

REPORT TO: Council

FOR: Committee of the Whole

REPORT FROM: Development Services & Engineering

PRESENTED: April 26, 2016

FILE : Cheekeye Fan OCP & Zoning
Bylaw Amendment

SUBJECT: Assessment of Mitigation Alternatives for Cheekeye Fan

Recommendation:

THAT the District of Squamish accept the Assessment of Mitigation Alternatives for Cheekeye Fan prepared for the District by Kerr Wood Leidal Consulting Engineers for information.

THAT Council direct Staff to work with BMS Cheekeye One Projects in determining a terms of reference for the process to design and review the proposed Canyon Debris structure(s) outlined in the Report.

1. Executive Summary:

This outlines a summary of the draft report on an Assessment of Mitigation Alternatives for Cheekeye Fan prepared for the District by Kerr Wood Leidal Consulting Engineers.

2. Background:

The work of reviewing alternate mitigation measures to the large debris retaining structure on the Cheekeye River, upstream of Highway 99, proposed by BMS Cheekeye One Projects (BMS), as part of an OCP and Zoning Bylaw amendment has previously been in front of Council on a number of occasions over the last year or so. Council has passed a number of resolutions and provided direction to Staff, including:

March 3, 2015 (partial resolution)

And finally be it resolved that District Staff report back to District Council at the April 7, 2015 Regular Council Meeting on the following works and related timelines:

Exploration and consideration of a range of options to mitigate debris flow risk to existing development and neighbourhoods as well as possible new development on the Cheekeye Fan and evaluation of these debris flow mitigation alternatives by a DOS appointed Qualified Professional (QP) in accordance with the Expert Review Panel's input.

June 23, 2015

Council met at Totem Hall to review the findings and report of the second expert panel, the Cheekeye River (Ch'kay Stakw) and Fan Landslide Risk Tolerance Criteria Report of the Cheekeye Expert Review Panel #2, which included the following recommendation:

"...all forms of mitigation, singly or in combination, should be considered and carefully evaluated..."

July 21, 2015

THAT the District of Squamish accept the Cheekeye River (Ch'kay Stakw) and Fan Landslide Risk Tolerance Criteria Report of the Cheekeye Expert Review Panel #2.

November 3, 2015

THAT the District of Squamish authorize the Cheekeye Fan Mitigation Alternatives work expense in 2015 and fund from the 2015 accumulated surplus (if necessary), AND THAT Staff be authorized to award Kerr Wood Leidal (KWL) the consulting services contract to assess alternative mitigation strategies for the Cheekeye Fan debris flow in the amount of \$49,597 + net tax.

February 2, 2016

At the Community Development Standing Committee, Council and Staff reviewed the Cheekeye Mitigation Alternative Evaluation Criteria, and provided input to finalize the evaluation matrix criteria provided by Staff.

3. Project Information:

Since November 2015, KWL has been working with Staff, and communicating with BMS and its consulting engineers (BGC), to work through a high level review of alternatives to the large debris retaining structure in the Cheekeye River canyon upstream of Highway 99. As has been noted previously by BGC and confirmed by the Second Expert Panel, existing development on the Cheekeye Fan has been determined to have an unacceptable risk, and mitigation of one form or another will be required, regardless of whether or not the BMS development proposal proceeds.

As part of the project, KWL compiled and reviewed an exhaustive list of recent studies and reports, including numerous documents from BGC. KWL concluded that current hazard assessments are generally adequate at this point in time, and noted that the (FLO-2D) model used by BGC is a robust model, provided that appropriate assumptions are applied in its application. KWL confirmed that the most recent outputs from BGC showing inundation to the Mamquam River are based on compounded extreme probabilities. The report does suggest that the hazard reports, debris flow modelling and Quantitative Risk Assessments (QRA) should be finalized based on Expert Panel findings and agreed upon parameters in order to ensure that future quantitative risk assessments are consistent.

The report then identifies 7 alternate mitigation options, in addition to 2 further options that represent the BMS proposal of large (#1 or #2) debris barriers in the Cheekeye Canyon. The options were:

1. Barrier above Hwy 99 – Upper Canyon
2. Barrier above Hwy 99 – Lower Canyon
3. Basin above Hwy 99
4. Barrier below Hwy 99 – dogleg Site
5. Basin on lower fan – below dogleg
6. Mid-Fan Channelization

7. Mid-Fan Berm
8. Berm Above Brackendale
9. Retreat

The options primarily cover structural mitigation options but also include one retreat option. It is anticipated that other mitigation options such as accommodate and avoid will be determined on a site-specific basis depending on the selected primary mitigation strategy. The “attack” option (creating new developable land within the river corridor) is not considered in KWL’s evaluation.

The report also identifies and discusses the factors considered and the criteria used to assess the options, from issues such as capital cost, operations and maintenance costs and cost sharing, to effectiveness in risk reduction and other factors such as environmental impacts and regulatory challenges. These were weighted in an evaluation matrix, and a summary commentary of the options is provided.

The criteria were sorted into 5 categories:

- Economic
- Environmental
- Social - Risk
- Social - Design
- Social - Other

The evaluation matrix and review concluded that the following are the three most promising alternatives:

- Upper Canyon Debris Barrier (#1)
- Mid Fan Berm (#7)
- Large Scale Retreat (#9)

A debris basin (#3) above Highway 99 was also identified as a promising alternative, but is not considered a ‘stand-alone’ form of mitigation and would likely only be effective if paired with another form of primary structural mitigation.

Large Scale Retreat was considered one of the three most promising alternatives primarily due to environmental, economic considerations (minimal O&M costs) and long-term risk reduction. However, the required extent of retreat to reach the As Low As Reasonably Possible (ALARP) zone of the risk diagram is currently unknown. Squamish Nation have previously expressed that retreat is not an option that they will consider. Additionally costs of expropriation/land acquisition are likely to be extremely expensive, offer no future growth potential (likely limited to recreational, resource and industrial land uses) and the costs would not be shared with any other parties. While large-scale retreat is likely to be cost-prohibitive and carry other significant challenges, small scale or localized retreat (likely near the Cheekeye/Cheakamus confluence) may play a part in a comprehensive mitigation plan depending upon the ability of primary structural mitigation’s ability to reduce risk. This requires further exploration as part of the detailed design process.

The mid-fan berm has several benefits which include: protection of the lands south of the berm, could allow further community growth in those areas, is anticipated to have lower capital, operating and maintenance and 'post-event restoration costs' than the upper canyon barrier and reduced in-stream works. However, the drawbacks of this option are that it would: not protect the entire Cheekeye Fan, may result in transfer of risk (to airport or other lands depending upon final alignment), allow less intensive land use north of the berm (again likely limited to recreational, resource and industrial) and require infrastructure impacts for construction (such as re-grading Highway 99).

Finally, benefits of the canyon debris barrier are that it: provides protection for all downstream areas, does not transfer risk, may allow further community development on the Cheekeye Fan and provides cost-sharing opportunities. The main drawbacks are capital costs, operating and maintenance costs and post-event restoration costs.

One of the primary benefits of the canyon debris barrier is that BMS has suggested that new development would fund the capital and operating and maintenance costs for the structure which would provide benefits to existing development. There are many questions that remain with this mitigation option including:

- Cost and feasibility for construction, O&M and post-event restoration,
- Security/reliability of proposed funding mechanisms,
- Ability of mitigation to meet risk targets,
- Ability to secure regulatory approvals, and
- Technical design considerations.

Given the cost-sharing opportunity associated with the upper canyon barrier option, it is recommended the proponent be provided an opportunity to refine the design and address and resolve the questions remaining.

The report notes that of the remaining options (Upper Canyon Debris Barrier and Mid Fan Berm), neither provides advantages above the other in all of the 5 evaluation categories. The Upper Canyon Debris Barrier option, does however, appear to have the majority of advantages, and the report recommends that this mitigation strategy be the one that is pursued and designed to determine clearly that it is feasible and can reduce risk as anticipated.

Finally, the report provides a detailed outline of the process that should be followed if consideration of the Upper Canyon Debris Barrier proceeds. This includes more detailed considerations of items that must be satisfactorily addressed in order to accept a final mitigation plan. If the above items cannot be adequately or satisfactorily resolved, then the District would need to re-evaluate preferred mitigation strategy at that time.

4. Implications:

a) Budget:

The \$50,000 budget has been used on the report to date.

b) Organizational Impact:

None at present, as this report is presented for information. Should work proceed on the Upper Canyon Debris Barrier option, then there will be significant work performed by BMS and BGC, which will be reviewed by the District. It is anticipated that the Director of Major Development Review will assume the majority of these review tasks, once hired.

c) Policy:

Council has previously directed this work through numerous resolutions, and as part of BMS' OCP and rezoning applications.

d) Environment:

None identified at this time. Detailed design of mitigation will identify and address any environmental issues.

e) Council Priority and Strategic Plan Alignment:

This represents a development application and so is not identified in the District's Strategic Plan, but with the Intergovernmental Protocol between the Squamish Nation (as owner of the lands) and the District, Council has substantial interest in the matter.

f) Citizen Engagement

There have been a number of prior project information meetings conducted by BMS to date on its development proposal; both for the OCP and Zoning Bylaw amendment, and Staff conducted 3 workshops in the Fall relating to risk tolerance criteria. A public hearing on the OCP amendment and the Zoning Bylaw is also coming in the very near future. Further public engagement will be undertaken as part of the process of determining the mitigation solution, which will be determined with BMS in the near future. As a technical, design process, this will fall more on the "inform" part of the IAP2 spectrum.

g) Implementation

Council consideration of acceptance of the report is scheduled for April 26. If Council accepts the KWL report for information at that time, then Staff will work with BMS to prepare a process to design and review the mitigation structure(s) and other mitigation measures, including a public information process. It is anticipated that this process will take many months to conclude, but both Staff and BMS are interested in seeing it start in the very near future.

5. Attachments:

1. None

2. Alternatives to Staff Recommendation:

That Council provide direction to Staff regarding further information that is required for Council to render a decision on the preferred mitigation strategy.

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Reviewed By:

Robin Arthurs, General Manager of Corporate Services
Christine Mathews, Director of Finance

CAO Recommendation:

That the recommendation of the Development Services Department be approved.
Linda Glenday, CAO