <p>Structural Adequacy Reviews are performed once every 5 years.</p> <p>Designated Substance Reviews are conducted before all renewal work in buildings.</p> <p>The accessibility objective is to have over 90% of existing buildings audited by the end of 2014.</p>
Parks	<p>Property elements are inspected on a 3-year cycle.</p> <p>Play structures are inspected monthly.</p>
Bridges and bridge-culverts	<p>Road and pedestrian bridges are inspected once every 2 years. Frequency may be increased to 4 years if bridges are in good condition.</p> <p>For bridges over 30 years old or in poor condition the frequency is 6 years maximum between enhanced OSIM inspections.</p> <p>Railway structures are to be inspected every 1 to 2 years but not exceed 540 days.</p> <p>Unscheduled inspections are carried out in response to inquiries or where specific concerns are identified.</p> <p>Warranty Period Inspections are completed before the end of the warranty period for new bridges.</p>

Asset Type	Condition Assessment Frequency
Culverts	<p>As of 2012, medium culverts are on a 4-year inspection cycle, but it will take time to go through a full cycle. In the meantime a risk-based approach is used to prioritizing medium culverts to be inspected. The ongoing criticality assessment will provide guidance for frequency of inspections for medium culverts.</p> <p>Small culverts are inspected in advance of planned resurfacing and along OR174. The ongoing criticality assessment will also provide guidance for frequency of inspections for small culverts.</p> <p>Unscheduled inspections are carried out in response to inquiries or where specific concerns are identified.</p> <p>Warranty Period Inspections are completed before the end of the warranty period for new culverts.</p>
Noise barriers	Noise barriers are inspected in response to inquiries.
Gateway/ entrance features	Gateway Features are inspected in response to inquiries.
Retaining walls	<p>Retaining walls are inspected in response to inquiries or concerns. These would also be inspected as part of planned coordinated renewal projects.</p> <p>Rock faces are inspected in response to inquiry or concerns.</p> <p>Warranty Period Inspections are completed before the end of the warranty period for new retaining walls.</p>
Watermains	Inspections of more critical transmission mains are prioritized based on risk. Two to three large transmission mains are assessed per year out of 69. The physical inspections are coordinated by ESD.

Asset Type	Condition Assessment Frequency
Sewers	<p>The ongoing criticality assessment will provide guidance for frequency of inspections of sewers. Sewers are generally on a 16-year inspection cycle. Annually approximately 325 km of sewers are inspected, although this can vary from year to year. The following represents frequency of inspection in a typical year:</p> <p>Inspections on a neighbourhood by neighbourhood basis representing 3-5 contracts per year of 60 to 70 km each. The neighbourhoods are selected based on various factors, such as average pipe age, last inspection date, flood history, maintenance requirements and anticipated future coordinated needs.</p> <p>Inspections in support of coordinated capital programs representing approximately 50 km/year.</p> <p>Inspections related to emergency or flooding response representing approximately 20 km/year.</p> <p>Inspections for general condition assessments varies between 10 and 60 km/year)</p> <p>Trunk Level Inspections representing approximately 30 to 40 km/year</p> <p>Prior to applying the final lift of asphalt, the contractor is required to complete CCTV inspections on all sewers within the construction limits and the first length of existing sewer pipes outside the contract limits including cross streets for review and acceptance by the City's contract administrator.</p>
Paved roads	<p>Network level assessments are undertaken every 3 years on OR174, arterials and Transitway. All other paved roads are assessed every 5 years.</p>
Gravel roads	<p>Assessment undertaken every 5 years for roads ranked in top 100 as candidates for upgrading to a hard surface.</p>
Park and ride lots	<p>Assessment undertaken on an annual basis.</p>
Guiderails	<p>Assessment conducted in response to inquiries or as part of coordinated capital program.</p>

Asset Type	Condition Assessment Frequency
Sidewalks and pathways	Assessment undertaken every 5 years.

Audit Objective No. 2: Compliance with the objectives of the Comprehensive Asset Management Program set by the City.

Criteria:

- Effectiveness of the Infrastructure inventories and inspections, design of renewal works, cost of renewal construction.
- Completeness of reporting of results to Committee and Council

Asset Management

The Ontario Government requires since 2010 that municipalities have an asset management plan to qualify for provincial funding. In the case of the City of Ottawa, asset management has been ongoing practically since the City's amalgamation in 2001. Since its commencement with coordinated road-water-sewer renewals, the City has added bridges and transit infrastructure (2004) and buildings and parks (2009). The formal Asset Management group was initiated in 2006.

In October 2012, the Infrastructure Services department submitted to Council for approval the Comprehensive Asset Management (CAM) Program, which consists of a State of the Asset Report, the Comprehensive Asset Management Policy, and the Comprehensive Asset Management Strategy.

The Comprehensive Asset Management Policy states that the City shall use asset management practices in support of delivering services to its customers. The objectives of the CAM Policy are to:

- Deliver services at the approved levels of service
- Improve the accountability and transparency of decisions
- Consider the long term consequences of present day investment decisions
- Reduce life cycle costs while maintaining accepted levels of services demonstrating the link between investments and levels of service.

In addition to the State of the Asset Report, CAM Policy and CAM Strategy, the Long Range Financial Plans, the Customer Levels of Service and the Departmental Asset Management Plans complete the documentation required to apply the CAM Program and Policy. The Asset Management branch is responsible for the Comprehensive Asset Management Program and its delivery throughout the

City's departments. The CAM Program should help the City enhance the effectiveness of dollars spent on renewal works, given that the CAM Strategies and Plans will help in focussing renewal work on those assets that must be renewed to maintain the expected Levels of Service, based on the principles of CAM.

At present the CAM Strategy is being implemented, but not all the Departmental Asset Management Plans are complete. Furthermore, the Levels of Service are not complete.

Inventories and Inspections

The City maintains an inventory of the infrastructure assets in a number of databases. In the case of drinking water, sanitary and storm sewers and drainage infrastructure, the databases are shared with Environmental Services. Parks data is shared with the Parks department. In general terms, the databases are associated with a Geographical Information System.

Renewal needs assessments are based on the results of the conditions assessments. The asset management process requires that the condition of the asset be evaluated based on criticality and risk. The Comprehensive Asset Management Program was approved by Council in October 2012, including the CAM Policy, the State of the Asset Report, and the CAM Strategy. The CAM Framework used to develop the CAM Program and Policy requires that the City undertakes Demand Management, Lifecycle Management, and Financial Management programs, culminating in Asset Management Plans for all Departments.

Since the CAM Program and Policy were approved by Council, the City has completed the Infrastructure Master Plan and the Transportation Master Plan. In both instances, the components of the plan have been developed taking into account the principles of the CAM Policy.

As indicated above in the discussion of Audit Objective No. 1, the Asset Management branch has completed a thorough inventory of the City's existing infrastructure assets, based on inspections where feasible and on proxy assessment where direct inspections are not feasible. A proxy assessment is one where the current condition of an asset is estimated based on other known factors that are relevant to the condition, such as construction material, age, location, etc. Based on the methodology used to determine the condition rating of the assets, the City plans to continue to collect data on physical asset conditions to update the proxies used.

An example of the proxy method of assessment used is the watermain break that occurred in October 2013 on St. Joseph Blvd. near Tenth Line Road and on Innes Road. The initial break occurred on a pipe that was 40 years old and that had been selected for condition assessment as a result of its importance and age. The information collected from the break and the assessment of the pipes will be used in the future to refine the risk of breakage for watermains that are constructed of ductile iron pipe and that are between 30 and 40 years old.

Design of Renewal Works

The current procedures used by ISD to determine renewal needs take into account the principles and objectives of the CAM Program. Design of renewal works is based on an evaluation of alternative renewal options, taking into account life cycle costs, the importance of the asset and the risk of failure of the same. The procedure will be improved as more data on the condition of the renewed assets is confirmed during implementation of the renewal works. This is particularly important when undertaking renewal works on assets that cannot be readily inspected, such as watermains and sewers.

The design of renewal works is undertaken by ISD's Design and Construction Municipal (DCM-East and DCM-West) and Design and Construction Building and Parks (DCBP) branches. The Asset Management branch transfers the renewal projects to the DCM and DCBP branches via a Scoping Document that describes the asset in need of renewal, constraints, background data and preliminary schedule.

Based on the review of the projects examined in this audit, the project transfer process is occurring in a formal manner with a well-defined scope.

In the case of renewal of assets administered by Environmental Services (ES) or Drinking Water Services (DWS), renewal needs are being determined by AMB in conjunction with the ES and DWS. At the time that the project is transferred to DCM for execution, the project is accompanied by a Project Intake Form.

Cost of Renewal Construction

The cost of renewal construction is determined by the procurement processes in place at the City. Sections 4 to 7 of this report discuss the process and methodologies used for selection of consultants and contractors; the effectiveness of program management and project monitoring; the control systems used for delivery of the projects within budget and schedule; and the processes and methodologies used for control of change orders and costs in design and construction.

This audit did not review the cost of renewal work in comparison with costs being paid by other municipalities in Ontario.

Report to Council

The last report on the CAM Program was in October 2012. ISD indicated at that time that an update would be provided at the same time as the refresh to the Long Range Financial Plan so that the CAM report would provide the basis for the LRFP update. No update of the CAM Program was given to Council in 2013 because the City was still working on the LRFP update.

Recommendation 1

That the City complete the service based Asset Management Plans and Levels of Service as soon as possible.

Management Response

Management agrees with this recommendation.

As part of the City's draft 2015-2018 Strategic Priorities, advancing the Comprehensive Asset Management (CAM) Program has been identified as a Term of Council priority. This includes undertaking Service-Based Asset Management Plans and Levels of Service for all service areas by the end of Q4 2018.

Audit Objective No. 3: Structure of ISD within the City in terms of responsibilities

Criteria:

- Ensure there is no duplication of responsibilities with Planning and Development Approvals, Drinking Water Services, and Drainage and Wastewater Services and other City Departments

The Infrastructure Services Department is part of the Planning and Infrastructure Portfolio, and is responsible for the upkeep of all of the infrastructure owned by the City.

The Infrastructure Services Department (ISD) is part of the Planning and Infrastructure Portfolio, along with Planning and Growth Management department, Rail Implementation office, and the Real Estate Partnership & Development Office. The Planning and Infrastructure Portfolio reports to the City Manager. The City Operations Portfolio also reports to the City Manager, and is made up of Community and Social services department, Public Works department, Parks, Recreation & Cultural Services department, Human Resources department,

Emergency and Protective Services department, ServiceOttawa Department, Environmental Services department, and Transit Services department.

The mandate of the Infrastructure Services Department is to deliver effective and efficient survey, mapping, utility coordination, design, construction, and asset management services ensuring safe, accessible and sustainable municipal infrastructure.

The Infrastructure Services Department is responsible for maintaining approximately \$30 Billion of municipal infrastructure including roads, sidewalks, sewers and watermain systems, bridges, culverts, the Transitway, buildings and parks.

The Infrastructure Services Department is divided into five permanent branches, namely three Design & Construction branches, the Asset Management branch and the Business & Technical Services branch.

The Infrastructure Services Department (ISD) is organized to manage the existing City infrastructure and the delivery of infrastructure projects related to the City's infrastructure.

The Asset Management branch is the central depository of the City's infrastructure, in that it is charged with identifying and recording all infrastructure; assessing its condition by inspections and other methods; determining renewal needs; determining the priority for renewals and preparing the budget for undertaking the required renewal works. At present, the delivery of all infrastructure work emanating from renewal needs of all infrastructure and from growth requirements are managed by the Asset Management branch. Asset Management branch (AMB) is responsible for managing the inventory and optimizing the renewal of the City's municipal infrastructure assets (roads, sidewalks, sewers and watermain systems, bridges, culverts and the Transitway), buildings and parks. AMB initiates all municipal, buildings and parks, renewal projects and coordinates the transfer of projects from other Client groups to Design and Construction branches.

The technical management structure of ISD is divided by geography and by specialties into three Design & Construction branches. Two Design & Construction Municipal branches undertake projects that are similar in scope, and are divided into West and East areas; the third Design & Construction branch specializes on Buildings and Parks.

Design and Construction – Municipal (East or West) branch (DCM) and Design and Construction – Buildings and Parks branch (DCBP) are responsible for design, construction management and other technical and professional services in the

establishment and implementation of branch priorities in the delivery of the capital program.

DCM branches are responsible for design and construction of new and renewal projects for bridges, culverts, roads, watermain, sanitary and storm sewers, pumping stations and similar infrastructure. DCBP branch is responsible for design and construction of new and renewal projects for buildings and parks, as its name implies.

The Design & Construction Lansdowne branch was set up to provide services related exclusively to the Lansdowne Park development. This type of set-up permits the City to assign staff to large, specific projects, for better service delivery. The City used this setup successfully to deliver the projects that were undertaken during the 2009 – 2011 Economic Stimulus program. In addition to the Lansdowne branch, ISD has set up a Special Projects division to manage the delivery of the Strandherd Armstrong Bridge and the Airport Parkway Pedestrian Bridge. These special branches were not examined in this audit.

Business and Technical Services branch (BTS) is responsible for managing the delivery of Business Services, coordination of the municipal Right-of-Way Information and Approvals, Surveys and Mapping Requirements for the City of Ottawa, Design Standards and Contract Services (including development of construction specifications, approved product listings and design guidelines), Quality Assurance of testing and services and managing corporate and departmental priorities and performance measurement.

The Infrastructure Services Department operates on the principle that it provides services to Clients. In the Project Delivery Manual 2012, a Client is defined as the recipient of project management delivery by the Infrastructure Services Department. The Client initiates the request, which is contributed to the intake process in AMB.

Client departments for Design and Construction Municipal (East and West) are Planning and Growth Management, Environmental Services, Transit Services, Rail Implementation, Public Works, and Real Estate Partnerships and Development Office.

Client departments for Design and Construction Buildings and Parks are Parks, Recreation and Cultural Services, Ottawa Public Library, Service Ottawa, Public Works, Transit Services, Police Services, Environmental Services, Ottawa Public Health, Emergency and Protective Services, Community and Social Services, Real Estate Partnerships and Development Office and other departments.

AMB is also considered the client for renewal projects.

Technical Management

Asset Management Branch

The Asset Management branch currently manages the Comprehensive Asset Management Program for the City. AMB maintains the inventory of all assets pertaining to bridges, buildings, parks, water supply system, wastewater management system, storm water and drainage systems, and parks; classifies the assets based on condition; sets priorities for renewal of assets; undertakes renewal needs studies and designs, and prepares the corresponding budgets with assistance from the City's other departments.

The functions and responsibilities of the Asset Management branch comprise management and optimization of the lifecycle of the City's municipal infrastructure assets (roads, sidewalks, sewers and watermain systems, bridges, culverts and the Transitway), buildings and parks, assets valued at approximately \$30 billion. AMB maintains the inventory of municipal infrastructure assets, buildings and parks, and undertakes condition and performance assessments, develops rehabilitation strategies and procedures, and develops and coordinates annual renewal capital programs

Design and Construction Municipal East and West

The Design and Construction Municipal (DCM) branches are responsible for the renewal of existing municipal infrastructure (roads, sidewalks and pathways, sewers, watermains, bridges, culverts), new municipal infrastructure undertaken as local improvements, renewal and new transit facilities (Transitway/stations and associated structures, bus only lanes, park 'n' ride facilities), renewal and expansion/modifications of pumping stations, water reservoirs and elevated tanks, sewage and water treatment facilities, storm water management facilities, solid waste facilities, traffic and transit safety and operational improvements (intersection improvements, transit priority measures, etc.).

As part of its duties, DCM undertakes Project Management, prepares construction estimates, manages public and agency consultation for road-water-sewer renewal projects, undertakes class environmental assessments for water and sewer renewal projects, carries out preliminary design, detailed design and contract preparation, prepares construction specifications, and provides contract administration, construction inspections, and quality assurance during construction.

Design and Construction Buildings and Parks

The Design and Construction Buildings and Parks (DCBP) branch provides project management services for the design and construction of new and renewal of City building and parks, manages buildings and park construction projects related to major and minor capital programs, coordinates developer construction requirements for park construction, undertakes the design and manages the construction of park amenities such as park furniture, bridges and play structures.

DCBP is also responsible for the renewal and accessibility needs of buildings (building envelope, mechanical, electrical, elevators) for Community centres, arenas, recreational complexes, pools, park services buildings, renewal or parks and sites: sports fields, tennis courts, basketball courts, baseball fields, skateboard parks; water spray pads, gazebos, playgrounds including play structures, pathway and pedestrian bridges, parking lots, site lighting (in parks, parking lots, sports fields and around buildings), slope stability and retaining walls, and irrigation systems, wading pools, and park site servicing.

DCBP delivers projects for Client departments for new construction, building additions, renovation programs, historical restorations and building renewal. DCBP also provides subject matter expertise on various building and construction industry practices and procedures.

As part of its duties, DCM undertakes Project Management, prepares construction estimates, manages public and agency consultation, carries out preliminary design, detailed design and contract preparation, prepares construction specifications, and provides contract administration, construction inspections, and quality assurance during construction.

Business and Technical Services

Business and Technical Support branch provides the following services:

Right-of-way (ROW) information:

- Manage information centre for all municipal and private infrastructure located in the City's rights-of-way. Includes acquiring and logging all as-built information provided by a third party that reflects the installed, constructed, or commissioned conditions of a device, machine, equipment, apparatus, structure, system, or other outcome of an engineering project within the right-of-way;
- Development and management of right-of-way agreements;
- Development and management of Municipal Street Occupation Agreements; and

- Manage information centre for all municipal and private infrastructure located in the City's rights-of-way.

ROW approvals:

- Utility coordination;
- Coordinate with utilities to manage the competing uses of the City's rights-of-way;
- Manage utility (Bell, Rogers, Enbridge, Hydro, etc.) applications for works within the City's rights-of-way; and
- Provide water and sewer permitting services for new infrastructure requests not related to a Development process.

Surveys / Mapping

The Surveys and Mapping group provide land information expertise, geographic data, and related services to support the City of Ottawa's internal operations, and external client needs. The services include procuring, maintaining, and distributing essential geographic data using specialized applications.

Legal Surveys

The Surveys and Mapping group provides all legal survey plans for the acquisition and disposal of properties.

Planning and Development

The Surveys and Mapping group performs services that support the City's planning and development operations, such as providing accurate and current property ownership and topographic mapping, protecting the City's interests by reviewing and providing advice on property development processes, auditing land development procedures through review of relevant plans and data, and advising on property boundary and ownership issues.

Mapping

The Surveys and Mapping Group provides digital and hard copy maps that are essential for maintaining and developing the City's infrastructure and for delivering a wide array of ongoing and emergency services. For example, digital and hard copy maps that directly support the City's land use, planning and development, public and emergency transportation, engineering design and construction, utility inventories and maintenance, and more.

The Surveys and Mapping Group receives, reviews, and integrates property ownership information into the City's Geographic Information Systems (GIS) corporate repository, so that it can be adapted for use by clients.

Interaction with Other Departments

Because ISD is responsible for the implementation of projects for all City Departments that require design and construction, they interact with many of them via regular meetings.

Design and Construction Municipal staff attends the following meetings with other departments on an ongoing basis:

- Interdepartmental Water
- Interdepartmental Waste water
- Interdepartmental OC Transpo
- Capital Construction
- Ottawa on the Move Traffic Management Coordination
- Environmental Assessment Technical Advisory Committees through PGM
- Community and Social Services – Strategic Community Initiatives – Public Engagement Strategy
- Corporate Communications –Departmental Directive – Communications
- Service Ottawa – Knowledge Services and Web Experience – Public Inquires
- Service Ottawa – Organizational Development – Strategic Planning and Departmental Initiatives
- Deputy City Manager – Planning and Infrastructure – Ottawa on the Move, Departmental Events, Project and Communications Updates, Legislative Agenda Items
- Bi-weekly Capital Construction Coordination Meetings lead by ISD (AMB)
- Bi-weekly Ottawa On The Move (OOTM) Meetings led by Traffic Management and Operations
- Ad hoc meetings based on specific project requirements.

Business and Technical Support branch interacts in an ongoing basis with the following:

- Service Ottawa Business Segment Line of Business Meeting (Service Ottawa Department) – every 3 weeks
- Several project specific Technical Advisory Committees with Planning and Growth Management Department
- Project specific interactions and general inquires with Real Estate Partnership & Development Office, Rail Implementation Office, City Clerk and Solicitor

Department, Environmental Services Department, Public Works Department, Planning and Growth Management Department

- TAC sessions: Some of Planning and Growth Management Department projects, for example Environmental Assessment Studies or development of planning guidelines such as the Suburban Design Study, often have several meetings/workshops with a Technical Advisory Committee (TAC). The TAC is generally composed of internal departments/stakeholders and outside agencies such as the NCC and Parks Canada, whose presence is requested to provide technical input and guidance.

Design and Construction Buildings and Parks branch interacts on an ongoing basis with:

- Community and Social Services: Strategic Community Initiatives branch, Older Adult Plan
- Emergency and Protective Services: Corporate Security
- Planning and Growth Management: Buildings Services, Site Plan Control, Zoning/Minor Variance
- Parks, Recreation and Culture Services: Public Art Program
- Information Technology: Telephone & Data connections
- Real Estate Partnership and Development Office: Corporate Realty Portfolio, Environmental Site Assessments, Public Private Partnerships (3P), Land Acquisition
- Public Works: Forestry, Traffic, Signal, Parking, Fleet, Building Controls, Building Operations, Energy Management
- Transit
- Environmental Services: Wastewater Drainage, Water Services
- Corporate Communications
- Media Relations
- Client Departments
- Ottawa Public Library
- Parks, Recreation and Culture Services
- Public Works.

Asset Management branch staff attends the following meetings with other departments on an ongoing basis:

- Interdepartmental Water - quarterly meetings to review ongoing water related projects
- Interdepartmental Waste water - quarterly meetings to review ongoing wastewater related projects

- Interdepartmental OC Transpo - quarterly meetings to review ongoing transit related projects
- Capital Construction Coordination - bi-weekly to monthly meetings to review coordination of overall capital construction projects
- OOTM Traffic Management Coordination - bi-weekly meetings to review traffic management coordination, with a focus on capital construction projects
- Comprehensive Asset Management Steering Committee - monthly meeting to implement Comprehensive Asset Management Program
- Capital Planning Coordination - annual to bi-annual meetings with other departments to review capital projects planned in the 1-5 years horizon
- Meetings with department Business Partners to review Service Understanding Agreements – annual meetings with Business Partners
- Project Scoping Meetings on a project-by-project basis between the Project Managers and AMB staff
- Wastewater Business Coordination Meetings...inter-departmental quarterly meetings of Managers to review overall wastewater priorities
- Participation on various Environmental Assessment Technical Advisory Committees - project specific
- Ongoing communications between AMB and client departments on identification of renewal needs
- There are also ad hoc meetings based on specific project requirements.

ISD makes a significant effort to communicate within it and with other City departments, which make duplication of responsibilities unlikely. Based on a review of the global responsibilities of ISD and other departments, we conclude that there is no duplication of ISD's mandate and scope of responsibilities in other departments within the City.

Planning & Growth Management (PGM) is responsible for determining the infrastructure needs for the anticipated City growth. ISD contributes to PGM by providing project input during initial planning activities (such as in some environmental assessments), but does not undertake any new infrastructure planning, maintaining its focus on renewal needs.

PGM carries modelling of the water supply system in the context of potential effects of planning and growth on the water supply system, and AMB within ISD carries modelling of the existing water supply system to support PGM and ES. However, there is no duplication of responsibilities.

Interaction with Environmental Services is essential for the delivery of the Asset Management Program. However, we did not find functions of ES that are being

done by both departments. ISD provides technical support to ES, but does not undertake any work that is duplicate.

The fact that all design and construction work for all the City's infrastructure is done by ISD is useful in ensuring that the work is properly coordinated and that it is designed and constructed to the same standards. We did not find any other City department that implements its own projects directly; all other departments rely on the ISD for implementation.

The Light Rail Implementation Office is managed by the Director of Light Rail, reporting to the Deputy City Manager, Planning and Infrastructure Portfolio. The design and construction specialties required for this major project are not core competencies of ISD.

Audit Objective No. 4: The process and methodologies used for selection of consultants and contractors

Criteria:

- Ensure appropriate interaction with Supply branch
- Adequacy and completeness of process for direct assignments, requests for quotation, requests for proposals, requests for tender

Until May 2013, the Project Manager Procedures Manual (PMM001) was used by ISD to provide direction to Managers, Program Managers and Project Managers on the tasks that were expected to be undertaken, procedures to be followed, and documentation to be prepared. PMM001 was replaced in May 2013 by the Project Delivery Manual (PDM) and Appendices, with similar objectives and requirements.

The PDM contain specific procedures and documentation to make sure that all procurement of services and construction is carried out with the full knowledge of, and based on standards set by, the Supply branch.

Selection of consultants is based on the estimated cost of the services required. If the cost is below the dollar amount threshold, a consultant is selected from a roster of consultants who have been pre-qualified using a Request for Standing Offer process, directed by Supply branch. The City indicated that in May 2012 the cost of services threshold for Engineering Services was raised to \$250,000 from \$150,000. The Purchasing By-law states that the limit is \$150,000 and that Supply branch can authorize exceptions, which it did in this case.

Table 12 summarizes the number of projects (assignments) where the consultants were selected from the Standing Offer, the number of projects that exceeded the threshold at completion of the project and the corresponding value of the services.

Table 12: Number of Standing Offer Assignments Exceeding \$250,000 Threshold

Year	Number of Contracts Assigned (Issued) Using Standing Offer	Total Value of Consulting Services Standing Offer	Number of Assignments	Total Fee Value	Percentage of Total Value of Consulting Services Standing Offer
2012	336	\$ 22,863,661.55	5	\$2,221,301.92	9.7%
2013	340	\$ 18,500,504.45	3	\$933,925.97	5.0%

The “Number of Contracts Assigned Using Standing Offer” column includes amendments which are not considered new contracts. The total number of new contracts was 248 in 2012 and 232 in 2013.

The “Total Value of Consulting Services Standing Offer” and “Percentage of Total Value of Consulting Services Standing Offer” columns include call ups made by ISD against two separate standing offers - Professional Engineering Services and Infrastructure Design Services, which includes professional engineering and architectural services.

The total value (including Standing Offer contracts) of professional and consulting services for ISD (including amendments each year) were:

Table 13: Total Value of Professional and Consulting Services for ISD (including amendments)

Year	Number of Contracts Awarded including RFP and Standing Offer	Total Value of Professional and Consulting Services	Number of Contracts Assigned (Issued) Using Standing Offer	Total Value of Consulting Services Standing Offer	Percentage of Value Awarded Using Standing Offer
2012	443	\$53,469,101	336	\$ 22,863,662	43%

Year	Number of Contracts Awarded including RFP and Standing Offer	Total Value of Professional and Consulting Services	Number of Contracts Assigned (Issued) Using Standing Offer	Total Value of Consulting Services Standing Offer	Percentage of Value Awarded Using Standing Offer
2013	488	\$55,652,525	340	\$ 18,500,504	33%

The “Number of Contracts Awarded including RFP and Standing Offer” column includes amendments which are not considered separate contract awards.

The total value of contracts for professional and consulting services awarded using the Standing Offer represent an average of 37% of the total value of consulting services for 2012 and 2013.

The City indicated that the intention is to use the \$250,000 as the threshold for services that included design and contract administration services. However, in some of the projects that were started after the dollar threshold was changed, some of the project managers used the threshold for design only, requiring amendments to the consulting contract to include the contract administration component. These amendments increase the value of the contracts over the threshold. In effect, the Standing Offer was used for projects that should have been procured using a Request for Proposal, not the Standing Offer process.

Where contracts were amended resulting in an increase in the contract value greater than the \$250,000 threshold, Supply, in consultation with ISD, determined that it would result in an advantage to the City in accordance with Article 21(9) of the Purchasing Bylaw.

Selecting one consultant only for each assignment processed under the terms of the consultant’s Standing Offer removes price competition from the process at that point. Requesting quotations under the Standing Offer from two or three consultants is expected to have a significant effect on the cost of consulting services. The procurement process should be modified to require more than one quotation.

For projects costing more than the dollar threshold for Standing Offer selection, ISD prepares Terms of Reference, and Supply branch issues a Request for Quotation or a Request for Proposals, as the case may merit. Evaluation of the

Proposals and selection of the consultant based on these methods is done under the direction and supervision of Supply branch.

For Standing Offers call-ups, the Project Manager provides the consultant with Scoping Documents and other documentation that allows the consultant to provide a proposal. The Terms of Reference for consultant selection are prepared by the Project Manager for both Requests for Quotation and Requests for Proposals. Only if the project is unusual or high profile does the Program Manager review the Terms of Reference. In our opinion, the Program Manager should routinely review the Terms of Reference. If that had been the case in the Standing Offer projects noted above, several of them may have been procured using an RFP.

The City has indicated that call-ups valued at greater than \$100,000 are reviewed and recommended for approval by Supply and the General Manager, ISD to the Deputy City Manager, Planning and Infrastructure. Call-ups less than \$100,000 are approved by Supply on behalf of the General Manager, ISD.

Based on the information in the Project Intake Form/Scoping Document, Supply branch finalizes a Request for Qualification (RFQ). This document contains a brief project description and a list of engineering, buildings and parks disciplines involved. This process is used to shortlist the most suitable consulting firms who will be requested to submit proposals. The Statements of Qualification submitted by the consulting firms are reviewed and scored on the Evaluation Grid – RFQ and a shortlist is developed. The RFQ Rating Team must include three to five inter-branch representatives including the ISD branch Manager and/or Program Manager, the Project Manager, the project Client and selected others from within or outside ISD.

For Professional Engineering assignments with a value less than the dollar threshold (\$250,000), the process specified in the PMD is as follows:

Standing Offer – In coordination with Supply branch a list of Approved Consulting Firms has been established by a competitive process. The Project Manager prepares Terms of Reference and selects one firm from the approved list for submission of a proposal in accordance with the terms of the Standing Offer. The Standing Offer assignment should include both design and contract administration. The selection of the firm should include a review of the Standing Offer usage statistics from Supply branch to divide the workload among consultants. This is carried out in consultation with the ISD branch Manager or Program Manager.

Given the relatively high value of the dollar threshold for use of the Standing Offer, it is our opinion that requesting a work plan and cost from more than one consultants could result in cost savings. The potential for savings in the use of

Standing Offers is consistent with our findings in the 2005 Audit of the Procurement Process. That audit found that there should be better management of Standing Offers with a greater emphasis on price. This was still the case in 2009 when the follow-up to the 2005 audit was completed. The 2009 follow-up audit found that in the issuance of the Standing Offers for engineering services, there was no real ranking to reflect best value and call-ups were not being made in relation to price.

During the review of files it was noted that in one project the City's project manager – who was responsible for the selection of the supplier from the Standing Offer and approval of the project budget – left the City's employment and went to work for the supplier as its project manager on the same project. This is a potential conflict of interest. The value of supplier's consulting services was \$304,000; the total budget for this project is \$3.55 Million.

Although the supplier did not seek formal authorization from the City for this individual to work on the project; the City was aware of the situation and accepted it. Although the City requires in Requests for Qualifications and Requests for Proposals that suppliers disclose and resolve to the satisfaction of the City any potential conflicts of interest, the City's procedures for Standing Offer call-ups, contracting procedures and the terms and conditions do not require formal notification of potential conflict of interest. They should be amended to require formal notification. The City should also assess whether the potential conflict of interest will be permitted and document its assessment.

The use of a sole source assignment is permitted, but the PDM indicates that use of Standing Offer is preferred for transparency and competitiveness.

The Project Manager issues a Request for Proposal and forwards it to Supply branch prior to initiating the Financial Approvals. Once the proposal is received, the Project Manager reviews it and consults with the ISD branch Manager or Program Manager, the authorized representative of AMB, and the project client.

Upon completion of the design, and after confirmation that it meets the established scope and budget and all technical requirements, the Project Manager is expected to review the project with the client and obtain authorization to proceed to tender. However, this was not being done for all projects, reviewed as shown in Tables 17 and 18.

The Tender and Award Phase begins once the Tender Package is provided to Supply branch and consist of the following steps:

1. On tender closing, the Tendered Bids are checked and reviewed by Supply branch for compliance

2. The Tendered Bids are sent to the Project Manager, who compares the bids to the estimate and budget
3. Supply branch prepares Bid Analysis and Cost Comparison Summary and sends it to the Project Manager. The recommended bid is highlighted in the document. Not all the projects we reviewed contained a Bid Analysis
4. The Project Manager reviews the tender results to rationalize any significant inconsistencies in unit prices, and identifies if the unit bid prices could have cost implications in the event of significant fluctuations in estimated quantities
5. If the lowest cost Tendered Bid is higher than the budget allocated, AMB and where appropriate the client are notified. In such an event, the budget could be updated, or the project could be modified or deferred
6. When a Tendered Bid is accepted, the Project Manager completes and seeks approval for the Estimated-Spending Project Authority (E-SPA)
7. Supply branch completes the Contract Approval Request (CAR) and obtains the necessary legal documents, insurance, bonding documents and other contract specific documentation from the successful Contractor
8. Once the CAR is approved, Supply branch notifies the Project Manager when the PO is issued
9. Supply branch notifies the Project Manager when the legal documents have been completed, that the contract has been executed, and that a Commence Work Order form may be issued.

When the Tender and Award Phase is complete, the Project Manager arranges for inspection and Quality Assurance staff to facilitate scheduling. Consultant services may also be required for specialist engineering services during construction including QA services and testing.

For the construction of the projects, the ISD Project Manager supervises the preparation of the construction drawings and the corresponding specifications and special provisions. Once the design documentation is complete and it has received approval of the client department, the ISD Project Manager transmits the documentation to Supply branch, who then takes the project through the tender process, receipt of bids, evaluation of bids, assessment of contractor references, and award of contract. The ISD Project Manager is involved in the process of bid evaluation. In the files examined during this audit there was an appropriate bidding process.

Table 14 summarized the total value of construction contracts for ISD (including amendments each year):

Table 14: Total Value of Construction Contracts for ISD (including amendments)

Year	Number of Construction Contracts Awarded	Total Value of Contracts
2012	538	\$321,471,187
2013	502	\$271,833,785

Recommendation 2

That for the hiring of consultants the City modify its procedures and/or the contract terms and conditions to include wording that the hourly, per diem or other unit rates offered by the proponent for call-ups greater than \$150,000, the hourly, per diem or other unit rates will be discounted by a minimum of ten percent (10%).

Management Response

Management agrees with the recommendation. Finance department/Supply branch will revise the standing offer effective Q2 2016.

Audit Objective No. 5: The effectiveness of program management and project monitoring

Criteria:

- Ensure appropriate processes for review and approvals of study report and designs
- Ensure adequate processes for construction inspections

Overview

All ISD projects are divided into phases and have a similar structure. At a minimum, a project will have a definition or initiation phase, intermediate phase or phases, and an ending phase. The following table summarizes the steps in ISD project delivery.

Table 15: Project Delivery Phases

Phase	Description
1	<p>Initiation Phase This phase details what is required to take a project from the needs identification point through coordination and initial scoping, to a level that the project may be discussed and is usually approved by Council.</p>
2	<p>Start-up Phase This phase comprises the processes that are required to take a project from a scoping process to a project within ISD that has a Task Breakdown, Schedule and defined reporting process in place. The project at the end of this phase will have a defined Project Manager ready to proceed with the technical work of the project.</p>
3	<p>Development Phase There are several parts that comprise this phase of the project:</p> <p>Preliminary Design The objective of the Preliminary Design phase will be to investigate various designs to determine a preferred option, and through consultation with all stakeholders and/or the public, develop the preferred preliminary design option to be carried forward to the Detail Design phase. A preliminary design will be a basic plan that includes the elements of the project and how they will be laid out, which may or may not include specific measurements.</p> <p>Detail Design Detail Design involves the process of further refining the preliminary design. At the end of this phase, the design will be tender-ready as soon as budget approval is obtained.</p> <p>Tender and Award The Tender Package is distributed to and responded to by interested contractors. During this phase, the Project Manager, through Supply branch, responds to questions resulting from the contractor review of the tender package, prepares addendums to add, removes or corrects information in the tender package, and participates in the re-evaluation of the tender responses from the contractors.</p>

Phase	Description
4	<p>Construction Phase This phase comprises of what is required to take a project that has an approved final design and identified construction contractor through the steps required to implement the design and build the final product defined in the project scope. This phase includes the building of the product.</p> <p>Commissioning The Commissioning Phase is a quality assurance-based process that delivers preventive and predictive maintenance plans, tailored operating manuals, and training procedures. Essentially the commissioning process formalizes review and integration of all project expectations during planning, design, construction, and occupancy phases by inspection and functional performance testing, and oversight of operator training and record documentation.</p>
5	<p>Close-out Phase Upon completion of the Construction Phase, a project is terminated by ensuring the product has satisfied the project scope definition and the contract close-out activities are completed, including project documentation.</p>

Project Delivery Procedures

The Infrastructure Services Department prepared the Project Management Manual (PMM001) in 2006 for use by the City for the delivery of projects. The manual was updated in 2012 and rolled out in the Spring of 2013, into a document titled Project Delivery Manual (PDM). The PDM provides an overview of the project management delivery basic concepts that guide project management principles and procedures for the Infrastructure Services Department at the City of Ottawa. The manual was developed to support all ISD staff in the delivery of capital projects. It is also a reference for those departments who receive capital project delivery services provided by ISD.

The PDM and its predecessor the PMM001 provide detailed step-by-step direction to the ISD Design and Construction branches for the delivery of projects, including sample documentation for the various tasks that Project Managers must execute. The PMM001 was in effect up to May 2013, when it was replaced by the PDM.

Training documents show that introductory sessions were presented to ISD staff when the PDM was introduced. The PDM was provided also to consultants working for the City at that time. However, it is not referenced in the Terms of

Reference that form part of the procurement process, and therefore is not formally a requirement. The PDM should be referenced in the Terms of Reference as a requirement to be followed by consultants.

Recommendation 3

That ISD ensure that the procurement process for consultants includes the requirement that the Project Delivery Manual be followed.

Management Response

Management agrees with this recommendation.

ISD, in consultation with Finance Department/Supply branch, will amend the procurement process to emphasize the requirement for consultants to follow the Department's policies, procedures and guidelines that relate to ISD project delivery.

This will be completed by Q4 2015.

ISD also has prepared the Inspection Manual for City Construction Contracts, which is intended for use by the City’s Project Managers and Inspectors.

As part of the audit, twenty projects were examined to determine the extent to which the PMM001 and PDM were being applied by Project Managers. Some of the projects selected started when the PMM001 was in force, but were completed in 2013, based on the PDM. From the requirements of the Manuals, the aspects listed in Table 9 were examined for all projects.

Table 16: PMM001/PDM Requirements Reviewed

Item	Description
Project scoping report or project intake form	Document that describes the project scope, work plan, project schedule, budget and cash flow.
Project schedule prepared by project manager	The Project Manager (PM) prepares a Project Task Breakdown and a Project Schedule. In most cases, as discussed below, the PM relies on the project schedules prepared by the consultant and the contractor.
Project budget, cash flow and invoice approvals	The PM determines cost estimates for the project budget, provides to the Program Manager at start of project and once a year a project cash flow; reviews and approves invoices from suppliers.
Monthly project review and reporting	The PM is required to submit monthly reports to the Program Manager.
Project team initiation meeting	Meeting with internal and external project team.
Consultant selection process data	Information on how the consultant was selected (Standing Offer selection, Request for Qualifications, Request for Proposal).
Preliminary design documentation	Preliminary design report and drawings
External stakeholder meetings	Meeting with stakeholders (defined as those who have interest in the project, e.g. BIA, NCC, Community Associations, etc.)

Item	Description
Update scope, budget and schedule	Upon completion of preliminary design, PM to update the project scope, budget and schedule, if necessary. Inform the Program Manager or Manager of the changes.
Preliminary design review	The PM to review the preliminary design, modify as necessary to meet requirements.
Public communications	Consult with Ward Councillor to determine if public notification or meeting is required.
Sign-off for approval to proceed to detail design (not required for smaller projects)	PM to secure sign-off from program manager and client representative, using form. Sign-off is not required in clearly defined municipal rehabilitation or structure renewal projects.
Review at 50% and 75% value points	Review work progress vs. fees paid and ability to complete with remaining fees. This is not a requirement of the PDM.
Invoice and fee status summary	Maintaining and updating of invoice and fee status summary
Consultant appraisal for each completed assignment	For projects greater than \$500,000, complete appraisal at end of each phase.
Detail design Terms of Reference (ToR), scope, budget, schedule	PM confirm project scope, prepare terms of reference, update budget and schedule.
Review of detail design	Formal review of detail design
Utility circulations	PM requests an Utility circulation
Approvals submissions	PM prepares applications and documents for approvals.
Public notifications	PM to arrange a public notification or public meeting for the detail design.
Detail design review	Review detail design based on results of utility circulations and public meeting.

Item	Description
Design approval form	PM to secure sign-off using form.
Contract tender package	Contract tender package to be prepared consistent with City's standards.
Bid analysis	PM to review bids, do a tender bid comparison.
Commence work order	Letter authorizing the contractor to start work upon notification from Supply branch that all contract requirements are met.
Pre-construction inspections	Photos, video of site; video inspections of existing buildings; seismic monitoring; noise and air quality monitoring (if required).
Preconstruction meeting	Meeting of PM, Contractor, Consultant, and stakeholders.
Updated status/schedule and final cost forecast	PM to provide an updated status report to Program Manager, including a Final Forecast cost.
Weekly site visits	PM to visit the site weekly, normally with the inspector.
Payment certificates	PM to issue payment certificates on a regular basis.
Change orders and documentation	PM to manage changes to the contract, including requests for changes in the work and extra work, and approval of change orders up to the limits set by management.
Quality assurance testing	PM to arrange for and review quality assurance testing
Inform the division manager if significant budget variations are expected.	Self-explanatory.
Project management reports – monthly project review and reporting	Before the Project Status Reports were instituted, this was done using Appendix D3 of the PMM001.
Contractor performance appraisal	Complete form at end of contract.

Item	Description
Project close-out documentation and report	PM to review the project with the aim to determine potential improvements for future projects. PM to review the project file and ensure that all the required documentation is included.

Table 17 summarizes the findings for the 20 projects reviewed.

It is noted that in the initial review of the project files the results of the application of the requirements of the PDM was far from acceptable. For several requirements the level of compliance with the requirements was quite low. It was acknowledged that in some cases the results are due to the files reviewed not being complete since some of the projects were on-going; therefore, during the audit the City was provided in both cases with a second opportunity for the project managers to complete the file documentation. Where additional information was provided it was included in the evaluation. During the fact verification phase of the audit the City provided the information that was missing from the files, resulting in the outcome in Table 17.

Table 17: Summary of Findings from Project Reviews - Twenty Projects Reviewed

PMM001/PDM Requirement	No. of Compliant Projects	No. of Applicable Projects	Compliance (Based on Applicable Projects)
Project scoping report or project intake form	20	20	100%
Project schedule prepared by project manager	20	20	100%
Project budget, cash flow and invoice approvals	20	20	100%
Monthly project review and reporting	20	20	100%
Project team initiation meeting	19	20	95%
Consultant selection process data	20	20	100%
Preliminary design documentation	19	19	100%
External stakeholder meetings	17	18	94%

PMM001/PDM Requirement	No. of Compliant Projects	No. of Applicable Projects	Compliance (Based on Applicable Projects)
Update scope, budget and schedule	19	19	100%
Preliminary design review	18	19	95%
Public communications	15	16	94%
Sign-off for approval to proceed to detail design (not required for smaller projects)	11	15	73%
Review at 50% and 75% value points	14	18	78%
Invoice and status summary	18	18	100%
Consultant appraisal for each completed assignment	4	8	50%
Detail design ToR, scope, budget, schedule	18	18	100%
Review of detail design	18	18	100%
Utility circulations	18	18	100%
Approvals submissions	15	15	100%
Public notifications	15	15	100%
Detail design review	17	17	100%
Design approval form	12	15	80%
Contract tender package	18	18	100%
Bid analysis	17	17	100%
Commence work order	16	17	94%
Pre-construction inspections	15	15	100%
Preconstruction meeting	15	15	100%

PMM001/PDM Requirement	No. of Compliant Projects	No. of Applicable Projects	Compliance (Based on Applicable Projects)
Updated status/schedule and final cost forecast – monthly	15	15	100%
Weekly site visits	15	15	100%
Payment certificates	15	15	100%
Change orders and documentation	14	14	100%
Quality assurance testing	14	14	100%
Inform the division manager if significant budget variations are expected.	12	13	92%
Project management reports – monthly project review and reporting	15	15	100%
Contractor performance appraisal	2	4	50%
Project close-out documentation and report	5	5	100%

Note: Applicable Projects are those that had advanced sufficiently to have the requirement applicable to them.

Table 18 below discusses the findings with respect to PDM compliance summarized in Table 17 that have percentage of compliance lower than 100%.

Table 18: Discussion of PMM001/PDM Requirement with Compliance < 100%

PMM001/PDM Requirement	% Compliance	Discussion
Project team initiation meeting	95%	The initiation meeting is an opportunity for the project team to meet and to discuss issues and concerns, obtain clarification on issues and requirements.
External stakeholder meetings	94%	Some communications are at the Councillor’s discretion, but they should be addressed and recorded fully.
Preliminary design review	95%	The preliminary design sets the overall configuration of the project. A formal design review helps to identify and disclose any issues.
Public communications	94%	Some communications are at the Councillor’s discretion, the direction given by the Councillor should be recorded fully.
Sign-off for approval to proceed to detail design (not required for smaller projects)	73%	Should be completed to ensure that the Client department has agreed explicitly to the preliminary design concepts.
Review at 50% and 75% value points	78%	This is a formal step that is not being completed explicitly. It should be done formally to confirm that there is sufficient budget left to complete the work remaining The preliminary design review sets the overall configuration of the project. A formal design review helps disclose any issues.

PMM001/PDM Requirement	% Compliance	Discussion
Consultant appraisal for each completed assignment	50%	The consultant appraisal provides a record for other PMs to use when selecting consultants.
Commence work order	94%	The CWO is issued after Supply confirms that the contract requirements have been met; it is a milestone that clearly records the project start date.
Inform the division manager if significant budget variations are expected	92%	This is partially covered by PSU. A copy of the PSU should be kept in the file.
Contractor performance appraisal	50%	This is important for reference by other PMs

The low level of compliance for several of the PDM requirements increases the risk that projects could become problematic due to budget, schedule and results:

Budget Control

Budget control requirements have good compliance. The requirement to review the budget and schedule at the 50% and 75% value points in relation to the deliverables was a requirement of the 2006 Project Manager Manual, but not the current Project Delivery Manual. It was listed as it was a requirement when the project started. There is a compliance rate of 78% compliance.

The review of budget at 50% and 75% value points helps the PM review the fees paid vs the deliverables and work completed, and to take corrective action if necessary to make sure that the budget is not exceeded.

The PSUs are being used as the reporting tool, but they do not always provide the detail of information that the PM needs to review the status of expenditures vs. budget and project progress, including status of deliverables.

The PSU is intended for overall status updates. Financial status, budgets and expenditures are recorded in the City SAP system, which is the source of budget and expenditure data. Management noted that Project Managers, Program Managers and Managers do monitor and control project budgets on a regular basis through a variety of mechanisms. Managers check SAP, Ozone or have regular discussions with the Financial Services unit (FSU) to review and monitor financial data..

Project Schedule

Project Managers are using project design schedules provided by the consultants and construction schedules prepared by contractors.

Requirement No. 13 provides the Project Manager with a milestone that lets the PM review the overall project schedule and budget to take any corrective action, and should be done consistently by all project managers. However, this is no longer a requirement of the Project Delivery Manual.

Communications

Communications within the Project Team and external stakeholders and the public have good compliance. Items No. 5, 8 and 11 have the potential for some improvements to bring the items to 100% compliance.

Project Reviews

The low compliance rate for required formal sign-offs, such as at completion of preliminary design and detail design could result in misunderstandings with respect to scope and acceptability of the solutions to the Client, leading to potential cost overruns and delays.

Although there is evidence that the projects are being reviewed during preliminary design and detail design, the formal sign-off should serve as a clear notification to the Client and the program managers and managers that the project is moving to the next phase.

Quality Assurance

Quality Assurance (QA) during construction is essential to confirm that the materials being incorporated into the project meet the specifications.

Asset Management identifies projects for design and construction based on the asset condition assessment and the renewal needs assessment. In addition to these projects, other City departments transfer projects to AMB based on needs to address growth, as identified in the various City Master Plan documents.

The transfer of the project from AMB to Design & Construction branches require either a Scoping Document or a Project Intake Form. For transfer of the projects to the Design & Construction branches, AMB prepares a Scoping Document if the project is a renewal project. For projects originating in other departments, a Project Intake Form is prepared by the client department and AMB. The purpose of the Scoping Document and the Project Intake Form is to summarize all the essential aspects of the project, including background data and reports, survey data, etc. that is essential for completion of the design assignment.

At that stage, the branch Manager selects the most appropriate Program Manager for the project.

Discussions with Managers and Program Managers showed that the selection and assignment of Project Managers is carried out based on workloads and competencies of the Project Managers. However, detailed discussion with the branch Managers disclosed that ISD does not maintain a database of the skills, experience and specialized training of the program and project managers. This means that the branch Manager does not have the means to confirm that the Program Manager and the Project Manager selected for a given project are indeed the most suitable. A database of program manager and project manager training, skills and experience would be useful in assigning the most appropriate project manager. We estimate that approximately 50 staff would be put into such a database.

The process of transferring projects generally occurs in the month of January. The process of assignment to a Program Manager generally takes place at a meeting between the Manager and the various Program Managers. Once the project is assigned to a Program Manager, it is then delegated by the Program Manager to a suitable Project Manager for execution.

The Project Manager undertakes the selection of a consulting firm to assist in the design of the project, tendering and subsequent construction project administration. Based on the scope and cost estimate for design, the Project Manager may select a consultant from the Standing Offer roster, or if the project is large, prepare Terms of Reference for the project for preparation of a Request for Proposals.

The Standing Offer, Request for Qualifications, and Request for Proposals processes are managed and administered by the Supply branch. The scope of this audit did not include reviewing these processes, but whether ISD abide by the processes, and involve Supply branch in an appropriate manner. We found that ISD followed the required procedures.

The processes for reviewing and approving study reports and designs are documented in the PDM. Review of the PDM and files that have commenced after the PDM was issued showed that the Project Managers are not fully following its requirements. The PDM processes cover the range of projects that are undertaken by ISD, and are sufficiently detailed to enable the branch Manager to confirm that the Program Managers and Project Managers are delivering their responsibilities.

The PDM contains a number of milestones where projects must be reviewed by Program Managers, by the branch Manager, and by the General Manager, as well as by the Client. We found that the current ISD project management procedures are proper for the type of projects undertaken by ISD.

We found that the required reviews are occurring consistently, but in some cases they are not being documented properly. The PDM requires two formal sign-off instances and provides forms to record the formal sign-off to be completed prior to proceeding to detail design and prior to proceeding to tender. Although there is evidence in the files that the project managers are following a process to obtain feedback from the Client and the Program Managers, the form is not being formally completed consistently.

Construction inspections are being undertaken by City inspectors and by consultants, depending on the availability and the workload of City inspectors. The Project Delivery Manual specifically directs that inspections of work in specialties that are not within the ISD's core competencies must be assigned to a qualified consultant. This direction is appropriate and prudent, as it is aimed at making sure that the City does not become exposed to liability where it is not warranted. This audit did not examine construction services in depth as it was the subject of a prior 2012 audit.

Consultant Appraisal and Contractor Appraisal forms for each completed assignment are not being completed consistently. ISD has explained that the forms at present do not have any effect on the evaluation of consultants and contractors for award of subsequent assignment or contracts. With the development of the supplier evaluation process with Supply branch, these forms will become an important component of the evaluation of suppliers for future projects.

Recommendation 4

That ISD ensure that the requirements of the Project Delivery Manual are being completed.

Management Response

Management agrees with this recommendation.

Through the department's Integrated Departmental Management Plan (IDMP) Program, there will be a continued effort to enhance compliance with the requirements of the Project Delivery Manual (PDM). The PDM will be going through another significant update by Q2 2017.

Recommendation 5

That ISD develop and maintain a database of training, skills and experience for the program managers and project managers.

Management Response

Management agrees with this recommendation.

ISD will continue to leverage SAP as the database for training. Through the Competency Development Project as part of the department's Integrated Departmental Management Plan (IDMP) Program, processes will be enhanced to track skills and experience of project delivery staff. The Competency Development Project will be completed by Q2 2017.

Audit Objective No. 6: The control systems used for delivery of the projects within budget and schedule

Criteria:

- Ensure appropriate program management
- Ensure Project Managers and Inspectors responsibilities and reporting are complete
- Adequate design process, standards, reviews, control
- Adequate construction supervision, process, standards, reviews, control

Control of costs during the life of the project is the responsibility of the Project Manager as a first line of control, backed up and supervised by the Program Manager. The City has provisions for the required steps to be taken during the project to control costs and maintain the schedule.

As discussed in Audit Objective No. 5, the current project management procedures, as documented in the Project Delivery Manual are appropriate for the type of projects undertaken by ISD. Furthermore, the procedures require that the financial situation of the projects be reported up to the General Manager on a monthly basis. At present the financial situation of the projects is being reported using the Project Status Update (PSU) reports, which are issued monthly by each Project Manager and are intended to inform the Program Managers, Branch Managers and General Managers of the project's status.

Up until December 2013, the Branch Managers and the General Manager received a list of projects and the PSUs, but without a summary of the projects that had any concerns. Since December 2013, they have been receiving a Dashboard sheet summarizing at a glance the status of all the projects.

The PSUs are also used to help inform the corresponding councillors about the projects within their wards. However, review of the documentation provided to councillors showed that it consists of a table of PSUs and a link to a site in the City Council network. Each councillor then must navigate through the site to retrieve the required information. Councillors do not receive the Dashboard information that is provided to the General Manager. In the sample set of PSUs provided to Councillors the date of completion of the contract listed in the table was not the actual date of completion, as the project was known to be delayed. The City explained that the project manager had left the contractual completion date, as it had not been revised within the contract; the heading has been modified to "Ready for Use" to avoid this inconsistencies.

Design process, standards, reviews, and control are well explained in the PDM, and are commensurate with standard process that would be used in design offices

for project delivery. Similar conclusion applies to construction supervision, process, standards, reviews, and control.

The reported overall performance of delivery of the construction projects indicates that over 90% of the projects are tendered as scheduled. However, review of the seven files showed that control of the schedule may be a reason for concern within ISD. Based on the review of the projects, it is concluded that the processes are being followed in general terms. However, as noted in the previous section, there is a risk that some of the projects could fall behind their original schedule and senior management would not be made aware due to PSUs not having an adequate level of detail.

Design

The City requires that each invoice by consultants be accompanied by a description of the work completed in the period covered by the invoice, the amounts invoiced by task, and the budget remaining by task. In addition, the Project Manager is required to maintain control of the budget spent vs. the work completed by the consultant. Generally revisions to the cost are only accepted if there is an approved scope change.

Review of the files disclosed that they do not always contain all the invoices and that in many cases the project manager is not requiring a work report from the consultant before approval of the invoice.

The 2006 Project Manager Manual required that the project manager carries out a review of the budget spent in comparison with the work completed at the 50% and 75%, and that any issues be resolved with the consultant, to confirm that the work can be completed within the established budget. This step is not being done consistently, based on the review of the files. However, as noted before, the requirement is not included in the Project Delivery Manual.

Construction

The Project Manager is accountable for all expenditures related to the project and is required to obtain Purchase Orders from Supply branch for utility work, additional consultant services and all other external services; authorizing Work Orders and all other requests for internal services; approving Contract Payment Certificates; initiate the authorization for Change Orders and all other payments to the Contractor (under delegated authority); and approving and processing invoices for Consultant services.

For change orders exceeding \$25,000, or if the cumulative value of the change orders exceeds the contingency allowance for the contract, the Project Manager must obtain authorization from the Program Manager.

The Program Manager reviews all change orders on a monthly basis when the Project Status Updates are prepared by the Project Managers.

Construction Inspection is governed by the following documents:

- Inspection Manual
- Health and Safety Manual
- Health and Safety Alerts
- Ontario Traffic Manual – Book 7 Temporary Conditions, Field Edition
- Occupational Health and Safety Act and Regulations

In Design & Construction Municipal, internal resources are fully utilized before using external resources. Inspectors area assigned based on project risk, sensitivity, and complexity of project.

In Design & Construction Buildings and Parks all buildings and parks work is done by consultants. The Project Manager along with the consultant provide oversight of the construction. The contractor must comply with building permit drawings and specifications in order to get the final sign off from the building inspector.

The Project Manager is required to ensure that the Contract Administrator role provided by either internal staff or consultants is aware of their responsibility to carry out inspections in accordance with ISD Contract Administration Forms and Procedures.

The Project Manager must interface with the Contract Administrator on a regular and continuing basis during the life of the project to ensure that the City's specific expectations in terms of product, schedule and cost will be met. The Project Delivery Manual states that a particularly key concern is to confirm that timely and appropriate corrective action is taken when problems are encountered.

The reported overall performance of delivery of the construction projects indicates that over 90% of the projects are tendered as scheduled. However, review of the project files found that control of the schedule may be a reason for concern within ISD. As summarized below, these projects had delays that required postponement or delay in proceeding to construction.

The PDM requires that the Project Manager prepares a Project Schedule, based on a Work Breakdown Structure of the project tasks, and that the schedule be

coordinated with the project schedule prepared by the consultant for the design tasks and the contractor for construction.

Audit Objective No. 7: The processes and methodologies used for control of change orders and costs in design and construction

Criteria:

- Evaluate process:
 - Change order methods
 - Approval of change orders
 - Recording of change orders

Changes to the contract referred to as Change Orders are generally required to accommodate a change in field conditions relative to those expected in the design.

Change Orders generally take three forms:

- Changes in the Work to be done within the intended scope of the Contract;
- Extra Work not provided for in the Contract, but considered essential to satisfactory completion of the Contract; and
- Additional Work not provided for in the Contract, but not considered essential to satisfactory completion of the Contract.

The Project Manager or the Contractor could request changes in the work and extra work in a written Change Directive. A “Contemplated Change Notice (CCN)” is used to request a quote from the Contractor to initiate negotiations.

When a Change is covered by items already included in the Contract, payment for the Change will be made based on adjustment of quantities at the Contract unit price for the item. When the Change is not covered by items included in the Contract, the price will be negotiated in accordance with the Contract General Conditions. If the negotiation is unsuccessful, payment is made on a time and materials basis (force account).

The Project Manager must keep track of all Change Orders and must notify the Program Manager and the ISD Branch Manager as soon as the extent of the Change Orders and contract items indicates that the projected final construction cost may exceed the contract amount, including contingency. In addition, the Project Manager must notify Supply branch of the adjustment and provide the supporting documentation. An increase to the Purchase Order may be required.

The process for Design & Construction – Buildings and Parks is similar.

As discussed in Audit Objective No. 5, the current project management procedures, as documented in the Project Delivery Manual are appropriate for the type of projects undertaken by ISD. Furthermore, the procedures require that the financial situation of the projects be reported up to the General Manager on a monthly basis. The Project Status Update (PSU) reports, being issued monthly by each Project Manager, are intended to inform the Program Managers, Branch Managers and General Managers of the project status.

Until December 2013, the Branch Managers and the General Manager received a list of projects and the PSUs, but without a summary of the projects that had any concerns. From December 2013, they are receiving a Dashboard sheet summarizing at a glance the status of all the projects.

The Project Status Update (PSU) reports, being issued monthly by each Project Manager, are intended to help in maintaining the corresponding councillors informed of the projects within their wards. However, review of the documentation provided to councillors showed that it consists of a table of PSUs and a link to a site in the City Council network where each councillor must navigate through the site to retrieve the required information. Councillors do not receive the Dashboard information that is provided to the General Manager.

The PSUs are not being filed with the project. In fact, information gleaned from a project manager's email shows that they PSUs are being overwritten, rather than saved. This information should be saved every month that it is prepared to show compliance and to allow review for compliance.

Design process, standards, reviews, and control are well explained in the PDM, and are commensurate with standard process that would be used in design offices for project delivery. Similar conclusion applies to construction supervision, process, standards, reviews, and control.

Approval of change orders follow a specific procedure: Once the need for the change is confirmed, the Project Manager requests a formal cost estimate from the contractor. If the cost estimate is acceptable and the amount is below the Delegated Authority sum (generally the contingency allowance for the project), the Project Manager can authorize the change order. If the value of the change order exceeds the delegated authority level, the change orders must be reviewed by the Program Manager.

Recording of change orders is done by the Project Manager in the progress payment certificates. A record of all documentation pertinent to the change order is placed in the file. Review of change orders in the 2012 Audit of Construction

Services shows that this process is followed. However, the files reviewed in this audit did not contain all the information required.

Program Managers and Managers have access to the change order data for a specific project. However, there is no centralized summary of change order amounts that summarizes the total sum of change orders per project that can be reviewed by the Managers and General Manager. Providing an overall summary of the original contract value and the change order total for each active project could be beneficial in allowing the General Manager to review the overall health of the projects by using a dashboard.

At present, the Project Manager has authority to approve change orders up to the value of the project contingency, except that change orders with a value of \$25,000 or more must be approved by the Program Manager. There is no upper limit to the Program Manager authority, unless the project contingency is exceeded.

Recommendation 6

That the City arrange for the Project Status Update and Dashboard to be provided to Councillors on a monthly basis, highlighting issues of concern.

Management Response

Management agrees with this recommendation.

Project status updates have been provided monthly to councillors since Q2 2012. The dashboard document was originally used as an internal management tool. The project status update will be amended to highlight any areas of concern currently contained in the dashboard by Q2 2016.

In addition, there is greater oversight by Executive Committee (EC) due to the requirements under the 'Project Status Report for EC' to report on a quarterly basis.

Recommendation 7

That the City modify the project control system to permit the General Manager and the Managers to obtain summaries at department and branch level of all the change orders and their potential impact on project budgets.

Management Response

Management agrees with this recommendation.

Project controls will be amended in SAP to enhance the ability of the General Manager and Managers to obtain summaries of project change orders. The amendments will be completed by Q4 2015.

Audit Objective No. 8: Identify areas of potential savings for the City in the technical management and operations of ISD

Criteria:

- Determine if potential savings are possible through a more efficient and effective technical management and operation of ISD

Review of the technical management and operations of ISD revealed the following opportunities for Potential Savings:

1. Selection of consultants using the Standing Offer should be modified to require obtaining submissions from three consultants. If the cost of services procured by the Standing Offer is reduced by 5% based on cost competition, the City could save nearly \$1.0 million per year.
2. In cases where the initial RFP for services included only design and tender services, any subsequent contracts or amendments for contract administration services should be subject to requesting proposals from at least three suppliers. In two of the projects we reviewed, the value of contract administration services totalled roughly \$1.0 million. These contracts were awarded essentially as sole source contracts to the suppliers that were originally selected to provide design and tender services.
3. The City could undertake a review to determine if there could be cost savings by adding construction supervisors and inspectors to undertake contract administration and inspection of a larger proportion of projects than at present, unless specialized tasks, in lieu of consultants. This would apply to bridges, roads, watermains, and sewers. However, there is not sufficient data at present to enable this audit to quantify any potential savings from this recommendation.

Recommendation 8

That the City undertake an evaluation of the potential cost savings of increasing the inspection staff to meet City needs, in lieu of using consulting firm staff for inspections.

Management Response

Management agrees with this recommendation.

In 2008, ISD completed a Competitive Service Delivery Review (CSDR). This review has guided the department in terms of services most effectively delivered by internal staff versus external consultants. The CSDR will be refreshed by Q4 2018 after completion of the department's Integrated Departmental Management Plan Project.

Potential Savings

Engineering service contracts have been in the range of \$7 to \$10 million annually. The modifications to the procedures and/or the contract terms requiring a reduction of 10% on the rates will deliver a saving of around \$350,000 annually. There may be further opportunities for savings by revising the application of the Standing Offer limits, by requiring proposals for contract administration services when the estimated cost exceeds the Standing Offer limits, and by using more in-house construction inspectors.

Conclusion

The City's Infrastructure Services department has in place the project management and construction inspection processes required to deliver the services required of the department. However, review of sample files disclosed that those processes are not being applied consistently by all project managers. There are specific areas that require further attention of management. These include project schedule, budget control, communications, quality assurance and project reviews. Other issues were identified in previous audits, namely responsibility for redesign costs, recovery of change orders due to errors, exercising of contract liquidated damages, project oversight and others.

Acknowledgement

We wish to express our appreciation for the cooperation and assistance afforded the audit team by management.