Watershed Adaptation and Resilience Branch
c/o Operations Infrastructure Branch
8th Floor Oxbridge Place, 9820 – 106 Street
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TERMS OF REFERENCE

(19TDRSTR807)

for

Bow Basin Water Management Options

Phase 1: Conceptual Assessment

(Glenbow, Morley and Expanded Ghost Reservoirs)

Watershed Adaptation and Resilience Branch

Alberta Environment and Parks

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Revisions

Please be advised of the following revisions to the Terms of Reference:

Item	Date of Revision
9.0 Project Schedule	September 25, 2018

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Alberta Government

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Bow Basin Water Management Options
Phase 1: Conceptual Assessment
(Glenbow, Morley and Expanded Ghost Reservoirs)

1.0 Introduction

Alberta Environment and Parks (AEP) requires consulting services for a conceptual assessment of potential additional storage options on the Bow River upstream of the City of Calgary.

- Feasibility Level designs for three potential storage options are to be included in the study; a new Glenbow Reservoir, a new Morley Reservoir, and expanded storage capacity at Ghost Reservoir.
- The purpose of the study is to review options for additional storage to provide flood and drought mitigation at these three sites on the Bow River, confirm their viability, and provide conceptual engineering level detail specific to the infrastructure requirements to achieve the proposed storage.
- Feasibility level supplementary hydrologic studies, mapping, and geotechnical studies are to be undertaken, where adequate information is currently unavailable, to confirm project viability and to provide the support needed to complete the conceptual design of the various components required for each option.
- Stakeholder and Indigenous Communities engagement will be required and will include three specific groups: Direct and indirect stakeholders, First Nations and Métis, and the Bow River Working Group.
- An overview of the regulatory approval requirements, existing infrastructure impacts, social impacts, and environmental impacts; a scheduling estimate for potential regulatory approval, engineering, and construction; and a conceptual level cost estimate including anticipated annual operation and maintenance costs are to be provided for each option.

The Consultant must be pre-qualified under Alberta Transportation's Major Dam and Reservoir Projects of Water Management Projects in order to be considered for this project. See PQR#: AT – ECPQ001 (APC Reference #: AB-2009-00076)

2.0 Background

The 2005 and 2013 floods surpassed any observed on the Bow River since 1932 resulting in significant risk to public safety and substantial damage to infrastructure in the floodplain. Droughts also pose significant risk to the reliable supply of clean water for municipal, residential, commercial, agricultural, and environmental needs for all Albertans.

The Bow River Water Management Project, announced in October 2015 by Alberta Environment and Parks (AEP) and jointly chaired with the City of Calgary, was one of many water management projects and investments initiated in the Bow River Basin since the floods in 2013. The project was carried out by the Bow River Working Group (BRWG), a collaborative of water users, water managers, and other stakeholders from across the basin. In May, 2017, the BRWG prepared a report entitled "Advice to Government on Water Management in the Bow River Basin" which identified increased storage on the Bow River upstream of Calgary as a means of significantly reducing these risks in the future. The three major storage options recommended in the report for further study were; a new Glenbow Reservoir, a new Morley Reservoir, and expanded storage capacity at Ghost Reservoir.

1. The Glenbow Reservoir, identified as Site #10 on Figure A1, is to be located on the Bow River upstream of Bearspaw. It is anticipated that it would be able to provide around 70,000 dams³ of live storage, with 60,000 dams³ for flood mitigation and 10,000 dam³ for drought mitigation.
2. The Morley Reservoir, identified as Site #11 on Figure A1, is to be located on the Bow River upstream of the Ghost Reservoir. It is anticipated that it would be able to provide around 150,000 dams³ of live storage, with 75,000 dam³ for flood mitigation and 75,000 dam³ for drought mitigation.
3. The Expanded Ghost Reservoir option involves modifications to the existing Ghost Dam, identified as Site #13 on Figure A1. It involves increasing the Full Supply Level (FSL) by increasing the dam height by 3 metres and providing for greater draw down by incorporating a new low level outlet. Raising the dam by 3 metres is anticipated to provide an additional ~30,000 dam³ of storage while incorporating a new low level outlet is anticipated to provide an additional 30,000 dam³ of live storage, for a total of 60,000 dams³ of additional storage.
    - Investigation of the Ghost Reservoir drawdown rate, as recommended in the BRWG report, is not included in this Terms of Reference as that scope of work is being investigated independently by the Dam owner.

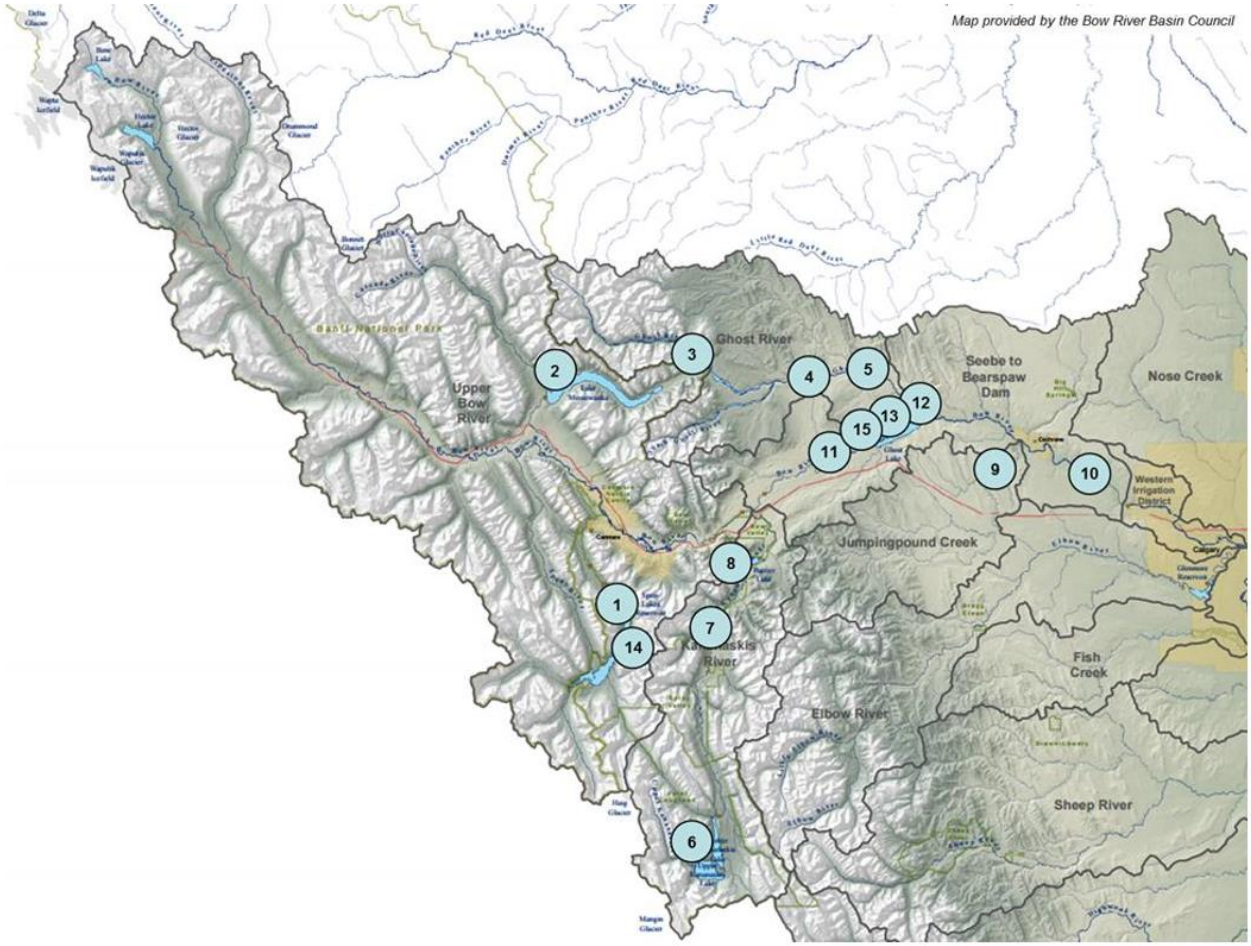

Figure A1. Location of the mitigation schemes.

3.0 Project Scope

3.1 General

1. Develop a management plan for the organization and execution of Services.
2. Prepare a time schedule for the Services, in detail appropriate to their scope and complexity, and in both graphic and textual formats.
3. Institute and maintain a program of cost planning and control, and reporting, for the Engineering Services related to different design phases.
4. The Consultant shall arrange a facilitated risk management workshop. This workshop shall include key design, engagement and environmental team members and shall identify and evaluate all risks that could affect the schedule and budget for the completion of Project.

5. The Consultant shall assign one overall Project Manager responsible for managing and coordinating the work.
6. Coordinate and assist with public, stakeholder and Indigenous engagement, including preparing for and participating in project, public, stakeholder and Indigenous engagement meetings as required throughout the project (as per Section 3.3).
7. Maximum upset limit of this Project is $ 2,000,000, which includes following disbursement allowances;
    - Geotechnical investigation $300,000
    - Indigenous engagement $300,000

3.2 Engineering

Review the May, 2017, Bow River Water Management Project report entitled "Advice to Government on Water Management in the Bow River Basin". The additional storage shall provide flood and drought mitigation.

3.2.1 Glenbow and Morley Reservoirs

1. Review available related hydrology, mapping, and geotechnical information to determine whether or not it is adequate enough to undertake a conceptual level design required for a feasibility level study of each option.
2. Complete a preliminary screening assessment to select a preferred location for each dam site within the reach of the river identified.
3. Provide whatever supplementary hydrologic analyses may be required to transpose available hydrology to the project location.
4. If not already available, provide digital format mapping that covers the proposed dam and reservoir areas.
    - The accuracy of the digital data shall be such that mapping at 1 m contour intervals with a minimum 0.5 m accuracy can be plotted. Photo mosaic layout maps with the 1 m contours transposed on them shall be produced that clearly illustrate the topographic and natural features of the area as well as current development and land use.
    - Identify the amount of live storage, Full Supply Level, 1:100, 1:1000 and maximum flood levels.
    - LIDAR shall be considered as a source of this digital data.
5. Provide feasibility level geotechnical investigations sufficient to broadly identify foundation conditions that could have a significant impact on the conceptual design of the dam and appurtenant structures. Identify potential earth material sources.

6. Provide conceptual level designs for the dams and appurtenant structures. These conceptual designs shall fully meet the Canadian Dam Associations (CDA) 2013 Dam Safety Guidelines.
7. Provide a high level determination of the risk hazard classification for the proposed projects in accordance with CDA Guidelines.
8. Identify all existing infrastructure in the area that will be affected by the proposed projects.
9. Identify opportunities to provide additional storage for each option including an assessment of additional existing infrastructure affected by such additional storage.
10. Identify opportunities for hydropower development.
11. Provide a preliminary assessment of land requirements and utility impacts.
12. Conduct a high level environmental scan and identify environmental impacts and potential mitigation requirements.
13. Explore and discuss implications to potentially affected Provincial Parks and other public use areas.
14. Identify all landowners, stakeholders, First Nations and Métis that would be directly and/or indirectly impacted by the proposed projects.
15. Support engagement activities with Indigenous groups for their input for potential options as outlined in the Engagement with Stakeholders, First Nations and Métis, and the Public section below.
16. Complete a desktop study for traditional uses for Indigenous groups for all potential areas.
17. Conduct a high level historical resources assessment, and any potential mitigation requirements.
18. Identify debris and sediment management issues.
19. Provide a Conceptual Level cost estimate for each option including operation and maintenance costs.
20. Provide a preliminary schedule for regulatory approval, final engineering design, and project construction.
21. Prepare a final report including applicable drawings and other support information.

3.2.2 Expanded Ghost Reservoir

The Ghost Dam is owned and operated by TransAlta and the Consultant will be required to enter into a confidentiality agreement with TransAlta. TransAlta will provide dam design drawings, recent dam safety reports and general operating procedures for the site. The Consultant shall use this information to conduct their review but will not directly include original data in the final report as identified by TransAlta during the execution of this contract. TransAlta will provide a site tour to the Consultant, which will require adherence to TransAlta's standard safety procedures.

1. Review relevant engineering documents available for the existing dam.
2. Provide a conceptual level assessment of the modifications, where any proposed modifications shall fully meet the CDA Guidelines, that would have to be made to:
    - The existing dam and appurtenant structures in order to raise the dam and the current FSL by 3 metres; and
    - Incorporate a new low level outlet that would allow for an access to an additional 20 metres of live storage.
3. Identify all existing infrastructure in the area that will be affected by the raised FSL and lower draw down level.
4. Provide whatever supplementary hydrologic analyses that may be required to transpose available hydrology to the project location.
5. Provide a preliminary assessment of additional land requirements, environmental impacts, and social impacts of the raised FSL.
6. Conduct a high level environmental scan and identify environmental impacts and potential mitigation requirements.
7. Identify all landowners, stakeholders, First Nations and Métis that would be directly and/or indirectly impacted by the proposed project.
8. Support engagements with Indigenous groups for their input for potential options as outlined in the Engagement with Stakeholders, First Nations and Métis, and the Public section below.
9. Complete a desktop study for traditional uses for Indigenous groups for all potential areas.
10. Conduct a high level historical resources assessment, and any potential mitigation requirements.
11. Identify debris and sediment management issues.
12. Provide a Conceptual Level cost estimate for both raising the dam and incorporating the lower low level outlet options including any additional operation and maintenance costs.
13. Provide a preliminary schedule for regulatory approval, final engineering design, and project construction.
14. Prepare a final report including applicable drawings and other support information.

3.3 Engagement with Stakeholders, First Nations and Métis, and the Public

Engagement will be carried out as part of this contract. The consultant will, in cooperation with AEP and Indigenous Relations staff, develop a detailed engagement plan and coordinate all public-facing engagement activities. A separate standalone engagement plan will be required for First Nation and Métis conversations. AEP shall serve as the public face for all engagement activities. Engagement

activities will be carried out in coordination with the technical work associated with this assessment as appropriate.

The engagement plans should:

1. Propose a process for identifying stakeholders that might be directly or indirectly impacted by each option, should any of the proposed projects proceed. Stakeholders should be categorized as follows:
    - directly-impacted stakeholders (landowners and organizations);
    - indirectly-impacted stakeholders (municipalities and other organizations);
    - First Nations and Métis; and
    - Bow River Working Group (membership list will be provided to consultant).
2. Using the agreed upon process, identify all landowners, key stakeholders, and First Nations and Métis directly and/or indirectly impacted by the proposed project, its design, construction and operation, and describe how they might be impacted.
3. Include an assessment and recommendation on engaging with identified directly and indirectly impacted stakeholders to inform them of the project and encourage their active participation in issue identification, review of interim results, and identification of mitigation measures. Details will be determined in collaboration with the project team.
4. Include an assessment and recommendation on engaging with First Nations and Métis.
    - First Nations and Métis to be engaged include all 13 First Nations that participate in the South Saskatchewan Regional Plan First Nation Subtable, and the Métis Nation of Alberta Region 3.
    - Include in the budget, for appropriate cultural protocol, an honorarium for all engagement sessions with First Nations and Métis (see note on Indigenous engagement disbursements on pg.6).
    - Consider inclusion of First Nations and Métis into the design of the engagement session(s).
5. Include an assessment and recommendation on engaging with the BRWG to allow active participation in issue identification, review of interim results, and identification of mitigation. Details will be determined in collaboration with the project team.

Engagement activities may include:

- Direct mailing of project and contact information;
- Targeted meetings and/or public Information sessions to share information on the findings of the conceptual assessment, and to answer questions and to provide opportunity for public and stakeholders to provide input/feedback; and

- Opportunity for one-on-one feedback as necessary.

As part of their bid, the consultant will provide a high-level overview that proposes a strategy for engaging with all directly and indirectly impacted stakeholders, First Nations and Métis and the Bow River Working Group for the sites included in this conceptual assessment. This should include:

- Identification of project milestones at which time stakeholders and First Nations and Métis should be engaged, and recommendations as to how to best to engage with them;
- A proposed process for analysing stakeholder feedback for each proposal;
- An outline of the percentage of project budget that would be allocated to engagement activities;
- An outline of timing and coordination of engagement activities with the technical work; and
- Rationale demonstrating that the engagement activities meet regulatory requirements and are in accordance with Government of Alberta policy.

To assist in defining a budget for the engagement process, the consultant should plan for:

- quarterly half day meetings with the Bow River Working Group;
- several meetings with impacted First Nations and Métis;
    - 6 meetings with Siksika Nation
    - 6 meetings with Stoney Nakoda Nation
- 5 public information sessions; and
- additional targeted stakeholder meetings as requested or required.

4.0 General Requirements

1. The work shall be carried out in accordance with the latest versions of AT's "Engineering Consultant Guidelines for Highway, Bridge and Water Projects, Volume 1 – Design and Tender" and "Engineering Consultant Guidelines for Highway and Bridge Projects, Volume 2 – Construction Contract Administration", and all relevant AT Design and Construction bulletins.
2. The design shall be in compliance with current AT standards, all current AT Design and Construction Bulletins and all AT environmental policies and guidelines. Where conflicts exist between Design Bulletins and other AT publications, the Design Bulletins shall govern. The Consultant is advised that Design Bulletin 57 (including additional Section 12 for Volume 1 and Section 5 for Volume 2 of AT's Engineering Consultant Guidelines) addresses Water Management Projects.
3. Develop a management plan for the organization and execution of the Services.

4. Prepare time schedule for the Services, in detail appropriate to their scope and complexity, and in both graphic and textual formats.
5. Institute and maintain a program of cost planning and control, and reporting, for the Engineering Services.
6. Consultant representatives will attend monthly project meetings to review progress, findings, schedule, risks, and coordination requirements.
7. The Consultant will assign one overall Project Manager responsible for managing and coordinating the work.
8. Prepare and submit monthly progress reports.

5.0 Meetings

1. A kick-off meeting for the contract, to discuss contract management procedures; this meeting can be by teleconference and organized from the Consultant's office.
2. In addition to the monthly meetings, progress meetings between the consultant and AEP departmental representatives will be held:
   - after the completion of field work,
   - at the completion of approximately 70% of the study work, and
   - approximately two weeks after the delivery of the draft report.

   The purpose of these meetings are to update the department of their findings as well as get feedback from the department.
3. The AEP departmental representative will arrange additional meetings at the consultant's office or by Live Meeting/teleconference call when deemed necessary.
4. The consultant will present the final report and recommendations at the completion of the study.
5. The consultant's responsibilities include:
   - Record the issues and decisions, and
   - Prepare and distribute minutes within two working days of the meeting.

6.0 Health and Safety

1. Any field work envisaged in this contract could present significant health and safety hazards. Prior to undertaking this work, the consultant will prepare a written Site-Specific Health and Safety Plan (SSHSP) based on hazard assessments and continue to implement, maintain, and enforce the plan

through the field work. The SSHSP needs to cover all activities of the Consultant team (consultant personnel, sub-consultants and sub-contractors).

2. The Consultant shall provide all required Personnel Protective Equipment and other equipment and material required to meet the intent of the safety requirements set in the Consultants SSHSP or as required by the Provincial Occupational Health and Safety Legislation.
3. The Consultant shall be responsible for health and safety for all project personnel on site, and for the protection of the general public and government employees adjacent to the site to the extent that they may be affected by the field work being conducted.
4. The Consultant must employ employees who are knowledgeable and possess the appropriate OH&S competencies and training to complete their work safely. The Consultant shall adhere to all applicable Occupational Health and Safety legislation while working on this project and extreme care must be exercised when conducting field work.
5. Prior to undertaking the site inspection/investigation, the consultant will develop:
   - A site inspection/investigation plan, including a schedule;
   - A Health and Safety Plan, including hazard assessments, hazard control and an Emergency Response Plan for the field work.
6. Tailgate meetings are required at the project site.

7.0 Deliverables

Notwithstanding the deliverables described in Section 12 of Volume 1 and Section 5 of Volume 2 of the latest versions of the AT's Engineering Consultant Guidelines, and relevant Design Bulletins, the deliverables required for this project include, but are not limited to, the following:

1. Provide a report including applicable drawings and other support information outlined in the Project Scope Section of this document.
   - Provide an **unlocked** and editable pdf file of all **draft** versions of reports and documents.
   - Provide an **unlocked** digital (pdf) copy of the **final** version of all reports and documents.
   - Provide a **locked** digital (pdf) copy of the **final** version of all reports suitable for posting online.
2. Electronic copies of any table, figures and model/associated files generated during the analysis and review for the report, in the original file format (i.e. .xls, .dwg, etc.), photographs, model – input and output files, drawings in AutoCAD and pdf format.
3. Provide 3 hard copies of the final report.

8.0 Information Available

The following publications are available on the Government of Alberta's Open Government website for review by the Proponent:

Bow River Water Management Project: Advice to Government on Water Management in the Bow River Basin. Submitted to Alberta Environment and Parks on May 17, 2017. https://open.alberta.ca/publications/bow-river-water-management-project-advice-to-government-on-water-management-in-the-bow-river-basin
Southern Alberta Flood Mitigation Feasibility Study for Sheep, Highwood River Basins and South Saskatchewan River Sub-Basin South Saskatchewan River Sub-Basin Water Management Plan. June 2014. AECOM 2014. 108 pp. https://open.alberta.ca/publications/south-saskatchewan-river-sub-basin-water-management-plan

The following publications are available on the City of Calgary's website for review by the Proponent:

Flood Damage Assessment and Flood Mitigation Options Assessment (2017): https://cityonline.calgary.ca/Pages/Product.aspx?category=Unlisted&cat=CITYonlineDefault&id=8092-12527-14294-00002-P , **and Summary report**:http://www.calgary.ca/UEP/Water/Pages/Flood-Info/Stay-informed/Flood-Mitigation-Measures-Assessment.aspx
Hydraulic Model and Inundation Mapping Update (Golder, 2015): http://www.calgary.ca/UEP/Water/Documents/Water-Documents/Flood-Info-Documents/Bow-and-Elbow-Rivers-Hydr.pdf
Basin-Wide Hydrology and 2013 Flood Documentation (Golder, 2014): http://www.calgary.ca/UEP/Water/Documents/Water-Documents/Flood-Info-Documents/River%20Hydrology%202014.pdf
Riparian Strategy and Action Plan: http://www.calgary.ca/UEP/Water/Pages/Watersheds-and-rivers/Riverbanks-and-Floodplains-in-Calgary.aspx
Source Water Protection Plan: http://www.calgary.ca/UEP/Water/Documents/Water-Documents/Source-Water-Protection-Plan.pdf

The following information will be released to the successful Consultant:

Bow, Elbow, Highwood, and Sheep River Hydrology Assessment (February 2017) – Prepared by Golder Associates for Alberta Environment and Parks.

• The study provides peak flow data series and flood frequency discharge estimates for the naturalized and regulated 2-, 5-, 10-, 20-, 35-, 50-, 75-, 100-, 200-, 350-, 500-, 750- and 1000 year open water floods at multiple locations along the Bow River.
Dam design drawings, recent dam safety reports and general operating procedures for the Ghost Dam (upon signing a confidentiality agreement with the dam owner).
Other reports and studies as deemed appropriate.

9.0 Project Schedule

For the Project to be implemented in a timely manner, the following milestone dates shall be met unless agreed to by AEP Project Manager. The consultant shall determine all other Milestone Dates in addition to the Milestone Dates listed below.

Contents	**Date**
Contract Award	November 9, 2018
Project Start up and Submission of work plan	November 16, 2018
Draft report submission	October 9, 2019
Final report submission	November 19, 2019