FLOOD MITIGATION PROJECT FOR CALGARY ZOO

EXECUTIVE SUMMARY

Following the 2013 June flood event, The City engaged engineering, geotechnical and hydrotechnical consultants to analyze the impact of the flood on the Calgary Zoo, and provide recommendations on protecting the Zoo from future floods.

As more than half of the Calgary Zoo's infrastructure is located on St. George's Island, the most significant damage during the 2013 flood was caused by overland flow that entered the Calgary Zoo at low points on the south side of St. George's Island. In 2013 November, as part of the 2014 business plan and budget adjustment process, Council was advised that, to protect the Zoo from future flooding by constructing a berm, the cost would be $11 million. Since this estimate, geotechnical data indicates berm protection must be augmented to protect the island from groundwater seepage associated with rising river levels. The current estimate for the entire project is $25 million which includes site preparation, reinforcement of existing berms, construction of new berms or dykes, and implementation of groundwater control measures for flood resiliency to the 1:100 year flood level. Up to $1.2 million is required for the detailed design phase of the project as it is in a state of readiness to proceed.

ADMINISTRATION RECOMMENDATIONS

That the Priorities and Finance Committee recommends that Council:

1. Approve the capital budget appropriation of up to $1.2 million to Program 956 (Project #004 – Calgary Zoo Floodproofing) funded in the interim from the Fiscal Stability Reserve for the detailed design phase for the flood mitigation project at the Calgary Zoo;
2. Direct Administration to develop and coordinate implementation of a plan to advocate for reimbursement by the provincial and federal governments for the flood mitigation project at the Calgary Zoo; and
3. Direct Administration to report back to Council:
   (a) once the Government of Alberta has rendered any funding decision on the applications for either the Flood Recovery Erosion Control Program and the Resiliency and Mitigation Framework Fund, with recommendations regarding the flood mitigation project at Calgary Zoo; and
   (b) as part of Action Plan 2015-2018 with business plan and budget recommendations for the flood mitigation project at the Calgary Zoo.

RECOMMENDATION OF THE PRIORITIES AND FINANCE COMMITTEE, DATED 2014 APRIL 01:

That the Administration Recommendations contained in Report PFC2014-0279 be approved.

PREVIOUS COUNCIL DIRECTION / POLICY

On 2013 September 03, PFC2013-0578 Flood Status Update regarding the 2013 Flood Event was received for information by the Priorities and Finance Committee.

On 2013 November 25, 26 and 27, Council received Flood Recovery Task Force: 2014 Business Plan and Budget Adjustments Companion Report (C2013-0742) for information as a

companion report to C2013-0668 Proposed Adjustments to the 2014 Business Plans and Budgets.

On 2013 November 25, 26 and 27, Council approved a referral motion moved by Councillor Chabot, seconded by Councillor Pootmans, that Councillor Carra's proposed Motion Arising with respect to Report C2013-0668 be referred to Administration as follows: to return to the Priorities and Finance Committee no later than Q1 2014 once there are more details available on the project. "*Motion Arising, moved by Councillor Carra, seconded by Councillor Woolley, that Council: "1. Approve a one-time transfer of up to $11 Million from the Fiscal Stability Reserve to undertake the flood resilience project for the Calgary Zoo Identified in Report, Flood Recovery Task Force: 2014 Business Plan And Budget Adjustments Companion Report C2013-0742; and 2. Direct Administration to seek all sources of reimbursement for this project including, but not limited to, the provincial and federal governments*."

On 2013 December 16, Council received Flood Recovery Task Force: Update (C2013-0836) for information.

BACKGROUND

Alberta's 2013 flood in the Bow River Basin inundated low lying areas of St. George's Island with up to two meters of flood water and peak river flows equal to the 1:100 year flood. As approximately 60 percent of the Calgary Zoo's infrastructure is located on St. George's Island within the Bow River, the damage from the 2013 flood to infrastructure was significant.

It is estimated up to $50 million in damage was incurred at the Calgary Zoo; tallying up the damage to the buildings and other critical infrastructure, cost of protecting animals, loss of revenue and other intangibles. Insurance coverage has funded the majority of the repair costs for insured infrastructure, as well as Government of Alberta funding programs including Disaster Recovery Program and Flood Recovery Erosion Control Program for non-insured infrastructure damage and riverbank erosion caused by the flood.

The Zoo's land exceeds 110 acres in size and features a range of exhibits and facilities. The Zoo is one of Calgary's most significant landmarks with nearly a century of history in this location. Reconstruction of the Zoo in a different location is not practical given: the scarcity of suitable locations, high cost of replacing specialized infrastructure, likely impact on Calgarians wishing to access the Zoo and significant negative impact on ongoing operations. The insured assets at the Calgary Zoo are valued at approx $174 million. Costs to relocate the Calgary Zoo will far exceed that amount as it does not include costs such as land acquisition, servicing, underground infrastructure, roads, pathways as well as impact to operations.

INVESTIGATION: ALTERNATIVES AND ANALYSIS

The City, as the landowner, has been working with the Calgary Zoo, as the operator, to develop a long-term solution to mitigate the risks from another flood of similar magnitude. With approved funding of $500 thousand for preliminary design, The City engaged engineering, geotechnical and hydrotechnical consultants to analyze the impact of the flood on the Calgary Zoo, and provide recommendations on protecting the Zoo from future floods. The preliminary berm design is provided in the Attachment.

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The City's initial focus of the mitigation project was to provide a solution for protection from flood stage overland flows, by constructing barriers including berms, dykes and walls that are 100 m and 50 m above the 1:100 year flood elevation of the adjacent river. The preliminary design and construction of the barriers include using engineered earth embankments with a natural vegetation surface for the dykes/barriers and concrete using cast-in-place and pre-cast methods will be utilized for the walls.
Regulatory permits are not anticipated as the preliminary design flood protection berms and walls are all outside the floodway, with the exception of part of a food services building and administration parking lot. To marginally alter the flood boundary to reflect the physical realities of the existing river, these areas will require approval from regulators at the Government of Alberta and The City. The City's consultant has completed hydrotechnical analysis and has confirmed that the proposed work will not have any impact on river levels upstream or downstream of The Zoo. Consultation has been initiated with Alberta Environment and Sustainable Resource Development with respect to the regulatory approvals required. In addition, Water Resources has been engaged to provide input on the technical aspects of working near the river and groundwater conditions.

The initial focus of the mitigation project was on overland flows being the original scope of the $11 million project estimate. However, the scope of the preliminary design expanded to address subsurface conditions at the Zoo. Recent geotechnical work showed that groundwater in the gravels under St. George's Island rise and fall in concert with the elevation of the river. This means that in a high water event, groundwater would inundate the bermed area making the flood mitigation efforts less effective. As a result, the berm protection must be augmented to also protect the island from groundwater seepage associated with rising river levels.

To protect the island from rising groundwater, three options were considered. These are:

1. Raise all vulnerable infrastructure on the island on an individual case-by-case basis;
2. Seal the interior of the island off from the rising flood waters around the island; and
3. Dewater or pump the rising groundwater out of the interior of the island as fast as, or faster than it is rising.

To apply an appropriate degree of mitigation and protection for the Zoo, a combination of options 2 and 3 are proposed. These include the initial scope of augmenting overland flooding protection, coupled with a combination of sealing the island interior with subsurface seepage cut-off walls (option 2) and pumping to manage inflows from both groundwater and stormwater drainage (option 3). Option1 was not explored further as it was determined to be cost prohibitive.

For option 2, both conventional and emerging technologies, have been considered for the subsurface seepage cut-off wall. More specifically, these include steel sheet pile walls, vinyl sheet pile walls, in situ mixing of bentonite and gravel and cast-in-place secant pile wall. A recent geotechnical report by The City's consultant has identified either the steel sheet pile with very heavy sections or cast-in-place secant pile wall as the best options. It must be noted that while groundwater flows can be minimized by creating a subsurface seepage cut-off wall, they cannot be completely eliminated. As such, dewatering inside the protected perimeter is required

(option 3). The proposed pumping system will control all potential seepage through the perimeter wall, help manage stormwater, and also draw down groundwater levels to help mitigate potential flooding.

This comprehensive approach, combining options 2 and 3, has an estimated cost of $25 million, including a 20 per cent contingency provision. The estimate has been set using the most conservative construction materials.
The Zoo mitigation project is in a state of readiness to move to detailed design. Prior to detailed design, additional research and value engineering sessions will be undertaken to specify further the evaluation of the best construction options. Each option will be assessed for constructability, cost, disruption to the Zoo, among other criteria. Additionally, specific user requirements will be fully determined and resolved during the detailed design via design review and input from the Calgary Zoo management and staff, as well as other affected stakeholders.

The preliminary design proposes to keep access at grade and resembles the current access as much as possible. The embankments and walls will change how the perimeter of the Zoo appears from the outside. Finished landscapes will be developed under The City's and Calgary Zoo's standards for aesthetics.

Further refinement will be made during detailed design. Administration will work with consultants and contractors to find opportunities to control costs by ensuring cost effective materials and construction methods are used. Subject to funding approval, it is anticipated that detailed design will commence in April and construction will commence in the fall of 2014 with an estimated completion date by 2016.

Generally the Zoo's future development plans avoid the perimeter and therefore space is available for construction of the berms, sub-surface seepage cut-off wall and pumping system. The infrastructure associated with future plans significantly add to the tangible and intangible assets on St. George's Island at risk from future floods.

Aside from the proposed project, the Calgary Zoo will need to continue implementing strategies to protect their existing and future infrastructure from flood risk where practical. In addition, the Calgary Zoo will need to enhance their emergency response plans, as the proposed berms do not completely remove the risks of overland flooding especially from events larger than the 1:100 year event. Protection of the Zoo is essential in order to ensure that it can maintain its image as a global destination and Canada's leader in wildlife conservation for future generations.

Funding Considerations and Next Steps
Given the vast amount of mitigation projects as set out in the Flood Recovery Task Force Update Report and the impact on The City's Fiscal Stability Reserve Fund, Administration has assessed the following options for funding and next steps as outlined below:

1. Not fund the flood mitigation project from The City's funding;
2. Request confirmation of reimbursement from provincial government before proceeding with any further work on the flood mitigation project;

3. Fund $1.2 million in the interim from the Fiscal Stability Fund for detailed design for the flood mitigation project. Administration will develop and coordinate implementation of a plan to advocate for reimbursement by the Government of Alberta for the project. As well, Administration will report back to Council once the Government of Alberta has rendered any funding decision on the applications for either the Flood Recovery Erosion Control Program and the Resiliency and Mitigation Framework Fund and report as part of Action Plan 2015 – 2018 with recommendations regarding the project.
4. Fund $25 million as an interim source of funding for the entire project to not delay the construction for the flood mitigation project. Administration will develop and coordinate implementation of a plan to advocate for reimbursement by the Government of Alberta for the project. As well, Administration will report back to Council once the Government of Alberta has rendered any funding decision on the applications for either the Flood Recovery Erosion Control Program and the Resiliency and Mitigation Framework Fund and report as part of Action Plan 2015 – 2018 with recommendations regarding the project.

It is recommended, by Administration, to proceed with option 3 to fund $1.2 million to enable the project to move to the detailed design phase of the berms and pumping system around the perimeter of St. George's Island up to the 1:100 year level. This will ensure that the commencement of this complex project is not delayed while advocating for funding opportunities by the Government of Alberta on the Flood Recovery Erosion Control Program and the Resiliency and Mitigation Framework Fund.

Stakeholder Engagement, Research and Communication
The Calgary Zoo has been engaged in this project as part of the project governance and primary stakeholder as the operator. The project will adhere with the Corporate Project Management Framework. This framework requires formal project chartering, including the preparation and implementation of a stakeholder engagement and communication plan. In addition, consultation has been initiated with Alberta Environment and Sustainable Resource Development with respect to the regulatory approvals.

Strategic Alignment
This report is in alignment with 2013 Flood Recovery Operations Task Force Update: Resilience Report to Priorities and Finance Committee on 2014 April 01.

The recommendations in this report are strategically aligned with the following:

- Council's Fiscal Plan for Calgary
  - Investing in great communities and a vibrant urban fabric
- Municipal Development Plan
  - 2.2.4 Complete communities
  - 2.3.6 Community services and facilities

Social, Environmental, Economic (External)
The recommendations in this report are in alignment and compliance with the Triple Bottom Line policy and framework as follows:

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Social: The Calgary Zoo is one of Calgary's most significant landmarks with nearly a century of history in this location having been established in 1929. The Zoo is a valuable asset contributing to the excellent quality of life enjoyed by Calgarians. The City and the Calgary Zoo agree that a zoo is an integral contributor to The City's vision of creating and sustaining a vibrant, healthy, safe and caring community. Protection of the Zoo is essential in order to ensure that it can maintain its image as a global destination and Canada's leader in wildlife conservation for future generations.

Economic: The Zoo leverages The City's assets, and operating and capital contributions in the community to generate revenue and other financial support. The Zoo is a valuable asset to The City contributing to the economic advantage of the city as a major tourist attraction. The operation of the Zoo generates significant direct and indirect economic and employment impacts for Calgary and Alberta. In 2012, the Zoo attracted over 1.45 million visitors setting a new record for attendance attributable to the introduction of the Penguin Plunge exhibit. The Zoo has an excellent opportunity to generate increased attendance and revenues with its proposed 20-year Master Plan. One of the most highly anticipated specialized exhibits planned for 2018 is the new five-year giant panda exhibit. It has been conservatively estimated to increase attendance to at least 1.50 million visitors per year.

Environmental: Preservation of land base demonstrates environmental stewardship. During design and construction, the preservation of mature trees and natural vegetation will be considered.

Financial Capacity

Current and Future Operating Budget:

There is no impact to the current operating budget from the recommendations. The Calgary Zoo will need to incorporate estimated life-cycle costs of 0.5 to one per cent of the capital costs or $125 thousand to $250 thousand per year on average for maintenance, monitoring and inspection of the berms and groundwater protection once constructed.

Current and Future Capital Budget:

The current request of $1.2 million for interim funding for the detailed design is recommended from the Fiscal Stability Reserve to Program 956 (Project 004 – Calgary Zoo Floodproofing).

As a potential funding source for reimbursement, The City has submitted an application to request funding from the Government of Alberta's Flood Recovery Erosion Control Program and the Resiliency and Mitigation Framework Fund. In discussions with the Government representatives, the flood mitigation project is eligible for funding from both programs. Given the vast amount of projects throughout Alberta, the Government must assess all projects and prioritize the funding available. Funding decisions are expected by Q3 of 2014. Administration will continue to advocate for funding from all levels of government.

Administration will report back as part of Action Plan 2015 – 2018 with recommendations for the flood mitigation project at the Calgary Zoo.

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Risk Assessment

In accordance with The City's Corporate Project Management Framework, The City has conducted its initial risk workshop to identify the risks based on high impact and high probability to low impact and low probability. Risks were assessed in many categories, including design, constructability, stakeholders, budget and regulatory approvals. Emerging from the risk workshop is the complexity of the project at all stages and the potential impact on cost, schedule and performance. The highest impact risks that were identified included, but are not limited to:

1. Potential scope creep due to unforeseen circumstances as the project progresses. This may result in cost escalation;
2. Challenges in construction due to contractor inexperience;
3. Unpredictable subsurface conditions which may impact the constructability and operability of the proposed groundwater barrier technology; and
4. Addressing utility conflicts with the proposed groundwater barrier technology.

As part of the design phase, additional research and value engineering sessions will be undertaken to continue to evaluate the best options for construction, cost, and disruption to the Zoo, among other criteria. The City will continue to conduct risk assessments and develop risk mitigation strategies as the project progresses.

Depending on the schedule, it would be most effective to commence construction of the barriers near the Savannah building to achieve some efficiencies in the construction (Location 5 on Attachment). Construction timing is likely to occur concurrent with low water levels in the Bow River which is spring (April to May) and early fall (September to October). Recognizing that the Zoo's busiest season is during the summer, a majority of the construction or the least disruptive works will be scheduled for the spring, fall and winter months, if practical. Safety of the visitors, staff, animals and zoo infrastructure will be addressed with a detailed construction plan and phasing schedule.

Additionally, the Calgary Zoo must continue efforts over time to reduce impacts from flooding and to protect their assets. These efforts should include integrating site specific flood mitigation and resiliency measures for all future works and emergency response procedures based on learnings from the 2013 event.

REASONS FOR RECOMMENDATIONS:

Funding of the $1.2 million for detailed design of the project enables Administration to progress to the next phase of the project while The City advocates funding from the Government of Alberta. The intent of the flood mitigation project is to provide an optimal mitigation strategy for the Calgary Zoo in the case of another flood. As 60 percent of the Calgary Zoo's infrastructure is located on St George's Island with approximately $50 million in damage from the 2013 Alberta flood, protection of the Calgary Zoo is necessary in order to ensure that it can maintain its image as a global destination and Canada's leader in wildlife conservation for future generations.

ATTACHMENT

Berm Design