



THE CITY OF
CALGARY
CITY AUDITOR'S OFFICE

Rocky Ridge Recreation Facility Audit

February 8, 2016

THIS PAGE LEFT INTENTIONALLY BLANK

Table of Contents

Executive Summary	5
1.0 Background	7
2.0 Audit Objectives, Scope and Approach	10
2.1 Audit Objective	10
2.2 Audit Scope	10
2.3 Audit Approach	10
3.0 Results.....	11
3.1 Project Cost and Schedule Management.....	11
3.2 Project Quality Issues Management.....	12
3.3 Project Risk Management.....	12
3.4 Project Change Control Process.....	12
4.0 Observations and Recommendations	14
4.1 Project Performance Monitoring.....	14
4.2 Project Risk Management.....	16
4.3 Project Change Control Process.....	17
4.4 Project Quality Issues Management.....	18

The City Auditor's Office completes all projects in conformance with the *International Standards for the Professional Practice of Internal Auditing*.

Executive Summary

The City of Calgary's Recreation Business Unit ("Recreation") is building four new recreation facilities to provide affordable and accessible recreation and leisure opportunities to citizens. These new recreation facilities are located at Rocky Ridge, Quarry Park, Seton, and Great Plains. City Council approved \$480 million¹ project funding for these four new facilities on June 25, 2012.

Rocky Ridge is one of the more complex in build and facilities offered. The Rocky Ridge Recreation Facility will be approximately 284,000 sq. ft., including a 25m 8-lane pool and leisure pool, triple gymnasium, fitness centre and fitness studios, leisure and recreation ice rinks, flexible performance theatre, art space, art gallery, and library kiosk. Construction began on the Rocky Ridge site in February 2015 and is expected to finish by the end of September 2017.

Our audit of the Rocky Ridge Recreation Facility project evaluated project management controls in place to manage risks to project cost, schedule and construction quality. Risks to project objectives such as delivering the facility on time and on budget are inevitable. However, establishing strong project management practices prior to, and during project construction, assists in managing project risks by allowing the program team to react as quickly as possible to mitigate the impact of risks as they emerge. We assessed project management practices against The City's Corporate Project Management Framework (CPMF) and the Project Management Institute's Project Management Body of Knowledge (PMBOK) standards of good practice in project management.

Overall we determined that basic project management processes and tools such as cost and schedule baselines, a risk register, and quality inspections had been established, however, these processes/tools have not been fully developed and utilized to appropriately manage significant risks. As a result the audit could not determine with certainty whether or not this project was operating within cost and schedule budget, nor could we validate that high risks had been identified and appropriately mitigated. We identified four areas requiring prompt action.

Our audit results noted that project performance measures to monitor and assess project health were not tracked. The program team was monitoring cost spent to date, as well as schedule progress, but without additional comparable measures such as cost/variance to the work breakdown schedules, this did not provide complete information as to whether the project was likely to be completed on time within budget. Project performance measures assess the magnitude of variation from the project baseline and provide early indication of variance on cost and schedule to allow immediate action to be taken. Implementing project performance measures will allow the program team to utilize information to understand project progress, and to take prompt action in response to emerging risks.

At the time of the audit, not all high project risks were identified, or assessed, and those that were lacked monitoring to ensure that appropriate risk mitigation strategies had been executed. The project's risks register includes 424 identified risks, but approximately three-quarters of those risks had not been assessed to determine if they represented a significant risk to the project. Of the high risks that were identified, approximately one quarter were not being monitored to ensure that mitigation responses were in place.

Project quality standards and inspections are in place. However, the project lacks a defined process to monitor timely corrective action where quality concerns arise. We recommend the development

¹ Functional Program and Concept Design Report-June 2012

and implementation of a project risk management plan and a quality issue management process to define what constitutes highest risks and issues, to continuously reassess those significant risks and issues, and to monitor responses and mitigation.

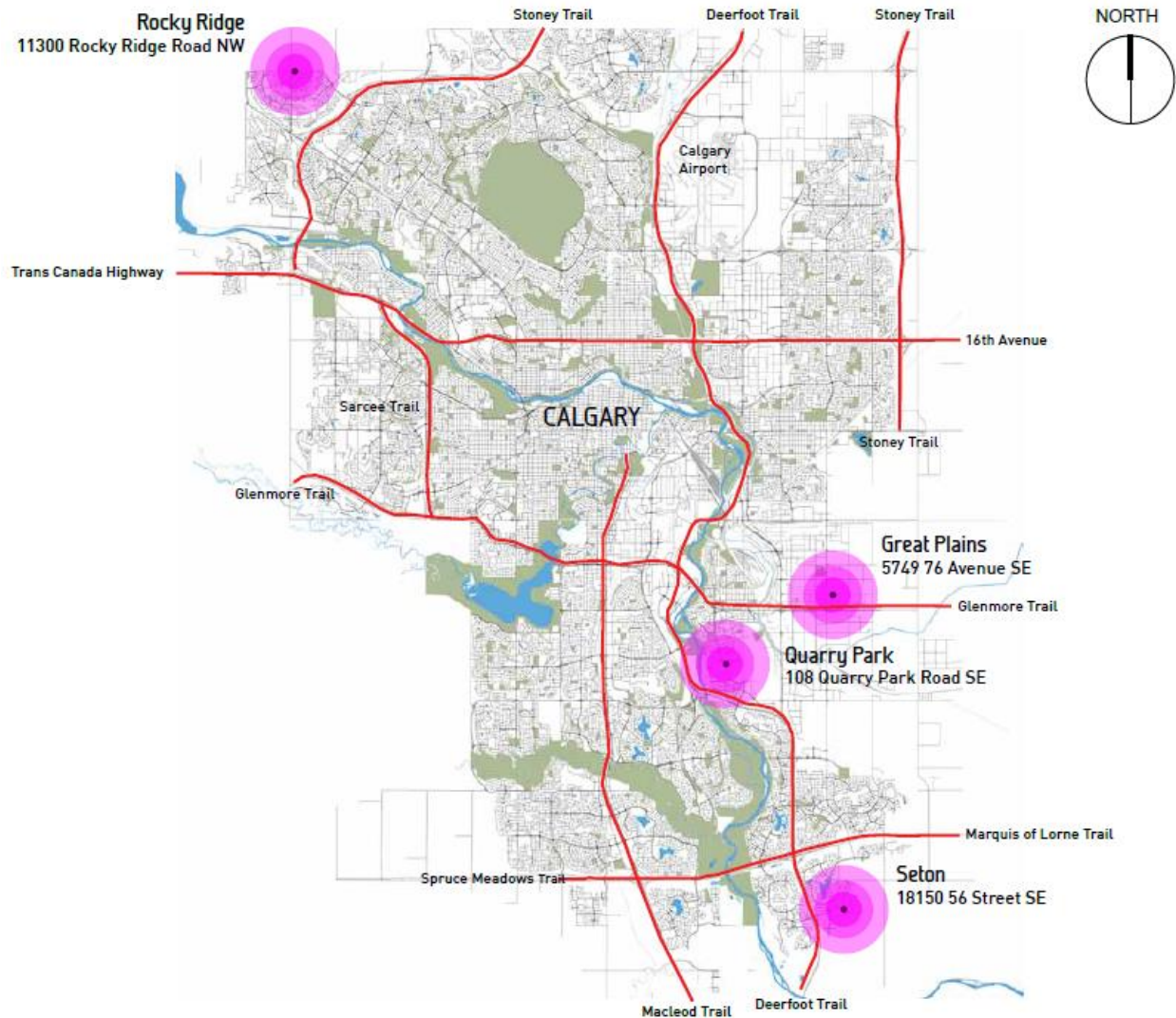
A process has been defined and implemented to manage changes within the scope of the project plan through the use of contingency reserves, but the project lacks a change control process to identify, evaluate, and approve changes outside the scope of the project plan. A defined change control process, including the analysis, approval, communication and implementation of changes, helps support appropriate decision making, and mitigates the risk that gaps in governance could lead to cost and schedule overruns and quality issues. Although no changes to the project scope outside of the project plan have occurred during the construction phase, this is a good proactive control that should be developed prior to further maturity of the project.

Recreation have agreed to our recommendations. Since the audit, Recreation have shared early designs of the processes and tools to be implemented. Recreation have set implementation dates for the recommendations of March 2016. As the project is at a relatively early stage in construction (approximately 10% complete), we believe that the immediate implementation of these controls will enhance the likelihood of successful project delivery. While we confined the scope of our audit to the Rocky Ridge Recreation Facility project, the recommendations may also benefit other projects in the program, particularly Seton, as construction is scheduled to start in the first quarter of 2016.

1.0 Background

Recreation has a mandate “to develop and manage a comprehensive recreation service delivery continuum”². Through this mandate, Recreation is building four new recreation facilities, one in northwest and three in southeast Calgary as shown in Diagram 1.

Diagram 1 – City of Calgary Context Map



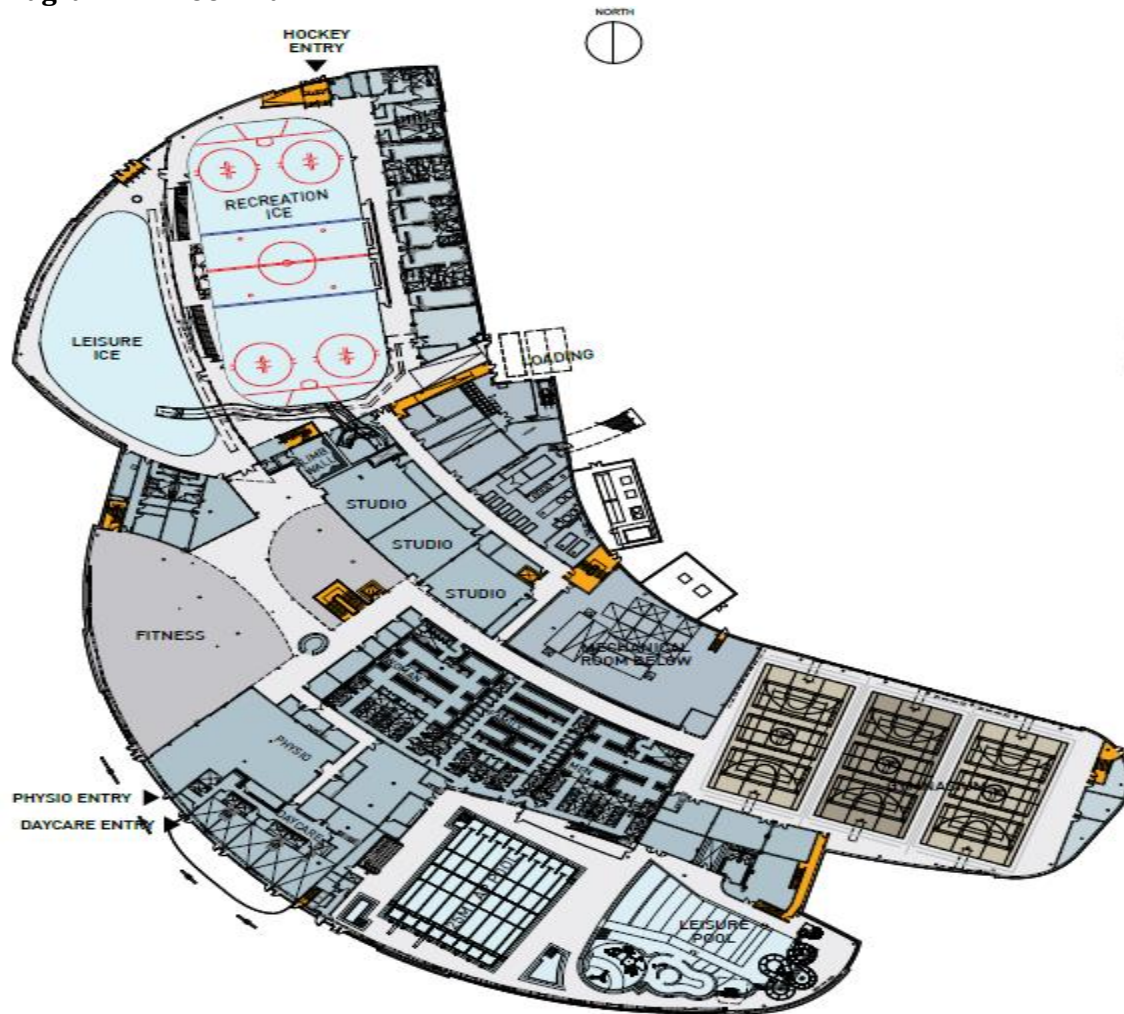
Source: The City of Calgary Recreation Facilities – Functional Program and Concept Design Report June 2012

In addition to design, development and construction of the new facilities, Recreation is also responsible for land preparation, stakeholder consultation, funding strategy, and operator agreements. All facilities are now under construction except the Seton facility which is in the design phase, and expected to commence construction in the first quarter of 2016. The development of the new facilities is being managed as a program by Recreation, with a program budget of \$480 million.

² Recreation Master Plan-2015

The Rocky Ridge Recreation Facility includes a 25m 8-lane pool and leisure pool, triple gymnasium, fitness centre and fitness studios, leisure and recreation ice rinks, flexible performance theatre, art space, art gallery, and library kiosk. Diagram 2 illustrates the floor plan for level one (activity level). The second floor will contain a library kiosk and a theatre. A third floor will contain a running track.

Diagram 2 - Floor Plan



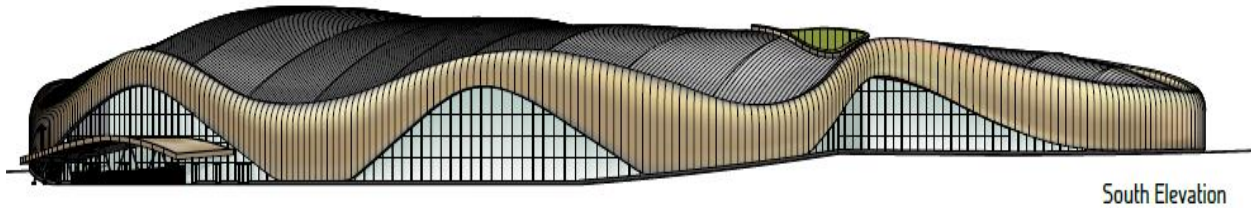
Level One Floor Plan (Activity Level)

Source: Rocky Ridge Recreation Facility – Calgary Planning Commission Councillor Presentation May 2014

Program elements are set beneath a curved, undulated roof structure to create an open and integrated facility, which has been “designed to complement the surrounding rolling landscape”³. Diagram 3 illustrates the design of the facility.

³ <http://www.calgary.ca/CSPS/Recreation/Pages/Research-and-development/About-the-new-Rocky-Ridge-recreation-facility.aspx>

Diagram 3 – South Elevation



Source: Rocky Ridge Recreation Facility – Calgary Planning Commission Councillor Presentation May 2014

Recreation managed the design phase of the Rocky Ridge project in consultation with a primary consultant. Recreation assigned Corporate Properties and Building (CPB) as the Project Manager for the construction phase under a service level agreement. Recreation also procured the services of a construction company as a Construction Manager (CM). The CM works with the design team and with trade contractors and suppliers to complete the construction. Following project initiation, the project reported through Community & Neighbourhood Services and has since changed to report through Recreation. Diagram 4 illustrates the project governance structure at the time of the audit.

Diagram 4 – Project Governance Structure

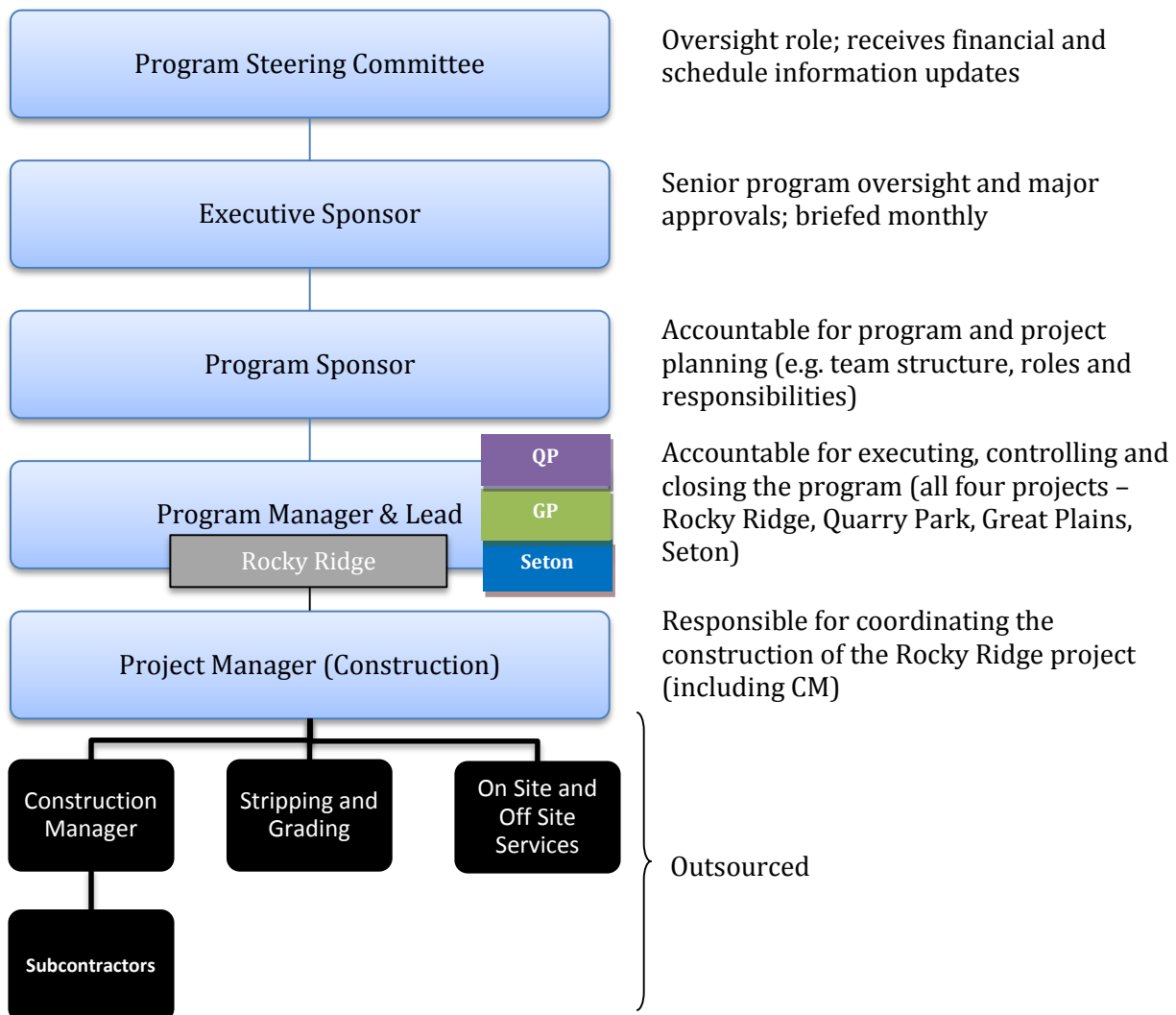


Diagram 5 shows a simplified version of the project’s baseline schedule. The project started at the end of June 2012, and currently has a construction completion date of September 2017.

Diagram 5 – Project’s Baseline Schedule

2012		2013				2014				2015				2016				2017		
Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3
Site Analysis and Approvals																				
Design																				
			Stripping & Grading, Site Preparation				Construction (36 months)													

2.0 Audit Objectives, Scope and Approach

2.1 Audit Objective

The objective of this audit was to provide assurance on the effectiveness of project management processes to support the capital construction of the Rocky Ridge Recreation Facility.

2.2 Audit Scope

The scope of the audit was on project controls to effectively manage cost, schedule and construction quality. During planning, the Program Manager identified that schedule and quality were the highest priorities to the project. Even though the overall budget is managed at the program level (all four recreation centres) we examined project cost risk, as cost overruns could negatively impact project quality and/or City finances.

Operational management of the recreation centre once built was outside the scope of this audit.

2.3 Audit Approach

We used a risk based approach to evaluate project management controls utilized by the project team. We assessed the effectiveness of the design and operation of controls to manage risks to project cost, schedule, and construction quality by conducting interviews with project staff, and reviewing project documentation such as the Project Charter, Project Plan, Risk Register, and Progress Reports. We also visited the construction site to gain a better perspective on the current state of the construction. We used The City’s Corporate Project Management Framework (CPMF) and the Project Management Institute’s Project Management Body of Knowledge (PMBOK) as standards of good practice in project management.

3.0 Results

Strong project management practices are critical to the success of any large construction project as the application of the knowledge, skills, tools, and techniques from generally recognized good practice can enhance the chances of success of a project. PMBOK states that project success is measured by project quality, timeliness (schedule), and budget compliance (cost).

We assessed project management processes in place to mitigate the risks to cost, schedule and project quality. Basic project management processes and tools such as cost and schedule baselines, a risk register, and quality inspections had been established, however, these processes and tools have not been fully developed and used to appropriately manage significant risks.

3.1 Project Cost and Schedule Management

A project baseline schedule was established in 2012, and revised in 2014, based on a project breakdown of work items, critical activities and tasks. Project activities, sequencing, resources and duration were included in the Project Charter. The baseline schedule is monitored monthly by the Project Manager (construction) and the Program Manager.

Rough orders of magnitude cost estimators were developed in 2012 and refined as the project design progressed, in line with the CPMF's estimation and contingency guidance. Two value analysis studies were conducted by a cost consultant, architect, and project management to identify cost savings during the design phase of the project. In addition, a cost analysis by the Construction Manager (CM) and the project team at the class 1 estimation stage (final design/pre-tender phase) indicated that the projected construction cost was significantly higher than previously estimated as a result of market conditions.

The cost analysis was used to determine if additional savings could be achieved. Although there was value in completing this exercise (resulting in a reduction of the construction budget by approximately \$14M), it did delay project tendering and initiation of construction by almost six months. Construction began on the Rocky Ridge site at the end of February 2015 as opposed to the approved baseline schedule construction initiation of October 2014. No changes have been made to the expected end of construction date of September 2017. Eight tendering processes for site preparation and construction took place between October 2014 and November 2015. Once the tendering process was completed, a baseline budget for the project was established in November 2015, including contingency reserves in line with CPMF guidance.

The information that is currently tracked and reported is insufficient to assess the status of the project in terms of cost and schedule versus forecast final cost and schedule completion estimates.

Actual costs, total estimated budget information, and cash flow projections are reported to the program's Steering Committee, along with actual start and completion dates. Effective project cost and schedule performance measures had not been implemented to track work performed in terms of the budget authorized for that work. Progress measurement criteria were not established for each work breakdown structure component, which meant that program governance could not easily determine whether the project was on track regarding schedule and cost. We recommended implementing and reporting on project cost and schedule performance measures to provide critical information in a timely manner and

therefore allow the program governance structure to react quickly to risks to cost and schedule overruns (Recommendation 1).

3.2 Project Quality Issues Management

Project quality assurance has been assigned to the CM, who has a quality plan that applies to all design and construction work by subcontractors. Third party inspectors and consultants have also been hired by The City as required to ensure construction work meets the applicable standards and specifications. We confirmed that quality inspections were taking place by subcontractors as per the CM's quality plan and by third party inspectors. We reviewed testing that had taken place on slope stability, strength of the concrete and installation of the building envelope system.

At the time of the audit, the CM had identified ten outstanding quality issues. No quality issue management process is defined to assess issues, assign ownership for issue resolution and validate issue responses. A quality issues management process (Recommendation 4) would help the Program Manager monitor the severity and re-occurrence of issues, and determine whether issues have been resolved.

3.3 Project Risk Management

The Program Manager established a risk register to identify project risks in March 2015, and updated the risk register to identify further risks in October 2015. Diagram 6 illustrates the CPMF's risk management process.

Diagram 6 – CPMF Risk Management Process



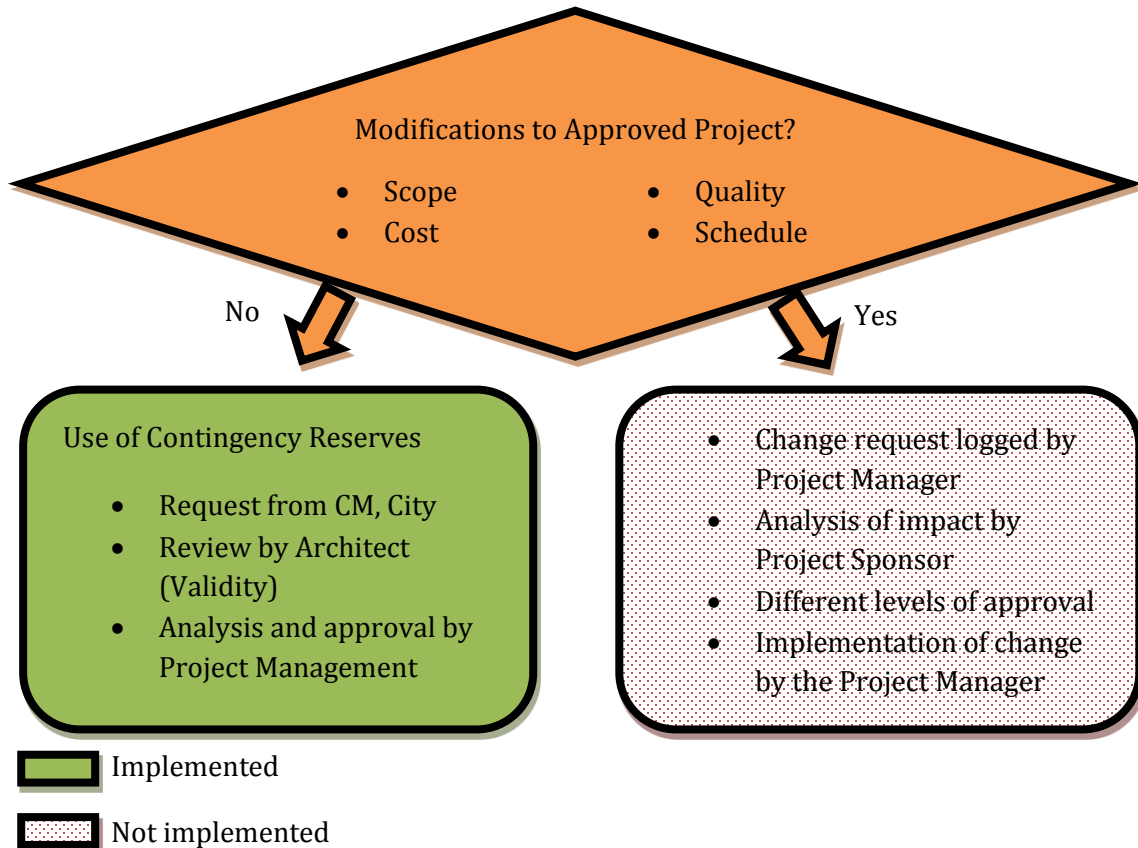
A risk register is in place, but it is not effectively used to manage the highest risks to the project. The risk register identifies 424 risks, but the majority (73%) of those risks are not assessed to determine whether they are a high risk to the project. The risk register identifies 38 high risks to cost, schedule and quality. Approximately one in every four high risks (26%) does not have evidence of monitoring to ensure that action had been taken to mitigate the risk. We recommended the development and implementation of a project risk management plan to support the risk assessment process, the identification, reporting and resolution of high risks, and to continuously reassess risks throughout the life of the project (Recommendation 2).

3.4 Project Change Control Process

The City's CPMF project change control guidance documents define project changes as modifications to the project scope, budget, quality or schedule – that is, changes outside the scope of the project plan. These changes are not to be funded by contingency. The CPMF requires that a process is established to identify, evaluate and approve (or reject) such changes. The Program Manager has established a process to identify, evaluate and approve changes that are within the scope of the project plan (i.e. no need for additional funds or time, or changes to project quality). These changes are to be approved by the Program Manager

and funded by the use of contingency reserves. At the time of the audit, there had been 21 requests for changes that were within the approved project plan, covering mechanical, electrical and structural changes. To date, these changes had a net result of approximately \$300K in construction savings. As illustrated in Diagram 7, a process to manage change outside the scope of the project plan has not been clearly defined.

Diagram 7 – CPMF Project Change Control Process



This is particularly important to the project, as, at the time of the audit, changes in the project governance’s roles and responsibilities were taking place, and the reporting and approval structure needs to be clearly defined. We recommended the establishment of a change control process to address project scope, cost, time, and quality changes that go beyond the project plan (Recommendation 3).

Making these changes to processes to use and enhance the existing project tools more will support the success of the project. Construction is in early stages, and the implementation of project management tools can support management in managing risks to project cost, schedule, and quality as the cost to correct deficiencies increases as a project nears completion.

We would like to thank staff from Recreation and CPB for their assistance and support throughout this audit.

4.0 Observations and Recommendations

4.1 Project Performance Monitoring

At the time of the audit, while project cost and schedule status were tracked, project performance measures had not been implemented.

Project performance measures are used to assess the magnitude of variation from the cost and schedule baselines. The CPMF states that reports on current performance status of the project compared to the specified baseline budget are to be used as project health indicators. Variances are defined as quantitative deviations from the baseline and are to be addressed. The baseline budget and schedule are to be compared with actual results to determine if a change, corrective action or preventive action is necessary.

Project cost and schedule performance monitoring reduce the risk of cost and schedule overruns by providing a structured method of identifying deviations at an early stage and throughout the life of a project. A key project performance measure is cost performance index (CPI). CPI measures the cost efficiency of budgeted resources expressed as a ratio of earned value (work authorized budget) divided by actual cost. If this ratio is less than 1, it indicates a cost overrun for work completed. Schedule performance index (SPI) is a measure of schedule efficiency expressed as the ratio earned value to planned value. SPI measures how efficiently the project team is using its time. An SPI of less than 1 indicates less work was completed than was planned. In addition, SPI can be used in conjunction with CPI to forecast the final project completion estimates.

The project has been underway since June 2012 and the baseline budget was defined on November 3, 2015. Prior to the definition of the baseline budget, the program team reported on the total estimated budget, actual expenses, and remaining funds. Without a baseline budget, the program team could not measure cost variances, that is, the difference between authorized budget for work completed to date, and actual costs.

A baseline schedule for the project was established in June 2012. Although the program team reports on actual start and completion dates, there are no defined measures to monitor variances against baseline dates or to estimate time to complete the project. No defined variance thresholds exist to indicate agreed upon amounts of variation to be allowed before action needs to be taken (e.g. percentage deviations from the baseline).

Implementing project performance measures will improve effectiveness in monitoring and provide early mitigation of risks to cost and schedule.

Recommendation 1

The Program Manager implement project performance measures by:

- a) Establishing performance measures such as CPI and SPI to continuously monitor project cost and schedule performance throughout the life of the project; and
- b) Monitoring and reporting on project performance measures as part of the monthly performance report.

Management Response

Agree.

Action Plan	Responsibility
<p>Since the audit, the New Recreation Facility program team has developed performance measures on earned value, planned value, actual cost and the reporting mechanism.</p> <p>The plan to implement performance measures such as CPI, SPI and Earned Value Management for project performance monitoring is underway. Project performance measures used are the measure of work performed, expressed in terms of budget, and authorized for that work referred to as “earned value”. The methodology used is to combine scope, schedule and cost measurements to assess project performance and progress. A detailed cash flow analysis has been prepared on spending for the site and building works. Performance metrics enable project managers to assess the status of the project in terms of schedule, cost and foresee any potential risks. Monthly monitoring will identify risk and deviation of schedule. This is an ongoing exercise until project completion. This recommendation will be applied to all other new recreation facility projects.</p>	<p><u>Lead:</u> Program Manager</p> <p><u>Support:</u> Recreation, New Recreation Facility project team, CPB Project Manager</p> <p><u>Commitment Date:</u></p> <ul style="list-style-type: none"> a) Design: December 7, 2015 b) Implementation and monitoring: March 31, 2016

4.2 Project Risk Management

The project's risk management approach does not effectively support the management of cost, schedule and quality risks.

As per The City's CPMF, risk identification, risk assessment, risk response and risk response validation are all components of risk management that should be included in the management of projects throughout the entire project lifecycle. A project's budget is to include measures to cover known risks.

Project risks, if not identified, assessed, monitored and mitigated, can negatively impact project costs, schedule and quality. The aim of risk management is to increase the likelihood of the project achieving its objectives and to minimize the occurrence of negative impacts.

Currently, project risks are monitored and managed on an ad-hoc basis. Weaknesses observed in the current approach are:

- While the project's risk register identifies 424 risks, the majority (73%) of these risks are not assessed to determine high risks.
- There is no definition on what constitutes high risks.
- 38 high risks to cost, schedule and quality are identified in the risk register. 10 (26%) of those high risks have no evidence of risk response validation (monitoring), that is, their status has not been updated to indicate if the risk mitigation strategy or additional measures were implemented.
- In addition, high risks were identified by the Project Manager (construction). The project's risk register does not include these high risks to cost, schedule and quality. No risk response monitoring exists for these risks.
- High risks reported to the project's Steering Committee are not aligned to the high risks in the risk register, that is, what is reported is a subsection of the high risks contained in the risk register.

Recommendation 2

The Program Manager develop and implement a project risk management plan, including:

- i. Definition of what constitutes high risk to the project;
- ii. Identification of high risks to the project using this definition;
- iii. Inclusion of mitigation strategies for identified high risks in the risk register;
- iv. Regular reporting on the status of high risks contained in the risk register;
- v. Establishing a process to continuously reassess risks in the risk register and include risks identified by the Project Manager (construction); and
- vi. Communicating high risks and associated mitigation strategies to key project team members.

Management Response

Agree.

Action Plan	Responsibility
<p>New Recreation Facility Program Manager has developed the project's risk management plan to effectively support the management of cost, schedule and quality risks.</p> <p>The project risk management plan will be implemented in the first quarter of 2016 and maintained to the project completion. This recommendation will be applied to all other new recreation facility projects.</p> <p>The Project Manager (construction) and other members of the project team are responsible for owning, updating and maintaining the project risk register and to provide monthly status updates to the Program Manager, including significant risks and planned mitigation strategies.</p> <p>All project team members will ensure all categories of risk have been considered and that significant risks are monitored regularly. Risk owners will be identified with an appropriate response/mitigation strategy and to provide clarity and awareness of the risk definitions.</p>	<p><u>Lead:</u> Program Manager</p> <p><u>Support:</u> Recreation, New Recreation Facility project team, CPB Project Manager</p> <p><u>Commitment Date:</u></p> <p>a) Design of a project risk management plan: December 7, 2015</p> <p>b) Implementation and monitoring: March 31, 2016</p>

4.3 Project Change Control Process

A formal project change control process to identify, evaluate, and approve a project change outside the scope of the project plan has not been implemented.

The Project Manager (construction) has implemented a process to address changes that are within the project plan through the project's contingency reserves. However, our interviews with the Program Manager and Project Manager (construction) indicated that a formal process to approve a project change beyond the project plan (i.e. not funded through project contingency) has not been clearly defined.

A change request form, roles and responsibilities, and thresholds for approving project changes have not been defined and implemented. Changes are taking place to the program's leadership structure, increasing the risk of lack of accountability and transparency regarding the management of funds, quality, and schedule changes.

The CPMF's Project Change Control Standard and Guideline are minimum project change control requirements to be followed by project managers on capital projects. Project changes are modifications to agreed and approved project scope, budget, quality or schedule. Any change to these project variables must be undertaken with involvement and agreement of key stakeholders.

A change control process ensures accountability and transparency regarding the management of funding and schedule for capital project management. Without a project change control process to help support appropriate decision-making, there is a risk of lack of governance that may lead to cost and schedule overruns, and quality issues.

Recommendation 3

The Program Manager establish a change control process as set out in the CPMF's Project Change Control Standard to address any project changes related to project scope, cost, time, or quality beyond the project plan.

Management Response

Agree.

Action Plan	Responsibility
<p>The Program Manager has recently established a change control process as set out in the CPMF's Project Change Control Standard to address any project changes related to project scope, cost, time, or quality beyond the project plan.</p> <p>The Program Manager has implemented a process to address changes that are within the program plan. A formal process to approve a program/project change beyond the project plan will be implemented.</p>	<p><u>Lead:</u> Program Manager</p> <p><u>Support:</u> Recreation, New Recreation Facility project team, CPB Project Manager</p> <p><u>Commitment Date:</u></p> <p>a) Design of a project change control process: December 7, 2015</p> <p>b) Implementation and monitoring: March 31, 2016</p>

4.4 Project Quality Issues Management

Although an issue log existed to identify outstanding quality issues, the project quality issue management process did not define how to assess the severity of issues, the assignment of ownership for issues resolution, and the validation of issues responses.

The City's CPMF states that 'A risk becomes an issue if it actually occurs and thus the two terms are often closely associated'. The absence of the issue management process can expose the City to financial, reputational, safety and program delivery risks if issues are not addressed in a timely and complete manner.

The Program Manager has assigned project quality assurance responsibilities to an external organization. Firstly, the construction manager has a quality plan, monitors subcontractors, and identifies any deficiencies in subcontractors' work. Secondly, the City also utilizes external inspectors and testing agencies to review whether specific aspects of the work (such

as structural, concrete, building envelope) meet all relevant contract specifications, standards and regulations.

At the time of the audit, it had not been determined and communicated how the City (Program Manager, Project Manager (construction)) would manage any reported quality deficiencies. The Construction Manager’s August 2015 report identified that a trade contractor had ongoing quality performance issues. The issues include completeness and accuracy of shop drawings, delivery of proper rebar, and quality and timeliness of installation. An issues management process would help ensure that quality issues are resolved promptly and cost-effectively.

Recommendation 4

The Program Manager define and implement a quality issue management process.

Management Response

Agree.

Action Plan	Responsibility
<p>The Program Manager has recently defined a quality issue management process. The quality issue management process will be implemented by the end of the first quarter of 2016. A project issue plan will be created and implemented, and maintained to the project completion. This recommendation will be applied to all other new recreation facility projects.</p> <p>The Project Manager (construction) and other members of the project team are responsible for owning, updating and maintaining the Project Issue Registry, and to provide monthly status updates to the Program Manager, including significant issue and planned mitigation strategies. Issue owners will be identified with an appropriate response/mitigation strategy and to provide clarity and awareness of the issue definitions.</p>	<p><u>Lead:</u> Program Manager</p> <p><u>Support:</u> Recreation, New Recreation Facility project team, CPB Project Manager</p> <p><u>Commitment Date:</u></p> <p>a) Design of a project quality issue management process: December 7, 2015</p> <p>b) Implementation and monitoring: March 31, 2016</p>