ENGINEERS & GEOSCIENTISTS
BRITISH COLUMBIA

COUNCIL MEETING

DATE	September 8, 2017
LOCATION	Dan Lambert Boardroom, 2nd Floor (Large Room, Upstairs) Engineers and Geoscientists BC Offices, 200 – 4010 Regent Street, Burnaby, BC

Meeting Schedule

08:30 – 09:00	**APEGBC Benevolent Fund AGM**
09:00 – 09:30	**APEG Foundation AGM**
09:30 – 10:30	**Closed Session**
10:30 – 10:45	**Morning Break**
10:45 – 11:00	**Closed Session (continued)**
11:00 – 11:45	**Open Session**
11:45 – 12:45	**Lunch Break**
12:45 – 15:00	**Open Session (continued)**
15:00 – 15:10	**Afternoon Break**
15:10 – 15:30	**Open Session (continued)**
15:30 – 15:40	**Break before In-Camera Session**
15:40 – 16:40	**In-Camera Session**
16:40	**Adjournment**

For more information, contact Sarah Wray at swray@apeg.bc.ca or 604.412.4896.

ENGINEERS & GEOSCIENTISTS
BRITISH COLUMBIA

OPEN AGENDA

DATE	September 8, 2017
TIME	11:00 – 15:30
LOCATION	Dan Lambert Boardroom, 2nd Floor (Large Room, Upstairs) Engineers and Geoscientists BC Offices, 200 – 4010 Regent Street, Burnaby, BC

11:00	4. **OPEN SESSION CALL TO ORDER** *Chair: Bob Stewart, P.Eng., President*	
11:00 **(5 min)**	4.1 Declaration of Conflict of Interest	
11:05 **(10 min)**	5. **OPEN CONSENT AGENDA** **MOTION: That Council approve all items (5.1 to 5.13) on the Open Consent Agenda.**	
	5.1 June 16, 2017 Open Minutes **MOTION: That Council approve the June 16, 2017 Open Meeting minutes as circulated.**	Open Minutes June 16, 2017
	5.2 Appointments Approval **MOTION: That Council approve the recommended appointments and re-appointments to Engineers and Geoscientists BC Volunteer Groups and to outside Organizations, as applicable.**	
	5.3. Political Neutrality Policy **MOTION: That Council approve the revised Political Neutrality Policy.** *Janet Sinclair, Chief Operating Officer*	Political Neutrality Policy

	5.4. Board of Examiners Terms of Reference **MOTION: That Council approve the updates to the Board of Examiners Terms of Reference.** *Governance Committee*	BoE TORs
	5.5. New and Updated Registration Policies	
	5.5.1. Extend Waiver of Application Fee for Refugees **MOTION: That Council approve that the waiver of the application (examination of credentials) fee for refugees and persons in a refugee-like situation be extended under November 2018.** *Cassandra Hall, P.Geo., P.Eng., Chair of the Registration Committee*	Extend Refugee Fee
	5.5.2. Policy on Non-Accredited International Programs **MOTION: That Council approve the updates to the *Policy on Non-Accredited Reputable International Programs*.** *Cassandra Hall, P.Geo., P.Eng., Chair of the Registration Committee*	Reputable Programs
	5.5.3. Policy on Selection and Training of Registration Volunteers and Staff **MOTION: That Council approve the modified *Policy on Selection and Training of Registration Volunteers and Staff.*** *Cassandra Hall, P.Geo., P.Eng., Chair of the Registration Committee*	Reg Volunteers and Staff
	5.5.4. Policy on Transition to Competency-Based Reporting of Engineering Experience **MOTION: That Council approve the modified *Policy on Transition to Competency-Based Reporting of Engineering Experience.*** *Cassandra Hall, P.Geo., P.Eng., Chair of the Registration Committee*	Transition to Competency
	5.5.5. Policy on Currency of Experience **MOTION: That Council approve the modified *Policy on Currency of Experience.*** *Cassandra Hall, P.Geo., P.Eng., Chair of the Registration Committee*	Currency of Experience

	5.5.6. Policy on Inter-Provincial/Territorial Mobility **MOTION: That Council approve the modified *Policy on Inter-Provincial/Territorial Mobility* (formerly the Policy on the Inter-Association Mobility Agreement).** *Cassandra Hall, P.Geo., P.Eng., Chair of the Registration Committee*	Mobility Policy
	5.6. Professional Practice Guidelines – Legislated Flood Assessments in a Changing Climate (Version 2.0) **MOTION: That Council approve the Professional Practice Guidelines – Legislated Flood Assessments in a Changing Climate (Version 2.0) for final editorial and legal review, prior to publication.** *Lindsay Steele, P.Geo., Associate Director of Professional Practice, Standards, and Development*	Prof Guide – Flood Assess
	5.7. Quality Management Guideline – Use of the Seal (Version 2.0) **MOTION: That Council approve the Quality Management Guideline – Use of the Seal (Version 2.0) for final editorial and legal review, prior to publication.** *Lindsay Steele, P.Geo., Associate Director of Professional Practice, Standards, and Development*	Use of Seal
	5.8. Endorsement of the Revisions to the Letters of Assurance in the BC Building Code **MOTION: That Council endorse the revisions to the Letters of Assurance in the BC Building Code for final editorial and legal review.** *Peter Mitchell, P.Eng., Director of Professional Practice, Standards, and Development*	LOA
	5.9. Seismic Retrofit Guidelines (Third Edition) For Use on Low Ride Buildings in BC **MOTION: That Council endorse the Seismic Retrofit Guidelines (Third Edition) and Seismic Performance Analyser 1 (Version 3.0) for Use on Low Rise Buildings in BC.** *Peter Mitchell, P.Eng., Director of Professional Practice, Standards, and Development*	Seismic Retrofit Guide
	5.10. Volunteer Guidelines Policy **MOTION: That Council approve the proposed Volunteer Guidelines Policy, as revised (Appendix C).** *Governance Committee*	Volunteer Guidelines Policy

	5.11. KPI for 2017-2020 Strategic Plan **MOTION: That Council approve the Key Progress Indicators for the 2017-2020 Strategic Plan.** *Janet Sinclair, Chief Operating Officer*	KPI for New Strategic Plan
	5.12. Policy on Bylaw Consultation **MOTION: That Council approve the revised Council Policy on Bylaw Consultation.** *Governance Committee*	Policy on Bylaw Consultation
	5.13. Information Reports	
	5.13.1. CEO & Registrar Report *Ann English, P.Eng., Chief Executive Officer & Registrar*	CEO Report
	5.13.2. Update on Volunteer Management Activities *Jennifer Cho, CPA, CGA, Director of Finance and Administration*	Update on Volunteer Management Act
	5.13.3. Registration Admissions Report to Council for Fiscal 2017 *Gillian Pichler, P.Eng., Director of Registration*	Reg Admissions Report
	5.13.4. Branch Engagement Report *Deesh Olychick, Director of Member Services*	Branch Engage Report
	5.13.5. Strategic Plan, KPI, and Dashboard Update for 2014-2017 *Janet Sinclair, Chief Operating Officer*	Strat Plan, KPI, Dashboard Update
	5.13.6. Update on Professional Reliance *Tony Chong, P.Eng., Chief Regulatory Officer and Deputy Registrar*	Update on Prof Reliance
	5.13.7. Engineers Canada Director's Report *Russ Kinghorn, P.Eng., FEC, FGC (Hon.), Engineers and Geoscientists BC Director to Engineers Canada* *Jeff Holm, P.Eng., FEC, FGC (Hon.), Engineers and Geoscientists BC Director to Engineers Canada*	EC Directors Report
	5.13.8. Geoscientists Canada Director's Report *Garth Kirkham, P.Geo., FGC, Engineers and Geoscientists BC Director to Geoscientists Canada*	GC Directors Report

	5.13.9. 2017 Enforcement and Engagement Report *Efrem Swartz, LLB, Director of Legislation, Ethics, and Compliance*	Enforce Report
	5.13.10. Year End Report on Investigation and Discipline *Efrem Swartz, LLB, Director of Legislation, Ethics, and Compliance*	Invest Report
	5.13.11. Division Activity Report *Deesh Olychick, Director of Member Services*	Division Activity Report
	5.13.12. Engineers and Geoscientists BC Road Map for 2016-2017 – Update *Ann English, P.Eng., Chief Executive Officer and Registrar*	Road Map Update
	5.13.13. Committee Attendance Summary *Ann English, P.Eng., Chief Executive Officer and Registrar*	Committee Attendance Summary
11:15	**6. OPEN REGULAR AGENDA** **MOTION: That Council approve the Open Regular Agenda (with any additions from the Consent Agenda).**	
11:15 **(30 min)**	**6.1.** Audited Financial Statements/Year End Review **MOTION 1: That Council accept the report of the Audit Committee.** **MOTION 2: That Council approve the audited APEGBC Financial Statements for the fiscal year ended June 30, 2017.** **MOTION 3: That Council authorize the President and the Chief Executive Officer and Registrar to sign the fiscal 2017 Financial Statements on behalf of Council.** **MOTION 4: That Council recommend the appointment of PricewaterhouseCoopers LLP, CPAs as the Association's external auditors for the fiscal year ending June 30, 2018 for final approval at the Annual General Meeting in October 2017.** **MOTION 5: That Council set the General Operating Fund target to be a minimum of 3 months of operating expenses starting in fiscal year 2017/18.** *Ken Laloge, CPA, CA, TEP*	Audited Financial Statements/Year End
11:45 **(60 min)**	**LUNCH BREAK**	

12:45 **(30 min)**	**6.2.** Public Opinion Survey *Mario Canseco, Vice President of Public Affairs for Insights West* *Megan Archibald, Director of Communications and Stakeholder Engagement*	Presentation Public Opinion Survey
13:15 **(30 min)**	**6.3.** Bylaw Changes **MOTION 1: That Council approve the proposed interim solution to be implemented for the 2018 membership year, i.e. to allow a one-time waiver of the annual fee in lieu of deferral of the annual fee, to any member who formally declares and justifies financial need.** **MOTION 2: That Council approve for stakeholder consultation the proposed changes to the Non-Practising Member Bylaw 10(c).** **MOTION 3: That Council approve for stakeholder consultation the proposed changes to the Life Membership or Licensure Bylaw 10(c.1).** **MOTION 4: That Council approve for stakeholder consultation, the proposed repeal of the Honorary Life Membership or Licensure Bylaw 10(c.2) and the changes to the Honorary Member Bylaw 10(d).** **MOTION 5: That Council approve the 2017/18 Communication and Consultation plan for the proposed changes to the Non-Practicing Member Bylaw 10(c), the Life Membership or Licensure bylaw 10(c.2) and the Honorary Member Bylaw 10(d); and the proposed repeal of the Honorary Life Membership or Licensure Bylaw 10(c.2).** *Megan Archibald, Director, Communications and Stakeholder Engagement* *Jennifer Cho, CPA, CGA Director, Finance and Administration* *Tony Chong, P.Eng., Chief Regulatory Officer and Deputy Registrar* *Gillian Pichler, P.Eng., Director, Registration* *Efrem Swartz, LLB, Director, Legislation, Ethics, and Compliance*	Presentation Bylaw Changes
13:45 **(25 min)**	**6.4.** Regulating for the Future: Options for Modernizing Engineers and Geoscientists BC Processes **MOTION 1: That Council approve Option 1, Engagement of the Professional Standards Authority to conduct an external audit of Engineers and Geoscientists BC's functions.** **MOTION 2: That Council direct that stakeholder engagement occur both at the audit and recommendation implementation phases.** *Executive Committee*	Regulating for the Future

14:10 **(40 min)**	**6.5.** Visiting Dean Presentation *Dr. Eugene Fiume, Professor and Dean of Applied Science at Simon Fraser University*	Presentation
14:50 **(10 min)**	**6.6.** Government Relations Strategy **MOTION: That Council approve the 2017 Government Relations Strategy.** *Janet Sinclair, Chief Operating Officer*	Govt Relations
15:00 **(10 min)**	**AFTERNOON BREAK**	
15:10 **(10 min)**	**6.7.** Councillor Agenda Item Request **MOTION: To be determined.** *Ross Rettie, P.Eng., Councillor*	Councillor Agenda Item Request
15:20 **(10 min)**	**6.8.** Past Presidents Forum Survey Results **MOTION: To be determined.** *Ann English, P.Eng., Chief Executive officer and Registrar*	Past Pres Forum Survey Results
15:30	**END OF OPEN SESSION**	

MINUTES OF THE OPEN SESSION OF THE FIFTH MEETING OF THE 2016/2017 COUNCIL of the Association of Professional Engineers and Geoscientists of British Columbia,
held on June 16, 2017 in the DAN LAMBERT BOARDROOM, APEGBC OFFICES, BURNABY, BC

PRESENT

Council	
Bob Stewart, P.Eng.	President (Chair)
Dr. Ed Casas, P.Eng.	Vice President
Dr. Mike Wrinch, P.Eng., FEC, FGC (Hon.)	Past President
Kathy Tarnai-Lokhorst, P.Eng., FEC	Councillor
David Wells, JD	Councillor
Richard Farbridge, P.Eng.	Councillor
Ken Laloge, CPA, CA, TEP	Councillor
John Turner, P.Ag. (ret.)	Councillor
Brock Nanson, P.Eng.	Councillor
Caroline Andrewes, P.Eng.	Councillor
Susan Hayes, P.Eng.	Councillor
Ross Rettie, P.Eng., FEC	Councillor
Cassandra Hall, P.Geo., P.Eng.	Councillor
Larry Spence, P.Eng.	Councillor
Scott Martin, P.Eng.	Councillor
Suky Cheema, CPA, CA	Councillor
Staff	
Ann English, P.Eng.	Chief Executive Officer & Registrar (via teleconference)
Tony Chong, P.Eng.	Chief Regulatory Officer & Deputy Registrar
Janet Sinclair	Chief Operating Officer
Jennifer Cho, CPA, CA	Director – Finance & Administration
Gillian Pichler, P.Eng.	Director - Registration
Efrem Swartz, LLB	Director - Legislation, Ethics & Compliance
Lindsay Steele, P.Geo.	Associate Director – Professional Practice, Standards & Development
Megan Archibald	Director – Communications & Stakeholder Engagement
Deesh Olychick	Director – Member Services
Sarah Wray	Executive Assistant to Council and to the Chief Executive Officer & Registrar
Tracy Richards	Administrative Assistant
Guests	
Jeff Holm, P.Eng., FEC, FGC (Hon.)	APEGBC Director to Engineers Canada
Garth Kirkham, P.Geo., FGC	APEGBC Director to Geoscientists Ccanada
Regrets	
Chris Moser, P.Eng.	Councillor

OPEN SESSION – CALL TO ORDER

Bob Stewart, President and Chair, called the meeting to order at 11:55 am. Dr. Ed Casas, Vice President, acted as the Parliamentarian, Councillor Susan Hayes acted as the Membership Engagement Champion, and Councillor Kathy Tarnai-Lokhorst acted as the 30 by 30 Champion.

Guests: The Chair advised that Jeff Holm, P.Eng., FEC, FGC (Hon.) of Engineers Canada and Garth Kirkham, P.Geo., FGC of Geoscience Canada would be joining for the Open Session. Also attending the Open Session was Ken Zeleschuk, AScT, MBA, Council Director at ASTTBC.

CO-17-61 OPEN CONSENT AGENDA

MOTION: It was moved and seconded that Council approve the Open Consent Agenda with item 5.4 being moved to the Open Regular Agenda. CARRIED

Motions carried by approval of the Consent Agenda:

5.1 **MOTION** that Council approve the April 28, 2017 Open Meeting minutes as circulated.

5.2 **MOTION** that Council approves the recommended appointments and reappointments to APEGBC Volunteer Groups and to outside Organizations, as applicable.

Individual, Designation	Position	APEGBC Volunteer Group/Outside Organization	Staff Contact	Start Date	Expiry Date	New/Returning * Over 6 Years
Re-appointments (under six years)						
Dr. Thomas George, P.Eng.	Chair	Editorial Board	Megan Archibald	June 16, 2017	June 15, 2019	Returning
Karen Chan, P.Eng.	Member	Editorial Board	Megan Archibald	June 16, 2017	June 15, 2020	Returning
New Appointments and Re-Appointments (over six years)						
Gilles Richard Dessureau, P.Geo.	Member	Geoscience Committee	Jason Ong	June 16, 2017	June 16, 2019	New
John Watson, P.Eng., FEC, FGC (Hon.)	Member	Scrutineer for 2017/18 Council Election	Deesh Olychick	June 16, 2017	October 21, 2017	New
Kathleen Kompauer, P.Eng., FEC, FGC (Hon.)	Member	Scrutineer for 2017/18 Council Election	Deesh Olychick	June 16, 2017	October 21, 2017	New
Ken Williams, P.Eng., FEC	Member	Scrutineer for 2017/18 Council Election	Deesh Olychick	June 16, 2017	October 21, 2017	New
Dr. David J. Wilford, P.Geo, FGC	Member	APEGBC/ABCPF Joint Practice Board	Peter Mitchell	June 1, 2017	June 1, 2019	New

5.3 **MOTION** that the Foundation Nominating Committee be stood down, with thanks to its members.

5.4 **This item was moved to the Open Regular Agenda.**

5.5 The following informational reports were received by Council:

- CEO & Registrar Report
- Engineers Canada Director's Report
- Geoscientists Canada Director's Report
- AGM Motion Follow Up
- APEGBC Road Map for 2016/2017
- Council Attendance Summary

CO-17-62 OPEN REGULAR AGENDA

MOTION **It was moved and seconded that Council approve the Open Regular Agenda with the addition of Item 5.4 of the Open Consent Agenda.**
CARRIED

CO-17-63 APPROVAL OF VOLUNTEER GUIDELINES POLICY

MOTION It was moved and seconded that the issue of Council compliance with the volunteer guidelines be referred to the Governance Committee to determine alignment with the Code of Conduct and how compliance will be managed.
CARRIED

CO-17-64 2017 AGM RULES

MOTION It was moved and seconded that Council approved the (draft) 2017 AGM Meeting Rules for the ratification of members.
CARRIED

CO-17-65 POLICY ON BYLAW CONSULTATION

MOTION 1 It was moved and seconded that the revisions to the Council Policy on Bylaw Consultation be approved.
DEFEATED

MOTION 2 It was moved and seconded that with the feedback received that the Council Policy on Bylaw Consultation be referred to the Governance Committee for further consideration.
CARRIED

CO-17-66 VISITING DEAN (UBC SCHOOL FOR MECHNICAL ENGINEERING)

Dr. Elizabeth Croft, B.A.Sc., M.A.Sc., Fellow of ASME, Engineers Canada, Past NSERC Chair for Women in Science and Engineering (BC & Yukon 2010-2015) updated Council on the programs at UBC and the trends and demand in the market in BC for engineers.

CO-17-58 LIFE MEMBER BYLAW CHANGES WITH CONSULTATION PLAN

MOTION 2 It was moved and seconded that Council cease to exercise its discretion to grant Life Membership under Bylaw 10(c.1) and to directly contact members potentially affected by this change to explain Council's actions in this regard.
CARRIED

MOTION 3 It was moved and seconded that Council direct staff to develop an analysis of options for interim treatment of those who may be affected by Council's decision to cease granting Life Membership under Bylaw 10(c.1).
CARRIED

MOTION 4 It was moved and seconded that Council direct staff to develop a new proposed Bylaw, an impact analysis, and a communication and consultation plan for consideration at its September 2017 meeting.
CARRIED

The above three motions was brought into these Open minutes from the Closed.

END OF OPEN SESSION

The Open Session ended at 2:08 pm.

ENGINEERS & GEOSCIENTISTS
BRITISH COLUMBIA

OPEN SESSION

ITEM 5.3

DATE	August 21, 2017
REPORT TO	Council for Decision
FROM	Janet Sinclair, Chief Operating Officer
SUBJECT	Political Neutrality Policy
LINKAGE TO STRATEGIC PLAN	We act first and foremost in the public interest.

Purpose	To modernize the Political Neutrality Policy.
Motion	That Council approve the revised Political Neutrality Policy.

BACKGROUND

Engineers and Geoscientists BC has had a Political Neutrality Policy in place since 2008 to guide the association's interactions with elected officials and government staff. This policy recognizes that as a public body entrusted with protecting the public interest, Engineers and Geoscientists BC must not be perceived as having political interests.

MOTION

That Council approves the revised Political Neutrality Policy.

ATTACHMENT A – Political Neutrality Policy (Revised September 2017)

ATTACHMENT B – Political Neutrality Policy (June 2008)

ENGINEERS & GEOSCIENTISTS
BRITISH COLUMBIA

CONFIDENTIAL

POLICY	Policy on Political Neutrality (September 2017)
DATE OF POLICY	June 13, 2008
APPROVED BY	Council: June 13, 2008 (CO-08-84)

PURPOSE

As a legislated entity that serves the public interest, Engineers and Geoscientists BC must demonstrate political neutrality. In doing this it will avoid any impression that a particular political candidate or party has the support or endorsement of the association.

GOVERNMENT ENGAGEMENT

Engagement with elected officials and government staff enables Engineers and Geoscientists BC to achieve the objectives of the organization related to the practice of professional engineering and geoscience. Principles guiding this engagement are:

1. Engagement with elected officials and government staff is to be apolitical.
2. Information provided to government officials is to be unbiased and free of political commentary or overtones.

POLITICAL SUPPORT

Engineers and Geoscientists BC shall not engage in partisan political activities or act in a way that may cause the perception of having political bias. Personal political activities of staff and volunteers must be kept separate and apart from of the administration and governance of the association.

Activities that the organization, including its staff and volunteers in their official Engineers and Geoscientists BC capacities will not engage in include, but are not limited to:

1. Donating to or attending fundraisers for political candidates, elected officials, or political parties.
2. Endorsing, promoting or opposing political parties, candidates or platforms.
3. Allowing its office, membership lists or other resources to be used for partisan political purposes.
4. Allowing use of its name or logo on documents intended for political purposes, including soliciting funds for political support or carrying on a political campaign.
5. Attempting to direct its members as to which candidate or party they should vote for.

Any questions regarding the implementation of this policy should be directed to the Chief Executive Officer & Registrar.

APPLICABLE LEGISLATION

BC Elections Act http://www.bclaws.ca/Recon/document/ID/freeside/96106_10#division_d2e16410

Created: June 13, 2008 CO-08-84

Updated: __________________

Professional Engineers and Geoscientists of BC

APEGBC Policy on Political Neutrality

Overview

At its March 2008 meeting, Council directed the Governance Committee to review the issue of APEGBC participating in political functions or making donations to political parties or candidates.

The Policy

Self-regulating professions, and the organizations that govern them, are in a unique circumstance – professional regulating bodies bear an expectation from citizens that the public interest is their paramount objective. Any activity that takes away from that perception is to be avoided.

Many professional regulators choose to ensure their actions are politically neutral, so as to avoid causing a possible perception of bias or interest beyond the general public interest.

APEGBC has a responsibility to its registrants and the public to be seen to carry out its activities in an unbiased fashion.

APEGBC – and its staff and officials while carrying out their APEGBC functions – will not act in a way that causes the perception of APEGBC having political bias. This includes such activities as attending political fundraisers, making a donation to a political party, or endorsing a particular political party or candidate.

Staff and officials who wish to undertake these activities need to do so on their personal time and expense, as a private activity.

Approved by Council: **June 13, 2008 (CO-08-84)**

ENGINEERS & GEOSCIENTISTS
BRITISH COLUMBIA

OPEN SESSION

ITEM 5.4

DATE	August 18, 2017
REPORT TO	Council for Decision
FROM	Governance Committee
SUBJECT	Revision to the Terms of Reference for the Board of Examiners
LINKAGE TO STRATEGIC PLAN	Establish, maintain and enforce qualifications and professional standards

Purpose	To revise the Terms of Reference of the Board of Examiners to reflect current practice
Motion	That Council approve the updates to the Board of Examiners Terms of Reference.

BACKGROUND

The Board of Examiners Terms of Reference were last revised in 2012. The Terms of Reference are reviewed on an annual basis by the Board of Examiners.

DISCUSSION

At its April 24, 2017 the Board of Examiners (BoE) reviewed its Terms of Reference and suggested two small changes to better reflect the current operation of the BoE. These changes are both in section 7 which refers to the membership of the BoE:

- In section 7.1, the insertion of the words "a minimum of" in reference to the number of members on the BoE from each engineering discipline of evaluation for registration or licence. This reflects the fact that for several disciplines there is more than one member on the BoE.
- In section 7.2, the replacement of the word "university" with the words "institution of higher learning" when describing where members of the BoE come from as several are not members of university faculties but are members of faculties at institutions such as a polytechnic school.

On May 31, 2017, the Registration Committee carried a motion (RG-137) that the revised Terms of Reference for the Board of Examiners be sent to the Governance Committee to endorse and forward to Council for approval.

Clean and redlined versions of the revised Terms of Reference are attached.

Below is the suggested review and approval plan for the revised Terms of Reference:

i.	April 24, 2017	Review and approval by Board of Examiners (Complete).
ii.	May 31, 2017	Review and approval by Registration Committee, subject to a final review by the Governance Committee (Complete).
iii.	August 9, 2017	Review and endorsement by the Governance Committee (Complete).
iv.	September 8, 2017	Review and approval by Council.

RECOMMENDATIONS

That the revisions to the Terms of Reference be adopted.

MOTION

That Council approve the updates to the Board of Examiners Terms of Reference.

APPENDIX A – Redlined version of the Terms of Reference for the Board of Examiners

APPENDIX B – Clean version of the Terms of Reference for the Board of Examiners with new format

ENGINEERS & GEOSCIENTISTS
BRITISH COLUMBIA

OPEN SESSION

ITEM 5.5.1

DATE	August 23, 2017
REPORT TO	Council for Decision
FROM	Cassandra Hall, P.Geo./P.Eng., Chair of the Registration Committee
SUBJECT	Extend Waiver of Application Fee for Refugees
LINKAGE TO STRATEGIC PLAN	Establish, maintain and enforce qualifications and professional standards

Purpose	To extend the fee waiver for refugees and persons in a refugee-like situation.
Motion	That Council approve that the waiver of the application (examination of credentials) fee for refugees and persons in a refugee-like situation be extended until November 2018.

BACKGROUND

In November 2015, deciding that it would be appropriate to waive the application fee for those who are classified as refugees, with respect not only to affordability, but also as their ability to prove qualification is likely to follow an onerous and uncertain path, Council approved the following motion: *that the Designated Refugees who apply for enrollment, registration, or licence be exempt from payment of the application (examination of credential) fee and that this practice be revisited in November 2016.* In September 2016, due to the extended settlement times that resulted in low uptake numbers, Council approved extending the waiver of the fee through November 2017.

DISCUSSION

Since November 2016, 26 applicants who are refugees or in a refugee-like situation have applied to Engineers and Geoscientists BC for registration or licence, including ten that Engineers and Geoscientists BC is assessing on behalf of APEGA and EPEI.

From discussions with other regulators and entities such as World Education Services, an evaluator of international credentials, it appears that as the refugees have begun to settle, there has been an increased interest in registering for professional status.

It is anticipated that more refugees will apply for registration in 2017/18 as they become settled in Canada.

RECOMMENDATIONS

- As the number of refugees applying for registration is still increasing, the fee waiver should be extended.

MOTION

That Council approve that the waiver of the application (examination of credentials) fee for refugees and persons in a refugee-like situation be extended under November 2018.

ENGINEERS & GEOSCIENTISTS
BRITISH COLUMBIA

OPEN SESSION

ITEM 5.5.2

DATE	August 17, 2017
REPORT TO	Council for Decision
FROM	Cassandra Hall, P.Geo./P.Eng., Chair of the Registration Committee
SUBJECT	Update to Policy on Non-Accredited Reputable International Programs
LINKAGE TO STRATEGIC PLAN	Establish, maintain and enforce qualifications and professional standards

Purpose	To outline and explain the research and methods used in the recommended revisions to the Non-Accredited Reputable Program List ("Reputable List") for Professional Engineer registration and to revise the corresponding policy.
Motion	That Council approvethe updates to the Policy on Non-Accredited Reputable International Programs.

BACKGROUND

To become academically qualified, applicants must demonstrate they have successfully graduated from, or have the equivalent to, a four-year full time post-secondary program in engineering, geoscience, applied science or technology. Applicants are considered to have met the minimum academic standards automatically if they have a Bachelor's Degree in Engineering from an institution accredited by Canada Engineering Accreditation Board ("CEAB"). Otherwise, an applicant will be assigned academic examinations and/or an interview to determine their academic qualification.

The current policy regarding meeting minimum academic qualification outlines the following exemptions from academic examinations:

- Having an undergraduate engineering degree that is recognized by an engineering accreditation body with a Mutual Recognition Agreement with Engineers Canada (ex. Washington Accord, Commission des Titres d'Ingenieur (CTI) France)
- Having a post graduate engineering degree from an accredited program, and the undergraduate degree is not an accredited program but is in the same discipline

- Having a university level engineering degree of 4+ years (not recognized or accredited) combined with at least 5+ years of engineering experience, confirmed through an interview
- Having an undergraduate degree or equivalent in applied science, engineering, geoscience, science or technology and having passed the U.S. Fundamentals of engineering and the Principles and Practice of Engineering exams (in the discipline the applicant is applying for)
- Having an undergraduate or post graduate degree from a program on the Non-Accredited Reputable International Programs list

The Reputable List is a valuable tool for the Registration Department, as it allows for faster evaluation of academic credentials. Maintaining an updated list ensures that the latest information is available on engineering programs at specific institutions around the world.

This list is also quickly and easily accessible to Registration staff. The convenience of all of these data in one place makes the Reputable List extremely useful.

DISCUSSION

The research began by collecting data from three online ranking producing lists. Once this was complete, each individual institutions' website was reviewed to ensure that the program offered is one that meets the requirements set out under the Act. The result of this compiled information is a proposed list of institutions and a corresponding policy.

Institution Source Lists

Three different services that rank the quality of universities worldwide ("Institution Source Lists") were used to compile new potential institutions for the Reputable List update.

The first list consulted was the Shanghai Jiao Tong University Academic Ranking of World Universities, which provides a list by field. The field used for the top 50 list was Engineering/Technology and Computer Sciences 2016. The ranking indicators used include citations, number of publications, percentage of papers published, and use of funds.[1]

The second list consulted was the Times Higher Education World University Ranking, which provides a list by subject. The subject used for the top 50 list was Engineering and Technology 2016-2017 General Engineering. The ranking indicators used include Citations, Industry Income, International Outlook, Research, and Teaching.[2]

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[1] http://www.shanghairanking.com/FieldENG2016.html
[2] https://www.timeshighereducation.com/world-university-rankings/2017/world-ranking#!/page/0/length/25/subjects/3066/sort_by/rank/sort_order/asc/cols/stats

The third list consulted was the QS World University Rankings, which provides a list by subject. The subject used for the top 50 list was Engineering and Technology 2016. The ranking indicators used include Academic Reputation, Citations per Paper, and Employer Reputation.[3]

Compiled Data Explained

The top 50 institutions from each source were compiled into one list. Only institutions in the top 50 of each source were used for the purposes of data collection. This compiled Institution Source List was combined with the current Reputable List, then any institutions located in countries that were Washington Accord Signatories prior to 2013 were removed, and any repeating institutions were combined into one row. Please see Appendix A for the proposed updated Policy and Reputable List, with revisions in red.

Each institutions' website was examined to confirm the degree offered. This degree confirmation process determined if the institution offered a Bachelor's of Engineering or a Bachelor's of Science in an Engineering field. In addition, this research confirmed that the programs offered were full time and took at least 4 years as per the Act's requirements.

As well, a column outlining the different programs offered by each institution was created and inserted. Another column that was added is the "Reason for Acceptance." The reason for acceptance includes on which list, or lists, the institution was found. The star asterisk (*) indicates which institutions are under the Bologna Accord. Under the Bologna Accord, the five year degrees have been replaced by two cycles of studies: bachelors and masters and the Registration Department only accepts second cycle master level degrees as fulfilling the academic qualification.

Institutions on the current Reputable list were removed if the institution:

- Is located in a country that was Washington Accord Signatories prior to 2013;
    - These institutions fall under a separate academic examination exemption for the policy on meeting minimum academic credentials, therefore these institutions should be removed.
- Did not rank in top 100 of any of the Institution Source Lists; and
    - Removal from the list should be more difficult because of the potential disadvantage to applicants, which is why the cut off is 100 instead of top 50. In addition, the proposed policy also states that: "Any applicant who applied for registration prior to the approval date of this policy will continue to be assessed under the previous version of the policy."
- Advertised a different degree title on their website now and subsequently does not match the degree title on the Current Reputable List.

[3] https://www.topuniversities.com/university-rankings/university-subject-rankings/2017/engineering-technology

- The list has been updated to reflect what degree the intuition's website advertises now. The policy also states: "An applicant applying who graduated prior to 2017 will continue to be assessed under the previous degree title as listed on the previous version of the policy and list."

Programs were added into the final proposed policy and list if they were:

- In the top 50 of at least one of the three online ranking producing lists;
- Located in a country that has become a Washington Accord Signatory since 2013; and
- In compliance with the Act and Bylaws.

After this research, the programs that meet all of the required criteria listed above were combined into a single list. The Policy outlines that all institutions on the Non-Accredited Reputable International Programs List must be found in the IIDD. All of the remaining compiled institutions were found in the IIDD.

The final product resulting from this research is a proposed Policy and Reputable List. Please see Appendix B for the proposed Policy and Reputable List.

RECOMMENDATIONS

1. Approve the proposed Policy and Reputable List. Revisions include:
    - Removing programs that had significantly dropped in ranking, are located in a country that is a Washington Accord Signatory prior to 2013 or are not a full time 4 year bachelor's program
    - Adding programs that were found on at least one of the three International Source Lists, are located in a country that is not a Washington Accord Signatory prior to 2013, found in the IIDD and are a full time 4 year bachelor's program
2. The Policy should be reviewed in two years.

MOTION

That the updates to the Policy on Non-Accredited Reputable International Programs be approved.

APPENDIX A – Red Lined Policy

APPENDIX B – Clean, revised Policy

ENGINEERS & GEOSCIENTISTS
BRITISH COLUMBIA

OPEN SESSION

ITEM 5.5.3

DATE	August 17, 2017
REPORT TO	Council for Decision
FROM	Cassandra Hall, P.Geo./P.Eng., Chair of the Registration Committee
SUBJECT	Selection and Training of Registration Volunteers and Staff
LINKAGE TO STRATEGIC PLAN	Establish, maintain and enforce qualification and professional standards

Purpose	To determine whether senior practitioners with fewer than five (5) years of registration should be made eligible to become an Experience Review Panel member, Competency Assessor, Reviewer, or Interviewer (a "Reviewer") for Engineers and Geoscientists BC (the "Association").
Motion	That Council approve the modified Policy on Selection and Training of Registration Volunteers and Staff

BACKGROUND

The Policy on Selection and Training of Registration Volunteers and Staff outlines what qualifications are necessary for an individual to become a Reviewer.

To summarize, Experience Review Panel members, Competency Assessors and EIT/GIT online reviewers, must meet the following requirements:

a) Be a professional engineer, professional geoscientist, or engineering or geoscience licensee registered or licensed in a Canadian jurisdiction;
b) Have at least five (5) years of experience as a professional engineer or professional geoscientist or engineering or geoscience licensee in their stated field or scope of practice; and
c) Have completed appropriate training in the conduct of experience reviews (including competency assessments) and the application of Association policy

Interviewers must meet the following requirements:

a) Have at least five years of experience as a professional engineer or professional geoscientist or engineering or geoscience licensee in their stated field or scope of practice;

b) Have acted as an observer/interviewer in at least two interviews prior to acting as a primary interviewer or chair of an interview; and

c) Have completed appropriate training in the conduct of experience reviews (including competency assessments) and the application of Association policy.

In November 2015, the Policy was revised to require five (5) years of experience rather than ten (10) years.

The Registration Committee relies on the reports created by these Reviewers to make decisions about registering applicants, so these roles are critical to the function of the Association.

DISCUSSION

The Policy outlines that potential Reviewers must have at least five (5) years of experience as a professional member, which also means that these members must have at least five (5) years of registration. A member cannot have the experience as a professional member without having been registered for the same length of time. However, someone can be registered for five (5) years without having five (5) years of experience. Changing the language to requiring five (5) years of registration, instead of experience, means someone who has not been practicing but has been registered could become a Reviewer. The responsibilities given to the Reviewers are such that current knowledge of technical experience is a requirement. Thus, the requirement for years of experience is necessary and should not be changed to years of registration.

Reducing the number of years is desirable from a recruitment perspective as it would widen the pool of potential volunteers. There is nothing in our act or Bylaws that would prevent this. However, the question then becomes, does allowing senior practitioners with fewer than five (5) years of registration to become a Reviewer, maintain the Association’s duty to uphold and protect the public interest respecting the practice of professional engineering and geoscience?[1]

The requirement for 5 years of experience (not registration) appears to be a reasonable requirement and any further reduction does not seem justified at this time. A provision for allowing the Registration Committee to approve the appointment of a volunteer with less than the minimum experience on an exception should be added as there have been rare occasions where an outstanding candidate has been found with less than 5 years’ experience. This policy should be reviewed in 5 years’ time and if enough exceptions to the minimum experience requirement have been found, the policy could be modified at that time.

Relevant and similar standards used by sister Associations were reviewed to help make an informed decision on changing this requirement.

[1] Engineers and Geoscientists Act, [RSBC 1996] Chapter 116

Engineers Canada does not provide information on their website regarding requirements for Reviewers across Canadian Engineering Regulatory bodies.[2] The Association for Professional Engineers and Geoscientists of Alberta ("APEGA") and, the Association of Professional Engineers and Geoscientists of Manitoba ("APEGM"), also do not advertise requirements for becoming reviewers.[3]

The Professional Engineers Ontario ("PEO") outlines that they prefer volunteers with the Experience Requirement Committee have at least 10 years of experience, but do not have a minimum number of years required to volunteer.[4] PEO does not have a requirement for number of years of experience for volunteering with the Academic Requirement Committee.[5]

The Association of Professional Engineers and Geoscientists of Saskatchewan ("APEGS") has an Academic Review Committee, Experience Review Committee, and Licensee Admissions Committee.[6] APEGS does not have a required minimum number of years of experience to volunteer with any of the listed committees.[7]

The requirements and preferences for volunteers to have a certain number of years of experience varies across the provinces. The Association's requirement for experience appears lower than the number of years preferred by some of our sister Associations. Thus, the decision to not reduce the required number of years of experience is reasonable.

In conclusion, the requirement for the type and length of experience should not be changed. The addition of an exception clause will allow for the approval, by the Registration Committee, of the rare individual who has less than the required amount of experience. Please see Appendix A for a red lined version of the Policy and Appendix B for the Proposed Policy.

RECOMMENDATIONS

1. Revise the Policy so it maintains the requirement for experience and includes a provision allowing for exceptions to the required number of years of experience.

2. Review this Policy in 5 years.

[2] https://engineerscanada.ca/
[3] https://www.apega.ca/; http://www.apegm.mb.ca/
[4] *Ibid*
[5] http://www.peo.on.ca/
[6] http://www.apegs.ca/Portal/Pages/Home-Page
[7] *Ibid*

MOTION

That Council approve the modified Policy on Selection and Training of Registration Volunteers and Staff.

APPENDIX A – Red Lined Policy

APPENDIX B – Proposed Policy

OPEN SESSION

ITEM 5.5.4

DATE	August 24, 2017
REPORT TO	Council for Decision
FROM	Cassandra Hall, P.Eng./P.Geo., Chair of the Registration Committee
SUBJECT	Policy on Transition to Competency-Based Reporting of Engineering Experience
LINKAGE TO STRATEGIC PLAN	Establish, maintain and enforce qualifications and professional standards

Purpose	To revise the Policy on Transition to Competency-Based Reporting of Engineering Experience to set out conditions for ending the transition period.
Motion	That Council approve the modified Policy on Transition to Competency-Based Reporting of Engineering Experience

BACKGROUND

The current version of this policy sets out the requirements, dates and exceptions for applicant groups and engineers-in-training to transition to competency-based assessment. Approved by Council in 2015, it left open the date by which all applicants were to transition to competency-based assessment and said that this should be reviewed in 2017.

All applicants for professional engineer who applied for registration after April 1, 2015 were required to report experience on the competency-based reporting system. There are currently over 4,300 applicants, student members and engineers-in-training reporting experience in the competency format and over 1,400 professional engineers who were granted registration based on a competency-based experience submission.

There remain 646 applicants and EITs with active applications for professional engineer registration or licence who are listed as reporting their experience in the traditional Satisfactory Engineering Experience method, instead of through competency assessment.

Of these 646 applicants:

i. 58 have outstanding experience reassignments;

ii. 51 have completed experience requirements but have outstanding academic examinations;

iii. 116 have completed both academic and experience requirements and have outstanding Professional Practice Examination or seminar requirements

iv. The remainder (421) have not completed their first submissions of traditional experience details and references and/or academic documentation

DISCUSSION

The proposed changes to the policy set out final transition and notice dates for several categories of applicant situations. The final date for transition of all applicants to competency-based assessment, regardless of status of application and reporting route is proposed as July 1, 2019. The proposed new end-of-transition dates are summarized in the table below:

Applicant for Professional Engineer Status	Deadline for transition date to competency assessment
New application	Deadline has passed – was April 1, 2015 in current version of the policy
Inactive application	September 8, 2017
Assigned experience prior to January 1, 2016	Submit for review by January 1, 2018, failing which be required to transition to competency assessment. If experience requirement not completed by July 1, 2019, be required to transition to competency assessment (this allows for the maximum experience assignment of 4 years for applicants who applied prior to April 1, 2015)
First experience submission not complete (details or references missing)	Submit by January 1, 2018, failing which be required to transition to competency assessment
Experience approved; outstanding academic examinations, Professional Practice Examination or Seminar completion	If examinations or seminar are not completed by July 1, 2019, be required to resubmit experience via competency assessment
All applicants regardless of situation	July 1, 2019

RECOMMENDATION

- Approve the updates to the policy to set out conditions for ending the transition to competency-based reporting of engineering experience.

MOTION

That Council approve the modified Policy on Transition to Competency-Based Reporting of Engineering Experience.

APPENDIX A – Redlined Modified Policy

APPENDIX B – Clean version of the Modified Policy

ENGINEERS & GEOSCIENTISTS
BRITISH COLUMBIA

OPEN SESSION

ITEM 5.5.5

DATE	August 17, 2017
REPORT TO	Council for Decision
FROM	Cassandra Hall, P.Geo./P.Eng., Chair of the Registration Committee
SUBJECT	Currency of Experience
LINKAGE TO STRATEGIC PLAN	Establish, maintain and enforce qualifications and professional standards

Purpose	To outline and explain the rationale for the proposed revisions to the Currency of Experience Policy.
Motion	That Council approve the modified Policy on Currency of Experience.

BACKGROUND

In April 2014, SAARS developed a Final Report (the "SAARS Report") for Council. This report was a result of the research completed by this Council appointed task force. The purpose was to report findings and make recommendations regarding different systems of qualifying candidates for professional designation. The SAARS Report developed four overarching recommendations, one of which involved implementing five promising practices. One of those promising practices was to create a Currency of Experience Guideline for New Applicants.

The recommendation made in the SAARS report was meant to clarify the ambiguous statement "Experience must be current to be meaningful"[1] in the Policy.

DISCUSSION

Section 11(e)(3) the *Bylaws of the Association* states, that the minimum experience required for registration is four years. An applicant must also show that his or her engineering or geoscience

[1] Policy RE: Currency of Experience

experience is sufficiently current to demonstrate competency with present-day Canadian codes, legislation, technical standards, safety and regulations.[2]

The SAARS Report recommends that the four years of work experience must be completed within the last ten years. In addition one of the four years of experience, must have been within the last three years.

The SAARS Report also recommends that the currency of experience requirements should coincide with the format of the Return to Practice Policy. Please see Appendix D for the Return to Practice Policy. The return to practice requirements are different depending on how long ago the member became a non-practicing member. If the member has had non-practicing status for less than a year, there are fewer requirements to complete for returning to practice than if the member has had non-practicing status for over three years. Consequently, the more distant the experience is, the more the applicant is required to provide to Engineers and Geoscientists BC as proof that their experience is current.

Using the SAARS Report recommendations to revise the Currency of Experience Policy will create a more definitive understanding of currency of experience.

The recommendation of using the SAARS Report wording was brought before the Registration Committee. After a robust discussion, the Registration Committee amended the recommendation for council for experience to be current to be:

At least two years of experience must be completed within the last four years, and that all four years must have been completed within the last seven years.

RECOMMENDATIONS

Approve the proposed changes to the policy that include requiring:

- Two of the four years of experience to have occurred in the last four years;
- All four years of experience to have occurred in the last seven years;
- Implementing the general format of the policy on the Return to Practice;
- An adjustment clause stating "Applicants, who apply for professional membership or licence prior to the approval date of this policy, will be permitted to continue their application pursuant to the previous Currency of Experience Policy"

MOTION

That Council approve the modified Policy on Currency of Experience.

[2] Bylaws of the Association, at 11(e)(3)(a); Engineers and Geoscientists BC's List of all key Competencies & Generic Indicators

APPENDIX A – Red Lined Policy

APPENDIX B – Clean version of the Policy

ENGINEERS & GEOSCIENTISTS
BRITISH COLUMBIA

OPEN SESSION

ITEM 5.5.6

DATE	August 23, 2017
REPORT TO	Council for Decision
FROM	Cassandra Hall, P.Geo./P.Eng., Chair of the Registration Committee
SUBJECT	Policy on Inter-Provincial/Territorial Mobility
LINKAGE TO STRATEGIC PLAN	Establish, maintain and enforce qualifications and professional standards

Purpose	To revise the Policy on Inter-Provincial/Territorial Mobility to reflect current practice.
Motion	That Council approve the modified Policy on Inter-Provincial/Territorial Mobility (formerly the Policy on the Inter-Association Mobility Agreement).

BACKGROUND

The current version of this policy was approved by Council in 2008. The current version of the policy refers to the Inter-Association Mobility Agreements of Engineers Canada and Geoscientists Canada. Internal trade agreements that supersede these professional mobility agreements have taken effect since then, and are not reflected in the policy. Several changes to registration processes and statutory requirements in other jurisdictions have also occurred since the last approved version of the policy.

The New West Partnership Trade Agreement (NWPTA) came into effect on July 1, 2010 for three provincial governments - British Columbia, Saskatchewan and Alberta. Under the NWPTA, a single economic region encompassing British Columbia, Alberta, Saskatchewan, and Manitoba was created. Labour mobility provisions allow certified workers to practice their occupation in these provinces without being subject to additional exams or training requirements. The NWPTA came into effect for Manitoba in January 2017.

The Canadian Free Trade Agreement (CFTA) is an intergovernmental trade agreement signed by Canadian Ministers that entered into force on July 1, 2017 that replaced the Agreement on Internal Trade (AIT).

The Policy needs to be updated to reflect these changes.

DISCUSSION

The Policy on the 'Inter-Association Mobility Agreement' requires updating to:

i. Articulate compliance with internal trade agreements such as the New West Partnership Trade Agreement and the Canadian Free Trade Agreement;

ii. Provide a definition of 'in good standing' which includes compliance with statutory requirements (including professional development) of the 'home' regulatory body; and

iii. Reflect current online and other practices by Engineers and Geoscientists BC and its sister regulatory bodies in Canada.

RECOMMENDATIONS

- Update the Policy on Inter-Provincial/Territorial Mobility to reflect current practice.

MOTION

That Council approve the modified Policy on Inter-Provincial/Territorial Mobility (formerly the Policy on the Inter-Association Mobility Agreement).

APPENDIX A – Red Lined Policy

APPENDIX B – Clean version of the Policy

ENGINEERS & GEOSCIENTISTS
BRITISH COLUMBIA

OPEN SESSION

ITEM 5.6

DATE	August 24, 2017
REPORT TO	Council for Decision
FROM	Lindsay Steele, P.Geo., Associate Director, Professional Practice
SUBJECT	Professional Practice Guidelines – Legislated Flood Assessments in a Changing Climate in BC, Version 2.0
LINKAGE TO STRATEGIC PLAN	Enhance members' awareness and use of professional practice resources

Purpose	For Council's review and decision to approve the Professional Practice Guidelines – Legislated Flood Assessments in a Changing Climate, Version 2.0 for final editorial and legal review prior to publication.
Motion	That Council approves the Professional Practice Guidelines – Legislated Flood Assessments in a Changing Climate, Version 2.0 for final editorial and legal review prior to publication.

BACKGROUND

The Professional Practice, Standards and Development (PPSD) Department focuses on the proactive regulation of professional engineering and professional geoscience. One of the important ways in which the Department delivers on the proactive regulation of the professions is through the development and revision of Professional Practice Guidelines. These guidelines identify the standard of practice that engineering/geoscience professionals are expected to provide when carrying out professional activities involving the practice of professional engineering and professional geoscience.

These professional practice guidelines establish a common level of expectation, for a variety of stakeholders on what constitutes good professional practice when carrying out a particular professional activity. These stakeholders include engineering/geoscience professionals, statutory decision makers, clients, the public and a variety of other groups.

DISCUSSION

In March of 2016, a contract was signed between APEGBC (now Engineers and Geoscientists BC) and the Ministry of Transportation and Infrastructure – Emergency Management BC to develop and publish the Professional Practice Guidelines – Flood Mapping in BC and to revise and re-publish the Professional Practice Guidelines – Legislated Flood Assessments in a Changing Climate in BC. The Flood Mapping Guidelines were approved by Council in February 2017 at which time the revisions to the Flood Assessments in a Changing Climate in BC Guidelines began.

There were three main stages to the revision process for the Flood Assessments in a Changing Climate in BC Guidelines:

1) The initial revisions were completed by the authors of the Flood Mapping Guidelines, David Sellars, P.Eng. and Adrian Chantler, P.Eng. Their revisions focused on ensuring that there are no conflicts between the Professional Practice Guidelines- Legislated Flood Assessments in a Changing Climate in BC and the Professional Practice Guidelines- Flood Mapping in BC.

2) The second round of revisions was conducted by Mike Currie, P.Eng. an author of the first version of the Legislated Flood Assessments in a Changing Climate in BC Guidelines. These revisions focused on correcting outdated technical information and references as well as providing additional clarity in various areas of the document.

3) Finally, the majority of the revisions in the document were focused on updating the guidelines to match the current Practice Guideline style. These edits along with edits related to the recent re-brand will continue during the editorial and legal review stage.

The revisions were submitted to the following individuals and groups for comment:

1) Michael Church, P.Eng. (Original author)

2) Matthias Jakob, Ph.D.,P.Geo. (Original author)

3) Engineers and Geoscientists in the Resource Sector Division

4) Environmental Professionals Division

5) Consulting Practice Committee

Finally, the revised document was submitted to the Professional Practice Committee for review. The following motion was passed:

"The Professional Practice Committee recommends that Council approve the revisions to the Professional Practice Guidelines – Legislated Flood Assessments in a Changing Climate in BC for final editorial and legal review prior to publication."

RECOMMENDATIONS

That Council approve the Professional Practice Guidelines – Legislated Flood Assessments in a Changing Climate, Version 2.0 for final editorial and legal review prior to publication.

MOTION

That Council approves the Professional Practice Guidelines – Legislated Flood Assessments in a Changing Climate, Version 2.0 for final editorial and legal review prior to publication.

APPENDIX A – Professional Practice Guidelines – Legislated Flood Assessments in a Changing Climate in BC

ENGINEERS &
GEOSCIENTISTS
BRITISH COLUMBIA

OPEN SESSION

ITEM 5.7

DATE	August 24, 2017
REPORT TO	Council for Decision
FROM	Lindsay Steele, P.Geo., Associate Director, Professional Practice
SUBJECT	Quality Management Guideline – Use of Seal, Version 2.0
LINKAGE TO STRATEGIC PLAN	Enhance members' awareness and use of professional practice resources

Purpose	For Council's review and decision to approve the Quality Management Guideline – Use of Seal Version 2.0 for final editorial and legal review prior to publication.
Motion	That Council approves the Quality Management Guideline – Use of Seal, Version 2.0 for final editorial and legal review prior to publication.

BACKGROUND

The Professional Practice, Standards and Development (PPSD) Department focuses on the proactive regulation of professional engineering and professional geoscience. One of the important ways in which the Department delivers on the proactive regulation of the professions is through the development and revision of the Quality Management Guidelines. These guidelines provide context and clarity on the quality management requirements in the *Engineers and Geoscientists Act* and Bylaws of the Association.

DISCUSSION

The Quality Management Guideline – Use of the APEGBC Seal was released in October 2013. Since that time, the PPSD Department has conducted many sessions on the sealing requirements and OQM audits where the sealing requirements have been discussed. Through these activities as well as through the questions received by our Practice Advisors it was clear that a revision to the guideline was necessary. Over a period of time, as gaps in the guideline were identified, the PPSD Department would draft revisions. Suggested edits were also informally solicited from various members and OQM company personnel as part of our effort for continuous improvement to ensure our members have the information they need to practice professionally. In addition, to the informal consultation, the revised guideline was issued to the Consulting Practice Committee, the OQM

Committee, the Building Code Committee, the Building Enclosure Committee and ACEC-BC for comments and suggestions. All of these groups have expressed their support of the revisions.

The revised guideline was presented to the Professional Practice Committee on August 10. The committee suggested some minor additions to the guideline, which have since been incorporated. The committee passed the following motion:

"The Professional Practice Committee recommends that Council approve the revised Quality Management Guideline – Use of Seal, subject to the addition made at the August 10, 2017 Professional Practice Committee meeting, for final legal and editorial review prior to publication."

In addition, given the recent brand change, the terminology within the guideline related to the old brand will be revised during the editorial and legal review stages.

RECOMMENDATIONS

That Council approve the Quality Management Guideline – Use of Seal, Version 2.0 for final editorial and legal review prior to publication.

MOTION

That Council approves the revisions to the Quality Management Guideline – Use of Seal, Version 2.0 for final editorial and legal review prior to publication.

APPENDIX A – Quality Management Guideline – Use of Seal

ENGINEERS & GEOSCIENTISTS
BRITISH COLUMBIA

OPEN SESSION

ITEM 5.8

DATE	August 22, 2017
REPORT TO	Council for Decision
FROM	Peter Mitchell, P.Eng. , Director, Professional Practice
SUBJECT	Revisions to the BC Building Code Letters of Assurance
LINKAGE TO STRATEGIC PLAN	Clarify the association's regulatory role and responsibilities through ongoing communication and engagement with members and other stakeholders.

Purpose	For Council's review and decision to endorse the revisions to the BC Building Code Letters of Assurance pending final legal and editorial review.
Motion	That Council endorses the revisions to the BC Building Code Letters of Assurance, pending final legal and editorial review.

BACKGROUND

Letters of Assurance are legal accountability documents that are required under the British Columbia Building Code (BCBC) 2012, intended to clearly identify the responsibilities of key players in a construction project. Uniform, mandatory Letters of Assurance have been included as Schedules in the BCBC since December 1992.

The BCBC 2012 requires Letters of Assurance in specific instances to document the parties responsible for design and field review of construction, and to obtain their professional assurances that the work substantially complies with the requirements of the BCBC 2012, except for construction safety aspects, and that the requisite field reviews have been completed. Construction safety is the responsibility of the Constructor.

DISCUSSION

On April 7, 2017 the Hon. Rich Coleman, Minister of Natural Gas Development, Minister Responsible for Housing, and Deputy Premier, released Ministerial Order M158 that amended the BCBC, effective immediately. The changes were to introduce the BC Energy Step Code, a voluntary compliance path within the BCBC. The changes included revisions to the Letters of

Assurance, specifically to Schedule B and Schedule C-A. Engineers and Geoscientists BC identified some issues with the changes in these schedules and brought them to the attention of the Building Safety and Standards Branch (BSSB). The BSSB was supportive of Engineers and Geoscientists BC and the Architectural Institute of BC (AIBC) releasing a member/licensee advisory which included instructions on how to use the schedules until a time when they can be amended by a future ministerial order addressing the issues raised by Engineers and Geoscientists BC and AIBC. The member/licensee advisory was released on May 24, 2017.

On June 9, 2017 the BSSB proposed amendments to the schedules in order to address the concerns raised by Engineers and Geoscientists BC and AIBC, and issued them to the association for review and endorsement. The association took these proposed amendments to the Building Codes Committee, the Building Enclosure Committee and the Consulting Practice Committee for comments and suggestions. The discussion with the various committees resulted in some edits to the BSSB amendments to the schedules. Engineers and Geoscientists BC coordinated their feedback on the proposed amendments with AIBC.

The province of BC requires that Engineers and Geoscientists BC formally endorse the Letters of Assurance. BSSB has been made aware that this endorsement can only be provided by the association's Council. This is a time sensitive issue as government wishes to release the endorsed Letters of Assurance by mid-September 2017. The BSSB has confirmed their support for the association's revisions to the schedules as reflected in the attached documents. These revisions were presented to the Professional Practice Committee on August 10, 2017. The committee passed the following motion:

"The Professional Practice Committee recommends that the Council endorses the revisions to the BC Building Code Letters of Assurance, pending final legal and editorial review."

RECOMMENDATIONS

That Council endorses the revisions to the BC Building Code Letters of Assurance, pending final legal and editorial review.

MOTION

That Council endorses the revisions to the BC Building Code Letters of Assurance, pending final legal and editorial review.

ATTACHMENT A – BCBC Schedule B

ATTACHMENT B – BCBC Schedule C-A

BRITISH COLUMBIA BUILDING CODE 2012

SCHEDULE B

Forming Part of Subsection 2.2.7, Div. C of the British Columbia Building Code

____
Building Permit No
(For authority having jurisdiction's use)

ASSURANCE OF PROFESSIONAL DESIGN AND COMMITMENT FOR FIELD REVIEW

Notes: (i) This letter must be submitted prior to the commencement of construction activities of the components identified below. A separate letter must be submitted by each *registered professional of record*.
(ii) This letter is endorsed by: Architectural Institute of B.C., Association of Professional Engineers and Geoscientists of B.C., Building Officials' Association of B.C., and Union of B.C. Municipalities.
(iii) In this letter the words in italics have the same meaning as in the British Columbia Building Code.

To: The *authority having jurisdiction*

____
Name of Jurisdiction (Print)

Re: ____
Name of Project (Print)

____
Address of Project (Print)

The undersigned hereby gives assurance that the design of the
(Initial those of the items listed below that apply to this *registered professional of record*. All the disciplines will not necessarily be employed on every project.)

____________ ARCHITECTURAL
____________ STRUCTURAL
____________ MECHANICAL
____________ PLUMBING
____________ FIRE SUPPRESSION SYSTEMS
____________ ELECTRICAL
____________ GEOTECHNICAL — temporary
____________ GEOTECHNICAL — permanent

(Professional's Seal and Signature)

____
Date

components of the plans and supporting documents prepared by this *registered professional of record* in support of the application for the *building* permit as outlined below substantially comply with the B.C. Building Code and other applicable enactments respecting safety except for construction safety aspects.

The undersigned hereby undertakes to be responsible for *field reviews* of the above referenced components during construction, as indicated on the "SUMMARY OF DESIGN AND FIELD REVIEW REQUIREMENTS" below.

____
CRP's Initials

1 of 4

DRAFT – DO NOT DISTRIBUTE

Schedule B - *Continued*

Building Permit No.
(for authority having jurisdiction's use)

Project Address

Discipline

The undersigned also undertakes to notify the *authority having jurisdiction* in writing as soon as possible if the undersigned's contract for *field review* is terminated at any time during construction.

I certify that I am a *registered professional* as defined in the British Columbia Building Code.

Registered Professional of Record's Name (Print)

Address (Print)

Phone No.

(Professional's Seal and Signature)

Date

(If the *Registered Professional of Record* is a member of a firm, complete the following.)

I am a member of the firm ______________________
and I sign this letter on behalf of the firm. (Print name of firm)

Note: The above letter must be signed by a *registered professional of record,* who is a *registered professional* . The British Columbia Building Code defines a *registered professional* to mean

(a) a person who is registered or licensed to practise as an architect under the Architects Act, or
(b) a person who is registered or licensed to practise as a professional engineer under the Engineers and Geoscientists Act.

CRP's Initials

Schedule B - *Continued*

____
Building Permit No.
(for authority having jurisdiction's use)

____
Project Address

____
Discipline

SUMMARY OF DESIGN AND FIELD REVIEW REQUIREMENTS

(Initial applicable discipline below and cross out and initial only those items not applicable to the project.)

_______ ARCHITECTURAL

1.1 Fire resisting assemblies
1.2 *Fire separations* and their continuity
1.3 *Closures*, including tightness and operation
1.4 Egress systems, including *access to exit* within *suites* and *floor areas*
1.5 Performance and physical safety features (guardrails, handrails, etc.)
1.6 Structural capacity of architectural components, including anchorage and seismic restraint
1.7 Sound control
1.8 Landscaping, screening and site grading
1.9 Provisions for fire fighting access
1.10 *Access* requirements for *persons with disabilities*
1.11 Elevating devices
1.12 Functional testing of architecturally related fire emergency systems and devices
1.13 Development Permit and conditions therein
1.14 Interior signage, including acceptable materials, dimensions and locations
1.15 Review of all applicable shop drawings
1.16 Interior and exterior finishes
1.17 Dampproofing and/or waterproofing of walls and slabs below grade
1.18 Roofing and flashings
1.19 Wall cladding systems
1.20 Condensation control and cavity ventilation
1.21 Exterior glazing
1.22 Integration of building envelope components
1.23 Environmental separation requirements (Part 5)
1.24 Building envelope, Part 10, – ASHRAE, or NECB or Energy Step Code requirements
1.25 Building envelope, - testing ~~and/or~~, confirmation or both ~~of~~as per Part 10 requirements

(Professional's Seal and Signature)

____
Date

_______ STRUCTURAL

2.1 Structural capacity of structural components of the *building*, including anchorage and seismic restraint
2.2 Structural aspects of *deep foundations*
2.3 Review of all applicable shop drawings
2.4 Structural aspects of unbonded post-tensioned concrete design and construction

_______ MECHANICAL

3.1 HVAC systems and devices, including high *building* requirements where applicable
3.2 *Fire dampers* at required *fire separations*
3.3 Continuity of *fire separations* at HVAC penetrations
3.4 Functional testing of mechanically related fire emergency systems and devices
3.5 Maintenance manuals for mechanical systems
3.6 Structural capacity of mechanical components, including anchorage and seismic restraint
3.7 Review of all applicable shop drawings
3.8 Mechanical systems, Part 10 – ~~–~~ASHRAE, NECB or Energy Step Code requirements
3.9 ~~Building envelope~~ Mechanical systems, - testing/ and/or, confirmation or both ~~of~~as per Part 10 requirements

____
GRP's Initials

3 of 4

DRAFT – DO NOT DISTRIBUTE

Schedule B - *Continued*

____
Building Permit No.
(for authority having jurisdiction's use)

____
Project Address

____
Discipline

_______ PLUMBING

4.1 Roof *drainage systems*
4.2 Site and foundation *drainage systems*
4.3 *Plumbing systems* and devices
4.4 Continuity of *fire separations* at plumbing penetrations
4.5 Functional testing of plumbing related fire emergency systems and devices
4.6 Maintenance manuals for *plumbing systems*
4.7 Structural capacity of plumbing components, including anchorage and seismic restraint
4.8 Review of all applicable shop drawings
4.9 Plumbing systems, Part 10 – ASHRAE, ~~or~~ NECB or Energy Step Code requirements
4.10 Plumbing systems, – testing/ and/or, confirmation or both ofas per Part 10 requirements

_______ FIRE SUPPRESSION SYSTEMS

5.1 Suppression system classification for type of *occupancy*
5.2 Design coverage, including concealed or special areas
5.3 Compatibility and location of electrical supervision, ancillary alarm and control devices
5.4 Evaluation of the capacity of city (municipal) water supply versus system demands and domestic demand, including pumping devices where necessary
5.5 Qualification of welder, quality of welds and material
5.6 Review of all applicable shop drawings
5.7 Acceptance testing for "Contractor's Material and Test Certificate" as per NFPA Standards
5.8 Maintenance program and manual for suppression systems
5.9 Structural capacity of sprinkler components, including anchorage and seismic restraint
5.10 For partial systems — confirm sprinklers are installed in all areas where required
5.11 Fire Department connections and hydrant locations
5.12 Fire hose standpipes
5.13 Freeze protection measures for fire suppression systems
5.14 Functional testing of fire suppression systems and devices

_______ ELECTRICAL

6.1 Electrical systems and devices, including high building requirements where applicable
6.2 Continuity of *fire separations* at electrical penetrations
6.3 Functional testing of electrical related fire emergency systems and devices
6.4 Electrical systems and devices maintenance manuals
6.5 Structural capacity of electrical components, including anchorage and seismic restraint
6.6 Clearances from *buildings* of all electrical utility equipment
6.7 Fire protection of wiring for emergency systems
6.8 Review of all applicable shop drawings
6.9 Electrical systems, Part 10 – , ASHRAE, ~~or~~ NECB or Energy Step Code requirements
6.10 Electrical ~~Ss~~ystems – testing/ and/or, confirmation or both ofas per Part 10 requirements

_______ GEOTECHNICAL — Temporary

7.1 *Excavation*
7.2 Shoring
7.3 Underpinning
7.4 Temporary construction dewatering

(Professional's Seal and Signature)

_______ GEOTECHNICAL — Permanent

8.1 Bearing capacity of the soil
8.2 Geotechnical aspects of deep *foundations*
8.3 Compaction of engineered fill
8.4 Structural considerations of soil, including slope stability and seismic loading
8.5 Backfill
8.6 Permanent dewatering
8.7 Permanent underpinning

____
Date

____
CRP's Initials

4 of 4

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BRITISH COLUMBIA BUILDING CODE 201 2~~7~~

SCHEDULE C-A

Forming Part of Subsection 2.2.7, Division C of the British Columbia Building Code

Building Permit No.
(for authority having jurisdiction's use)

ASSURANCE OF COORDINATION OF PROFESSIONAL FIELD REVIEW

Notes: (i) This letter must be submitted after completion of the project but before the *occupancy* permit is issued, or a final inspection is made, by the *authority having jurisdiction*.
(ii) This letter is endorsed by: Architectural Institute of B.C., Association of Professional Engineers and Geoscientists of B.C., Building Officials' Association of B.C., and Union of B.C. Municipalities.
(iii) In this letter the words in italics have the same meaning as in the British Columbia Building Code.

To: The *authority having jurisdiction*

Name of Jurisdiction (Print)

Re:
Name of Project (Print)

Address of Project (Print)

Legal Description of Project (Print)

(The *coordinating registered professional* shall complete the following:)

Name (Print)

Address (Print)

Phone No.

(Professional's Seal and Signature)

Date

I hereby give assurance that

(a) I have fulfilled my obligations for coordination of field review of the registered professionals required for the project as outlined in Subsection 2.2.7, Division C of the British Columbia Building Code and in the previously submitted Schedule A, "CONFIRMATION OF COMMITMENT BY OWNER AND BY COORDINATING REGISTERED PROFESSIONAL,"
(b) I have coordinated the functional testing of the fire protection and life safety systems to ascertain that they substantially comply in all material respects with
  (i) the applicable requirements of the BC Building Code and other applicable enactments respecting safety, not including construction safety aspects, and
  (ii) the plans and supporting documents submitted in support of the application for the building permit.
(c) I have coordinated the ~~compliance of the building~~field reviews to ascertain that the project substantially complies in all material respects with
  (i) the applicable requirements of Part 10 ~~requirements~~, and
  ~~(ii)~~(ii) the plans and supporting documents submitted in support of the application for the building permit.
~~(c)~~(d) I am a registered professional as defined in the British Columbia Building Code.

(If the *registered professional* is a member of a firm, complete the following:)

I am a member of the firm
and I sign this letter on behalf of the firm. (Print name of firm)

Note: The above letter must be signed by a *coordinating registered professional*, who is also a *registered professional*. The British Columbia Building Code defines a *registered professional* to mean

(a) a person who is registered or licensed to practise as an architect under the Architects Act, or
(b) a person who is registered or licensed to practise as a professional engineer under the Engineers and Geoscientists Act.

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CRP's Initials

DRAFT – DO NOT DISTRIBUTE

ENGINEERS & GEOSCIENTISTS
BRITISH COLUMBIA

OPEN SESSION

ITEM 5.9

DATE	August 24, 2017
REPORT TO	Council for Decision
FROM	Peter R. Mitchell, P.Eng., Director, Professional Practice, Standards and Development
SUBJECT	Seismic Retrofit Guidelines, 3rd Edition
LINKAGE TO STRATEGIC PLAN	Enhance members' awareness and use of professional practice resources

Purpose	For Council's review and decision to endorse the Seismic Retrofit Guidelines 3rd Editions and the Seismic Performance Analyzer for use on low-rise buildings in British Columbia.
Motion	That Council endorse the Seismic Retrofit Guidelines 3rd Edition and the Seismic Performance Analyzer for use on low-rise buildings in British Columbia.

BACKGROUND

The Professional Practice, Standards and Development (PPSD) Department focuses on the proactive regulation of professional engineering and professional geoscience. One of the important ways in which the Department delivers on the proactive regulation of the professions is through the development and revision of practice guidelines. These guidelines identify the standard of practice that engineering/geoscience professionals are expected to provide when carrying out professional activities involving the practice of professional engineering and professional geoscience.

These practice guidelines establish a common level of expectation, for a variety of stakeholders on what constitutes good professional practice when carrying out a particular professional activity. These stakeholders include engineering/geoscience professionals, statutory decision makers, clients, the public and a variety of other groups.

DISCUSSION

Since 2004, through on going contracts with the provincial government and in partnership with UBC and the local and international earthquake engineering community the Association has been assisting the BC Ministry of Education to implement their Seismic Mitigation Program related to the seismic assessment and retrofit of low-rise (3 stories or less) BC school buildings. As stated in Clause 4.1 (2) (b) of the Engineers and Geoscientists Act one of the primary objects of the association is to “establish, maintain and enforce standards for the qualifications and practice of its members and licensee“. Consistent with this legislated authority, on June 15, 2012 Council endorsed the Seismic Retrofit Guidelines, 2nd Edition (SRG-2) for use on low-rise buildings in BC. As with SRG-2, the Seismic Retrofit Guidelines 3rd Edition (SRG-3) provides information on seismicity by community and common school construction types, prioritizes structural elements that are at greatest risk and includes a complementary web-based tool (Seismic Performance Analyzer) which allows practitioners to instantly generate seismic resistance criteria for specific types of construction. SRG-3 is comprised of 11 volumes and the primary enhancements over SRG-2 include considering the effects of the new ground motions developed for the National Building Code of Canada 2015 as well as also providing additional seismic retrofit prototypes. Finally, improvements to the Seismic Performance Analyzer web-based tool have been incorporated into Seismic Performance Analyzer 1 version 3.0.

As directed by and funded through the BC Ministry of Education, the Seismic Retrofit Guidelines were created in order to provide a consistent and rational engineering approach to the seismic assessment and retrofit of low-rise school buildings in BC. They have now been adopted for use by other government ministries for use on other types of buildings (university buildings under the BC Ministry of Advanced Education and Emergency Management BC for the seismic assessment and of low-rise buildings in BC).

These guidelines and the web-based tool have undergone the following consultation and review process:

- They were approved by the APEGBC Seismic Peer Review Committee, comprised of engineering and geotechnical experts appointed by Council, including 5 nominees recommended by the Association of Consulting Engineering Companies of BC. In addition, John Sherstobitoff, P.Eng. sits on the APEGBC Seismic Peer Review Committee and also the Board of the Structural Engineering Association of BC as well as being the Chair of the National Building Code’s Standing Committee on Earthquake Design and is a Board Member of the Canadian Association of Earthquake Engineering. The APEGBC Seismic Peer Review Comm. was delegated by Council to advise them on the use and development of the Seismic Retrofit Guidelines.
- The Seismic Retrofit Guidelines 3rd Edition (SRG 3) and the Seismic Performance Analyzer were approved by the External Peer Review Committee comprised of three international experts experienced in this field of practice
- 100 professional engineers registered in BC participated in a full day seminar on the Seismic Retrofit Guidelines 3rd Edition (SRG 3) and the Seismic Performance Analyzer on June 22, 2017. The feedback for these new guidelines and the Seismic Performance Analyzer was very positive.

- The Director, Standards & Construction Branch Capital Division Ministry of Education and the Assistant Deputy Minister of Emergency Management BC made presentations at the seminar on June 22, 2017 in support of the implementation of the Seismic Retrofit Guidelines 3rd Edition (SRG 3) and the Seismic Performance Analyzer

The Seismic Retrofit Guidelines have received provincial, national and international recognition through the following awards:

- Canadian Society of Civil Engineering - Excellence in Innovation in Civil Engineering (2010)
- Association of Consulting Engineering Companies BC - 'Lieutenant Governor's Award for Engineering Excellence' and 'Award of Excellence - Soft Engineering' (2013)
- Association of Consulting Engineering Companies Canada - 'Engineering a Better Canada Award' and 'Award of Excellence - Special Projects' (2013)
- Applied Technology Council (ATC) and Structural Engineering Institute (SEI) of the American Society of Civil Engineers - 'Champions of Earthquake Resilience Award - Extraordinary Innovation in Seismic Protection of Buildings' (2015)

The Association is currently in detailed discussions with the BC Ministry of Education regarding the government's desire to maintain the contract with Engineers and Geoscientists BC in order to continue our work on the development of these guidelines.

Finally the following motion was passed by the Professional practice Committee at their meeting on August 10, 2017.

"The Professional Practice Committee recommends that Council endorse the Seismic Retrofit Guidelines 3rd Edition and the Seismic Performance Analyzer 1 version 3.0.for use on low-rise buildings in British Columbia.

As these guidelines are in two binders and over 1000 pages, access to SRG-3 can be granted upon request via a Dropbox. Access via a password to the Seismic Performance Analyzer can also be provided upon request.

RECOMMENDATIONS

That Council endorse the Seismic Retrofit Guidelines 3rd Edition and the Seismic Performance Analyzer 1 version 3.0.for use on low-rise buildings in British Columbia.

MOTION

That Council endorse the Seismic Retrofit Guidelines 3rd Edition and the Seismic Performance Analyzer 1 version 3.0.for use on low-rise buildings in British Columbia.

ENGINEERS &
GEOSCIENTISTS
BRITISH COLUMBIA

OPEN SESSION

ITEM 5.10

DATE	August 9, 2017
REPORT TO	Council for Consideration and Recommendation
FROM	Governance Committee
SUBJECT	Proposed Volunteer Guidelines Policy
LINKAGE TO STRATEGIC PLAN	Members practice to high professional and ethical standards, and supporting effective governance

Purpose	To address the concerns expressed by Council on the proposed Volunteer Guidelines Policy
Motion	That Council approve the proposed Volunteer Guidelines Policy, as revised (Appendix C).

BACKGROUND

The attached report (Appendix A) dated May 29, 2017 on this subject was considered by Council at the June 16, 2017 meeting. While the Proposed Volunteer Guidelines Policy was generally well received, specific questions and concerns were raised about the application of this proposed Policy to members of Council. The existence of the Code of Conduct for Council Members Policy and the fact that the Engineers and Geoscientists Act (the "*Act*") does not have any provisions to remove a member of Council during his/her elected term of office were provided as the main reasons why the proposed Volunteer Guidelines Policy should not apply to Council members.

DISCUSSION

The Council Governance Policy CG-6 Code of Conduct for Council Members is a brief document that sets out the expected behaviour of Council Members to achieve good governance. Contrasting with the Proposed Volunteer Guidelines Policy and the companion Guidelines, this high level document does not set out the expectation on a number of legal, operational and administrative issues such as:

- The requirements under the Workers Compensation Act and Regulations
- Bullying, Harassment and Violence
- Political Activities
- Use of Alcohol and Drugs
- Gifting, Hospitality and Other Benefits
- Ownership of Copyright
- Expense Reimbursement
- Use of Social Media
- Interaction with the Media

That said, one option would be to revise the Code of Conduct Policy (Appendix B) for Council Members to include the missing items from the above list so that the two documents are aligned. However, this is not ideal since revisions to one document may not result in the same revision to the other document and vice versa. Should this occur, confusion will follow which is undesirable. A better option is to address the offending provisions of the proposed policy.

The offending provisions of the proposed Volunteer Guidelines Policy appear to be the following:

> *3.3 Existing volunteers that have not confirmed electronically that they have read, understand and agree to abide by the Volunteer Guidelines within 30 days of the initial release of the document will no longer be permitted to function in the capacity of Volunteer with Engineers and Geoscientists BC..*
>
> *3.4 New volunteers will only be able to function in the capacity of Volunteer with APEGBC once they have provided the electronic confirmation that they have read, understand and agree to abide by the Volunteer Guidelines.*

From recent legal research and advice, we know that the refusal on the part of a Council member to affirm the Oath of Office will not prevent the individual to serve as a member of Council. As stated earlier, the *Act* contains no direct provisions for the removal of a duly elected member of Council. Therefore, the aforementioned offending provisions in the proposed Volunteer Guidelines Policy can not apply to elected members of Council. However, while the removal of a Council member from office is not possible under the *Act*, Council members are still subject to the requirements of and must be in compliance with other applicable Legislation such as the Workers Compensation Act and Regulations, Human Rights Code, etc. Furthermore, as Policy Makers of Engineers and Geoscientists BC, Council members should set a good example for others in terms of being in full compliance with the policies made by Council. For these reasons, with the exception of the two above stated offending provisions, the proposed Volunteer Guidelines and the companion Policy should apply to all Council members.

To address the concerns associated with the two offending provisions, the following additional provisions are recommended to be added to the proposed Volunteer Guidelines Policy:

> ***3.5 Sections 3.3 and 3.4 do not apply to elected and currently sitting members of Council.***
>
> ***3.6 In the event that a Council member is alleged to have breached the provisions of the Voluntary Guidelines, the matter will be referred to the President for investigation and appropriate action unless the non-compliance involves the President, in which case the report must be made to the Vice-President. The actions to be taken by the President or Vice-President, as appropriate, will be in accordance with the procedures set out in the "Implementation of Council's Code of Conduct" as appended to Council Governance Policy CG-6 Code of Conduct for Council Members.***

RECOMMENDATIONS

The Governance Committee endorses the two additional provisions to the proposed Volunteer Guidelines Policy (Appendix C) and recommends the revised Policy for Council approval.

MOTION

That Council approves the proposed Volunteer Guidelines Policy, as revised (Appendix C).

APPENDIX A – Report to Council on Volunteer Guidelines Policy for June 16, 2017 meeting complete with attachments.

APPENDIX B – Council Governance Policy CG-6 Code of Conduct for Council Members and the appended procedures for the implementation of Council's Code of Conduct.

APPENDIX C – Revised Volunteer Guidelines Policy.

ENGINEERS & GEOSCIENTISTS
BRITISH COLUMBIA

OPEN SESSION

ITEM 5.11

DATE	August 22, 2017
REPORT TO	Council for Decision
FROM	Janet Sinclair, Chief Operating Officer
SUBJECT	Key Progress Indicators for 2017 – 2020 Strategic Plan
LINKAGE TO STRATEGIC PLAN	We support effective governance.

Purpose	To establish the progress indicators for the 2017 – 2020 Strategic Plan.
Motion	That Council approve the Key Progress Indicators for the 2017 – 2020 Strategic Plan.

BACKGROUND

Key Progress Indicators (KPIs) are a tool that Council can use to assess whether the strategic plan is being achieved. Reports on these indicators should be provided to Council at least semi-annually.

DISCUSSION

The 2017 – 2020 Strategic Plan was developed by Council in June 2016 and approved in September 2016. Strategies to support the implementation of the strategic plan were developed by staff, prioritized by Council at the February 2017 Planning Session, and approved in April as part of the annual budgeting process.

Key Progress Indicators (KPIs) that will report on the progress being made on the various strategies have now been developed and approval of Council for these KPIs is being sought.

MOTION

That Council approves the Key Progress Indicators for the 2017 – 2020 Strategic Plan.

ATTACHMENT A – Strategic Plan 2017 – 2020 with Proposed KPIs

APEGBC STRATEGIC PLAN 2017-2020

Item 5.11 - Attachment A

GOAL 1

To uphold and protect the public interest through the regulation of the professions.

OUTCOMES

1. APEGBC's role as a regulator is broadly understood.

2. Stakeholders embrace efforts to enhance professional standards.

3. The Act is modernized to reflect the evolution of the professions and the regulatory mandate of the Association.

STRATEGIES

1. Clarify the association's regulatory role and responsibilities through ongoing communication and engagement with members and other stakeholders.

2. Identify and implement practices, programs, policies, bylaws, and Act amendments that improveAPEGBC's ability to more effectively carry out its duty and objects.

KEY PROGRESS INDICATORS

1. Member and public surveys indicate improved awareness of and alignment with APEGBC's responsibilities.

2. A legislative renewal plan is formulated, approved and implemented that has stakeholder support.

GOAL 2

Establish, maintain and enforce qualifications and professional standards.

OUTCOMES

1. Members and organizations practice to high professional and ethical standards.

2. APEGBC standards are broadly utilized by all stakeholders.

3. All engineering and geoscience in BC is practiced by professionals licensed by APEGBC.

STRATEGIES

1. Enhance members' awareness and use of professional practice resources.

2. Deliver timely, outcomes-focused complaints and enforcement processes.

3. Develop a system for corporate regulation that demonstrates enhanced public protection.

4. Participate in initiatives that improve national harmonization of regulatory processes.

KEY PROGRESS INDICATORS

1. Availability and awareness of practice resources increases.

2. Demonstrate that improvements have been achieved for the timely management of complaints against members and enforcement against unauthorized practice and/or use of title.

3. Progress is made on the development and implementation of a corporate regulation program.

4. Pan-Canadian programs that address evolving issues in admissions and professional practice standards are advanced.

GOAL 3

Promote and protect the professions of engineering and geoscience (subject to goals 1 & 2).

OUTCOMES

1. Membership is diverse and inclusive.

2. The supply of skilled engineering and geoscience professionals meets the needs of BC's labour demand.

3. Stakeholder trust in the professions is maintained.

4. Member satisfaction is improved.

STRATEGIES

1. Implement the new brand and increase awareness of the high standards that engineers and geoscientists in BC must meet.

2. Assess and improve admission processes and tools to facilitate robust and timely assessment of applicants.

3. Implement processes that support Engineers Canada's 30 by 30 program for improving the number of women in the professions.

4. Clarify the association's regulatory role and responsibilities through ongoing communication and engagement with members and other stakeholders.

KEY PROGRESS INDICATORS

1. Application processing times are reduced.

2. Gender balance improves.

3. Member survey indicates improved alignment between APEGBC's responsibilities and member expectations.

ENGINEERS & GEOSCIENTISTS
BRITISH COLUMBIA

OPEN SESSION

ITEM 5.12

DATE	August 23, 2017
REPORT TO	Council for Decision
FROM	Governance Committee Report author: Megan Archibald, Director, Communications and Stakeholder Engagement
SUBJECT	Policy on Bylaw Consultation
LINKAGE TO STRATEGIC PLAN	Effective governance and resources that enable and guide APEGBC's operations.

Purpose	To update the Council Policy on Bylaw Consultation.
Motion	That Council approve the revised Council Policy on Bylaw Consultation.

BACKGROUND

The Policy on Bylaw Consultation was created to establish a consistent process for member and stakeholder engagement on proposed bylaw changes.

The current policy (Attachment 1) was approved by Council on December 2, 2011. Updates were reviewed by the Governance Committee in May 2017. Changes included:

- Editorial updates to align with current terminology (e.g. referring to licensees, rather than "limited" licensees); and
- Editorial updates to address member concerns that consultation processes are run after Council has already made its decisions. The revised wording demonstrated an emphasis on gathering information first, rather than assuming a predetermined outcome.

The Governance Committee presented the revisions to Council for approval at their June 16, 2017 meeting. Council reviewed the updates and requested that additional changes be made to provide more clarity to the policy and to have Council, rather than the Executive Committee, approve the consultation plan for each bylaw.

DISCUSSION

The policy was further revised to address Council's feedback, and was **rewritten as a new document** for simplicity and to provide more detail to the process (Attachment 2). It addresses Council's request that they review and approve the consultation process for each bylaw, rather than the Executive Committee.

At their August meeting, the Governance Committee approved the revised policy, and moved that it be presented to Council for approval.

MOTION

That Council approve the revised Council Policy on Bylaw Consultation.

ATTACHMENT A – APEGBC Policy on Bylaw Consultation (original document)

ATTACHMENT B – REVISED Policy on Bylaw Consultation

Note: This document represents the original policy with the changes that were proposed to Council in June.

APEGBC Policy on Bylaw Consultation

Purpose and Scope

To guide the member and stakeholder consultation process for proposed APEGBC bylaw amendments. The process will respect the individual nature of each bylaw. ~~Unless otherwise stated, f~~For the purposes of this document, "member" includes registered members, licensees, members in training, provisional members, ~~(~~and students.~~?)~~

Policy

2.1 Bylaw consultation should follow the process outlined below:

2.1.1 Bylaw or amendment identified and proposed to Council for consideration by a group or individual (committee, Division, Task Force, staff, or other; hereafter the "Proposer")

2.1.2 Council will vote on whether the proposed bylaw or amendment should be approved ~~in principle~~ for consultation and proceed to stakeholder consultation

2.1.3 Feedback from members and other stakeholders will be gathered and reviewed by the Proposer.

2.1.4 The Proposer will make any changes it considers necessary based on consideration of the feedback received, and will forward the wording to Council, along with a report on the consultation process and results.

2.1.5 Consultation results will be communicated to members and stakeholders.

2.1.~~5~~6 Council will consider the Proposer's report and draft wording and, if appropriate, vote on the final wording of the bylaw.

2.1.7~~6~~ If approved by Council ~~and required by the Act~~, the bylaw will proceed to those members eligible to vote (registered members and ~~limited~~ licensees) for ratification.

2.2 In consultation with staff, the Proposer will recommend to the Executive Committee an appropriate level of consultation and consultation process, along with a budget for the process if required.

2.3 The consultation process, and any changes to the process, will be approved by the Executive Committee.

APPROVED BY COUNCIL: December 2, 2011 (Minute CO-12-22)

Note: This document represents the <u>new</u> policy that has been drafted.

POLICY ON BYLAW CONSULTATION

PURPOSE

To guide member and stakeholder consultation processes for proposed bylaw amendments.

1. Proposals for bylaw amendments may be initiated by Council, a volunteer group (division, committee, task force, or working group), or staff. The initiating group or individual will be referred to as “the Proposer” within this policy.
2. The Proposer will present their request for a bylaw amendment to Council along with:
    a. A consultation plan; and
    b. A budget for consultation, if required.
3. Council will review the request and consultation plan, and will vote on whether it should proceed for consultation.
4. If Council approves that consultation should proceed:
    a. Feedback from members and stakeholders will be gathered as per the approved consultation plan, and reviewed by the Proposer.
    b. The Proposer will create a final draft of bylaw wording, taking into account consultation feedback as necessary.
    c. The Proposer will present the final draft bylaw to Council, along with a report on the consultation process and results.
    d. Council will review the draft bylaw and consultation results and will vote on whether the bylaw should proceed to member ratification.
    e. If approved by Council, the bylaw will proceed to those members eligible to vote (registered members and licensees) for ratification.
5. Throughout the process, members and stakeholders will be kept updated on the progress and results of consultation and bylaw review.

APPROVED BY COUNCIL:

ENGINEERS & GEOSCIENTISTS
BRITISH COLUMBIA

OPEN SESSION

ITEM 5.13.1

DATE	August 1, 2017
REPORT TO	Council for Information
FROM	Ann English, P.Eng., Chief Executive Officer & Registrar
SUBJECT	CEO and Registrar Report to Council
LINKAGE TO STRATEGIC PLAN	To uphold and protect the public interest through the regulation of the professions.

Purpose	This report summarizes activities of the Leadership Team related to policy work, implementation of the Strategic Plan and ongoing Regulatory duties of the association since the June 16, 2017 meeting of Council.
Motion	No motion required.

1. INTERNAL OPERATIONS

a. COMPLIANCE STATEMENT

Engineers and Geoscientists BC has met all of its legal obligations. There are no outstanding lawsuits or other liabilities that would materially modify our financial position.

b. BRAND IMPLEMENTATION UPDATE

Brand implementation was executed successfully, with no major issues noted.

The website switchover from apeg.bc.ca to the new egbc.ca site occurred at midnight August 22nd. The association's business functions continued unimpeded.

At 7 am a press release was distributed to media notifying them of the branch launch. Shortly after 9 am, emails were sent to members and applicants notifying them of the launch. Emails were distributed to key contacts in government, Branch and division executives and OQM certified companies.

The member email saw a slightly higher than average open rate (35.7%) open rate, with 847 click-throughs to the Brand FAQ.

The website saw a spike in activity, with about 1400 views on the “Brand FAQ” page, and about 800 on the “Brand Story” page.

As of August 24, the video has been viewed 955 times, which is significantly high vs. other videos on our YouTube channel.

Feedback received to date from members and stakeholder has generally been positive. We’ve received several direct queries/comments, and a number of additional comments through social media. We’ve received practical usage questions about the new name from members. Critical comments received have been focused on the absence of the word “professional” from the new name.

Staff will continue to monitor feedback and provide information to members.

2. MEMBER AND PUBLIC AFFAIRS

a. MEDIA INTERACTIONS

Media activity for this reporting period was mainly in response to our release of information regarding the Shawnigan Lake conflict of interest investigation. Detail on that issue is provided below.

- August 15: Penticton Herald. Inquiry related to a complaint regarding use of title and hiring practices. Article published on August 18: http://www.pentictonherald.ca/news/article_59e9fb0a-83a9-11e7-8704-cbdb46b4927a.html

i. SHAWNIGAN LAKE

On August 3, we released a statement regarding the results of our investigation into allegations of conflict of interest regarding a contaminated soil facility near the headwaters of Shawnigan Lake. The statement and background information can be found here: https://www.egbc.ca/News/News-Releases/Conflict-of-Interest-Investigation-into-Contaminat

The release resulted in several direct inquiries, and coverage by the Cowichan Valley Citizen, The Victoria Times Colonist, Business in Vancouver, the Lake Cowichan Gazette, and CFAX1070.

Staff responded to media and individual inquiries, and engaged government stakeholders.

b. COMMUNICATION TO MEMBERS ON AGM RULES

Following the approval of new AGM Rules, we have communicated broadly to members to ensure the information on the changes has been made widely available. To date, information has been included on the website, in eNews (2 issues), in Innovation, and on social media. This information was also provided to all staff to enable them to update their volunteer groups. Upcoming communication includes eNews, direct communication to Branch and Division reps and Past Presidents, and an email to all members (scheduled for mid-September).

The deadline to receive motions is September 21. Following this, any approved motions will be communicated to members prior to the AGM.

3. ELECTION UPDATE

On September 6th, all eligible voters will be invited to participate in the 2017/18 Council election. There are two candidate running for the office of President, two candidates running for the office of Vice President and twelve candidates running for the office of Councillor. The election will close at noon on October 6, 2017. Voter turnout by branch will be published periodically throughout the voting window. All professional members and limited licensees are encouraged to vote.

4. DIVISION PROGRAM UPDATE

At the August 2017 meeting of the Governance Committee, the committee endorsed criteria for evaluating requests for new divisions. The criteria focused on four areas: Member Interest, Practice Area Considerations, Exploration of Alternative Frameworks and the Availability of Resources. In addition, the Governance Committee requested staff to develop a broader Council policy to determine when Council should stand down or merge divisions. The broader policy, including the criteria for evaluating requests for new divisions will be brought forward for Council consideration at a future meeting. Staff will begin working on the broader policy in consultation with current divisions.

Earlier this year, Council received a request to form a new division for fire protection engineers. This request prompted the creation of criteria for evaluating such requests. At the present time, the association is exploring alternative ways to work with the Society of Fire Protection Engineers. This will include learning more about the current issues and to consider specific actions that the association can take to assist in addressing the issues.

5. ONLINE LEARNING

On August 25th, the association hosted a free webinar on Professional Practice Trends. The webinar provided participants with information on the most common questions the professional practice department receives and top trends in the Quality Management program audits and practice reviews. The webinar hosted 138 participants and received very positive feedback. As part of our strategy to provide more online learning opportunities for members, sessions will be offered to share learnings gained through some of our regulatory programs. A free webinar on the Annual Review of Investigation and Discipline Cases will be offered this fall.

There are currently eight upcoming webinars scheduled this fall including an Overview of Engineers and Geoscientists BC 2017/2018 Operating and Capital Budget. Last year, 24 online offerings were hosted drawing in attendees from across the province.

The association's online learning centre features video recordings of previously held seminars, synchronized with PowerPoint presentations. Five new online recordings will be made available this month including the Human Rights and Diversity Professional Practice Guidelines, Mitigating Risk through Insurance and the Seismic Retrofit Guidelines Third Edition. The association's online learning centre continues to expand and allows flexibility to achieve professional development anywhere and at any time.

6. ANNUAL CONFERENCE & AGM

The 2017 Annual Conference and AGM will be held from October 19 to 21, 2017 at the Whistler Conference Centre. Councillors are encouraged to participate wherever possible, and complimentary tickets to all events are available to you. Invitations for the conference were emailed to Councillors including a link to register online and a schedule of events. If you have not yet completed your registration, please do so at your earliest convenience. If you have any questions, please contact Gurjeet Phungura at gphungura@apeg.bc.ca.

Conference delegate rates of $159.00/night have been arranged at the Westin Resort and Spa. **It is recommended that you book your accommodation as soon as possible as space is now limited.** Reservations can be made directly at 1-866-412-2846 or online (link to: https://www.starwoodmeeting.com/events/start.action?id=1704042410&key=29CDFF23. Please review the hotel's cancellation policy and note that delegate rates are guaranteed only until September 18, 2017 and based on availability.

ENGINEERS & GEOSCIENTISTS
BRITISH COLUMBIA

OPEN SESSION

ITEM 5.13.2

DATE	August 22, 2017
REPORT TO	Council for Information
FROM	Jennifer Cho, CPA, CGA Director, Finance & Administration Kevin O'Connell, CPHR Manager, Human Resources
SUBJECT	Update on Volunteer Management Activities
LINKAGE TO STRATEGIC PLAN	Continue to implement best practices in governance

Purpose	To provide an update on the volunteer management activities to Council.
Motion	No motion required.

BACKGROUND

As a part of the current Council Work plan, staff are to bring an update to Council on volunteer management activities. With over 1,500 volunteers that assist and support the association, the volunteers play a major role in the organization. As a result, the plan for a formal volunteer management was developed in 2014. Key aspects of this program include a formalized recruitment process, an orientation process for volunteers which includes guidelines of policies and procedures related to volunteering with Engineers and Geoscientists BC, as well as volunteer service recognition. The following information report will provide an update on these key aspects.

DISCUSSION

Volunteer Recruitment

In 2014, a formalized recruitment process for volunteers was put in place. Official volunteer opportunities to serve the association were formalized into job descriptions. Matching of qualifications and requirements for each posting to applicants in a fair, equitable process is the standard. Alignment with the Strategic Plan for diversity and equity of volunteers has been achieved. This is indicated through some key metrics as of June 30, 2017:

- Over 40 under 40 initiative has improved from a 2014 1:4 ratio to 2017 1:2 ratio

- Female vs. male ratio of volunteers has improved from a 2014 ratio 1:7.5 to 2017 ratio 1:3.5
- Number of first time volunteers have increased year over year since 2014

Volunteer Guidelines & Policy & Orientation

As a part of the volunteer orientation program that is in development, guidelines for volunteers have been created. The document provides volunteers with information on policies and procedures that influence their involvement with the Association. Council approved these guidelines at the June 17, 2016 meeting. Subsequently, an accompanying Volunteer Guideline Policy was approved by Council at the June 16, 2017 meeting that requires all volunteers to abide by these guidelines to ensure that legal requirements are achieved.

The Volunteer Guidelines will be made available online and built into the new volunteer orientation. The guidelines and policy will be rolled out to volunteer Chairs September 6th, 2017 via email following an introduction and training webinar. The guidelines and policy will be rolled out to all remaining volunteers September 18th, 2017 through email. Following the rollout of the guidelines and policy, the official Volunteer Orientation program will launch September 18, 2017. The volunteer guidelines, and policy will be made available online.

The webinar will be hosted live for support staff and Chairs that can attend, but will be recorded and made available online for all volunteers going forward.

Volunteer Service Recognition

In order to understand and receive feedback of how volunteers want to be recognized, a focus group and survey was conducted in early 2015. The feedback received indicated that volunteers would like to be recognized for their time and contributions through simple tokens of appreciation such as thank you letters, recognition in publications and the website, and years of service certificates of participation.

Currently, to thank and appreciate the volunteers for their service and contributions to the association, volunteers receive a thank you letter from the President on an annual basis. In July 2017, a letter of appreciation from President Bob Stewart has been sent out to all volunteers. In addition, a small token gift of appreciation will be given to volunteers in the fall when most volunteers resume their activities.

Further development of volunteer service recognition is being reviewed in the fall by staff.

OPEN SESSION

ITEM 5.13.3

DATE	August 24, 2017
REPORT TO	Council for Information
FROM	Gillian Pichler, P.Eng., Director of Registration
SUBJECT	Registration Admissions Report to Council for Fiscal 2017
LINKAGE TO STRATEGIC PLAN	Promote and Protect the Professions of Engineering and Geoscience (subject to Goals 1 and 2)

Purpose	To report on the admissions and membership statistics and performance for Fiscal 2017.
Motion	No motion required.

BACKGROUND

The Registration Report (Admissions & Membership) is provided to Council on a semi-annual basis. Reports are provided to Council at its September meeting to provide fiscal year-end results; and at its first meeting of each calendar year to report on the prior calendar year for budget planning purposes. Members of Council are invited to provide feedback on any aspect of the attached report and are welcome to ask for additional analysis.

DISCUSSION

Changes of Note from the January 2017 Registration Report

a. Omid Lashkari, PhD, P.Eng. was engaged as Registration Activity Manager and started in this position in mid-March. Omid comes from a manufacturing background. His main responsibilities are to enhance: a. process monitoring, analysis and improvement. Registration volunteer recruiting, workload balancing and support and c. Registration outreach activities.

b. The volume of new applications increased 7.2% for Fiscal 2017 vs Fiscal 2016 with an overall increase in total applications of 5.2%.

c. The percentage of the total of new P.Eng. applications that were received from internationally-educated applicants remained at 51%. Iran continues to be the top source country of applicants after Canada.

d. In September, Registration Staff are making two presentations at the Annual Education Conference of the Council on Licensure Enforcement and Regulation for Licensure (CLEAR):

- Mark Rigolo, P.Eng. is presenting the Engineers and Geoscientists BC experience on a panel presenting Alternative Approaches to Assessing the Qualifications of Refugees; and
- Jason Ong, Gillian Pichler and Matthew Oliver, APEGA's Chief Regulatory Officer are presenting their experience in implementing competency assessment and collaborating with other regulators and employers to Build an Integrated Competency-Based Network for engineering in Canada.

e. Engineers and Geoscientists BC's online confirmation module for applicants who are applying for 'transfer' of membership under an internal trade agreement (Canadian Fred Trade Agreement or NWPTA). has been rolled out to all provinces and is saving considerable staff time.

f. The Accredited Employer Member-in-Training Program has expanded the number of employers participating in the program pilot. As of August 2016, fourteen employers with a combined 115 EITs have been granted provisional accreditation; and fifteen EIT 'graduates' that have been granted their P.Eng. licences under the auspices of the program.

g. A total of 17 applications have been received from Engineering Licensees wishing to qualify for Professional Engineer registration through APEGBC's bridging pilot, initiated in March of last year. Two applicants have submitted competency assessments, which have been validated by referees. To date, neither has been approved as we are seeking more information from the first who was assessed and the second applicant's validated assessment was submitted on August 17.

h. Two additional regulators – OIQ and PEGNL have joined the jurisdictions interested in finding out more about Engineers and Geoscientists BC's competency-based assessment system. A presentation was made to OIQ staff in July in Montreal, with a resulting invitation to present to the OIQ Board of Examiners in the near future.. Also in July, the CEOs and Executive Directors of Engineers and Geoscientists BC, APEGNB and PEI made progress in agreeing to setting an initial post-implementation rate for each assessment completed for a participating regulator.

ATTACHMENT A – Statistics and Analysis

Contents

Applications

Application Growth for 3 Calendar Years

- Application growth has continued, led by numbers of member-in-training applicants, but continues to lag 2015 levels for new professional engineer and professional geoscientist applications. In 2014, there was a large step change of 37% in application growth from first-time applicants, which included over 50% growth in professional engineer and professional geoscientists. These applicant levels were maintained in 2015 and have experiences some fall back in the past two years.

New Applications

Application Type	June 30 2015 Total	June 30 2016 Total	June 30 2017 Total	% Increase 2017-vs 2016
First Time Applying in Canada				
Professional Engineer[1]	1253	1092	1015	-7.1%
Professional Geoscientist[1]	114	63	85	34.9%
Engineer-in-Training	1251	1339	1580	18.0%
Geoscientist-in-Training	94	94	123	30.9%
Limited Licence	33	29	41	41.4%
Limited Licence Bridge to P.Eng.	0	13	4	-69.2%
Total First Time Applying in Canada	**2745**	**2630**	**2848**	**8.3%**
National Mobility Transfers (not including reinstatements)				
Professional Engineer	994	938	941	0.3%
Professional Geoscientist	43	45	49	8.9%
Engineer-in-Training	130	132	179	35.6%
Geoscientist-in-Training	11	10	11	10.0%
Limited Licence	5	19	21	10.5%
Total National Mobility Transfers	**1183**	**1144**	**1201**	**5.0%**
Other				
Designated Structural Engineer	8	6	5	-16.7%
Total New Applications	**3936**	**3780**	**4054**	**7.2%**
Total New Applications 2013/2014	**3350**			
Increase over Prior Year	**17.5%**	**-4.0%**	**7.2%**	

[1] Includes Non-Resident Licence Applicants

*does not include reinstatement/ return to practice and Life Member applications

**Trained = first degree origin

Total Applications including Conversions and Reinstatements

Application Type	June 30 2015 Total	June 30 2016 Total	June 30 2017 Total	% Increase 2017-vs 2016
Sub-Total New Applications	**3936**	**3780**	**4054**	**7.2%**
Reinstatements/Return to Practice - all categories	375	380	401	**5.5%**
Competency-Based Assessment Pilot			13	
Life Membership ((conversion)	105	279	220	**-21.1%**
Increase over Prior Year		0.5%	5.3%	

First Time in Canada P.Eng. and P.Geo. Applicants

Canadian vs Internationally Trained

First time making this type of application in Canada: Excludes transfers from other Provinces

Application Type	Total	Internationally Trained		Canadian Trained	
Professional Engineer	1019	522	51%	497	49%
Professional Geoscientist	85	23	27%	62	73%

Top 5 Source Countries

Professional Engineer Applicants

Country	FY 2016			FY 2017		
	Applicants	Ranking	Percentage of Total Applicants	Applicants	Ranking	Percentage of Total Applicants
Iran, Islamic Republic of	113	1	10	88	1	9
United States	99	2	9	73	2	7
India	71	3	7	44	3	4
China	62	4	6	38	4	4
United Kingdom	32	5	3	34	5	3

Professional Geoscientist Applicants

Country	Fiscal 2016			Fiscal 2017		
	Applicants	Ranking	Percentage of Total Applicants	Applicants	Ranking	Percentage of Total Applicants
Iran, Islamic Republic of				2	3	2
United States	7	1	9	5	1	6
New Zealand	1	6	1	1	4	1
Colombia	0		0	0		0
Australia	1	6	1	2	3	2
United Kingdom	3	2	4	5	1	6
France	2	3	3	1	4	1
South Africa	2	4	3	2	3	2
Turkey	2	5	3			3
Germany				3	2	4
Italy				1	4	1
Peru				1	4	1

New Registrants/Licensees – First Licence in Canada –Calendar 2016

Canadian vs Internationally Trained

Licence Type	Total	Internationally Trained		Canadian Trained	
Professional Engineer	800	302	38%	498	62%
Professional Geoscientist	66	28	42%	38	58%

Processing Times: Documents Complete to a Decision

Accurate numbers are not available for the entire data set, which makes reporting on these KPIs a time consuming process Despite the reporting challenges, registration staff is actively mindful of the Council targets and work towards expediting the processing of all applications in accordance with policy. Data cleanup and reconfiguration in MRM has been underway since April 2017. The figures in the table on the next page s are the results of some data cleanup and represent the full fiscal year. The real situation is somewhat better than these results; although Council targets have not been met for this fiscal year.

Applicant Type	Council Target – Time to a decision	Fiscal 2017 Result
First Time P.Eng. – Canadian Trained	85% within 70 calendar days Average: 35 days	85% within 108 calendar days Average: 57 days
First time P.Eng. – Internationally Trained	85% within 70 calendar days Average: 40days	85% within 182 calendar days Average: 98 days
EIT to P.Eng. - All	85% within 50 calendar days Average: 30 days	85% within 110 calendar days Average: 59 days
Mobility Applicants with confirmed registration or licence in another Canadian jurisdiction	95% within 3 business days	95% within 4 business days Average: 2 days

Membership

Membership Growth June 2012 to June 2017

	12-Jun	13-Jun	14-Jun	15-Jun	16-Jun	17-Jun	2017 vs 2016	Average 5 year Growth
Professional Members								
Professional Engineer	20,381	21,007	21,750	22,532	23,266	23933	2.9%	3.3%
Professional Geoscientist	1,526	1,603	1,663	1,706	1,753	1816	3.6%	3.2%
Dual Registrant	79	79	85	87	91	91	0.0%	3.6%
Non-Resident Licence (PEng)	412	475	540	585	608	619	1.8%	6.9%
Non-Resident Licence (PGeo)	30	36	40	40	42	40	-4.8%	2.8%
Provisional Member	12	6	7	5	3	3	0.0%	-13.0%
Members-in-Training								
Engineer-in-Training	3,566	3,805	4,161	4,445	4,892	5432	11.0%	9.3%
Geoscientist-in-Training	230	249	275	304	326	354	8.6%	9.2%
Limited Licensees								
Limited Licence (EngL)*	82	95	109	126	140	171	22.1%	15.9%
Limited Licence (GeoL)	5	5	7	9	9	9	0.0%	17.1%
Total Membership	**26,323**	**27,360**	**28,637**	**29,839**	**31,130**	**32,468**	**4.3%**	**4.4%**

ENGINEERS & GEOSCIENTISTS
BRITISH COLUMBIA

OPEN SESSION

ITEM 5.13.4

DATE	August 23, 2017
REPORT TO	Council for Information
FROM	Deesh Olychick, Director, Member Services Tim Verigin, Member Services Coordinator Mara Buzgar, Member Services Coordinator
SUBJECT	Branch Engagement Report
LINKAGE TO STRATEGIC PLAN	Members and organizations practice to high professional and ethical standards

Purpose	To update Council on Branch Engagement Activities for the 2016/2017 Fiscal Year
Motion	No motion required

BACKGROUND

Council has identified branches as playing a fundamental role in increasing member engagement. Branches currently support and drive member engagement in several different ways. Below is a summary of the branch achievements for the 2016/17 fiscal year.

BRANCH SUMMARY

- Branches held 12 successful seminars to support Members-in-Training towards the path to professional registration. In total 389 attended to learn about the path to professional registration.
- Branches assisted the association in the consultation process for corporate regulation. In total, eight out of the 15 branches hosted an event in their areas to aid the consultation process on corporate practice.
- Each branch participates in engagement with students from elementary to high school, some notable events include hosting presentations for Girl Guide groups, school presentations, Math Challengers and Science Fairs.
- For National Engineering and Geoscience Month (NEGM), the branches hosted 16 events for the community. Almost each branch hosted a Popsicle Stick Bridge Competition. In Prince George, the branch also hosted a GeoRocks event alongside their competition and the Vancouver Branch hosted its annual EG-Fest at the Vancouver Public Library.

- In support of diversity and inclusiveness, the branches hosted or participated in three events that focused on women in engineering, and hosted one event for internationally trained engineers and geoscientists.
- There were two panel discussions about sustainability organized by the Branches.

NOTABLE STATISTICS

- In the 2016 /2017 Fiscal Year, Branches held **134 events** for association members. Of these, **104 events were professional development events** in the form of presentations, tours and/or panel discussions. Branches also hosted **30 social events** that promoted engagement, such as golf tournaments, social mixers and other fun events.
- In the past year, **3,914 members** attended branch events.
- Total # of Kindergarten to Grade 12 Outreach: In total, **5,057** students in elementary and high school interacted with the association branches across **56 events** that promoted the professions of engineering and geoscience.
- Undergraduate Outreach: Collectively, the branches hosted 16 events geared towards undergraduate students, and engaged with **196 undergraduate students**.

NOTABLE EVENTS

Burnaby/New-West Branch: This year the branch hosted five successful tours to some interesting sites throughout the Lower Mainland: BCIT Smart Grid, Seymour Water Treatment Plant, BCRTC SkyTrain Operations and Maintenance Centre, D-Wave Quantum Computer Tour, and the Stave Falls Powerhouse.

Central Interior Branch: The Central Interior Branch hosted a tour of UNBC's state of the art Bioenergy Plant, which explored the sustainable bio-fuel method of powering UNBC's heating system. In addition, the branch hosted a BBQ for UNBC students strengthening their connection to their local university.

East Kootenay Branch: In collaboration with the West Kootenay Branch, the branch toured the association's 2015 Sustainability Award winner, the Kimberley SunMine and the Sullivan Mine underground railway. As well, the branch hosted a successful five part lecture series for an undergraduate classroom at the College of the Rockies.

Fraser Valley: This year the branch was very successful in collaborating with the Girl Guides and creating a Science, Technology, Engineering and Mathematics (STEM) event that had different stations for hands on activities. In total around 100 guides attended and enjoyed the event. A popular tour for the year was of the Langley Hockey Arena, which provided a technical tour of the arena followed by the attendees watching a hockey game.

Northern Branch: The branch hosted a two-day tour of the AltaGas Run of River Projects that featured multiple sites including hydroelectric facilities. As well, the branch hosted an event with the Girl Guides and constructed hover drones from everyday materials.

Okanagan Branch: In celebration of National Engineering and Geoscience Month, the branch hosted seven events that raised the profile of the professions. This included three tours, one dinner meeting, a panel discussion and an evening at UBC Okanagan.

Peace River Branch: Highlights include the tour of the AltaGas Wind Farm near Dawson Creek, connecting with a few different localities to visit the site. Each year the branch hosts three NEGM events throughout the region – in Fort St. John, Dawson Creek and in Fort Nelson.

Richmond/Delta Branch: Continuing with their partnership with the Richmond Public Library, the branch offered five sold out classes teaching 3D Design. As well, the branch hosted a successful Engineering and Geocience Fair as part of National Engineering and Geoscience Month that brought out different organizations and 300 attendees.

South Central Branch: The branch continues to host a series of very successful social nights and a golf tournament that brings members together to connect and engage in an informal environment.

Sea to Sky Branch: The Sea to Sky branch has hosted very many successful dinner events this past year that sell out quite often. One of their most successful dinners was a presentation on Norco Bicycles that drew 170 attendees, and another on Canadian Ship Design and LNG Fuel.

Tri-City Branch: The branch hosted a successful seminar on Rail Safety and as well, a successful sold out tour of the Mossom Creek Hatchery.

Victoria Branch: The Victoria Branch hosted their first annual Popsicle Stick Bridge competition this year alongside 16 other events that focused on engaging with students in elementary and high school. As well, the branch promoted diversity through a panel discussion on Women in Engineering.

Vancouver Island Branch: The branch hosted six different dinners in each community in their region, all with successful turnout. In addition, the branch provided a presentation for Vancouver Island University in their first year engineering class.

Vancouver Branch: The branch repeated their successful Social Networking evenings that is a collaboration between the Vancouver and Sea to Sky Branch. Their panel discussion on Women in Engineering and Geoscience was very successful drawing 92 attendees and the branch remains consistent in their success with monthly breakfast seminars.

West Kootenay Branch: The branch hosted a successful trip to the Kimberley SunMine and collaborated with the East Kootenay Branch. In addition, the branch hosted a successful National Engineering and Geoscience Month event that engaged with 132 students from their local communities.

ENGINEERS &
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BRITISH COLUMBIA

OPEN SESSION

ITEM 5.13.5

DATE	August 21, 2017
REPORT TO	Council for Information
FROM	Janet Sinclair, Chief Operating Officer
SUBJECT	Update on Strategic Plan 2014 – 2017 Outcomes
LINKAGE TO STRATEGIC PLAN	Continue to implement best practices in governance.

Purpose	To provide Council with a final overview of the outcomes of the 2014 – 2017 Strategic Plan.
Motion	No motion required.

BACKGROUND

In 2014, Council approved a three year strategic plan for 2014 – 2017. This past June saw the conclusion of that plan.

Appendix A, Strategic Plan Update, is a report on the initiatives that have been undertaken to achieve the goals and objectives with a specific focus on the final six months of the plan. Previous semi-annual reports have provided ongoing progress updates over the three year period. Attachment B outlines the outcomes of the Key Performance Indicators (KPIs) for July 1, 2016 – June 30, 2017.

DISCUSSION

When the three year strategic plan was launched in July 2014, a significant number of activities were planned to support the achieving of the plan's objectives. To this end, many enhancements have been made to the registration application process; guidelines have been developed and professional development seminars have been offered for a variety of practice areas; and a new brand for the association has been created.

The association has improved its engagement with employers and has made significant progress on the concept of regulating organizations. Enforcement efforts against unregulated practitioners, particularly in emerging disciplines has increased.

Engagement with government to achieve common objectives has also grown over the last three years and many government supported projects that support the health, safety and welfare of the public have been completed.

Diversity has been a key focus for the organization and modest increases have been achieved in the number of females practicing in the engineering and geoscience fields. The association has also made efforts to make its governance practices more effective.

A detailed overview of specific accomplishments can be found in Attachment A.

Key Performance Indicators

Twenty objectives are measured with a number of metrics tracked within each. Of the 20 objective targets 8 were fully achieved, 4 were partially achieved, and 7 have not been achieved. One metric, ratification of bylaws, is not applicable this reporting period as no bylaws were put forward for a vote. During the three year period 3 activities were discontinued.

Metrics that were achieved include: improved awareness of practice guidelines; mentoring program and career awareness participation; professional development partnerships and practice collaborations; member fee increases; and volunteer diversity.

Areas that were partially achieved include: increasing employer participation in APEGBC programs; number of media interactions; and increasing awareness of risk management tools.

Metrics which have not been achieved include: membership growth; processing times for registration applications and for member investigations; the variation in overall financial surplus (higher than target); and gender diversity.

MOTION

That Council receives the report on the strategic plan outcomes and the Key Performance Indicators as of June 2017.

ATTACHMENT A – Strategic Plan Update

ATTACHMENT B – Key Performance Indicators

Professional Engineers and Geoscientists of BC

Association of Professional Engineers and Geoscientists of BC

Executive
Update

June 30, 2017

Strategic Plan Progress Report
June 30, 2017 – End of Year 3

The information below covers major activities that have occurred in the past year that support the delivery of the strategic plan.

Goal 1:
Our goal is to make BC professional engineers and geoscientists synonymous with the highest standards of professional and ethical behaviour.

Progress on activities that support Goal 1:

Objective 1.1
Support potential members in acquiring the competencies required for professional registration.

Expedited Application Processes
Two major programs, the Enhanced Member in Training (MIT) program and the Accredited Employer Member in Training Program have been implemented over the past three years. These programs are focused on streamlining the application process for low risk applicants, which allows resources to be directed to more complex application types.

A pilot program to change the way that Canadian experience is assessed so that it is competency rather than time based is now complete. There are plans to incorporate the use of the Canadian Environment Competencies into the registration process.

Extensive work has been completed to automate and create an online interface for the registration application process.

Mentoring
APEGBC is piloting a new approach to better assist members-in-training (MIT) with their professional membership application through the creation of a new Registration Mentor/Mentee category as part of APEGBC's Mentoring Program. An online training session on current registration requirements was introduced to Mentors in November 2016. After completing this training session, these Registration mentors have a better understanding of what APEGBC Assessors are looking for in the experience requirements, which allows them to provide better guidance on the types of experiences a mentee should include. An online version of the mentor orientation session continues to be available and accessible by all mentors participating in the program and other resource materials are available on the mentoring program webpage.

Professional Engineering and Geoscience Practice in BC Online Seminar
The Law and Ethics seminar has been revised and relaunched as an online course, "Professional Engineering and Geoscience Practice in BC." To date it has been completed by 748 applicants.

Student Program
The value of registration as a Member in Training has been promoted on an ongoing basis through the APEGBC Student Program. Execution of a faculty communications plan is underway to increase engagement of educators in promoting MIT registration. Selkirk College Engineering Transfer Program added to Student Membership bulk buy. Outreach to students has been expanded through remotely

delivered presentations. Competency Based Assessment CBA) is regularly promoted through Student Program presentations, collateral and events and students can now access the CBA online system without requiring staff support.

Objective 1.2

Improve resources and education as well as awareness and access to resources that help members practice to high professional and ethical standards.

Practice Guidelines

Several practice guidelines have been created over the life of this strategic plan. In the 2016/2017 fiscal year three new and two revised guidelines were approved by Council on topics such as riparian assessments, climate resilient designs for highway infrastructure, dam safety reviews, and seismic retrofitting. In addition, APEGBC has been working with our committees, task forces and other partners in the development of resources and guidance on seismic related matters.

Seminars:

A series of seminars on APEGBC Professional Practice Guidelines were delivered in the 2016/2017 fiscal year.

The Certified Professional (CP) course was offered in collaboration with AIBC had 23 registrants with 13 successfully completing the course.

Objective 1.3

Develop and implement a brand strategy for the BC engineering and geoscience professions that is aligned with an overall APEGBC brand strategy.

New Brand Strategy:

The association's new brand launch is scheduled for August 23, and a comprehensive plan is in place to launch the brand to members, stakeholders, government, and the public, with the goal of reinforcing our regulatory mandate and being recognized as a strong regulator that acts in the public's interest.

Objective 1.4

Identify emerging engineering and geoscience practice issues and develop strategies with which to address them.

Professional Practice Advice Tracking Tool:

This tool allows for analysis of common questions and identification of trends related to professional practice inquiries. This year 482 entries have been made in the tool this year and ten Frequently Asked Questions (FAQs) have been added or revised in the practice section of the association's website.

Raising the Profile of the Discipline Process

Disciplinary actions have been given more prominence in association publications. The association's redesigned website includes architecture changes that provide direct pathways from the home page to discipline, enforcement, and complaints information.

Goal 2:
Our goal is to be regarded as a valued partner by clients and employers in all sectors, supporting the delivery of engineering and geoscience services in the public interest.

Progress on activities that support Goal 2:

Objective 2.1
Engage employers to improve the effectiveness of and participation in APEGBC programs.

Organizational Quality Management:
The Organizational Quality Management program continues to grow with an additional 57 new organizations certified.

Accredited Employer Member in Training Pilot Program
Eleven employers are accredited representing 198 EITs, with several requests from other employers to explore participation in the program. Council approved extending the pilot to March 2018 so that more experience can be gained before making the program permanent.

Industry Participation in Student Program:
Industry participation remains steady from last year. Evaluation of sponsorship opportunities for industry in the student program is continuing.

Objective 2.2
Demonstrate how APEGBC and its members provide technical, professional and ethical value to employers and clients.

New Brand Strategy:
The brand launch is scheduled for August 23, and a comprehensive plan is in place to introduce the brand to members, stakeholders, government, and the public, with the goal of reinforcing our regulatory mandate and being recognized as a strong regulator that acts in the public's interest.

Certifications & Licencees
A marketing plan for promotion of the EngL is being implemented. Potential EngL's have been engaged through attendance at ASTTBC's AGM tradeshow. Stakeholder consultation on the EngL title is expected to be complete January 2018. The *Bridging to P.Eng.* pilot has one potential graduate.

Objective 2.3
Develop strategies for protection from non-compliant members and unregistered practitioners.

Enforcement through Employer Outreach
When undertaking enforcement action, APEGBC demands that the company involved disclose its engineering and/or geoscience activities as well as the company’s policy in assigning titles to employees. We require the company to undertake that its employees comply with the Act. In fiscal 2017, APEGBC opened 58 enforcement files. In each case, the member and the company has complied.

Corporate Practice Regulation:
Phase One of the plan to investigate the regulation of corporations has been successfully completed. The Advisory Task Force on Corporate Practice provided a number of recommendations to Council, which were approved including a recommendation that corporate regulation be pursued. The Task Force will now begin work on Phase Two of this project.

Goal 3:
Our goal is to enhance public confidence in our members through leadership in regulatory, engineering and geoscience best practices.

Progress on activities that support Goal 3:

Objective 3.1
Provide informed perspectives on engineering and geoscience practice issues affecting public safety.

Collaborations to Improve Public Safety
Several collaborations were undertaken over the past year with the aim of improving public safety:

- A submission was made to the BC Safety Authority on the Elevator Regulation;
- Work continues on a submission to WorkSafeBC regarding proposed changes to the formworks and falseworks regulation.
- Feedback provided to the BC Safety Authority on a draft order on fire alarm annunciators.
- A workshop was delivered with the Earthquake Engineering Research Institute, City of Vancouver and District of North Vancouver to demonstrate the advantage of carrying out proactive seismic retrofits.

Labour Market Research:
Phase 2 of the Labour Market Research Study is complete. Research was done to fill in the information gaps in the areas of: (1) Occupation vs. Discipline (2) Workplace and Line of Business Structure (3) New Entrants and (4) Location of Worker vs. Location of Work.

Objective 3.2
Promote reliance on professionals in government legislation.

Submissions:
To support the professional reliance model the following activities have taken place:

- The APEGBC Building Codes Committee and the AIBC Regulatory Coordination Committee have been working with The Building Safety and Standards Branch on issues related to the recent revision of the BC Building Code Letters of Assurance.
- The APEGBC Building Codes Committee reviewed and submitted a letter of support to the City of Vancouver on proposed amendments to the Vancouver Building Bylaw.
- A submission was made to the Federal Expert Panel Reviewing the Canadian Environmental Assessment Processes.
- APEGBC and AIBC provided a response to BC Housing regarding concerns on the civil liability protection for building damage assessment personnel under the Emergency Program Act.

Objective 3.3
Define and establish a shared level of expectation among stakeholders regarding the practice of the professions in the public's interest.

A number of professional practice guidelines have been produced in collaboration with other professions this past year.

Goal 4:
Our goal is to provide a solid foundation for the sustainable delivery of the association's mission.

Progress on activities that support Goal 4:

Objective 4.1
Continue to implement best practices in governance.

Finance:
A three year budget FY18-FY20 developed and the 2017/18 budget was approved by Council. The surplus for fiscal 2016/17 is expected to be slightly higher than the budgeted range and the association reserve funds have been reviewed and are deemed to be at appropriate levels.

Amendments to the Engineers and Geoscientists Act:
With a change in government, amendments to the *Engineers and Geoscientists Act* will likely not be made in the immediate future. Engagement with MLAs and government officials to inform them regarding the need to modernize the Act is underway.

Strategic Planning:
The 2017 - 2020 Strategic Plan has been developed and approved by Council.

Council Governance Training:
New Council members received an orientation in November 2016. Eli Mina, a board effectiveness consultant, presented to Council on November 25, 2016 about running effective meetings and making good decisions.

Business Continuity:
A Business Continuity Plan is in place and new staff are advised of it in their employee orientation. Leadership Team undergoes an annual training exercise to practice the robustness of the plan.

Objective 4.2
Foster diversity and inclusiveness.

Council has directed that diversity be looked at more broadly. In support of this the Human Rights and Diversity Practice Guideline has been published and a webinar conducted. New career awareness presentation materials have been developed and shared with Branches. The materials showcase the diversity of members and disciplines.

Objective 4.3

Provide effective support and recognition for volunteers and staff.

Volunteer Support:

The Volunteer Guidelines and Implementation Policy have been developed and approved by Council.

APEGBC KEY PERFORMANCE INDICATORS

FOR THE REPORTING PERIOD JULY 1, 2016 - JUNE 30, 2017

Achieved
Partially achieved
Did not achieve

	Metrics	Key Performance Indicator Measure	As of June 30, 2014 Base Measure	2016/17 Target (YR3) Set September 2014	Results at June 30, 2017 (end of Year 3)	Status at June 30, 2017	Comments on Status
	Our goal is to make BC professional engineers and geoscientists synonymous with the highest standards of professional and ethical behavior.						
1	Increase awareness of, access to, and compliance with professional practice and ethics guidelines and resources.	Member survey on awareness and use of guidelines; number of APEGBC website hits on guidelines webpage.	2013 Level of satisfaction with practice guidelines Satisfied 69%; 6,574 guidelines webpage hits.	75% Satisfied as per survey; 8,000 or more guidelines webpage hits.	11,839 hits on Guidelines web page.		3 year target achieved re: # of hits on Guidelines page. Guideline satisfaction is measured in next fiscal year.
2	Increase participation in APEGBC's mentoring program.	Number of participants in the program measured by the number of mentors and mentees applying for the program, and the number of new and retained matches.	# of Mentor applications - 169 # of Mentee applications - 57 # of New Matches - 55 # of Retained Matches - 188	Total increase over 3 yrs # of Mentor applications - 30% # of Mentee applications - 30% increase # of New Matches - 30% increase # of Retained Matches - Maintain	55 Mentor applications 179 Mentee applications 200 New Matches 485 Retained Matches		3 year target achieved. Additionally, from December 2016 to April 2017, 51 Registration Mentors had completed training and 256 Registration MITs signed up.
3	Increase in the percent growth of membership	Percent of overall membership growth with breakdown analysis by membership category.	A. <u>5 Year Average Membership Growth (FY2009 through FY 2013)</u>: 4.1% B. <u>2013/14 MemberGrowth</u> Total Membership: 4.7% - P.Eng.: 3.8% - P.Geo.: 4.1% - MIT & Provisional: 9.4% - Limited Licence: 16%	Increase of 16% over 2014 membership numbers.	FY 2017 Annual Growth was 4.4%		Increase of 13.4% over 2014 membership numbers.
4	Increase in awareness of the engineering and geoscience professions.	Level of public respect & familiarity with what engineers and geoscientists do in their jobs as measured by a public opinion survey; number of *requests* from educators.	2011 Level of familiarity for what engineers do 81%; geoscientists do 52%. 2011 Level of respect engineers 90%; geoscientists 77%. 20 requests from educators for classroom/career awareness presentations	Familiarity for what engineers do (90%) ; what geoscientists do (65%), Respect for engineers (92%), Respect for geoscientists (83%.). 40 requests from educators for classroom/career awareness presentations.	In FY 2017, 27 requests from educators were filled. This does not include Special Events, Presentations arranged by Members. Overall engagement levels increased by 14% from the past fiscal year.		3 year target for requests from educators for classroom/career awareness presentations achieved. Public opinion not measured this year (anticipated July/August 2017)
	Member's Employers and Clients						
	Our goal is to be regarded as a valued partner by clients and employers in all sectors, supporting the delivery of engineering and geoscience services in the public interest.						
5	Increase year over year employer awareness and participation in key APEGBC programs.	Level of industry participation as measured by attendance at APEGBC events such as student industry nights, response for company representatives on APEGBC committees, number of firms who have registered to participate in OQM, number of companies in Employer Accredited MIT program.	2013/2014: # of AC sponsors - 14, # of AC exhibitors - 38, Science Games sponsorship $4k); OQM participation - total 250; MIT program new - 0	# of Exhibitors - 45 # of Sponsors - 20 #OQM firms registered to participate in OQM - 50/yr # Employers in MIT Program: 28; Science Games sponsorship increased to $6500.	# of employers in MIT Program: 11. # of Exhibitors 44. # of Student Event Sponsors: 58. 57 new companies have registered to participate in OQM since July 2016. In FY 2017, Science Games sponsorship was $9,800 (inlcudes NSERC promo science grant).		OQM - Above KPI target for both 3 year end and last fiscal year end. Still working on increasing the number of Employers in MIT Program to meet June 30, 2017 target.
6	Decrease processing time for applicants who participate in accredited employer and enhanced EIT/GIT training programs.	Processing time for applicants who participate in Accredited Employer MIT program as compared to other applicants.	<u>FY 2014</u> All Canadian Trained P.Eng. Applicants: 85% within 80 days; average of 40 days All Internationally Trained new P.Eng. Applicants: 85% within 78 Days; average of 40 days All EIT to P.Eng. Applicants: 85% within 77 days; average of 38 Days.	All Canadian Trained P.Eng. Applicants: 85% within 70 Days; Average 35 days All Internationally Trained new P.Eng. Applicants: 85% within 75 days; average 40 days; All EIT to P.Eng. Applicants: 85% within 50 days; Average 30 Days.	• All Canadian Trained P.Eng. Applicants: 85% within 108 Days; Average 57 days . • All Internationally Trained new P.Eng. Applicants: 85% within 182 days; average 98 days. • All EIT to P.Eng. Applicants: 85% within 110 days; Average 59 Days. • All mobility applicants with confirmed membership in other CA: 95% within 4 business days; Average 2 Days.		Data cleanup and reconfiguration in MRM has been underway since April 2017. These figures are the results of some data cleanup and represent the full fiscal year.
7	Increase the awareness and use of APEGBC risk management tools and programs.	Increased use of risk management tools and programs as measured by the number of practice reviews, number of certified OQM companies, number of participants in APEGBC seminars, reported compliance with CPD guideline.	100 Practice Reviews completed/year; 73 firms OQM Certified; 3035 participants in seminars ; 46% CPD compliance	100 Practice Reviews completed/year; 200 firms OQM certified; 100% CPD Compliance 3,600 Seminar attendance	# Practice Reviews have been completed since July 1, 2016: 103. # of new OQM Certified companies since July 2016 is 142 for an aggregate of 343 to date. 3,518 seminar attendance. 55.8% CPD Compliance.		# Practice Reviews completed from July 1, 2014 to June 30, 2017: 318. Over 100/year. Met fiscal year and 3 year targets. # of OQM Certified companies is 343, met target. Seminar attendance 3 year target met. CPD compliance number not met.
8	~~Increase the number of practice guidelines developed for emerging fields of practice.~~	Number of new professional practice guidelines published for emerging fields of practice.	0	~~One guideline completed , second in draft format~~	Discontinued	Discontinued	
8	NEW 2015/16 - Decision made on the course of action for the Regulation of Companies.	Phase 1 complete	n/a	Decision to proceed or not and if so the types of companies to be regulated (e.g. consulting firms, others).	The Advisory Task Force on Corporate Practice provided Council with a recommendation to proceed with corporate regulation at the April 2017 Council meeting. Companies to be regulated still under discussion.		Significant progress made on this objective. Determination of what type of companies to include is delayed to allow for more in depth analysis and consultation.
9	Improved resolution of complaints against members through better education on appropriate resolution processes.	Target to close or send to the Investigation Committee 85% of complaint files within 5 months.	2012: 7.8 months 2013: 6.3 months 2014: 3.7 months	Target to close or send to the Investigation Committee 85% of complaint files within 4 months.	For files closed or sent to the Investigation Committee in fiscal 2017, 85% have been closed or sent to the committee in 4.9 months. In fiscal 2017, the LEC dept opened 70 new complaint files, and assisted the Registration Committee on 1 file. The LEC dept closed 75 open files, and sent 10 files to the Discipline Committee relating to 8 separate members.		Of the files we have closed or sent to the Investigation Committee, 85% have been closed or sent to the committee in the following times: For files opened in fiscal 2015 – 4.8 months For files opened in fiscal 2016 – 7.9 months For files opened in fiscal 2017 – 4.9 months
10	Increase outreach to individuals and organizations in various sectors on the value of engaging APEGBC professionals.	Number of new corporate engagement initiatives and resources undertaken/produced.	n/a	Efforts to be refocused to the regulation of companies.	Discontinued	Discontinued	

APEGBC KEY PERFORMANCE INDICATORS

FOR THE REPORTING PERIOD JULY 1, 2016 - JUNE 30, 2017

Achieved

Partially achieved

Did not achieve

	Metrics	Key Performance Indicator Measure	As of June 30, 2014 Base Measure	2016/17 Target (YR3) Set September 2014	Results at June 30, 2017 (end of Year 3)	Status at June 30, 2017	Comments on Status
	Government, Public and Other Stakeholders						
	Our goal is to enhance public confidence in our members through leadership in regulatory, engineering and geoscience best practices.						
11	Increase in earned media and stakeholder interactions that provide positive exposure for APEGBC.	Increase in number of actual earned media and stakeholder interactions.	12 instances of successful media engagement; 9 instances of APEGBC supplied experts cited; 5 information release topics targeted; 5 documented forms of recognition/interaction with various stakeholders that provide positive exposure for APEGBC	20 instances of successful media engagement; 15 instances of APEGBC supplied experts cited; 15 media resource materials released; 7 documented forms of recognition/interaction with various stakeholders that provide positive exposure for APEGBC.	19 instances of successful media engagement; 13 instances of APEGBC or APEGBC supplied experts cited; 5 media resource materials released; 16 documented forms of recognition/interaction with various stakeholders that provide positive exposure for APEGBC.		Targets partially met due to the time and resources available.
12	Growth of collaborative interactions and formalized partnerships with private and public sectors, and with other professional associations in areas of common interest to build on existing successes.	Growth in number of collaborative interactions such as partnerships to produced PD seminars, joint submissions to authorities having jurisdiction, joint guidelines, joint initiatives	5 documented collaborative submissions/guidelines/initiatives; 3 PD partnerships	7 or more documented collaborative submissions/guidelines/initiatives 7 PD partnerships	During fiscal 2016/17, a total of 7 new documented collaborative submissions/guidelines/initatives (4 from PPSD, 3 from Registration) and 13 PD Partnerships (8 from Member Services, 5 from PPSD).		Met 3 year end target. An aggregate of 25 documented collaborative submissions/guidelines/initatives completed. 22 PD Partnerships completed.
13	Demonstrated confidence of government through continued or increased usage of the professional reliance model and/or requirements that specify the expertise of APEGBC members in support of the public interest.	Maintain existing legislation utilizing APEGBC members and licensees as qualified professionals. Attempt to achieve new pieces of legislation.	Two efforts in 2014 to maintain or increase the appropriate use of APEGBC professionals in legislation.	Three efforts to maintain or increase the appropriate use of APEGBC professionals in government legislation.	During fiscal 2016/17, 1 effort to maintain or enhance legislation utilizing APEGBC members, the Ministry of Health use of engineers in developing risk management plans for water and wastewater treatment plans, APEGBC provided a review of the changes to the MEM Health, Safety and Reclamation Code and APEGBC provided a review of the changes to the BCBC Letters of Assurance.		Met fiscal year end and 3 year end targets.
	Enabling Goal						
	Our goal is to provide a solid foundation for the sustainable delivery of the association's mission.						
14 a	Demonstrate financial prudency on a consistent basis.	Budgeted surplus/deficit vs. actual surplus/deficit to be less than 3%	Actuals 4x greater than budgeted deficit	Budgeted surplus/deficit vs. actual surplus/deficit to be less than 3%	Budgeted deficit of $140K vs. Actual surplus $685K = 589% variance.		Higher than expected membership revenues and staff vacancies.
14 b		Produce a clean audit ie. An unqualified opinion.	No material annual audit adjustments.	One or less material annual audit adjustments.	On track.		Audit occurs in July 2017. TBD.
14c		No additional annual membership fee increase outside of what is budgeted for 2015-2017	Established in budget $35 fee increase in 2015, $0 fee increase in 2016, $0 fee increase in 2017.	Established in budget $35 fee increase in 2015, $0 fee increase in 2016, $0 fee increase in 2017.	No fee increase in 2017.		Achieved.
14 d		Budgeted surplus/deficit vs. actual surplus/deficit to be less than 3% of gross budgeted revenue.	n/a added as metric in November 2015	≤3% of budgeted gross revenue	$685K surplus is 4.5% of budgeted gross revenue.		Higher than expected membership revenues and staff vacancies.
15	Gain membership approval for bylaw amendments which advance the work of the organization and the profession.	Members ratify bylaws.	Achieve member ratification.	Achieve member ratification.	No bylaws presented for ratification.	N/A	
16	Increase diversity and new volunteer participation in the volunteer program.	Enhanced diversity as measured by the number of new volunteers to APEGBC, the number of women, and the number of young professionals participating.	Ratio Male/Female = 7.5:1 Ratio of Volunteers >40 yrs to < 40 years = 4:1 ; 33% female speakers and participants at student program events.	20% of total volunteers are new; Ratio of 7.5:1 Male:Female and 4:1 >40 to < 40;	53% of the volunteers are new volunteers Male:Female Ratio 4.5:1 Ratio of Volunteers >age 40 vs < age 40 is 3:1.		Achieved.
17 a	Increase the number of women in the professions.	The percentage of women in the professions.	Total Female Membership: 3,257 (11.4%) - Engineering P.Eng. & Licensees: 2,015 (9%) - Geoscience P.Geo. & Licensees: 316 (17.6%) - EIT & Provisional Member (Eng): 806 (19.3%) - GIT & Provisional Member (Geo): 120 (43.6%)	Total Female Membership: (15%) - Engineering P.Eng. & Licensees: (11.7%) - Geoscience P.Geo. & Licensees: (23%) - EIT & Provisional Member (Eng): (25%) - GIT & Provisional Member (Geo): (50.0%)	No longer tracking this statistic as Active Membership provides a more accurate reflection.	Discontinued	No longer tracking this statistic as Active Membership provides a more accurate reflection.
17 b		Percentage of Active Members (In training & provisional) or with Practice Rights that is female.	At November 5, 2015 = 13.2%	14.8%	Total Active (Practising and Active) that is Female: 14.0% - P.Eng. and Eng.L. (11.8%) - P.Geo. And Geo.L. (21.0%) - EIT & Provisional Member (Eng) (18.7%) - GIT & Provisional Member (Geo) (39.4%)		Gradual increase over time seen in the number of members who are women but targets not quite met.
17c		Percentage of New Registrants excluding NRLs that is female.	Registered between November 1, 2014 to October 30, 2015, excluding NRLs = 19.3%	20.70%	Registered in FY 17: 17.6% - P.Eng. (16.2%) - P.Geo.(28.1%) - EIT & Provisional (18.0%) - GIT & Provisional (34.6%) - Eng.L. (5.3%)		Target missed by 3.1%

ENGINEERS & GEOSCIENTISTS
BRITISH COLUMBIA

OPEN SESSION

ITEM 5.13.6

DATE	August 24, 2017
REPORT TO	Council for Information
FROM	Tony Chong, P.Eng., Chief Regulatory Officer/Deputy Registrar
SUBJECT	Update on Professional Reliance
LINKAGE TO STRATEGIC PLAN	1. To uphold and protect the public interest through the regulation of the professions. 2. To establish, maintain and enforce qualifications and professional standards

Purpose	To provide Council with an update on Professional Reliance and the Government's intention to Review the Professional Reliance Model in BC
Motion	No motion required.

BACKGROUND

The concept of "professional reliance" is what we, as professionals, are all about. Its roots go well back into history. Laypersons regularly rely on professionals for their opinions, advice, recommendations and decisions to guide their actions. People rely on professionals because there is an expectation that professionals will be held accountable for the work they do and/or the services they provide. The concept of "professional reliance" is not new. What is new is the current debate regarding the efficacy of the Professional Reliance Model used in BC since the Provincial Government introduced and implemented this tool as part of their de-regulation and bureaucracy downsizing exercise about a decade ago. When that decision was made it gave birth to the Professional Reliance Model for BC. In essence, it is the shift by Government from prescriptive regulation to reliance on the appropriate professionals working outside of government to undertake a particular task to achieve the desired outcomes. In response to this de-regulation initiative, Engineers and Geoscientists BC analysed the implications and produced a position paper in 2006 which supports the concept of professional reliance in general but expressed a number of concerns as follows:

1. Government needs an overall policy on where the concept of professional reliance should be applied and where it should not.

2. Total transfer of the Government's liability to individual professional is not possible. Government has an overall duty of care and associated liability, and professionals are responsible and liable for their individual work.
3. The definitions and use of *Qualified Professionals* or *Qualified Persons* or *Authorized Persons* should be consistent across all Ministries.

Assessing the current practices under the Professional Reliance Model in BC, it does not appear that the above concerns have been addressed. We have learned that the Provincial Government will be conducting a review of this Model in the near future. This presents another opportunity for Engineers and Geoscientists of BC to assist government in making improvements to this Model.

DISCUSSION

The Professional Reliance Model in BC has been applied in different ways for different purposes by Government and its agencies. The following examples should be familiar to us:

a. Occupational Health and Safety Regulation in WorkSafe BC
b. Forest Range Practices Act in the Ministry of Forests and Range
c. Contaminated Sites Regulation, Organic Matter Recycling Regulation, and Riparian Areas Regulation in the Ministry of the Environment
d. Municipal Sewage Regulation and Sewerage System Regulation in the Ministry of Health
e. National Instruments 43-101 and 51-101 in the BC Securities Commission
f. Permit Requirements for the opening and operation of mines under the Mines Act in the Ministry of Energy Mines and Petroleum Resources.

The above-mentioned list is only a small sample of where the Professional Reliance Model has been used by the Provincial Government in BC. Indeed, following the Province's example, many municipalities and regional districts have also adopted the concept of professional reliance in various ways. Engineers and Geoscientists BC members are often call upon to serve as *Qualified Professionals* on land development, building and other infrastructure projects. Yet, despite the attempts over the years to bring some standardization of how the Professional Reliance Model should be applied by the various authorities having jurisdiction, the inconsistent application of this model in BC has continued.

The on-going application of the concept of Professional Reliance in BC without an overall policy clearly setting out the concept, the desired outcomes, the limitations and the specific roles/responsibility of all of the stakeholders involved has brought about confusion and blurred the accountabilities of the players. This outcome is clearly not in the public interest!

For one thing, even though the Professional Reliance Model is not intended as a tool to divest responsibility or elude accountability, it is unfortunately practiced by many authorities having jurisdiction and other stakeholders. Let's consider a typical mine operation as an example. The Ministry of Energy, Mines and Petroleum Resources using the Professional Reliance Model generally rely entirely on the Engineers of Record to ensure that the mine will be designed and operated in a safe manner even though the permit is issued to the mine owner. Should a failure at the mine occurs, it is extremely unlikely that the Ministry will accept any responsibilities. They would point their fingers to the Engineers of Record whom do not feel that is fair because they should only be held accountable for the specific things that they are responsible for. The remaining responsibilities are that of the permittee, or the owner/operator of the mine. The owner/operator, of course, would likely deny any responsibility because the mining company's position is usually along the lines that it hired qualified professionals to assume any and all responsibilities when things go wrong. This example supports the need for clarity in defining responsibilities and liabilities under the Professional Reliance Model. There are also other issues that need addressing.

We are also aware of other concerns associated with the implementation of the Professional Reliance Model based on our learnings from our members feed-back, our investigation process and the assessments of this model by the BC Auditor General, the Chief Mining Inspector, the Westcoast Environmental Law Group, and others. The following are some additional areas to be addressed:

- Who is qualified to perform professional reliance functions? Is self declaration acceptable?
- What are the professional functions, responsibilities and accountabilities for the professional?
- What are the functions, responsibilities and accountabilities for government and other authorities having jurisdiction?
- What constitute a conflict of interest? Is perception sufficient to disqualify a professional?
- The expected standard of record keeping, disclosure to achieve transparency?
- Who is liable for what?
- What is the appropriate insurance coverage and/or bonding requirements?
- What is the expectation for the professional regarding the duty to report non-compliance?
- Should there be a requirement to conduct an independent review of the professionals work? If so, when should this be a requirement?

Other professional regulators and associations such as the AIBC, the CoBiologists, BCIA, the ABCFP, ACECBC, etc…. will likely have additional questions to add to this list.

The lack of clarity in the answers to these questions clearly support the current provincial government's commitment to conduct a review of the Professional Reliance Model as it is used in BC. In the interest of public protection (which is our primary mandate), Engineers and Geoscientists of BC must be an active participant in the review of this Model so that it can learn what the issues are, analyse and offer suggestions so that improvements can be made. That is why we have asked the Province to include us in this review. The outcomes from this review could have significant impacts on all professionals involved under this Model in the future, including members of the Engineers and Geoscientists of BC. If we sit back and let others carry out this review and make changes without our input, I believe that we will be doing a disservice to the professions and the public.

Finally, even though little detail has been provided by the Ministry of Environment, which appears to be the lead Ministry for this review, we suspect that this work will commence relatively soon and that the Engineers and Geoscientists of BC will participate in some capacity. In the meantime, staff is gathering information ahead of this review and at the appropriate times, will be reporting to Council on the status of this review.

ENGINEERS & GEOSCIENTISTS
BRITISH COLUMBIA

OPEN SESSION

ITEM 5.13.7

DATE	August 25, 2017
REPORT TO	Council for Information
FROM	Russ Kinghorn, P.Eng., FEC Jeff Holm, P.Eng., FEC
SUBJECT	Engineers and Geoscientists BC Directors to the Board of Engineers Canada
LINKAGE TO STRATEGIC PLAN	To uphold and protect the public interest through the regulation of the professions.

Purpose	To provide Engineers and Geoscientists BC Council with an update on the recent activities at Engineers Canada.
Motion	No motion required.

GOVERNANCE AT ENGINEERS CANADA

The Governance Committee met in Toronto on August 20. Engineers Canada is rejigging governance from a pure Carver limitations model to a more common Policy objectives model that will be more functional and should provide greater board control and more direction to staff.

Governance cmt. will recommend that the Board size be reduced from 23 to 12 members (one per constituent) with proportional voting based on size retained for certain issues with those special motions approved by a double (2/3 +60%) vote. BC will still retain 2/23 (9%) proportional vote although we will drop to a single representative.

STAFF CHANGES

Stephanie Price is interim CEO while a search for a permanent CEO takes place. The CEO Search Committee has been formed and includes Ann English as the representative of the CEO Group.

Kathy Sutherland, VP Governance has resigned. Interim duties will be filled by Jeanette for international, financial team will report to Colin, and Stephanie will handle governance, legal issues and all project sponsor roles. With the arrival of a new CEO in Q1 2018, we've decided to not backfill the VP Governance role at this time.

PROVIDING REGULATORY SUPPORT

The **Accreditation Improvement Program** is fully launched. It incorporates four key projects: *accreditation systems technology* which refers to the technology and processes used to support visit document management, *accreditation communications* to improve visibility of accreditation actions, *accreditation training* for staff and volunteers, and *continuous improvement process* to ensure ongoing improvements can be implemented.

The project team is incorporating the feedback from the June face-to-face stakeholder consultation and the July email campaign. The email campaign was launched for stakeholders to provide feedback and sign up for updates on progress of the Program. Subscription rates have exceeded expectations and we now have over 179 individuals subscribed for updates.

If you have not yet subscribed, the **Accreditation Improvement Program** subscription links for the French and English Mail Chimp E-mail Campaign are:

French: http://eepurl.com/cVAMdf
English: http://eepurl.com/cU9jIX

BUILDING CONFIDENCE IN THE ENGINEERING PROFESSION

David Lapp delivered two presentations on the PIEVC Protocol and the Infrastructure Resilience Professional certification respectively at a meeting with **Public Works and Procurement Canada**. This was followed by a discussion on how the Protocol could be incorporated into infrastructure planning and procurement to take into account the risks from extreme weather and our future changing climate over the life cycle of the assets.

Jamie Ricci and Joey Taylor are meeting with the **Employment, Workforce Development and Labour** Minister's Office on August 31 to discuss diversity in the engineering profession, specifically Indigenous peoples' access to engineering.

Engineers Canada has submitted its pre-budget recommendations to the **House of Commons Standing Committee on Finance** for its consideration in developing the 2018 federal budget. The submission included six recommendations that impact the engineering profession and that Engineers Canada believes would enable Canadians and Canadian businesses to be more productive and competitive. The full pre-budget submission is available on the Engineers Canada website.

Engineers Canada will be submitting its recommendations to the **House of Commons Standing Committee on Transport, Infrastructure and Communities** to be considered in amending Bill C-49. The submission includes three targeted recommendations to Canada's Railway Safety Act that focus on clearly defining the term "engineering principles" within Section 11 of the Railway Safety Act; supporting the inclusion of professional engineers in the entire life cycle of railway infrastructure; and, ensuring that rail infrastructure in Canada can adapt to Canada's changing climate.

OUTREACH AND PROMOTING DIVERSITY IN THE PROFESSION

NSERC's Gender Summit Steering Committee meeting was attended by Jeanette Southwood and Julia Chehaiber. The Committee provided oversight on the development and focus of individual Summit sessions and key deliverables of organizers and NSERC staff.

Julia Chehaiber led two workshops at the August 8-11 **CONTACT 2017 Conference**, an annual event that brings together over 120 classroom teachers from all four Atlantic provinces. The workshop focused on how teachers can integrate STEAM (Science Technology Engineering Arts Mathematics) into their teaching and how they could use Future City.

The **Global Marathon Thought Leaders** teleconference started the planning process for the 2018 Global Marathon, focusing on sessions that provide women with toolkits to overcome day to day challenges of being a member of the engineering profession. Julia Chehaiber participated as Canada's representative.

Ontario Society of Professional Engineers' **Canada 150 STEM Project** has kicked off. Jeanette Southwood and Julia Chehaiber participated in the first teleconference for project partners.
The **Canadian Indigenous Advisory Committee (CIAC)** to the American Indian Science and Engineering Society (AISES) had its inaugural teleconference on August 17. The group discussed the purpose of CIAC and future plans.

Jeanette Southwood will present at the **Women of Innovation Symposium** on August 30 alongside Mary Wells, Monique Frize, Elizabeth Cannon, Denise Pothier and other female engineers.

MEETING THE PROFESSIONAL AND ECONOMIC NEEDS OF ENGINEERS

Engineers Canada's affinity partner, **Manulife**, is taking emergency action to support customers and communities affected by wildfires in British Columbia. Information has been placed on the member website at www.manulife.com/engineers. In addition, Manulife has donated $25,000 to the Canadian Red Cross and is matching up to $10,000 for employee donations.

Jeanette Southwood, Lorelei Scott, and Emily McParland met with **Manulife and visited REDLab**, where Manulife undertakes research, design, and prototyping of digital solutions. REDLab also functions as a conduit between Manulife Canada and the start-up community.

It's been a banner year for the Engineers Canada and **Great-West Life** relationship as together we have won two communications awards for our affinity program materials. The **Communicator Award** (integrated campaign, business to consumer category) is the leading international communications award that honours creative excellence for communication professionals and **the Bronze Summit Creative Award** in the integrated campaign category.

ENGINEERS & GEOSCIENTISTS
BRITISH COLUMBIA

OPEN SESSION

ITEM 5.13.8

DATE	August 23, 2017
REPORT TO	Council for Information
FROM	Garth Kirkham, P.Geo., FGC
SUBJECT	Engineers and Geoscientists BC Director to the Board of Geoscientists Canada
LINKAGE TO STRATEGIC PLAN	To uphold and protect the public interest through the regulation of the professions.

Purpose	To update Council on the recent activities of Geoscientists Canada.
Motion	No motion required.

BACKGROUND

The summer months have been relatively quiet on the Geoscientists Canada front. Geoscientists Canada is searching for a successor to Ollie Bonham, which will be difficult. A search committee has been constituted and will start reviewing submissions after the September 15 cut-off date.

ENGINEERS & GEOSCIENTISTS
BRITISH COLUMBIA

OPEN SESSION

ITEM 5.13.9

DATE	August 24, 2017
REPORT TO	Council for Information
FROM	Rohan Hill Staff Lawyer, Regulatory Affairs
SUBJECT	2017 Enforcement Report
LINKAGE TO STRATEGIC PLAN	To uphold and protect the public interest through the regulation of the professions. To promote and protect the professions of engineering and geoscience.

Purpose	This report is to update Council on enforcement activities undertaken by the Legislation, Ethics & Compliance ("LEC") Department from July 1, 2016 to June 30, 2017 (the "Reporting Period").
Motion	No motion required.

BACKGROUND

The LEC Department's "enforcement" activities mainly refer to steps undertaken pursuant to sections 22, 23, and 27 of the Act to stop:

- The unauthorized ***practice*** of professional engineering and professional geoscience by non-members of the association.
- The unauthorized ***use of titles*** by non-members of the association in a manner that contravenes the Act.

An enforcement file is typically opened in response to a complaint from the public, information received from other public bodies, or association staff otherwise coming to suspect that a case of potential unauthorized practice or misuse of title requires further investigation.

Historically, a small portion of enforcement files have ultimately required Court action for resolution, because the vast majority of enforcement targets agree to bring themselves into compliance following the communication of demands from the LEC Department. Compliance is typically achieved by the target either ceasing to engage in prohibited practices or registering with the association. However, in appropriate cases, the LEC Department is prepared to seek remedies via Court action, and has done so on many occasions in the past.

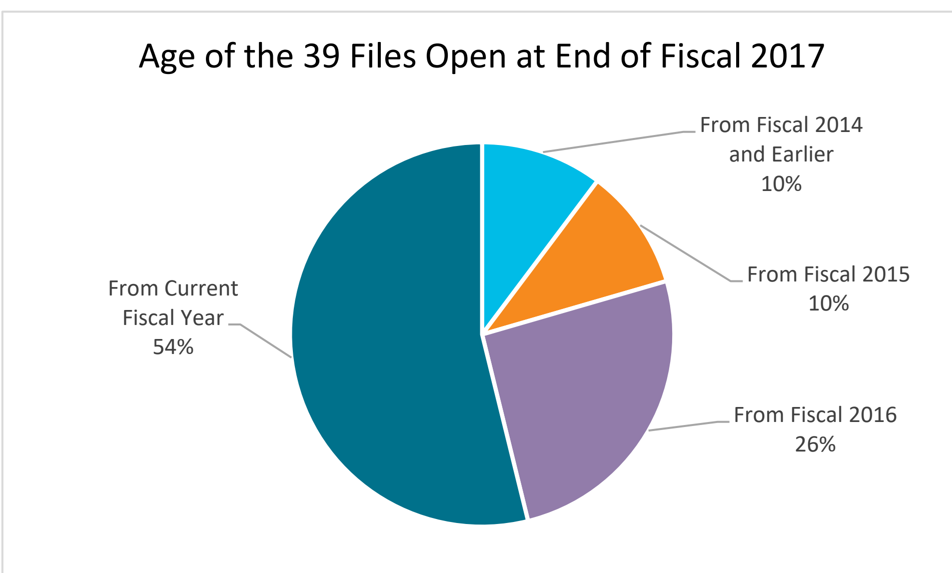
The LEC Department follows up on each enforcement file until resolution. However, the length of time that each file may remain open will vary, depending on the following factors:

- The responsiveness and compliance of the enforcement target.
- The length of monitoring required after the enforcement target agrees to come into compliance with the Act, for example by taking steps to become registered as a member of the association.
- The complexity of the case, the length of time required for the LEC Department's investigation, and whether Court action is necessary.

DISCUSSION

A summary of enforcement file opening and closure statistics for the Reporting Period are as follows:

Files carried forward from the previous reporting period:	28
Files opened during the Reporting Period:	58
Files closed during the Reporting Period:	47
Files to be carried forward to the subsequent reporting period:	39



During the Reporting Period, certain highlights of the LEC Department's enforcement efforts have included:

- Obtaining injunctive relief via court order to prevent Yogeshchandra Nathawad, a former member whose membership was revoked in 2001, from continuing to engage in the practice of professional engineering or act in a manner leading the public to believe that he is a professional engineer.

- Preparation of submissions to the Ministry of Advanced Education regarding the regulation of software engineering in British Columbia and extensive engagement on this topic with the other provincial regulators.

- Enforcement activity against various organizations in connection with the practice of software engineering and use of the "software engineer" title by individuals not registered with the association. Outcomes include a target agreeing to bring a registered professional engineer or licensee onto its staff within 60 days to directly supervise the company's engineering activities in BC, and to refrain from using the title software engineer in connection with any non-member of the association.

- Enforcement activity in connection with the use by non-members of the emerging phrase "coastal engineer", a title that is seeing increasing use in reference to a subset of the civil engineering discipline involving coastal and shoreline engineering.

RECOMMENDATIONS

A new Staff Lawyer, Regulatory Affairs was hired on June 19, 2017. In connection with that transition, the new Staff Lawyer is presently considering mechanisms to increase the efficiency and throughput of enforcement files, and to improve compliance generally, including:

- Increased use of computerized tracking of open enforcement files.

- Standardization and further development of a set of precedents to be used for recurring enforcement fact patterns.

- For low-complexity enforcement files, delegation of document preparation to staff supervised by the Staff Lawyer.

- Undertaking efforts are being made to increase the public's awareness and the visibility of enforcement actions taken, for deterrent value. As most enforcement files are resolved by consent, this often results in no public record of the association's actions. This may give the impression that the association is less active with respect to unauthorized practice and misuse of title than it actually is. In conjunction with the Director of the LEC, the Staff Lawyer will work towards development of an expanded publication policy with respect to enforcement outcomes.

ENGINEERS & GEOSCIENTISTS
BRITISH COLUMBIA

OPEN SESSION

ITEM 5.13.10

DATE	August 23, 2017
REPORT TO	Council for Information
FROM	Neil Nyberg, P. Eng. Chair, Investigation Committee Paul Adams, P. Eng. Chair, Discipline Committee
SUBJECT	2017 Fiscal Year End Investigation & Discipline Status Report
LINKAGE TO STRATEGIC PLAN	Establish, maintain and enforce qualifications and professional standards.

Purpose	Investigation & Discipline Status report for the period July 1, 2016 to June 30, 2017
Motion	For Information Only.

INVESTIGATION

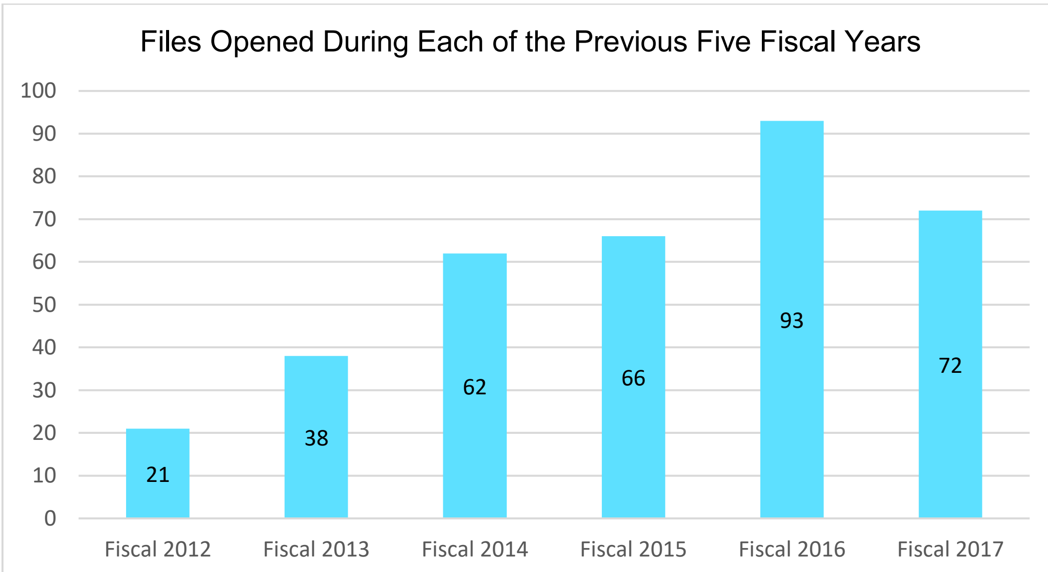
During fiscal 2017, the most common types of complaints to Engineers and Geoscientists BC concerned: conduct matters (25%); transportation (17%); structural engineering (12%); and geotechnical engineering (12%). Overall, the LEC department managed 72 new complaint files.

The Investigation Committee concluded a large-scale investigation involving the engineers and a geoscientist employed by Active Earth Engineering concerning the Shawnigan Lake landfill. The issue received recent significant media attention. There are two other large-scale investigations ongoing which are being managed, in part, with the assistance of external lawyers. In addition, we have received thousands of pages of documents from the provincial government pursuant to the *Freedom of Information and Protection of Privacy Act* on two separate investigations involving environmental issues.

The LEC department had two successful meetings with WorkSafeBC regarding the sharing of information where WorkSafeBC has identified that the conduct of a member of Engineers and Geoscientists BC may have fallen below the standard expected.

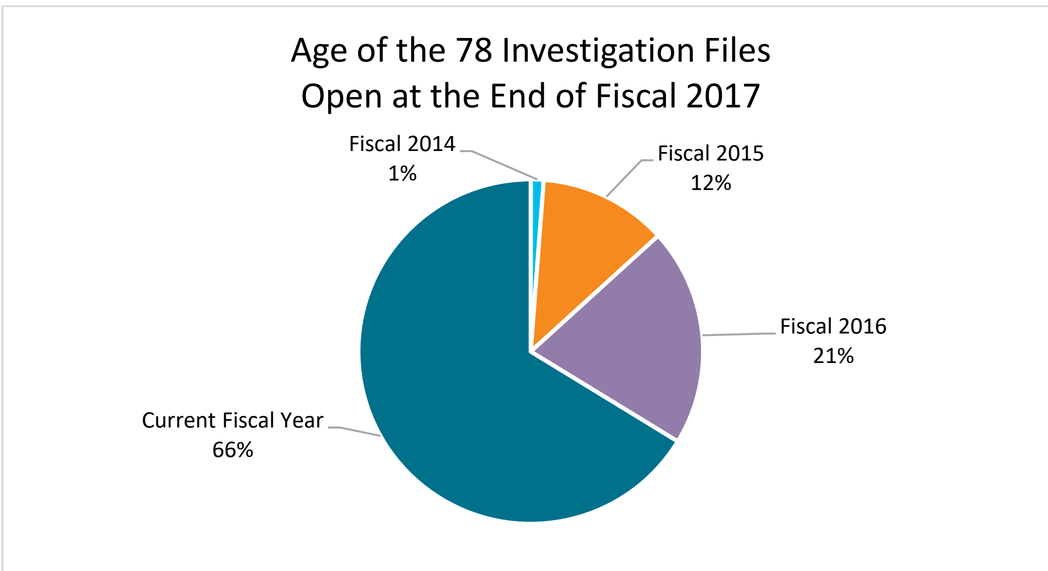
In order to manage the increased workload in the LEC department, the department successfully recruited four new members to the Investigation Committee to expand its capacity. The LEC Department is also currently advertising for an Investigation Manager and a paralegal to join the department to provide the Investigation and Discipline committees with increased staff support.

Below is a chart showing the number of complaints received in the previous five fiscal years:

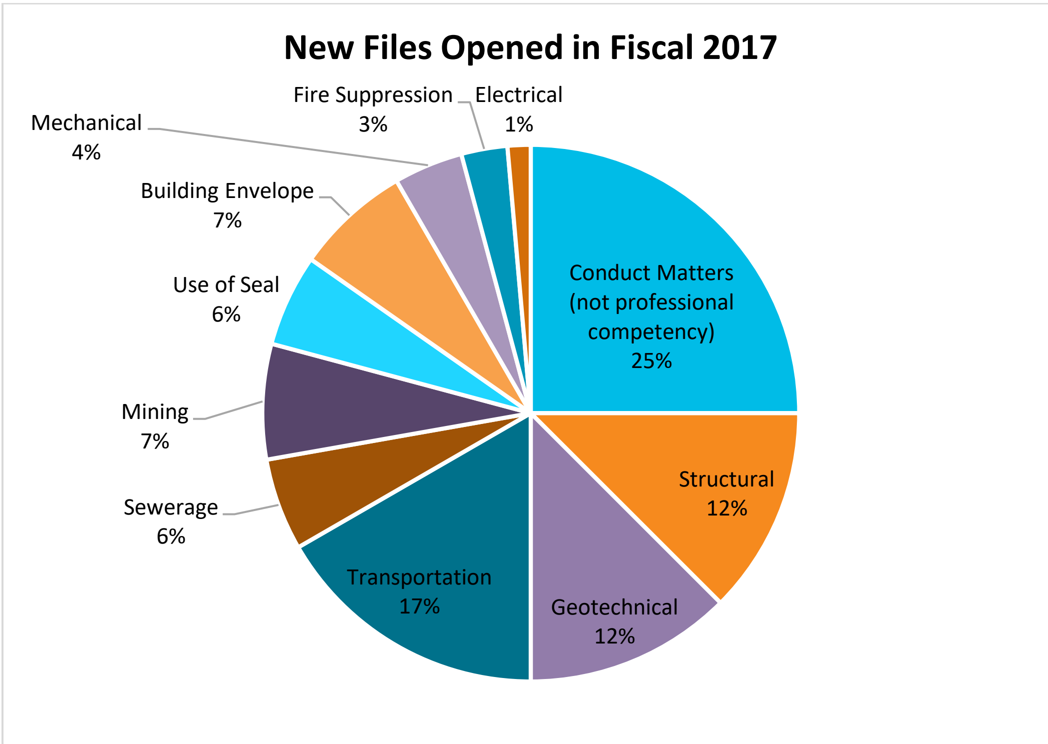


Investigation File Summary July 1, 2016 to June 30, 2017

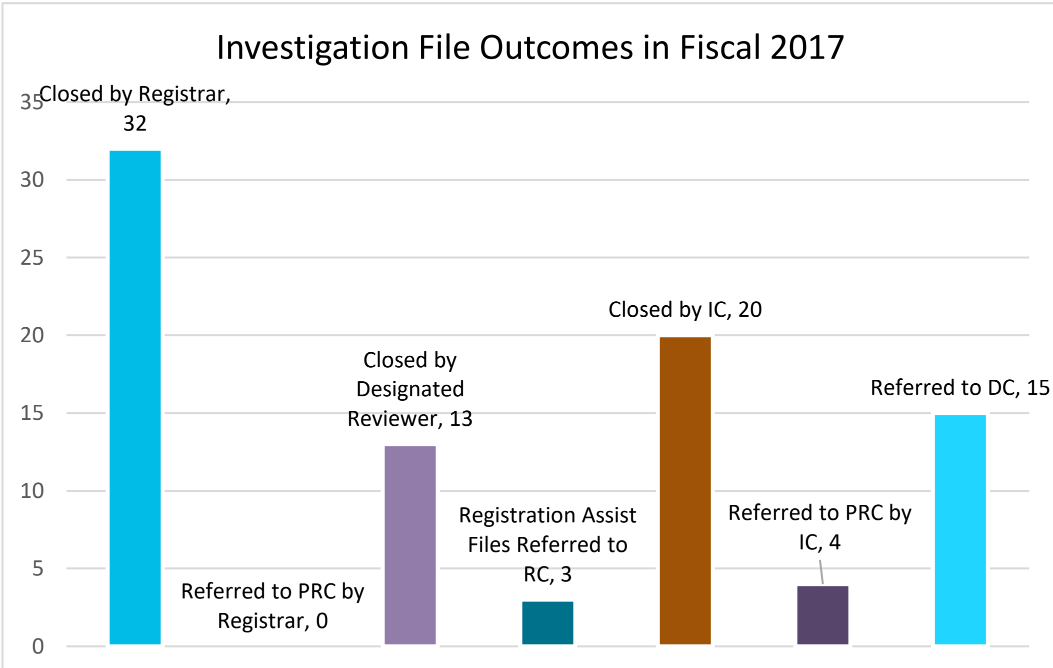
INVESTIGATION FILES	
Total open investigation files carried forward as of June 30, 2016:	93
New Complaint Files Opened between July 1, 2016 to June 30, 2017:	71
New "Registration Assist" Files Opened between July 1, 2016 to June 30, 2017:	1
Investigation Files Closed between July 1, 2016 to June 30, 2017:	72
Investigation Files sent to Discipline between July 1, 2016 to June 30, 2017:	15
Total Investigation Files Open at June 30, 2017:	78



New Files: The following is a breakdown of the categories of the 72 complaint and “registration assist” files received. The categories are approximate only and are not necessarily reflective as to the issues that the Investigation Committee isolated on its review of the complaints:



Outcomes of Investigation Files between July 1, 2016 and June 30, 2017



PRC: Practice Review Committee; **IC**: Investigation Committee; **RC**: Registration Committee
DC: Discipline Committee

Neil Nyberg, P.Eng.
Chair, Investigation Committee

DISCIPLINE

The following is a summary of the 11 discipline files which were concluded in the 2017 fiscal year. Some of these files have been presented to Council in prior quarterly reports and all are posted on the Engineers and Geoscientists BC website pursuant to the association's Publication Policy.

Patrick Triggs, P. Eng: A Notice of Inquiry was issued to Mr. Triggs relating to a flood hazard assessment report he authored. In lieu of proceeding to a disciplinary inquiry, Mr. Triggs agreed to a Consent Order dated September 30, 2016. In the Consent Order, Mr. Triggs admitted that he demonstrated unprofessional conduct by breaching principles 1 and 2 of the *Code of Ethics.* Mr. Triggs agreed to:

1. a three month suspension of his APEGBC membership;
2. pay $3,000 in costs; and
3. refrain from preparing flood hazard assessment reports, providing professional advice or services relating to flood hazards and practicing in the disciplines of hydrogeology and hydrology.

Charles Shen, P. Eng: A Notice of Inquiry was issued to Mr. Shen regarding misuse of seal. In lieu of proceeding to a disciplinary inquiry, Mr. Shen agreed to a Consent Order dated August 19, 2016. In the Consent Order, Mr. Shen admitted that he breached section 20(9) of the *Engineers and Geoscientists Act* by affixing his signature and his professional engineer's seal on engineering documents in circumstances in which he knew or ought to have known that those documents had not been prepared by him or under his direct supervision. As part of the Consent Order, Mr. Shen agreed to:

1. a one month suspension of his APEGBC membership starting from August 19, 2016;
2. take the APEGBC Law and Ethics Seminar by January 31, 2017; and
3. pass the APEGBC Professional Practice Examination by January 31, 2017.

Johannes Bluemink, P. Eng: A Notice of Inquiry was issued to Mr. Bluemink regarding deficient structural engineering design. In lieu of proceeding to a disciplinary inquiry, Mr. Bluemink agreed to a Consent Order signed December 22, 2016. In the Consent Order, Mr. Bluemink admitted that he demonstrated unprofessional conduct, incompetence, or negligence by sealing structural drawings for two jacking frames needed as part of a project to remediate part of the roof at a pulp mill in Prince George. The jacking frames were deficient and fell below the standard expected of a professional engineer. As part of the Consent Order, Mr. Bluemink agreed to:

1. not perform structural engineering except for structural design in connection with the structural components of mechanical systems;
2. have his structural designs in connection with the structural components of mechanical systems peer reviewed for a minimum of 12 months;
3. prior to applying to be relieved from his peer review requirement, Mr. Bluemink must obtain the written opinion of the peer reviewer as to whether Mr. Bluemink is fit to perform structural design in connection with the structural components of mechanical systems

without peer review and successfully complete the Structural Engineering Association of BC 12-week Structural Steel Design for Buildings course; and

4. pay a $5,000 fine to APEGBC and $5,000 towards APEGBC's legal costs within 30 days of the Consent Order.

Daniel Wu, P. Eng: A Notice of Inquiry was issued to Mr. Wu regarding his mechanical engineering services. In lieu of proceeding to a disciplinary inquiry, Mr. Wu agreed to a Consent Order dated February 17, 2017. By way of the Consent Order, Mr. Wu admitted that he demonstrated unprofessional conduct by providing a written assurance through a sealed Schedule B to the City of Surrey that a fire suppression system complied with the requirements of the British Columbia Building Code when Mr. Wu lacked reasonable and factual basis to provide the assurance. Further, Mr. Wu admitted that he affixed his APEGBC seal and signature to design drawings that he had not prepared or were not prepared under his direct supervision. As part of the Consent Order, Mr. Wu agreed to the following:

1. Mr. Wu's membership in APEGBC will be suspended for two months;

2. Mr. Wu will complete the APEGBC Professional Engineering and Geoscience Practice in BC Online Seminar by May 15, 2017;

3. Mr. Wu will complete the APEGBC Working in Canada Seminar by May 15, 2017; and,

4. If Mr. Wu does not complete the requirements set out at items B and C above, Mr. Wu's membership in APEGBC will be automatically suspended.

Pershing J. Balayo, P. Eng.: A Notice of Inquiry was issued to Mr. Balayo regarding his structural engineering services. In lieu of proceeding to a disciplinary inquiry, Mr. Balayo agreed to a Consent Order dated April 5, 2017. By way of the Consent Order, Mr. Balayo admitted that he demonstrated unprofessional conduct and contravened section 20(9) of the *Engineers and Geoscientists Act* by providing a written assurance through a sealed Schedule B and Schedule C-B for rooftop guardrails for which Mr. Balayo had not prepared the design and had not conducted field reviews.

Mr. Balayo was previously the subject of discipline in 1995 and 1998. As part of the Consent Order, Mr. Balayo agreed to cancellation of his membership effective July 1, 2017 along with interim provisions to protect the public. Mr. Balayo also paid a fine of $7,500 and costs of $1,500.

Victor Proctor, P. Eng.: Two Notices of Inquiry were issued to Mr. Proctor regarding his design of glass guards on two projects. In lieu of proceeding to disciplinary inquiries, Mr. Proctor agreed to a Consent Order dated April 5, 2017. In the Consent Order, Mr. Proctor admitted that he demonstrated unprofessional conduct, incompetence, or negligence by sealing drawings for a guard rail design on the first project which were materially incomplete and contained structural deficiencies. On the second project, Mr. Proctor further admitted that he failed to include critical design detail information on shop drawings that he prepared and failed to perform critical design calculations and design checks. Mr. Proctor further admitted to demonstrating unprofessional conduct by affixing his seal to a Letter of Assurance for his client and a Schedule B and Schedule C-B for the guard rail assembly on the second project. As part of the Consent Order, Mr. Proctor agreed to:

1. a two month suspension commencing May 15, 2017;
2. a condition that he not perform structural engineering work;
3. pay a fine in the amount of $5,000;
4. pay costs in the amount of $10,000 towards APEGBC's investigation and inquiry costs; and
5. complete and pass APEGBC's Professional Engineering and Geoscience Practice in BC Online Seminar and examination by July 15, 2017.

If, prior to the expiry of the suspension, Mr. Proctor fails to pay the fine or the costs, the suspension shall be extended and continue until such time as Mr. Proctor pays each.

<u>Patrick Triggs, P. Eng.:</u> Two Notices of Inquiry were issued to Mr. Triggs relating to two separate matters. The first matter was a referral from APEGBC's Practice Review Committee related to Mr. Triggs' structural and geotechnical engineering and the second matter related to a complaint APEGBC received from a client of Mr. Triggs regarding his conduct. In lieu of proceeding to disciplinary inquiries, Mr. Triggs agreed to a Consent Order dated April 13, 2017 resolving both matters. In the Consent Order, Mr. Triggs admitted that on two structural projects in Kamloops, BC, he failed to set out adequate detail in his design and failed to arrange to have his design independently reviewed. Mr. Triggs further admitted that on four geotechnical projects in Kamloops, BC, he failed to do field reviews during construction. Lastly, on the second matter, Mr. Triggs admitted to breaching principle 7 of APEGBC's *Code of Ethics,* by failing to respond to his client during the period from August 2015 to November 2016. As part of the Consent Order, Mr. Triggs agreed to:

1. the cancellation of his membership effective May 1, 2017; and
2. pay costs in the amount of $7,000 towards APEGBC's investigation and inquiry costs.

<u>Seyed Mahdi Beheshtian, P. Eng.:</u> A Notice of Inquiry was issued to Mr. Beheshtian regarding email correspondence Mr. Beheshtian sent to another engineer containing unprofessional and derogatory remarks directed at that engineer. Mr. Beheshtian also posted two reviews of the other engineer's work on the *HomeStars* website, which included public statements to the effect that the other engineer was fraudulent, untrustworthy and unethical, in circumstances in which Mr. Beheshtian knew or ought to have known that Mr. Beheshtian did not have justification in making those statements. Mr. Beheshtian willfully intended to cause harm to the other engineer's professional reputation and business in expressly refusing to retract the statements made on the *HomeStars* website.

In lieu of proceeding to a disciplinary hearing, Mr. Beheshtian agreed to a Consent Order dated May 12, 2017. As part of the Consent Order, Mr. Beheshtian agreed that he must:

1. pay $7,000 to APEGBC as a fine, within 60 days;
2. successfully complete an anger management workshop offered by a counselling service provider by October 31, 2017; and
3. pay $3,000 towards APEGBC's investigation and inquiry costs within 60 days.

Boriana Arguirova, P. Eng.: A Notice of Inquiry was issued to Ms. Arguirova regarding her use of a curriculum vitae (a "CV") that contained inaccurate information. In lieu of proceeding to a disciplinary inquiry, Ms. Arguirova agreed to a Consent Order dated June 19, 2017. Ms. Arguirova admitted that she indicated on her CV that she had the following degrees and certification when she did not:

a) Master of Business Administration degree;
b) Masters Degree of Accounting and Estimating; and
c) Project Management Professional certification.

Ms. Arguriova also admitted that she inaccurately indicated on her CV that she had experience on projects that she had never worked on.

Ms. Arguirova admitted that her conduct constituted unprofessional conduct and violated Principles 7 and 10 of the APEGBC Code of Ethics and the requirement in the preamble of the APEGBC Code of Ethics that engineers and geoscientists act at all times with fairness, courtesy and good faith to their associates, employers, employees and clients, and with fidelity to the public needs. As part of the Consent Order, Ms. Arguriova agreed to the following:

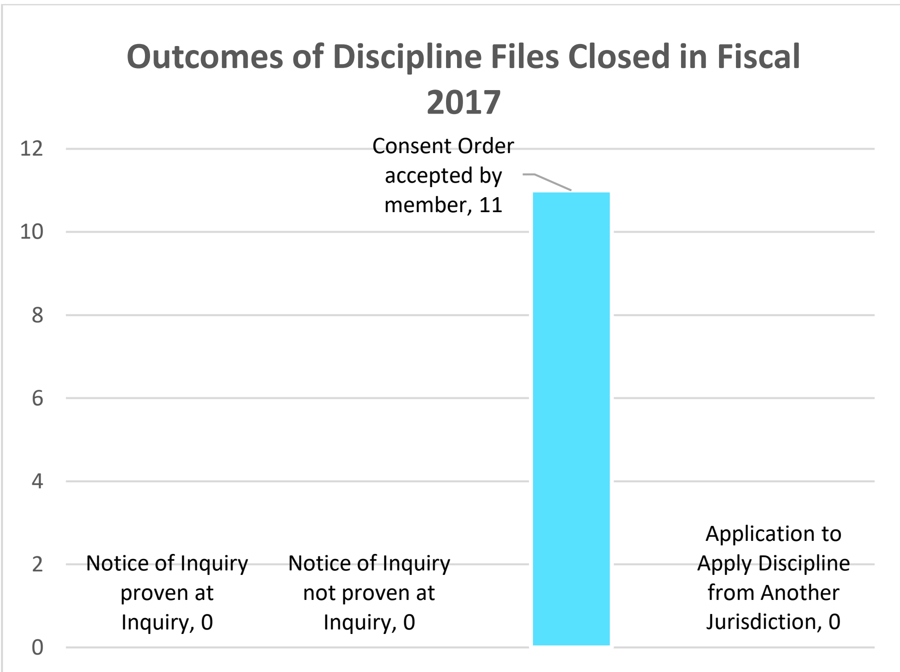
1. that her membership in APEGBC is suspended effective June 23, 2017 for one month (the "Suspension");
2. to complete the APEGBC Professional Engineering and Geoscience Practice in BC Online Seminar at her expense within 60 days of her resumption of practice following the Suspension;
3. pay a fine of $4,000 within 30 days; and
4. pay $2,500 towards APEGBC's legal costs within 30 days.

Discipline File Summary July 1, 2016 to June 30, 2017

DISICPLINE FILES	
Open discipline files carried forward as of July 1, 2016[1]:	1
Files received from Investigation Committee	15
Direct applications to the Discipline Committee to Apply Discipline from another Jurisdiction	0
Application to the Discipline Committee for Breach of a Consent Order	0
Application to the Discipline Committee for Interim Suspension	0
Discipline Files Closed between July 1, 2016 and June 30, 2017:	11
Total Discipline Files Open at end of June 30, 2017:	5

[1] For files in progress, this statistic is now measured from the date the Investigation Committee approves the Notice of Inquiry.

Outcomes of Discipline Files between July 1, 2016 and June 30, 2017



Paul Adams, P.Eng.
Chair, Discipline Committee

ENGINEERS &
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BRITISH COLUMBIA

OPEN SESSION

ITEM 5.13.11

DATE	September 8, 2017
REPORT TO	Council for Information
FROM	Deesh Olychick, Director of Member Services Amit Plaha, Mentoring Program Coordinator
SUBJECT	Division 2016/2017 Activity Report
LINKAGE TO STRATEGIC PLAN	Members and organizations practice to high professional and ethical standards

Purpose	Provide a summary of division activities from the 2016/2017 fiscal year
Motion	No motion required.

BACKGROUND

The association currently supports five divisions under its division program. Divisions are made up of members of the association that represent a common or specialized area of the professions of engineering and geoscience. The purpose of each division is to provide a forum for professionals to identify, examine, discuss or resolve specific challenges, emerging issues or opportunities as they relate to their common or specialized area. The association current divisions include:

- Engineers and Geoscientists in the Resource Sector Division
- Energy Efficiency & Renewable Energy Division
- Environmental Professionals Division
- Municipal Engineers Division
- Women in Engineering and Geoscience Division

All association divisions report to Council. For professional practice related matters, the divisions report to Council through the Professional Practice Committee.

A new reporting system has been implemented to ensure Council receives regular updates on the activities of all five divisions. Going forward, a summary activity report will be provided to Council twice a year at the June and November Council meetings. Listed below is a summary of division activities from the 2016/2017 fiscal year.

DIVISION SUMMARY

- Divisions assisted the association with developing, consulting and providing feedback on 14 guidelines and other professional practice related documents

- Divisions held 14 successful events related to their specific area of interest, which included seminars, webinars, tours and social events
- Divisions played an intricate role in developing topics, soliciting speakers and managing professional development seminars for four professional development streams at the 2016 Annual Conference & AGM

DIVISION CONSULTATION/REVIEW CONTRIBUTIONS

Divisions have reviewed and provided feedback on the following guidelines:

1. BC MOTI - Developing Climate Change–Resilient Designs for Highway Infrastructure in BC
2. Whole Building Energy Modelling Services
3. Watershed Assessments Guidelines
4. Professional Services in the Forest Sector – Crossings
5. Sustainability Guidelines
6. Human Rights and Diversity Guidelines for Professional Practice
7. Cycling Infrastructure Guidelines

Divisions have reviewed and provided feedback on the following consultation requests:

1. BC Energy Step Code
2. Consultation Request - Clean Fuel Standard Discussion Paper
3. National Energy Board (NEB) Modernization
4. Revisions to the Engineers Canada's 2009 model guide Site Remediation for Professional Engineers
5. Engineers and Geoscientists BC's input into the Federal Expert Panel tasked with reviewing the Environmental Assessment (now called Impact Assessment) Processes
6. Corporate Practice and Regulation of Engineering and Geoscience Companies
7. BC Government's Climate Leadership Plan

NOTABLE EVENTS/INITIATIVES

All five divisions hosted and participated in several notable events and initiatives during the 2016/2017 fiscal year some of which are included below.

Energy Efficiency & Renewable Energy Division:

- General Fusion Tour
- UBC Campus Energy Centre and the Bioenergy Research Demonstration Facility Tour

Engineers & Geoscientists in the Resource Sector:

- Framework for Managing Avalanche Risk Webinar
- Vulnerability Assessments Webinar
- Debris Avalanches Runout in Harvested Terrain Webinar
- Chemainus Privately Managed Forest Fieldtrip
- Awarded the 2016 Engineers & Geoscientists in the Resource Sector Bursary

Environmental Professionals Division:

- DND Remediation Site at Esquimalt Harbour Fieldtrip
- Awarded the 2016 Environmental Award

Municipal Engineers Division:

- Development Cost Charge Panel Discussion
- City of Surrey District Energy Plant and Biofuel Energy Plant Tour
- Awarded the Municipal Engineers Division Curtis Memorial Scholarship Award in Civil Engineering

Women in Engineering and Geoscience Division:

- December 6th Memorial and Holiday Social
- Roundtable Discussions

ENGINEERS & GEOSCIENTISTS
BRITISH COLUMBIA

OPEN SESSION

ITEM 5.13.12

DATE	August 25, 2017
REPORT TO	Council for Information
FROM	Ann English, P.Eng., Chief Executive Officer and Registrar
SUBJECT	Council Road Map (as at August 25, 2017)
LINKAGE TO STRATEGIC PLAN	To uphold and protect the public interest through the regulation of the professions.

Purpose	To provide Council with the current status of the actionable items listed on the Council Road Map for 2016/2017
Motion	No motion required.

BACKGROUND

The attached document summarizes the expected agenda items that are planned to be brought forward to Council during the 2016/2017 Council year. The items are aligned with the Strategic Plan and assist Council in seeing the progress on elements of the Plan. This road map and not exclusive and other additional items were added throughout the year but served as a focus for this year's meetings.

Kindly note the following item on the Work Plan has been postponed:

Annual Update on Eng.L. to P.Eng. Briding – has been shifted from the September meeting to the November meeting as this item needs to be brought to the Registration Committee in an annual report prior to being brought to Council.

ATTACHMENT A – Council Road Map 2016/2017

Item 5.13.12 - Attachment A

Engineers and Geoscientists BC Council Road Map for 2016-2017

	HIGHLIGHTS	November 25 (Council Mtg)	February 9 (Planning Session)	February 10 (Council Mtg)	April 28 (Council Mtg)	June 16 (Council Mtg)	September 8 (Council Mtg)	October 19-21 (Annual Conf & AGM)
Members & Future Members	BRANCHES, DIVISIONS & SOCIETIES REPORTS	Report of the October 2016 Branch Rep Meeting Branch Engagement Rpt			Branch Engagement Rpt		APEG Foundation AGM and Benevolent Fund AGM Branch Engagement Rpt	
	IMPROVING MEMBER SUPPORT & BRAND		Member Engagement Rpt	Brand Development Update			Public Opinion Survey Member Engagement Strategy Update Report on Eng.L. Title Research	
	ENHANCING REGISTRATION PROCESSES	Report on APEGBC's Role in Geoscience Competency Assessment			Report/Proposal Bridge P.Tech. to Eng.L. Enhanced MIT Program Policy Fairness Panel Annual Rpt		Annual Update on Eng.L. to P.Eng. Bridging Canadian Environment Experience Alternatives Report, Working in Canada Seminar - Policy and Implementation Approval	
Members, Employers, etc.	EMPLOYER ENGAGEMENT			Corporate Engagement Rpt Update on OQM Program	Update on OQM Program Extend Accredited Employer Training Program from Pilot to Permanent			
Government, Public & Other Stakeholders	INCREASING PUBLIC CONFIDENCE			Coporate Practice Task Force Rpt Update from CPD Committee		Approval of Award Nominations	Year End Rpts on (1) Investigation and Discipline and (2) Enforcement	
	ACADEMIC OUTREACH					Visiting Dean (UBC)	Visiting Dean (SFU)	
	ENGINEERS CANADA AND GEOSCIENTISTS CANADA	Directors Rpt Update & Prospectus for approval re: National Competency-Based Assessment		Directors Rpt	Directors Rpt	Directors Rpt		
Enabling Goal	STRATEGIC PLAN CYCLE AND MONITORING ACTIVITIES		Prioritization of Strategic Plan Initiatives KPI Progress Update for 2016/2017		Approval of Strategic Plan Initiatives	AGM Rules	Strategic Plan and KPI Update	
	LEGISLATION CHANGES AND BYLAW CYCLE				*Gov Comm Rpt on possible Revisions to Bylaws and Procedures re Delegation to Comms (tentative)*	*Draft Bylaw changes w/ Consultation Plan (tentative)*		
	IMPROVING DIVERSITY			Update on Diversity Initiatives			Update on Volunteer Management Activities	
	EFFECTIVE GOVERNANCE	Council Governance Training; Approval of Nominating Committee Appointees; AGM Motion Referral		Calendar 2016 Registration Admissions Report	Election Policy Approval		Council Evaluation Fiscal 2017 Registration Admissions Report	Appointment of Councillors to Committees
	FINANCIAL OVERSIGHT	Quarterly Financial Report / Budget Guideline Approval		Quarterly Financial Report	Quarterly Financial Report/ Budget approval		Audited Financial Statements / Year End Review	Approval of Auditors

Activities Completed	
Activities Behind Schedule (by end of September)	
New Item	Items Advanced

Printed: 8/29/2017

ENGINEERS & GEOSCIENTISTS
BRITISH COLUMBIA

OPEN SESSION

ITEM 5.13.13

DATE	August 25, 2017
REPORT TO	Council for Information
FROM	Ann English, P.Eng., Chief Executive Officer and Registrar
SUBJECT	Council Attendance Summary (as at August 25, 2017)
LINKAGE TO STRATEGIC PLAN	To uphold and protect the public interest through the regulation of the professions.

Purpose	To provide updates on the Council attendance summary.
Motion	No motion required.

BACKGROUND

The Council Attendance Summary is used to track individual Councillor attendance at the Council meetings and other related events and Committee meetings that Councillors are a part of (e.g. the Executive Committee, the Governance Committee, the Registration Committee, etc.). Each Councillor is assigned a column which is regularly updated.

At the end of the Council year, each Councillor's column will be tallied and a percentage applied. The intent in curating this summary is to provide information that will assist with future correspondence relating to things such as the election; this will enable staff to display the high level of dedication that is required of candidates. The Council Attendance Summary will also provide a clear visual of the amount of meetings that the average Councillor is required to attend and how many meetings each Committee holds.

ATTACHMENT A – Council Attendance Summary

	Bob Stewart, P.Eng.	Dr. Ed Casas, P.Eng.	Dr. Mike Wrinch, P.Eng., FEC, FGC (Hon.)	Suky Cheema, CA, CPA	David Wells, JD	Ken Laloge, CPA, CA, TEP	Kathy Tarnai-Lokhorst, P.Eng., FEC	Brock Nanson, P.Eng.	Caroline Andrewes, P.Eng.	Larry Spence, P.Eng.	Susan Hayes, P.Eng.	Ross Rettie, P.Eng., FEC	Cassandra Hall, P.Geo., P.Eng.	Richard Farbridge, P.Eng.	Scott Martin, P.Eng.	Chris Moser, P.Eng.	John Turner, P.Ag. (ret)	
Oct 22, 2016 (Inaugural Council)	✓	✓	✓			✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
Nov 7, 2016 (ATFCP)															✓		✓	
Nov 9, 2016 (Orientation)	✓	✓	✓					✓		✓	✓	✓						
Nov 9, 2016 (Reg Comm)								✓		✓		✓	✗					
Nov 10, 2016 (Prof Prac Comm)										✓	✓	✓						
Nov 16, 2016 (Exec Comm)	✓	✓	✓			✓	✓											
Nov 16, 2016 (Gov Comm)			✓						✓					✓		✓	✓	
Nov 22, 2016 (Orientation for New GA's)				✓	✓													
Nov 23, 2016 (Geo Comm)													✓		✗			
Nov 24, 2016 (New Council AG Walk-Thru)	✓	✓		✓	✓			✓		✓	✓	✓						
Nov 25, 2016 (Council)	✓	✓	✓	✗	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
Dec 6, 2016 (ATFCP)															✓		✓	
Dec 7, 2016 (Exec Comm)	✓	✓	✓			✓	✓											
Jan 18, 2017 (Exec Comm)	✓	✓	✓			✓	✓											
Jan 18, 2017 (Gov Comm)			✓						✓					✓		✓	✓	
Jan 25, 2017 (Reg Comm)								✓		✓		✓	✗					
Jan 26, 2017 (VP Branch Visit - Rich/Delta)		✓																
Jan 26, 2017 (Prof Prac Comm)					✓					✓	✓	✓						
Jan 31, 2017 (Audit Comm)				✓		✓			✓					✗		✗		Meeting cancelled - insufficient attendance
Feb 6, 2017 (Audit Comm)				✓		✓			✓					✓		✓		
Feb 8, 2017 (Nominating Comm)			✓															
Feb 8, 2017 (Planning Session, Pt 1)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✗	✓	✓	✗	✓	✗	✗	✓	
Feb 9, 2017 (Geo Comm)													✗		✗			
Feb 9, 2017 (Planning Session, Pt 2)	✓	✓	✓	~~✓~~	✓	✓	✓	✓	✓	✗	✓	✓	✗	✗	✗	✓	✓	
Feb 10, 2017 (Council)	✓	✓	✓	✗	✓	✓	✓	✓	✓	✗	✓	✓	✗	✓	✗	✗	✓	
Feb 23, 2017 (Gov Comm)			✓						✓					✗		✓	✓	
Feb 23, 2017 (Exec Comm)	✓	✓	✓			✓	✓											
Feb 27 - Mar 1, 2017 (Eng Can Board Mtg)	✓																	Ottawa
Mar 1, 2017 (Nom Comm)			✓															
Mar 2, 2017 (CCAG)											✓							
Mar 2, 2017 (VP Branch Visit - Central Int)		✗												✓				
Mar 6, 2017 (Question Period)	✓	✗	✗	✗	✗	✗	✓	✗	✗	✗	✓	✓	✗	✗	✗	✗	✓	Victoria
Mar 6 & 7, 2017 (Govt Receptions)	✓	✗	✗	✗	✓	✓	✓	✗	✗	✓	✓	✓	✗	✓	✗	✓	✓	Victoria
Mar 8, 2017 (Reg Comm)								✓		✗		✓	✗					
Mar 9, 2017 (ACEC-BC/APEGBC Joint Exec)	✓	✓	✓			✗	✓											
Mar 14, 2017 (ATFCP)															✓		✓	
Mar 16, 2017 (Exec Comm)																		Cancelled - meeting not required.
Mar 29, 2017 (Exec Comm)	✓	✓	✓			✓	✓											
Mar 29, 2017 (CPD Comm)					✓		✓	✓		✓		✓						Councillors attending as observers
Apr 5, 2017 (Special Council Session)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
Apr 5, 2017 (Right Touch Regulation)	✓	✓	✓	✗	✓	✓	✓	✓	✓	✓	✓	✓	✗	✓	✓	✓	✓	
Apr 6, 2017 (Spring Branch Rep Dinner)	✓	✓	✗	✗	✓	✗	✓	✗	✓	✓	✓	✓	✓	✓	✓	✗	✓	
Apr 7, 2017 (Spring Branch Rep Mtg)	✓	✗	✗	✓	✗	✗	✓	✗	✓	✓	✗	✗	✗	✗	✓	✗	✓	
Apr 6, 2017 (Geo Comm)													✓		✓			
Apr 19, 2017 (Reg Comm)								✓		~~✓~~		✓	✗					
Apr 20, 2017 (Branch Visit - Vancouver)																		Cancelled
April 24, 2017 (Nom Comm)			✓															
Apr 26, 2017 (Councillor Agenda Teleconference)	✗	✓	✗	✓	✗	✓	✓	✓	✗	✓	✓	✓	✗	✗	✓	✗	✓	
Apr 27, 2017 (CCAG)											✓							
Apr 27, 2017 (Council Forum)	✓	✓	✗	✓	✓	✗	✓	✓	✓	✓	✓	✓	✗	✗	✓	✗	✗	
Apr 28, 2017 (Council)	✓	✓	~~✓~~	✗	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
May 4, 2017 (Audit Comm)				✓		✓			✓					✓		✓		
May 10, 2017 (Geo Comm)													✓		✗			
May 19, 2017 (Prof. Prac. Comm)					✓					✓	✓	✓						
May 23-28, 2017 (Eng Can Board Mtg)	✓																	St. Johns
May 25, 2017 (VP Branch Visit - Peace River)		✗					✓											
May 25, 2017 (VP Branch Visit - Van)		✓																
May 25, 2017 (Exec Comm)																		Meeting cancelled - insufficient attendence
May 29, 2017 (Gov Comm)			✓						✗					✓		✓	✓	
May 31, 2017 (Reg Comm)								✓		✓		✓	✗					
June 2-3, 2017 (Geo Can Board Mtg)	✓																	Yellowknife
June 8, 2017 (VP Branch Visit - Okanagan)		✓																
June 12, 2017 (CPD Comm)								✓						✓				
June 14, 2017 (Councillor Agenda Teleconference)	✗	✓	✗	✗	✓	✓	✓	✓	✓	✓	✗	✓	✓	✗	✓	✗	✗	
June 15, 2017 (Audit Comm)				✗		✓			✓					✗		✗		
June 16, 2017 (Council)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✗	✓	
June 16, 2017 (Past Presidents Forum)	✓	✓	✗	✗	✓	✓	✓	✓	✓	✓	✓	✓	✗	✗	✗	✗	✓	
June 28, 2017 (Reg Comm)								✓		✓		✓	✗					
Aug 9, 2017 (Gov Comm)			✓						✓					✓		✗	✓	
Aug 16, 2017 (Reg Comm)								✓		✓		✓	✗					
Aug 23, 2017 (Audit Comm)				✓		✓			✓					✗		✓		
Aug 28, 2017 (Exec Comm)	✓	✓	✓			✓	✓											
Sept 8, 2017 (Council)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
Percentage of Attendance	100%	86%	85%	58%	94%	85%	100%	88%	88%	79%	100%	100%	40%	72%	57%	63%	95%	

Agenda Item #6.1
Council – Open
September 8, 2017

THE ASSOCIATION OF PROFESSIONAL ENGINEERS AND GEOSCIENTISTS OF THE PROVINCE OF BRITISH COLUMBIA

FINANCIAL RESULTS INDEX
FOR THE YEAR ENDED JUNE 30, 2017

ENGINEERS & GEOSCIENTISTS
BRITISH COLUMBIA

OPEN SESSION

ITEM 6.1

DATE	August 23, 2017
REPORT TO	Council for Decision
FROM	Ken Laloge, CPA, CA, TEP
SUBJECT	PricewaterhouseCoopers LLP (PwC) Auditor's Report FY2017
LINKAGE TO STRATEGIC PLAN	Continue to implement best practices in governance

Purpose	To accept the Audit Committee report and approve the audited APEGBC Financial Statements for the fiscal year ended June 30, 2017.
Motion	1. That Council accept the report of the Audit Committee.
	2. That Council approve the audited APEGBC Financial Statements for the fiscal year ended June 30, 2017.
	3. That Council authorize the President and the Chief Executive Officer and Registrar to sign the fiscal 2017 Financial Statements on behalf of Council.
	4. That Council recommend the appointment of PricewaterhouseCoopers LLP, CPAs as the Association's external auditors for the fiscal year ending June 30, 2018 be recommended for final approval at the Annual General Meeting in October 2017.

A. AUDIT COMMITTEE PURPOSE

The purpose of the Audit Committee is to assist Council in fulfilling its oversight responsibilities by reviewing: the financial information which will be provided to the public and others; reviewing the systems of corporate controls which management and Council have established; and reviewing the external audit process.

B. BACKGROUND

On August 23, 2017, the Audit Committee met with the Engagement Leader of Audit & Assurance of PricewaterhouseCoopers LLP (PwC) to review the Auditor's Report to Audit Committee of Council and the draft audited Financial Statements of the Association, the Foundation, and the Benevolent Society. The review focused on the unqualified audited financial results, notes, and supporting schedules for the fiscal periods ended June 30, 2017 for the Association, the Foundation and the Benevolent Fund Society. The Committee recommends to the Council, The Foundation Directors, and the Benevolent Society Directors approval of the entities' financial statements.

C. REVIEW OF FINANCIAL STATEMENTS AND DISCLOSURES

The Audit Committee reviewed the disclosures of the statements presented by the Director of Finance and her staff and requested modification to a presentation point for member clarity to aid in the understanding of the statements. These discussions included consideration of items subsequent to year end and matters related to the General Funds balance and its explanation in the notes. Explanations of the results from the Director were accepted and discussed related to individual financial statement items with follow up on certain matters to come to assist in the review with Council.

D. EXTERNAL AUDIT DISCUSSION

The review with the Auditor included the private discussion on the accounting and other staff of the Association and their co-operation in the external audit of the financial statements. It also included discussion on consolidation of the branches and other entities and the reporting of disclosures related to those parties. That discussion on the requirements for disclosures and the election by the Association not to consolidate those smaller entities is consistent with past practice and PwC is totally comfortable with the practice. The Audit committee confirmed to PwC it had no knowledge of fraud or internal control problems in the Association.

The Audit Committee has reviewed and discussed the relevant issues with both the PwC auditors and the APEGBC staff. PwC reviewed the following key areas, and found that the financial statements present fairly in accordance with Canadian audit standards and under Canadian accounting standards the results and positions of the entities. Below is the summary of audit findings as reported to the Audit Committee for Council by PwC:

Significant accounting, auditing and reporting matters	
Matter 1 – Risk of material misstatement due to management override (Significant risk)	**Significant risk** Accounting regulatory authorities require that the risk of material misstatement due to management override of controls be considered a significant risk on every audit engagement. **Audit work performed** We have understood management processes and internal controls in place, including application, authorization and monitoring controls; On a risk-based approached we used data auditing tools to select a sample of journal entries to examine and test for reasonableness; PwC examined accounting estimates, taking into account potential management bias; PwC ensured the general ledger is reconciled to the financial statements; Consistent with Canadian generally accepted auditing standards, PwC also implemented a level of unpredictability into our procedures; and There were no exceptions noted from our testing.
Matter 2 – Risk of fraud in revenue recognition (Significant risk)	**Significant risk** Accounting regulatory authorities require that the risk of fraud in revenue recognition be considered as a significant risk on every audit engagement. **Audit work performed** PwC have understood management processes and internal controls in place, including application, authorization and monitoring controls; PwC have performed substantive audit procedures to address the risk that revenue could be misstated due to fraud; PwC recalculate the portions recognized as revenue and deferred at year end; and There were no exceptions noted from PwC's testing.
Matter 3 - Response to Audit Committee request - Chief Executive Officer Expenses (area of focus)	**Area of focus** At the request of the Audit Committee, PwC have reviewed a sample of the Chief Executive Officer's expenses to ensure that they are in-line with the Association's reimbursement policy and have been appropriately approved. **Audit work performed** Using PwC's professional judgment, PwC selected a sample of twelve transactions to test. PwC agreed these expenses to supporting documentation without exception. All expenses were considered to be consistent with the Association's reimbursement policy and were properly authorized. As a result of PwC's work performed, PwC did not note any exceptions.

Fraud and illegal acts
No fraud or illegal acts involving senior management, or employees with a significant role in internal control came to our attention as a result of our audit procedures. As part of PwC's completion procedures, PwC asks management to reconfirm that they are not aware of any known, suspected or alleged incidents of fraud or illegal acts not previously discussed with us. This reconfirmation is included as part of management's representation letter to us. In addition, PwC reconfirms that the Audit Committee is not aware of any known, suspected or alleged incidents of fraud or illegal acts not previously discussed with them.

Summary of unadjusted and adjusted items
As a result of audits, PwC identified no unadjusted or adjusted items.

Internal control recommendations
Canadian Auditing Standards requires PwC to communicate in writing to the Audit Committee internal control weaknesses identified as part of our audit that are considered to be significant deficiencies. PwC have no significant internal control recommendations to report.

Independence
PwC confirmed their independence with respect to the Association.

Subsequent events
No subsequent events which would impact the financial statements other than those disclosed have come to PwC's attention.

E. CHIEF EXECUTIVE OFFICER'S EXPENSES

The Audit engagement provides that the audit include an audit of the CEO's expenses. PwC reviewed and verified a sample of expenses to supporting documentation and found no discrepancies. All expenses verified met the Association policy and were properly authorized with no issues noted.

F. INTERNAL CONTROL REVIEW

The review of current internal controls of the Association was undertaken by enquiry and discussion by the Audit Committee Chair that included enquiries the senior staff with a focus on events, reconciliations, and errors. The discussions indicated normal limitations in a smaller staff environment and the need to return to the subject on the annual cycle.

G. RISK MANAGEMENT PLANNING

The Audit Committee has met to review and discuss the current identified risks and high level risk plan. Feedback has been given to Director, Finance to take back to the Leadership Team for discussion and further development of the plan. Staff will resume work this fall/winter with the Committee to further develop and build out a more comprehensive draft risk plan. An update of the plan will be presented to Council in 2018.

H. RECOMMENDATIONS

The enclosed PwC Auditors' Report and Financial Statements package and this memo provide the reporting of the Audit Committee's review of the External Audit to Council. The Audit Committee recommends that Council receive and approve the motions in section I of this report.

Audit Committee Members

Ken Laloge, CPA, CA, TEP Chair

Caroline Andrewes, P. Eng.

Suky Cheema, CPA, CA

Richard Farbridge, P. Eng.

Chris Moser, P.Eng.

I. MOTIONS

1. **That Council accept the report of the Audit Committee.**
2. **That Council approve the audited APEGBC Financial Statements for the fiscal year ended June 30, 2017.**
3. **That the President and the Chief Executive Officer and Registrar be authorized to sign the fiscal 2017 Financial Statements on behalf of Council.**
4. **That the appointment of PricewaterhouseCoopers LLP, CPAs as the Association's external auditors for the fiscal year ending June 30, 2018 be recommended for final approval at the Annual General Meeting in October 2017.**

ENGINEERS & GEOSCIENTISTS
BRITISH COLUMBIA

OPEN SESSION

ITEM 6.1

DATE	August 15, 2017
REPORT TO	Council for Information
FROM	Jennifer Cho, CPA, CGA Director, Finance & Administration
SUBJECT	Summary of Financial Results for the Fiscal Year ended June 30, 2017

Over the past fiscal year ended June 30, 2017, APEGBC has an excess of revenue over expenses of $675K. The following is an explanation of the financial results for the fiscal year.

A. FY2016 Actuals vs. FY2017 Actuals

The FY2017 surplus is $135K more than the last fiscal year surplus due to revenue growth of $773K offset by an increase in expenses of $638K.

Revenue:

Most of the $773K revenue increase is due to steady membership growth. Other factors include growth in grants and project administration because of the progress of grant projects. The growth is offset by lower professional development revenue due to fewer sessions. The table below is an analysis of the major difference between prior year to current year revenues in ($'000).

Annual membership fees	360	79% of $360K revenue increase from P.Eng with a 4% volume increase. The 2nd largest member type, EIT, had a strong volume increase of 9%. GIT and Limited License also contributed large growth with 13% and 18% respectively.
Grant and project administration	338	Variance due to external grants' project progress
Innovation magazine and other advertising	62	Stronger magazine and web advertisement revenue from economy growth
Annual conference	57	Increase in attendees and exhibitors due to different AGM venue (Kelowna vs. Victoria)

Organization quality management	41	Increased OQM training attendance and certified firms. The increased volume also triggered higher rebate revenue from Notarius.
Professional and academic examinations	16	Professional practice exam revenue increased from higher fee offset by volume decrease
Affinity programs, Misc and Investment	20	No significant variance
Professional development	(107)	Decrease due to one off PD grant revenue in prior year plus current year's lower number of sessions due to staffing transitions
Application, registration and certification fees & Premise	(14)	No significant variance
	773	

Expenses:

The table below is an analysis of the difference between prior year to current year expenses in ($'000):

Salaries and employee benefits	400	Increase from 3 new budgeted positions total $136K (Reg manager, Professional Practice support and web/graphic designer) plus full year employment costs of Investigator who joined late FY2016, and 3% average merit increase of remaining staff
Contract and consulting services on grants	213	Variance due to project progress
Office, general and miscellaneous	140	Increase due to higher IT business continuity items, equipment leases, storage and office supplies
Premises and operating costs	107	Increase due to parking lot re-pavement and snow removal
Meetings, seminar room rentals and special events	(89)	Decrease from less CPD sessions resulting lower room rental expenses
Contract and consulting services	(78)	Decrease due to completion of initiatives such as online Law & Ethics project
Travel	(44)	Decrease due to less AGM subsidized travel and professional practice related travel

Other items	(11)	
	638	

B. FY2017 Budget vs Actuals

The FY2017 surplus is $815K higher than the budgeted deficit of ($140K) mainly due to savings in payroll and membership revenue growth.

Revenue:

Some unanticipated revenue increases such as membership revenue, legal cost recovery, and stronger magazine and web ad revenue contributed to the $847K revenue variance. The table below is a more detailed analysis of the difference between budget to actual revenues in ($'000).

Annual membership fees	397	Favorable budget variance due to strong volume growth and better rate of collections of fees due to redesigned annual membership renewal collections process
Grant and project administration	317	Variance due to external grants' project progress
Innovation magazine and other advertising	91	Stronger than expected in both magazine and web advertisement. Web advertisement has transitioned to online order platform, which allows customers with easier access to orders
Miscellaneous	58	Variance due to higher discipline recovery
Annual conference	49	Higher attendees and exhibit volume than anticipated
Application, Reg/Cert, OQM and other items	5	Stronger volume than budgeted
Professional and academic examinations	(70)	Decrease due to lower volume in professional exams resulted from higher exam fee and a slowdown of prior periods large influx
	847	

Expenses:

There were substantial savings in salary and benefits. The savings were due to timing of hires and vacant positions. The table below is a more detailed analysis of the difference between budget to actual expenses in ($'000).

Contract and consulting services on grants	212	Variance due to progress of projects, total project margin aligns with budgeted margin
Premises and operating costs	109	Variance due to parking lot re-pavement and unexpected snow pile
Contract and consulting services	67	Variance due to PCI related IT costs and investigation costs increase driven by higher than expected case volume.
Office, general and miscellaneous	48	Variance due to higher banking and merchant account fees from volume growth of member transactions
Meetings, seminar room rentals and special events	40	Variance mainly due to government relation meetings related expenses
Salaries and employee benefits	(271)	Savings from delayed hiring of Registration manager, OQM support, Professional Practice support, replacement of Associate Director of Professional Practice plus unfilled Registration coordinator
Amortization	(55)	Savings due to timing of renovation
Printing, publication and distribution costs	(43)	Savings from printing costs of annual billing, postage and online PD distribution costs
Examinations and examination books	(37)	Savings from lower volume of books and exams sold
Annual conference - facilities and meals	(35)	Savings from food and beverage
Other items	(3)	Variance due to council and president travel from larger number of meetings and further distance of traveling.
	32	

DRAFT

The Association of Professional Engineers and Geoscientists of the Province of British Columbia

Non-consolidated Financial Statements
June 30, 2017

FOR DISCUSSION WITH MANAGEMENT ONLY – SUBJECT TO AMENDMENT
NOT TO BE FURTHER COMMUNICATED

September 9, 2017

Independent Auditor's Report

To the Members of
The Association of Professional Engineers and Geoscientists of the Province of British Columbia

We have audited the accompanying non-consolidated financial statements of The Association of Professional Engineers and Geoscientists of the Province of British Columbia, which comprise the non-consolidated balance sheet as at June 30, 2017 and the non-consolidated statements of revenue and expenses, changes in net assets and cash flows for the year then ended, and the related notes, which comprise a summary of significant accounting policies and other explanatory information.

Management's responsibility for the non-consolidated financial statements
Management is responsible for the preparation and fair presentation of these non-consolidated financial statements in accordance with Canadian accounting standards for not-for-profit organizations, and for such internal control as management determines is necessary to enable the preparation of non-consolidated financial statements that are free from material misstatement, whether due to fraud or error.

Auditor's responsibility
Our responsibility is to express an opinion on these non-consolidated financial statements based on our audit. We conducted our audit in accordance with Canadian generally accepted auditing standards. Those standards require that we comply with ethical requirements and plan and perform the audit to obtain reasonable assurance about whether the non-consolidated financial statements are free from material misstatement.

An audit involves performing procedures to obtain audit evidence about the amounts and disclosures in the non-consolidated financial statements. The procedures selected depend on the auditor's judgment, including the assessment of the risks of material misstatement of the non-consolidated financial statements, whether due to fraud or error. In making those risk assessments, the auditor considers internal control relevant to the entity's preparation and fair presentation of the non-consolidated financial statements in order to design audit procedures that are appropriate in the circumstances, but not for the purpose of expressing an opinion on the effectiveness of the entity's internal control. An audit also includes evaluating the appropriateness of accounting policies used and the reasonableness of accounting estimates made by management, as well as evaluating the overall presentation of the non-consolidated financial statements.

We believe that the audit evidence we have obtained is sufficient and appropriate to provide a basis for our audit opinion.

Opinion

In our opinion, the non-consolidated financial statements present fairly, in all material respects, the financial position of The Association of Professional Engineers and Geoscientists of the Province of British Columbia as at June 30, 2017 and the results of its operations and its cash flows for the year then ended in accordance with Canadian accounting standards for not-for-profit organizations.

Chartered Professional Accountants

The Association of Professional Engineers and Geoscientists of the Province of British Columbia

Non-consolidated Balance Sheet

As at June 30, 2017

	2017 $	2016 $
Assets		
Current assets		
Cash and cash equivalents (note 3)	1,348,905	1,606,190
Short-term investments (note 4)	8,893,175	8,891,921
Interest receivable	17,134	16,044
Accounts receivable (note 5)	356,250	366,753
Prepaid expenses	420,888	350,791
Inventory	26,119	15,590
	11,062,471	11,247,289
Intangible assets (note 6)	319,537	305,816
Property and equipment (note 7)	3,377,517	2,474,914
Investments (note 4)	974,850	392,700
	15,734,375	14,420,719
Liabilities and Net Assets		
Current liabilities		
Accounts payable and accrued liabilities (note 8)	1,106,088	1,061,938
Deferred fees (note 9)	5,090,018	4,869,698
Deferred revenue	602,701	228,765
	6,798,807	6,160,401
Net assets (note 2)		
General fund		
Invested in property and equipment and intangible assets	3,747,726	2,831,402
Operating	4,492,692	3,414,933
Property, equipment and systems replacement fund	195,150	1,513,983
Legal and insurance fund	500,000	500,000
	8,935,568	8,260,318
	15,734,375	14,420,719

Commitments (note 10)

Approved on behalf of the Council

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The accompanying notes are an integral part of these non-consolidated financial statements.

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The Association of Professional Engineers and Geoscientists of the Province of British Columbia

Non-consolidated Statement of Revenue and Expenses

For the year ended June 30, 2017

	2017 $	2016 $
Revenue		
Fees		
Annual membership fees	9,974,525	9,614,202
Application, registration and certification fees	1,308,314	1,313,834
Professional and academic examinations	492,903	476,998
	11,775,742	11,405,034
Other revenue		
Affinity programs	410,107	399,502
Annual conference	329,180	272,532
Grant and project administration	1,652,829	1,314,078
Innovation magazine and other advertising	570,956	509,417
Investment income	53,478	51,746
Miscellaneous (note 14)	231,219	223,105
Organization quality management	185,194	144,558
Premises	-	8,905
Professional development	1,012,901	1,119,444
	4,445,864	4,043,287
Total revenue	16,221,606	15,448,321
Expenses		
Advertising	34,085	51,938
Annual conference - facilities and meals	156,450	152,257
Contract and consulting services	2,005,931	2,084,198
Contract and consulting services on grants	1,252,219	1,039,663
Engineers Canada assessment	288,800	278,289
Examinations and examination books	357,437	374,532
Geoscientists Canada assessment	66,854	64,143
Grants and awards	98,942	108,614
Innovation magazine printing	97,262	97,264
Legal	348,569	337,801
Meetings, seminar room rentals and special events	482,139	571,478
Office, general and miscellaneous (note 15)	997,245	857,463
Premises and operating costs	438,923	332,087
Printing, publication and distribution costs	409,582	443,458
Salaries and employee benefits	7,328,391	6,928,431
Secondary professional liability insurance premiums	150,436	145,129
Telecommunications	82,539	77,250
Travel	409,589	453,970
Total expenses before amortization	15,005,393	14,397,965
Excess of revenue over expenses before amortization	1,216,213	1,050,356
Amortization		
Intangible assets	204,966	187,038
Property and equipment	335,997	272,840
Total amortization	540,963	459,878
Writedown of computer software	-	50,672
Excess of revenue over expenses for the year	675,250	539,806

The accompanying notes are an integral part of these non-consolidated financial statements.

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The Association of Professional Engineers and Geoscientists of the Province of British Columbia

Non-consolidated Statement of Changes in Net Assets

For the year ended June 30, 2017

	General Fund				2017	2016
	Invested in property and equipment and intangible assets $	Operating $	Property, equipment and systems replacement fund $	Legal and insurance fund $	Total $	Total $
Net assets - Beginning of year	2,831,402	3,414,933	1,513,983	500,000	8,260,318	7,720,512
Excess of revenue over expenses for the year	(540,963) (1)	1,302,760 (2)	(86,547) (4)	-	675,250	539,806
Investment in intangible assets	218,686	(218,686) (3)	-	-	-	-
Investment in property and equipment	1,238,601	(1,238,601) (3)	-	-	-	-
Application of property, equipment and systems replacement fund	-	1,232,286	(1,232,286) (5)	-	-	-
Net assets - End of year	3,747,726	4,492,692	195,150	500,000	8,935,568	8,260,318

Note:

(1) Amortization for the year
(2) Excess of revenue over expenses before amortization, building repairs and maintenance
(3) To fund intangible assets and property and equipment purchases
(4) Building repairs and maintenance
(5) Building renovations

The accompanying notes are an integral part of these non-consolidated financial statements.

DRAFT

The Association of Professional Engineers and Geoscientists of the Province of British Columbia

Non-consolidated Statement of Cash Flows

For the year ended June 30, 2017

	2017 $	2016 $
Cash flows from operating activities		
Excess of revenue over expenses for the year	675,250	539,806
Items not affecting cash		
Amortization	540,963	459,878
Writedown of computer software	-	50,672
	1,216,213	1,050,356
Change in working capital accounts	567,193	(481,389)
	1,783,406	568,967
Cash flows from investing activities		
Investment in intangible assets	(218,686)	(199,579)
Investment in property and equipment	(1,238,601)	(258,710)
(Increase) decrease in short-term investments and investments	(583,404)	661,064
	(2,040,691)	202,775
(Decrease) increase in cash and cash equivalents	(257,285)	771,742
Cash and cash equivalents - Beginning of year	1,606,190	834,448
Cash and cash equivalents - End of year	1,348,905	1,606,190
Supplementary information		
Change in working capital accounts		
Accounts receivable	10,503	87,978
Interest receivable	(1,090)	15,481
Prepaid expenses	(70,097)	(150,392)
Inventory	(10,529)	(5,350)
Accounts payable and accrued liabilities	44,150	(542,581)
Deferred fees	220,320	123,947
Deferred revenue	373,936	(10,472)
	567,193	(481,389)

The accompanying notes are an integral part of these non-consolidated financial statements.

1 Mandate

The Association of Professional Engineers and Geoscientists of the Province of British Columbia (the Association or APEGBC) is incorporated under the provisions of the Engineers and Geoscientists Act. The Association's mandate is to protect public safety, health and well-being through the application of engineering and geoscience, as well as to ensure the responsible self-governance and vitality of the professions.

The Association is a tax exempt organization as described in the Income Tax Act and, as such is exempt from federal and provincial income taxes.

2 Significant accounting policies

These non-consolidated financial statements include the financial activities of the Association exclusive of the net assets of the Association of Professional Engineers and Geoscientists Foundation, APEGBC Benevolent Fund Society and member-supported branches and divisions (note 12).

Net assets

The "General fund" comprises two components. "Operating" represents funds used in the general operating and business activities including any extraordinary circumstances that may arise and "Invested in property and equipment and intangible assets" represents the investment in property and equipment and intangible assets used in those activities.

The "Property, equipment and systems replacement fund" represents an appropriation by Council, which serves the long-term objective of setting aside funds to replace and improve property, equipment and systems when required. Any repairs, maintenance and improvement associated with the building are deducted from this fund. Council reviews the method and the amount appropriated to ensure that the appropriation provides a reasonable basis for property, equipment and systems replacement. All repairs, maintenance and improvement deducted from the fund and property, equipment and systems acquisitions are approved by Council as part of the annual budgeting process.

The "Legal and insurance fund" relates to an appropriation by Council to set up a legal and insurance reserve to allow for extraordinary cases and situations over and above annual expectations. This allows the Association to be prepared for future contingencies. The amount appropriated for legal and insurance is reviewed by Council annually.

Managing capital

The Association defines its capital as the amount included in its net asset balances. The Association's objective when managing its capital is to safeguard its ability to continue as a going concern so that it can continue to fulfill its mandate as described in note 1. While there are no external restrictions on any of the net assets, Council has appropriated certain of the funds for specific purposes as described in net assets.

General fund

As at June 30, 2017, the General fund comprises $3,747,726 (2016 - $2,831,402) that is invested in the property and equipment and intangible assets and is not available for other future operating activities and $4,492,692 (2016 - $3,414,933) that is available for future operating activities including any extraordinary circumstances that may arise. Council has set a target of a minimum of 1.5 months operating expenses or $1,900,000 to be held in the “Operating” net asset fund as a general reserve given the stability of annual membership fee revenues and the Association’s ability to access a pre-approved line of credit.

Appropriated funds

As at June 30, 2017, the property, equipment and systems replacement fund balance is $195,150 (2016 - $1,513,983).

As at June 30, 2017, the legal and insurance fund balance is $500,000 (2016 - $500,000). Council estimates this amount to cover two consecutive years of extraordinary legal and/or insurance costs.

Revenue recognition and deferred fees

The Association follows the deferral method of accounting for annual fees and other revenues which are received, but for which services have not yet been performed. Membership and other fees are billed and received in advance on a calendar-year basis. Accordingly, a portion of these fees received prior to June 30, 2017, have been deferred for financial reporting purposes and will be recognized as revenue over the remainder of the current calendar year.

The Association enters into certain contracts for which it subcontracts the required services. These contracts are accounted for using the deferral method of accounting.

All other revenues are recognized when earned if the amount to be received can be reasonably estimated and collectability is reasonably assured.

Amortization

Amortization is recorded by using the following annual rates calculated on a straight-line basis:

Building	3.3%
Intangible assets (software and development)	33.3%
Computer	10% - 33.3%
Electronic equipment	20%
Furniture, fixtures and office improvements	10%

Donated services

The Association and its members benefit from donated services in the form of volunteer time for various committees. Donated services are not recognized in these non-consolidated financial statements.

Cash and cash equivalents

Cash and cash equivalents consist of cash on deposit and high interest savings accounts with banks.

Investments

Investments may consist of federal and provincial government bonds, T-bills and guaranteed investment certificates consistent with the Association's investment policy. The investments are designated as held-to-maturity and are recorded at amortized cost. Interest income is recognized over the lives of the instruments using the effective interest rate method. As at June 30, 2017, short-term investments consist of treasury bills, and guaranteed investment certificates maturing within one year. Long-term investments consist of guaranteed investment certificates maturing between one to two years.

Inventory

Inventory relates to exam books. Inventory is recorded at the lower of cost and net realizable value. Cost is determined on a specific item, actual cost basis.

Controlled funds

The Association of Professional Engineers and Geoscientists Foundation (the Foundation)

The Foundation provides financial support to fund, facilitate and promote activities and programs related to education in engineering and geoscience. The Foundation was incorporated on May 11, 1993 under the British Columbia Society Act and is a registered charity under the Income Tax Act.

The Association controls the operations of the Foundation through its ability to appoint the Directors, who direct all activities of the Foundation. The Association does not consolidate the financial results of the Foundation.

In 2007, a fund was created and restricted to be held as enduring property for no less than 10 years. The income from the property was used to fund the operations of the Foundation. These funds were invested in financial institution guaranteed securities. In 2017, the donor-imposed restriction expired and the contribution was recorded in investments and recognized in the statement of revenue, expenses and fund balance.

APEGBC Benevolent Fund Society (the Society)

The Society provides financial assistance to members of the Association and their dependants who qualify for the assistance. The Society was incorporated on November 1, 2010 under the British Columbia Society Act and is a registered charity under the Income Tax Act.

The Association controls the operations of the Society through its ability to appoint the Directors, who direct all activities of the Society. The Association does not consolidate the financial results of the Society.

Member-supported branches and divisions

The member-supported branches and divisions provide local support to the members of the Association throughout the region of British Columbia. The member-supported branches and divisions are unincorporated entities.

The Association controls the operations of the member-supported branches and divisions as it holds a significant economic interest and shares complementary objectives with the member-supported branches and divisions. The Association does not consolidate the financial results of the member-supported branches and divisions. Bank accounts and cash flows for all member-supported branches and divisions are managed and recorded by the Association's Finance department.

Financial information for the controlled funds is provided in note 12.

Use of estimates

The preparation of financial statements in accordance with Canadian generally accepted accounting principles requires management to make estimates and assumptions that affect the reported amounts of assets and liabilities at the date of the financial statements and revenues and expenses during the year. Significant areas requiring the use of estimates relate to determining the useful lives of property and equipment and the amount of membership fees received in advance to be deferred. Financial results, as determined by actual events, may differ materially from those estimates.

Financial instruments

The Association applies Chartered Professional Accountants of Canada (CPA Canada) Handbook Section 3861, *Financial Instruments - Disclosure and Presentation* (note 13).

3 Cash and cash equivalents

	2017 $	2016 $
Cash on hand	953,602	1,200,812
High interest savings accounts	395,303	405,378
	1,348,905	1,606,190

The Association has access to a pre-approved line of credit with a limit of $500,000 of which $nil was drawn on at year-end (2016 - $nil).

4 Investments

	2017 $	2016 $
Guaranteed investment certificates	1,494,900	1,490,200
Government of Canada treasury bills	8,373,125	7,794,421
	9,868,025	9,284,621
Short-term	8,893,175	8,891,921
Long-term	974,850	392,700
	9,868,025	9,284,621

5 Accounts receivable

	2017 $	2016 $
Government grants	60,000	193,870
Project grants (UBC and other association)	137,224	41,221
Innovation magazine	33,376	41,145
Due from CCPG	60,056	51,920
GST	19,688	35,138
Other	45,906	3,459
	356,250	366,753

6 Intangible assets

	2017			2016
	Cost $	Accumulated amortization $	Net $	Net $
Internally generated software	933,439	617,330	316,109	295,530
Externally acquired software	849,664	846,236	3,428	10,286
	1,783,103	1,463,566	319,537	305,816

7 Property and equipment

	2017			2016
	Cost $	Accumulated amortization $	Net $	Net $
Land	874,011	-	874,011	874,011
Building	3,251,166	2,384,375	866,791	975,219
Computer	1,924,485	1,836,189	88,296	117,058
Electronic equipment	142,966	28,246	114,720	62,771
Furniture, fixtures and office improvements	2,352,585	918,886	1,433,699	445,855
	8,545,213	5,167,696	3,377,517	2,474,914

8 Government payables

Government payables include provincial sales and payroll taxes. The following government remittances were payable at year-end:

	2017 $	2016 $
PST payable	21	1,246
WCB payable	1,552	1,283
	1,573	2,529

9 Deferred fees

	2017 $	2016 $
Professional Engineers and Geoscientists members fees	4,045,689	3,952,630
Engineer and Geoscientist-in-training membership fees	621,534	571,626
Non-resident licence and limited licence	225,979	213,669
Member advantage program for student membership fees	39,857	37,600
Other	156,959	94,173
	5,090,018	4,869,698

10 Commitments

The Association has operating lease commitments for office equipment for the next two years requiring the following minimum payments:

	$
Year ending June 30	
2018	80,913
2019	64,581
	145,494

11 Defined contribution plan

The Association has established a defined contribution plan for its employees, under which employees contribute 5% of their qualifying gross earnings and the Association contributes 7.85% of qualifying employees' gross earnings. Defined contribution plan expense for the year was $439,254 (2016 - $411,607).

12 Controlled funds

The Association controls the operations of the Benevolent Fund Society, the Foundation and member-supported branches and divisions. The results and net assets of these operations are not consolidated in the financial statements of the Association.

Summary financial information on each of the controlled funds is as follows:

	2017 $	2016 $
Benevolent Fund Society		
Total assets	294,218	294,129
Revenue - contributions and investment income	39,702	34,179
Expenses and grants	39,613	50,078
Cash flows from operating activities	(1,472)	(17,628)
Cash flows from investing activities	(3,664)	(5,428)
Foundation		
Total assets	662,611	641,001
Total liabilities	161,238	367,536
Net assets	501,373	273,465
Revenue - contributions and investment income	112,525	92,266
Expenses and grants	77,117	83,958
Cash flows from operating activities	23,910	21,513
Cash flows from investing activities	(206,277)	106,509

Member supported branches and divisions

APEGBC has a number of special interest divisions that allow members with common technical background or other interests to share and disseminate information and to review and develop policy in that area.

All APEGBC members are assigned to 1 of the 15 regional branches. Branches are led by an executive group composed of volunteers who serve as the members' regional representatives and link back to APEGBC leadership.

The Association collects and manages funds on behalf of member-supported branches and divisions. The Association does not consolidate the financial results of the branches and divisions because there is a large number of them that are individually small and therefore the expense of preparing consolidated financial statements exceed the benefits.

	2017 $	2016 $
Branches and divisions		
Total assets	242,332	231,959
Total liabilities	31,959	30,571
Net assets	210,373	201,388
Revenue	168,157	186,095
Expenses	159,172	168,010
Cash flows from operating activities	8,266	15,743

13 Financial instruments and risk management

Currency risk

Currency risk is the risk that the value of a financial instrument will fluctuate due to changes in foreign exchange rates. The Association is not exposed to significant currency risk.

Interest rate risk

Interest rate risk is the risk that the value of a financial instrument will fluctuate due to changes in market interest rates. The Association is exposed to interest rate risk on short-term deposits and investments. Management frequently reviews the interest rates to mitigate risk and uses professional investment management services.

Market risk and other price risk

Market risk and other price risk is the risk that the value of a financial instrument will fluctuate as a result of changes in market prices. The Association is not exposed to significant market risk and other price risk.

Credit risk

Credit risk is the risk that one party to a financial instrument will fail to discharge an obligation and cause the other party to incur financial loss. The Association does not have a significant concentration of credit risk in any single party or group of parties. Accounts receivable are due primarily from government.

Liquidity risk

Liquidity risk is the risk that an entity will encounter difficulty in raising funds to meet commitments associated with financial instruments. The Association is not exposed to significant liquidity risk.

There have not been any significant changes in risk exposure from prior years.

14 Miscellaneous revenue

	2017 $	2016 $
Discipline recoveries	47,500	52,660
Other	80,195	74,174
Return to Practice/Reinstatement	30,350	40,050
Certified Professional Program	73,174	56,221
	231,219	223,105

15 Office, general and miscellaneous

	2017 $	2016 $
Bank and credit card processing fees	425,711	395,990
Office and general (courier, copier, office supplies, storage, training and regalia)*	396,589	294,129
Information technology licensing	103,250	66,152
Member file management	-	38,098
Insurance	39,994	44,267
Dues and subscriptions	11,987	17,251
Other	19,714	1,576
	997,245	857,463

* Following a review of the classification of Office, general and miscellaneous expenses, $nil (2016 - $39,886) has been reclassified from Other to Office and general. The impact on total Office and general and miscellaneous expenses is nil.

APEGBC			
Balance Sheet			
	June 30	**June 30**	
	2017	**2016**	
	$	**$**	
Assets			
Current assets			
Cash and cash equivalents	1,348,905	1,606,190	Cash and cash equivalents
Short-term investments	8,893,175	8,891,921	Short-term investments such as T-bills and GICs.
Interest receivable	17,134	16,044	Interest receivable from investments
Accounts receivable	356,250	366,753	Project receivable, GST ITC receivable and CCPG receivable
Prepaid expenses	420,888	350,791	(1) Software licenses (2) AGM deposits/prepayments (3) Insurance (4) Property tax
Inventory	26,119	15,590	Exam text books
	11,062,471	11,247,289	
Intangible assets	319,537	305,816	Externally acquired and internally developed IT software
Property and equipment	3,377,517	2,474,914	Building, land, furniture fixtures, electronics and computer items
Investments	974,850	392,700	Investments maturing between one or two years
	15,734,375	14,420,719	
Liabilities and Net Assets			
Current liabilities			
Accounts payable and accrued liabilities	1,106,088	1,061,938	(1) Trade accounts payable (2) Vacation payable (3) Accrued liabilities
Deferred fees	5,090,018	4,869,698	(1) Members (2) EIT/GIT (3) Reduced Fee (4) NRL & LL & (5) Student membership
Deferred revenue	602,701	228,765	(1) Conference sponsors (2) Exam unearned (3) CPD seminar unearned (4)Advertising unearned revenue (5) Unearned grants revenue
	6,798,807	6,160,401	
Net assets			
General fund			
Invested in property and equipment and intangible assets	3,747,726	2,831,402	
Operating	4,492,692	3,414,933	
Property, equipment and systems replacement fund	195,150	1,513,983	
Legal and insurance fund	500,000	500,000	
	8,935,568	8,260,318	
	15,734,375	14,420,719	

APEGBC				
Balance Sheet				
	June 30	**June 30**	**Year to Year**	
	2017	**2016**	**Variance**	
	$	**$**	**$**	
Assets				
Current assets				
Cash and cash equivalents	1,348,905	1,606,190	(257,285)	Difference due to more funds invested in long term investments
Short-term investments	8,893,175	8,891,921	1,254	No significant variance
Interest receivable	17,134	16,044	1,090	No significant variance
Accounts receivable	356,250	366,753	(10,503)	Decrease due to project progress difference of grants project
Prepaid expenses	420,888	350,791	70,097	Increase due to renewal of IT licenses such as iMIS updates
Inventory	26,119	15,590	10,529	Increase due to cost increase
	11,062,471	11,247,289	(184,818)	
Intangible assets	319,537	305,816	13,721	No significant variance
Property and equipment	3,377,517	2,474,914	902,603	Increase due to building renovation
Investments	974,850	392,700	582,150	More cash invested in long term investment
	15,734,375	14,420,719	1,313,656	
Liabilities and Net Assets				
Current liabilities				
Accounts payable and accrued liabilities	1,106,088	1,061,938	44,150	Difference mainly due to higher vacation accrual from unused days
Deferred fees	5,090,018	4,869,698	220,320	Increase due to volume growth of members approx. 4%
Deferred revenue	602,701	228,765	373,936	Increase due to progress difference of grants projects
	6,798,807	6,160,401	638,406	
Net assets				
General fund				
Invested in property and equipment and intangible assets	3,747,726	2,831,402	916,324	
Operating	4,492,692	3,414,933	1,077,759	
Property, equipment and systems replacement fund	195,150	1,513,983	(1,318,833)	
Legal and insurance fund	500,000	500,000	0	
	8,935,568	8,260,318	675,250	
	15,734,375	14,420,719	1,313,656	

APEGBC			
Statement of Revenue and Expenses			
	2017	**2016**	
	$	**$**	
Revenue			
Fees			
Annual membership fees	9,974,525	9,614,202	
Application, registration and certification fees	1,308,314	1,313,834	(1) Examination of credentials (2) Administration/certificate fee (3) Transfer fee (4) SER application fee (5) Limited license application fee/job interview (6) Stamp and seal and certificate revenue (7) Certified professional program (8) Structural qualifications (9) Reinstatement/Return to Practice
Professional and academic examinations	492,903	476,998	(1) Professional Practice Exam (2) Academic Exam (3) IStructE/SER Exams & (4) Professional Practice Exams Book Sales
	11,775,742	11,405,034	
Other revenue			
Affinity programs	410,107	399,502	Affinity program rebates (Manulife, Marsh, Lombard)
Annual conference	329,180	272,532	(1) Attendee (2) Sponsor & (3) Exhibitor Revenue
Grant and project administration	1,652,829	1,314,078	Seismic retrofit guidelines, external peer review and registration projects
Innovation magazine and other advertising	570,956	509,417	(1) Magazine advertising revenue (2) Web advertising revenue
Investment income	53,478	51,746	(1) Interest earned on investments & (2) Interest earned on bank balances
Miscellaneous	231,219	223,105	(1) Miscellaneous Revenues & (2) Student Sponsor Revenue (3) other one off revenues
Organization quality management	185,194	144,558	OQM membership and training revenue
Premises	-	8,905	Revenue from ground floor rental suites
Professional development	1,012,901	1,119,444	Revenue from professional development seminars and distance education product sales
	4,445,864	4,043,287	
Total revenue	16,221,606	15,448,321	
Expenses			
Advertising	34,085	51,938	(1) Communications dept. - public/government relations, student programs (2) Administration dept.- employment advertising & (3) PPE dept. - discipline and enforcement advertising
Annual conference - facilities and meals	156,450	152,257	Annual conference - facilities and meals
Contract and consulting services	2,005,931	2,084,198	(1) Professional practice review (2) Continuing professional development seminars & workshops (3) Information technology & (4) Other contract or consulting services
Contract and consulting services on grants	1,252,219	1,039,663	Seismic retrofit guidelines, external peer review and registration projects
Engineers Canada assessment	288,800	278,289	Engineers Canada assessment
Examinations and examination books	357,437	374,532	(1) Exam marking & (2) Exam invigilation
Geoscientists Canada assessment	66,854	64,143	Geoscientists Canada assessment
Grants and awards	98,942	108,614	(1) Branches grants (2) Career awareness (3) Student program
Innovation magazine printing	97,262	97,264	Innovation magazine printing
Legal	348,569	337,801	Legal
Meetings, seminar room rentals and special events	482,139	571,478	(1) CPD seminars & workshops & (2) Other program meeting expenses
Office, general and miscellaneous	997,245	857,463	(1) Bank fees (2) Computer hardware and software (3) Office supplies (3) Staff training (4) Property insurance (5) Copier and mail equipment lease
Premises and operating costs	438,923	332,087	Premises and operating costs
Printing, publication and distribution costs	409,582	443,458	(1) Postage (2) Photocopy (3) Mail house services (4) Printing (annual conference, program brochures, CPD, annual reports, annual invoicing, interim invoices, receipts and membership cards) (5) Letterheads, envelopes, business cards (6) Certificates & stamps & (7) others
Salaries and employee benefits	7,328,391	6,928,431	Salaries and employee benefits
Secondary professional liability insurance premiums	150,436	145,129	Secondary professional liability insurance premiums
Telecommunications	82,539	77,250	(1) Telephone (2) Long distance & (3) T1 Internet access
Travel	409,589	453,970	(1) Staff (2) President (3) Council committee (4) Practice reviewer (5) CPD speaker & branch reps travel
Total expenses before amortization	15,005,393	14,397,965	
Excess of revenue over expenses before amortization	1,216,213	1,050,356	
Amortization	540,963	459,878	Amortization expense of capital assets
Writedown of computer software	-	50,672	Software written off
Excess of revenue over expenses for the year	675,250	539,806	

APEGBC									
Statement of Revenue and Expenses									
	2017	**2016**	**Year to Year**	**Year to Year**		**2017 Budget**	**Budget**	**Budget**	
	$	**$**	**% variance**	**$ variance**		**$**	**% variance**	**$ variance**	
Revenue									
Fees									
Annual membership fees	9,974,525	9,614,202	4%	360,323	79% of $360K revenue increase from P.Eng with a 4% volume increase. The 2nd largest member type, EIT, had a strong volume increase of 9%. GIT and Limited License also contributed large growth with 13% and 18% respectively.	9,577,405	4%	397,120	Favorable budget variance due to strong volume growth and better rate of collections of fees due to redesigned annual membership renewal collections process
Application, registration and certification fees	1,308,314	1,313,834	0%	(5,520)	No significant variance	1,283,400	2%	24,914	Stronger volume than budgeted
Professional and academic examinations	492,903	476,998	3%	15,905	Professional practice exam revenue increased from higher fee offset by volume decrease	563,314	-12%	(70,411)	Decrease due to lower volume in professional exams resulting from higher exam fee and a natural slowdown of prior periods large influx
	11,775,742	11,405,034	3%	370,708		11,424,119	3%	351,623	
Other revenue									
Affinity programs	410,107	399,502	3%	10,605	No significant variance	405,000	1%	5,107	No significant variance
Annual conference	329,180	272,532	21%	56,648	Increase in attendees and exhibitors due to different AGM venue (Kelowna vs. Victoria)	280,000	18%	49,180	Higher attendees and exhibit volume than anticipated
Grant and project administration	1,652,829	1,314,078	26%	338,751	Variance due to external grants' project progress	1,336,000	24%	316,829	Variance due to external grants' project progress
Innovation magazine and other advertising	570,956	509,417	12%	61,539	Stronger magazine and web advertisement revenue from economy growth	480,000	19%	90,956	Stronger than expected in both magazine and web advertisement. Web advertisement has transitioned to online order platform, which allows customers with easier access to orders
Investment income	53,478	51,746	3%	1,732	No significant variance	92,933	-42%	(39,455)	Mainly due to changes in composition of between long term and short term investments
Miscellaneous	231,219	223,105	4%	8,114	No significant variance	173,561	33%	57,658	Variance due to higher discipline recovery
Organization quality management	185,194	144,558	28%	40,636	Increased OQM training attendance and certified firms. The increased volume also triggered higher rebate revenue from Notarius.	163,000	14%	22,194	Stronger volume and higher Notarius partner revenue
Premises	-	8,905	-	8,905	Last year of rental income as space taken back for office renovation	0	100%	-	
Professional development	1,012,901	1,119,444	-10%	(106,543)	Decrease due to one off PD grant revenue in prior year plus current year's lower number of sessions due to staffing transitions	1,020,025	-1%	(7,124)	No significant variance
	4,445,864	4,043,287	10%	402,577		3,950,519	13%	495,345	
Total revenue	16,221,606	15,448,321	5%	773,285		15,374,638	6%	846,968	
Expenses									
Advertising	34,085	51,938	-34%	(17,853)	Less branding strategy related expenses in current year	44,113	-23%	(10,028)	No significant variance
Annual conference - facilities and meals	156,450	152,257	3%	4,193	Variance due to venue changes	191,780	-18%	(35,330)	Savings from food and beverage
Contract and consulting services	2,005,931	2,084,198	-4%	(78,267)	Decrease due to completion of initiatives such as online Law & Ethics project	1,939,188	3%	66,743	Variance due to PCI related IT costs and investigation costs increase driven by higher than expected case volume.
Contract and consulting services on grants	1,252,219	1,039,663	20%	212,556	Variance due to project progress	1,040,000	20%	212,219	Variance due to progress of projects, total project margin aligns with budgeted margin
Engineers Canada Assessment	288,800	278,289	4%	10,511	Volume growth	287,034	1%	1,766	No significant variance
Examinations and examination books	357,437	374,532	-5%	(17,095)	Decrease due to volume	394,100	-9%	(36,663)	Savings from lower volume of books and exams sold
Geoscientists Canada Assessment	66,854	64,143	4%	2,711	No significant variance	69,428	-4%	(2,574)	No significant variance
Grants and awards	98,942	108,614	-9%	(9,672)	No significant variance	103,600	-4%	(4,658)	No significant variance
Innovation magazine printing	97,262	97,264	0%	(2)	No significant variance	100,000	-3%	(2,738)	No significant variance
Legal	348,569	337,801	3%	10,768	No significant variance	350,644	-1%	(2,075)	No significant variance
Meetings, seminar room rentals and special events	482,139	571,478	-16%	(89,339)	Decrease from less CPD sessions resulting lower room rental expenses	442,594	9%	39,545	Variance mainly due to government relation meetings related expenses
Office, general and miscellaneous	997,245	857,463	16%	139,782	Increase due to higher IT business continuity items, equipment leases, storage and office supplies	948,853	5%	48,392	Variance due to higher banking and merchant account fees from volume growth of member transactions
Premises and operating costs	438,923	332,087	32%	106,836	Increase due to parking lot re-pavement and snow removal	330,304	33%	108,619	Variance due to parking lot re-pavement and unexpected snow pile
Printing, publication and distribution costs	409,582	443,458	-8%	(33,876)	Lower PD distance education costs while transitioning to online delivery module	452,770	-10%	(43,188)	Savings from printing costs of annual billing, postage and online PD distribution costs
Salaries and employee benefits	7,328,391	6,928,431	6%	399,960	Increase from 3 new budgeted positions total $136K (Reg manager, Professional Practice support and web/graphic designer) plus full year employment costs of Investigator who joined late FY2016, and 3% average merit increase of remaining staff	7,599,687	-4%	(271,296)	Savings from delayed hiring of Registration manager, OQM support, Professional Practice support, replacement of Associate Director of Professional Practice plus unfilled Registration coordinator
Secondary professional liability insurance premiums	150,436	145,129	4%	5,307	No significant variance	151,605	-1%	(1,169)	No significant variance
Telecommunications	82,539	77,250	7%	5,289	No significant variance	92,490	-11%	(9,951)	No significant variance
Travel	409,589	453,970	-10%	(44,381)	Decrease due to less AGM subsidized travel and professional practice related travel	379,666	8%	29,923	Variance due to council and president travel from larger number of meetings and further distance of traveling.
Total expenses before amortization	15,005,393	14,397,965	4%	607,428		14,917,856	1%	87,537	
Excess of revenue over expenses before amortization	1,216,213	1,050,356	16%	165,857		456,782	166%	759,431	
Amortization	540,963	459,878	18%	81,085	Increase due to asset acquisitions of building improvement	596,360	-9%	(55,397)	Savings due to timing of renovation
Writedown of computer software	-	50,672	-100%	(50,672)	One off expense in prior year's software write off due to technology changes	0	100%	0	
Excess of revenue over expenses for the year	675,250	539,806	25%	135,444		(139,578)	-584%	814,828	

FY2017
Statement of Revenue and Expenses

		REGULATORY				OPERATIONS				FINANCE	GENERAL
		Registration	Professional Practice, Standards & Development	Legislation, Ethics & Compliance	Council & Executive Office	Communications	Member Services	Information Systems	Human Resources	Finance & Administration	General
Revenue											
Fees											
Annual membership fees	9,974,525	-	-	-	-	-	-	-	-	-	9,974,525
Application, registration and certification Fees	1,308,314	1,308,314	-	-	-	-	-	-	-	-	-
Professional and academic examinations	492,903	492,903	-	-	-	-	-	-	-	-	-
	11,775,742	1,801,217	-	-	-	-	-	-	-	-	9,974,525
Other revenue											
Affinity programs	410,107	-	-	-	-	-	410,107	-	-	-	-
Annual conference	329,180	-	-	-	-	-	329,180	-	-	-	-
Grant and project administration	1,652,829	305,450	1,347,379	-	-	-	-	-	-	-	-
Innovation magazine and other advertising	570,956	-	-	-	-	570,956	-	-	-	-	-
Investment Income	53,478	-	-	-	-	-	-	-	-	53,478	-
Miscellaneous	231,219	30,350	73,174	47,500	-	4,900	1,200	-	-	-	74,095
Organization quality management	185,194	-	185,194	-	-	-	-	-	-	-	-
Premises	-	-	-	-	-	-	-	-	-	-	-
Professional development	1,012,901	-	-	-	-	10,300	1,002,601	-	-	-	-
	4,445,863	335,800	1,605,747	47,500	-	586,156	1,743,087	-	-	53,478	74,095
Total revenue	16,221,604	2,137,017	1,605,747	47,500	-	586,156	1,743,087	-	-	53,478	10,048,620
		Registration	Professional Practice, Standards & Development	Legislation, Ethics & Compliance	Council & Executive Office	Communications	Member Services	Information Systems	Human Resources	Finance & Administration	General
Expenses											
Advertising	34,085	-	-	-	-	34,085	-	-	-	-	-
Annual conference - facilities and meals	156,450	-	-	-	-	-	156,450	-	-	-	-
Contract and consulting services	2,005,931	170,988	517,325	172,412	134,209	246,968	440,195	239,140	80,401	4,293	-
Contract and consulting services on grants	1,252,219	-	1,252,219	-	-	-	-	-	-	-	-
Engineers Canada assessment	288,800	-	-	-	-	-	-	-	-	-	288,800
Examinations and examination books	357,437	357,437	-	-	-	-	-	-	-	-	-
Geoscientists Canada assessment	66,854	-	-	-	-	-	-	-	-	-	66,854
Grants and awards	98,942	-	-	-	-	73,818	25,124	-	-	-	-
Innovation magazine printing	97,262	-	-	-	-	97,262	-	-	-	-	-
Legal	348,569	-	-	348,569	-	-	-	-	-	-	-
Meetings, seminar room rentals and special events	482,139	30,005	28,960	18,365	85,109	38,216	228,426	1,281	31,785	19,993	-
Office, general and miscellaneous	997,245	8,363	26,175	4,375	768	30,766	17,935	103,250	141,331	238,571	425,711
Premises and operating costs	438,923	-	-	-	-	-	-	-	-	-	438,923
Printing, publication and distribution costs	409,582	100,395	8,045	3,844	5,455	138,105	68,487	-	-	85,252	-
Salaries and employee benefits	7,328,391	1,427,516	817,537	644,613	872,966	850,035	782,730	866,691	213,911	852,392	-
Secondary professional liability insurance premiums	150,436	-	-	-	-	-	-	-	-	-	150,436
Telecommunications	82,539	-	-	-	-	-	-	82,539	-	-	-
Travel	409,589	26,320	67,222	5,909	143,261	18,108	148,258	23	62	425	-
Total expenses before amortization	15,005,391	2,121,022	2,717,483	1,198,086	1,241,769	1,527,362	1,867,606	1,292,923	467,490	1,200,926	1,370,724
Amortization											
Intangible assets	204,966	-	-	-	-	-	-	204,966	-	-	
Property and equipment	335,997	-	-	-	-	-	-	-	-	-	335,997
Total amortization	540,963	-	-	-	-	-	-	204,966	-	-	335,997
Excess of revenue over expenses for the year	675,250	15,994	(1,111,737)	(1,150,586)	(1,241,769)	(941,206)	(124,519)	(1,497,889)	(467,490)	(1,147,448)	8,341,899

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OPEN SESSION

ITEM 6.2

DATE	August 24, 2017
REPORT TO	Council for Information
FROM	Megan Archibald, Director, Communications and Stakeholder Engagement
SUBJECT	2017 Public Opinion Survey Results
LINKAGE TO STRATEGIC PLAN	Engineers and Geoscientists BC's role as a regulator is broadly understood.

Purpose	To provide Council with the results of the 2017 public opinion survey.
Motion	No motion required.

BACKGROUND

Engineers and Geoscientists BC conducts public opinion surveys every three years to assess the public's awareness, understanding of, and confidence in the professions, and their awareness and expectations of the association. We concluded fielding the 2017 survey on August 18, and will be presenting the results to Council in person.

The survey is conducted by Insights West, a market research firm specializing in public opinion polls and consumer research. **Mario Canseco, Vice President of Public Affairs for Insights West**, will be attending Council to present the survey results.

Mario is responsible for designing and managing research projects for clients in the public and education sectors, as well as non-profit organizations and associations. Mario is also the company's spokesperson for political and sociological issues and surveys, and writes for the Vancouver Sun, the National Observer and Business in Vancouver. Mario has been in charge of Insights West's electoral forecasting program since June 2013, issuing 23 correct predictions of democratic processes in Canada and the United States, including the only forecast of the 2015 Metro Vancouver Transportation and Transit Plebiscite issued within the guidelines set by Elections BC, the 2015 Alberta provincial election, the 2016 United States presidential election, and the 2017 British Columbia provincial election. Mario holds a BA in Communication from Universidad Iberoamericana in Mexico City, and an MJ from the University of British Columbia.

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ITEM 6.3

DATE	August 24, 2017
REPORT TO	Council for Decision
FROM	Megan Archibald, Jennifer Cho, CPA, CGA, Tony Chong, P.Eng., Gillian Pichler, P.Eng. and Efrem Swartz, LLB
SUBJECT	Life Membership or Licensure and Associated Non-Practising Bylaw Revisions
LINKAGE TO STRATEGIC PLAN	Goal 1, Strategy 2: Identify and implement practices, programs, policies, bylaws, and Act amendments that improve Engineers and Geoscientists BC's ability to more effectively carry out its duty and objects.

Purpose	To update Council and to recommend a strategy to address the cessation of granting of Life memberships under bylaw 10(c.1); including proposed modifications to associated bylaws to harmonize grades of membership and enhance public protection.
Motions	1. That Council approve the proposed interim solution to be implemented for the 2018 membership year, i.e. to allow a one-time waiver of the annual fee in lieu of deferral of the annual fee, to any member who formally declares and justifies financial need. 2. That Council approve for stakeholder consultation the proposed changes to the Non-Practising Member Bylaw 10(c). 3. That Council approve for stakeholder consultation the proposed changes to the Life Membership or Licensure Bylaw 10(c.1) 4. That Council approve for stakeholder consultation, the proposed repeal of the Honorary Life Membership or Licensure Bylaw 10(c.2) and the changes to the Honorary Member Bylaw 10(d). 5. That Council approve the 2017/18 Communication and Consultation plan for the proposed changes to the Non-Practising Member Bylaw 10(c), the Life Membership or Licensure bylaw 10(c.2) and the Honorary Member Bylaw 10(d); and the proposed repeal of the Honorary Life Membership or Licensure Bylaw 10(c.2).

BACKGROUND

In June 2017, Council resolved to cease to exercise its discretion to grant Life Membership or Licensure under Bylaw 10(c.1) and to directly contact members potentially affected by this change to explain Council's actions in this regard.

It also directed staff to:

a. develop an analysis of options for interim treatment of those who may be affected by Council's decision to cease granting Life Membership under Bylaw 10(c.1); and
b. develop a new proposed Bylaw, an impact analysis, and a communication and consultation plan for consideration at its September 2017 meeting.

Proposed solutions took into account:

- APEGBC's duty to protect the public interest
- compliance with the Engineers and Geoscientists Act, Bylaws and other legislation
- fiscal responsibility to the membership
- inclusivity and alignment with other grades of membership
- consistency and fairness of application; and
- stakeholder feedback from consultation

Current Membership Numbers

Current Numbers in each Grade of Membership are:

	P.Eng. & P.Geo.	Eng.L. & Geo.L.	Non-Members	Total
Practising Regular	23,706	180		**23,886**
Practising Honorary Life (10c.2)	36	1		**37**
Practising Life Members Pre-1998 (10(c.1)	343			**343**
Non-Practising Regular (10c)	560			**560**
Non-Practising Life Members 1998 - 2017 (10c.1)	2,098			**2,098**
Honorary Members (Non-Members) (10d)			**7**	**7**
TOTAL	**26,743**	**181**	**7**	**26,931**

DISCUSSION

The six recommendations to Council consider the chain of events that will affect other grades of membership and arise from ceasing to admit members to Life Membership. Each section of the report addresses one recommendation. Listed below are the summaries of and links to each Motion and its associated Appendix.

	Title	Summary
Motion 1 /Appendix A	Interim solution for Prospective Life Members or Licensees	• Reviews membership and fee alternatives for those who would have been eligible for Life Membership in 2018 • Reports the results of a survey of potentially affected members • Makes a recommendation for a fiscally prudent interim fee solution that makes a minor change to the reduced fee structure and applies to all members for Membership Year 2018
Motion 2 /Appendix B	Revise Non-Practising Member Bylaw	• Reviews cohorts who may take advantage of this status • Reviews legislation and strategy on use of title for non-practising members • Proposes wording revisions to include restricted title, and return to practice provisions - for consultation • Proposes reduced fees for this status based on removal of certain member rights (practice, full designation) – for consultation
Motion 3 /Appendix C	Revise Life Membership or Licensure Bylaw	• Proposes repeal of the qualification requirements for Life Membership or Licensure • Adds proposed vesting (grandfathering), restricted title and return to practice sections conditions - for consultation
Motion 4 /Appendix D	Eliminate Honorary Life Membership or Licensure Bylaw and integrate with Honorary Membership Bylaw	• Reviews the purpose and restrictions of the current bylaw • Proposed repeal of bylaw and revisions to the Honorary Membership Bylaw to provide Council with the flexibility to award this grade of membership to a variety of members and non-members - for consultation
Motion 5 /Appendix E	Communications and Consultation Plan	• Proposes a consultation plan from September 2017 through May 2018 for recommendations 2 through 5.

RECOMMENDATIONS

Interim Solution

The recommended interim solution is

- Allow members who can formally declare and justify financial need to have a one year waiver of fees by changing the fee deferral procedure to a fee waiver procedure.

The conversion from fee deferral to fee waiver is a modification of the current tiered reduced fee structure that allows members to defer payment of annual fees for one year upon formal application to the Director, Registration. After one year of fee deferral, members who require further fee deferral or relief must apply to the Benevolent Fund or resign. Instead of deferring the fee for one year, the proposed change is that the annual fee be waived for one year. This waiver would be open to all members who qualify.

Current fee deferral volumes are relatively low –current uptake for fee deferral is one third to one half the uptake for Life Membership in a given year.

Waiving fees for one year for 70 to 120 members would result in a fee revenue loss significantly lower than the typical annual fee revenue loss of $60,000 or more for each new Life Member cohort of 210 to 250 members..

The proposed interim solution is intended to afford reasonable and fair treatment to all members, while recognizing that some prospective 2018 Life Members might need to take advantage of this solution for 2017/18.

Proposed Bylaw Changes for Consultation in 2017/18:

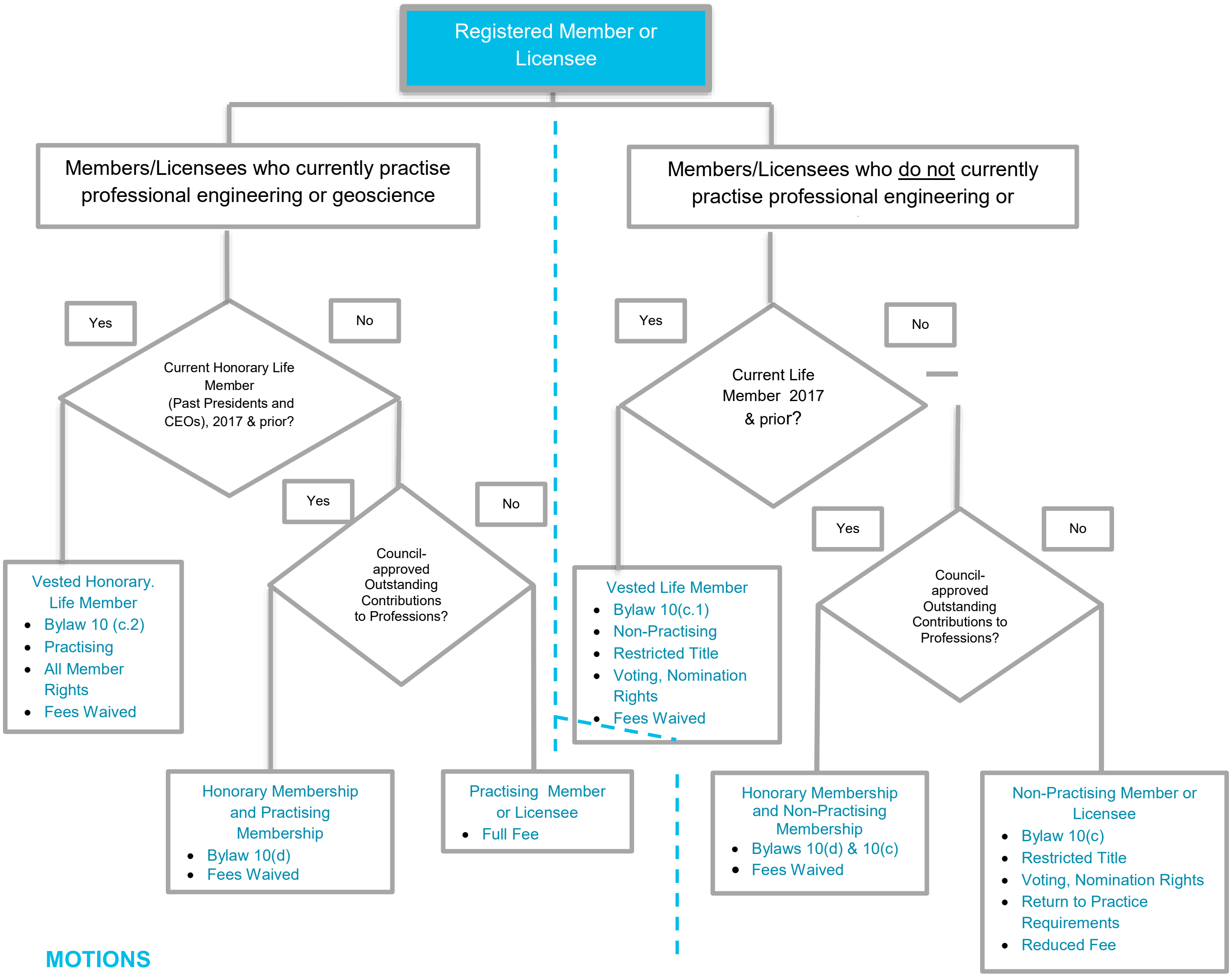
Motion Number/Discussion in Appendix	**Proposed Bylaw Changes – August 24, 2017**
Motion 2. /Appendix B	**Non-Practising member** 10 (c) Council, in its discretion, may upon application, grant non-practising membership to a member or limited licensee who is in good standing. (c.3) Non-practising members and non-practising limited licensees retain voting privileges. (c.4) A certificate of registration of a non-practicing member or non-practicing limited licensee is deemed to be revoked for the purposes of sections 20(6) and 20(7) of the Act. A non-practicing member or non-practicing limited licensee must use as applicable only the following professional designation(s) a. Professional Engineer (Non-Practising) or P.Eng. (Non-Practising) b. Professional Geoscientist (Non-Practising) or P.Geo. (Non-Practising) c. Limited Licensee (Non-Practising) or Eng.L. (Non-Practising), or d. Limited Licensee (Non-Practising) or Geo.L. (Non-Practising). (c.5) Non-practising members and non-practising limited licensees must annually commit to Council not to engage in the practice of professional engineering or professional geoscience until released from the commitment by Council in writing. (c.6) Non-practising members and non-practising limited licensees who apply for practising status must pay the applicable fees set by Council and demonstrate compliance with the current requirements in the Act and bylaws for registration as a member or limited licensee.

Motion 3. /Appendix C	**Prior life membership or licensure** 10 (c.1) [Repealed] ~~Council, in its discretion, may upon application, confer life membership or licensure in the association upon any member or limited licensee~~ ~~(i)~~ ~~[Repealed.]~~ ~~who is at least 70 years of age and has been practising professional engineering or professional geoscience for 35 or more years, with an unblemished record, and~~ ~~(ii)~~ ~~[Repealed.]~~ ~~who has been a member or limited licensee in good standing of the association for 20 or more years, or in the case of a professional geoscientist, has practised in British Columbia for 20 or more years, and~~ ~~(iii)~~ ~~[Repealed.]~~ ~~who has retired from all gainful employment, who shall, without further payment of fees, have use of title and voting privileges but no practice rights. Life members whose status had vested in accordance with the bylaws before December 31, 1997 shall retain all their rights and privileges of membership in the association.~~ (c.7) Life members whose status had vested in accordance with the bylaws before December 31, 1997 shall retain all their rights and privileges of membership in the association. (c.8) Life members or life limited licensees whose status had vested in accordance with the bylaws between January 1, 1998 and June 16, 2017 shall without further payment of annual fees retain voting privileges but continue not to have practise rights. (c.9) Except for those life members whose status had vested in accordance with the bylaws before December 31, 1997, all life members or life limited licensees must annually commit to Council not to engage in the practice of professional engineering or professional geoscience until released from the commitment by Council in writing. (c.10) Except for those life members whose status had vested in accordance with the bylaws before December 31, 1997, a certificate of registration of a life member or life limited licensee is deemed to be revoked for the purposes of sections 20(6) and 20(7) of the Act. A life member or life limited licensee must use as applicable only the following professional designation(s) (i) Professional Engineer (Non-Practising) or P.Eng. (Non-Practising)

	(ii) Professional Geoscientist (Non-Practising) or P.Geo. (Non-Practising) (iii) Limited Licensee (Non-Practising) or Eng.L. (Non-Practising), or (iv) Limited Licensee (Non-Practising) or Geo.L. (Non-Practising). (c.11) Life members or life limited licensees who apply for practising status must pay the applicable fees set by Council and to demonstrate compliance with the current requirements in the Act and bylaws for registration as a member or limited licensee.
Motion 4. /Appendix D	**Prior honorary life membership or licensure** 10 (c.2) [Repealed.] ~~Council, in its discretion, may confer honorary life membership or licensure in the association upon any member or limited licensee~~ ~~(i) who has served as president of the association, or~~ ~~(ii) who council deems worthy by virtue of outstanding contributions to the professions of engineering or geoscience who shall be entitled to enjoy the rights and privileges of membership or licensure in the association without further payment of fees.~~ (c.12) Honorary life members whose status had vested in accordance with the bylaws between January 1, 1998 and December 31, 2018 shall retain all their rights and privileges of membership in the association. **Honorary membership** 10 (d) Council, in its discretion, by unanimous vote, may confer honorary membership in the association, without payment of annual fees, on members, licensees or non-members who have made outstanding contributions to the professions of engineering or geoscience. (d.1) Honorary membership does not of its own accord confer: i. membership or licence, or ii. the right to practise professional engineering or professional geoscience, to vote or to be nominated as a candidate for president, vice president or councilor. (d.2) The honorary membership status of a member, licensee or non-member continues at the pleasure of Council and may be revoked at Council's discretion without notice to the honorary member.

Decision Tree

The proposed decision tree for 2018 onward is illustrated below:



MOTIONS

1. that Council approve the proposed interim solution to be implemented for the 2018 membership year, i.e. to allow a one-time waiver of the annual fee in lieu of deferral of the annual fee, to any member who formally declares and justifies financial need.
2. that Council approve for stakeholder consultation the proposed changes to the Non-Practising Member Bylaw 10(c).
3. that Council approve for stakeholder consultation the proposed changes to the Life Membership or Licensure Bylaw 10(c.1)
4. that Council approve for stakeholder consultation, the proposed repeal of the Honorary Life Membership or Licensure Bylaw 10(c.2) and the changes to the Honorary Member Bylaw 10(d).

5. that Council approve the 2017/18 Communication and Consultation plan for the proposed changes to the Non-Practising Member Bylaw 10(c), the Life Membership or Licensure bylaw 10(c.2) and the Honorary Member Bylaw 10(d); and the proposed repeal of the Honorary Life Membership or Licensure Bylaw 10(c.2).

APPENDIX A – Recommendation 1 – Interim Solution

APPENDIX B – Recommendation 2 - proposed changes to the Non-Practising Member Bylaw 10(c)

APPENDIX C – Recommendation 3 - proposed changes to the Life Membership or Licensure Bylaw 10(c.1)

APPENDIX D – Recommendation 4 - proposed repeal of the Honorary Life Membership or Licensure Bylaw 10(c.2) and changes to the Honorary Member Bylaw 10(d).

APPENDIX E – Recommendation 5 - proposed 2017/18 Communication and Consultation plan

ENGINEERS & GEOSCIENTISTS
BRITISH COLUMBIA

OPEN SESSION
ITEM 6.4

DATE	August 24, 2017
REPORT TO	Council for Decision
FROM	Janet Sinclair, Chief Operating Officer
SUBJECT	Regulating for the Future: Developing a Plan to Modernize Engineers and Geoscientists BC Functions
LINKAGE TO STRATEGIC PLAN	The Act is modernized to reflect the evolution of the professions and the regulatory mandate of the Association

Purpose	To discuss the plan for reviewing the modernization of Engineers and Geoscientists BC's functions and to identify any resulting amendments needed to processes, policies, bylaws, and the *Engineers and Geoscientists Act.*
Motion	1. That Council approves Option 1, Engagement of the Professional Standards Authority to conduct an external audit of Engineers and Geoscientists BC's functions. 2. That Council directs that stakeholder engagement occur both at the audit and recommendation implementation phases.

BACKGROUND

At the June 16, 2017 meeting of Council, staff was directed to outline a process through which Engineers and Geoscientists BC's functions could be modernized and as necessary articulated in a new Act. Staff were directed to provide details on the process and the resources required to achieve this to the Executive Committee. The Executive Committee's discussed this item at its August 24 meeting and is recommending that Council approve Option 1: Engagement of the Professional Standards Authority to conduct an external audit of Engineers and Geoscientists BC's functions.

The Executive Committee considered four options in determining its recommendation on this matter. They are:

1. Conduct an external audit using the Professional Standards Authority (PSA).
2. Have staff conduct an internal review

3. Set up a committee of experts to oversee a review
4. Set up a task force of members to oversee a review

DISCUSSION

Progressive regulators continually assess their processes to ensure that they are able to carry out their responsibilities effectively and efficiently. To be effective, these reviews will include not only an assessment of internal processes, but also an environmental scan to determine what external forces may affect the organization's ability to conduct its business. In the case of Engineers and Geoscientists BC, this could include the impact of technology, offshoring of work, emerging disciplines, scope overlap with other professions, national harmonization of practices, national and international trade agreements, etc.

Often improvements can be made by changes to process or Council policy, but there are times when amendments to bylaws or legislation (the Act) will be required. Review of processes is an ongoing activity, but the opportunity to amend legislation to enable any desired changes comes about infrequently and solely at the discretion of government. It is therefore prudent for Engineers and Geoscientists BC to be ready with considered concepts to inform new legislation when the opportunity arises.

Discussions with Government officials over the last couple of years has led members of Council and staff to believe that Government may be willing to significantly revise or rewrite the Engineers and Geoscientists Act to modernize the legislation. While a new government is now in place and its priorities for a rewrite are unknown, it is possible that a modernized Act could be included on the legislative agenda in the next few years.

The previous Advanced Education Minister, articulated three objectives with respect to the *Engineers and Geoscientists Act:*

1. That there should be a focus on Engineers and Geoscientists BC's regulatory responsibilities and likely a separation from its current advocacy role.
2. The processes guided by the Act should be forward thinking and aligned with leading practices in regulation.
3. National harmonization of processes should be pursued.

There have been many discussions over the years regarding differentiating between Engineers and Geoscientists BC's regulatory and advocacy functions. In reality, there are many activities that are a blend of both. There would be value in identifying which category(s) the functions fall under to determine what may remain within the purview of Engineers and Geoscientists BC should the Act be rewritten by government to remove the advocacy role.

In order for Engineers and Geoscientists BC to achieve the objective of improving its regulatory efficiency and effectiveness, a robust review of current functions and processes including a thorough benchmarking exercise should be undertaken. This would inform any changes that would be made to processes, policies, bylaws or legislation. The modernization activity could be conducted in a number of ways. Note that legal and other staff resources required for any Act amendments after the review process are additional to the costs estimated for each of the options.

Option 1: Engagement of the Professional Standards Authority to conduct an external audit of Engineers and Geoscientists BC's functions.

Engineers and Geoscientists BC has in the past engaged external consultants to review how effectively each department within the organization conducts its work. These reviews have been piecemeal with each department review occurring at a different time and were of an operational manner to determine effectiveness in terms of 'value for money' but they did not look at our overall effectiveness in terms of protecting the public or carrying out our mandate. Processes were reviewed only within the context of the individual department and were done by consultants with experience in the area being reviewed (e.g. auditors in finance, IT, etc.). These consultations did not necessarily have expertise in the running of professional regulatory bodies.

In 2014, the College of Registered Nurses of BC (CRNBC) commissioned the Professional Standards Authority (PSA) to do a review of their organization. The PSA follows the principles of Right Touch Regulation. The review examined the CRNBC's approach to and compliance with 33 standards of good regulation covering four regulatory functions (Guidance and Standards, Education, Registration, Complaints) and governance. By all accounts, this review provided CRNBC with excellent information about how they could improve their regulatory and governance processes. Use of an external auditor with extensive experience in this area not only provided a guide for improvement, it greatly enhanced the credibility of the review with internal and external stakeholders including Government. The full report of this review is available at

http://www.professionalstandards.org.uk/docs/default-source/publications/special-review-report/a-review-conducted-for-the-college-of-registered-nurses-of-british-columbia-(april-2015).pdf?sfvrsn=10.

Recently, the PSA was engaged by the Realtors Council of BC and they found this information helpful in helping them determine how to improving their regulatory effectiveness. While the PSA was initially established to work with health care authorities, they have established their expertise in regulatory regimes in general, regardless of professional area of responsibility.

An external review requires involvement of staff to provide the necessary documentation and support. The cost to engage is also not insignificant at an expected $150K - $200K. In order to fully benefit from this audit, an additional staff person may need to be hired and the work of some existing staff will potentially need to be reprioritized. The CRNBC had a dedicated quality manager assigned to the project for the better part of a year and individual departments invested up to 5 days per department to collect materials and answer questions.

In addition to the cost and resources involved one of the requirements of PSA to undertake this type of review is that the final report be published on their website. While there is opportunity to participate in and comment on the report, the final published version is determined by PSA.

Following the audit to identify what processes could be improved and recommendations as to how, Engineers and Geoscientists BC would need to determine what recommendations to act on and in what priority. It is expected that extensive member, expert, and stakeholder engagement will be undertaken to inform not only the audit process, but the implementation of the recommendations as well. The changes will also need to be considered in the context of national harmonization of practices.

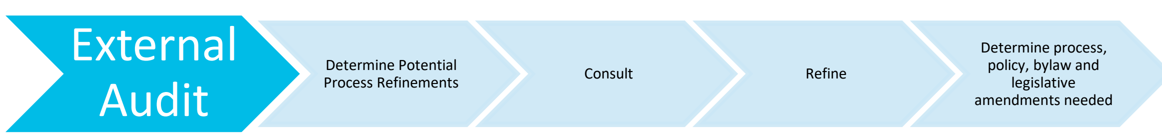
It would likely take at least 2 - 3 years from the decision to engage PSA to the decision on legislative amendments to request. Many changes would likely be able to be achieved through changes in processes, policy, or bylaws without the need to change legislation.

Pros:

- Objective external review by experienced auditors.
- Opportunity to expand Engineers and Geoscientists BC's knowledge about international regulatory practices.
- Enhanced credibility with stakeholders.
- Controlled expense ($150K – $200K).
- It would be possible and even desirable to role in aspects of Options 2, 3, and 4 into the process.

Cons:

- Staff resources required.
- The report would be published and available on a website frequented by international regulators as this is a condition of PSA to undertake this type of work.



Option 2: Internal Staff Review and Recommendations

The members of Engineers and Geoscientists BC's Leadership Team are arguably the most qualified to comment on the legislative issues that impact the performance of their departments.

These individuals are well versed not only in Engineers and Geoscientists BC's business processes, but have a level of awareness as to the processes of other regulators. It would still be possible to use the 33 standards of good regulation used by the PSA as a measure if so wished as these standards are publicly available.

This review would require staff resources to create a project plan, manage the review, write the reports and prepare recommendations. Directors would make recommendations based on their experience rather than having external auditors scrutinize documents and processes. Surveys, focus groups, and other means could be utilized to gain stakeholder input. The process could also have input from external experts as needed.

Following the assessment to identify what processes could be improved it would need to determined as to what changes should be made and in what priority. It would likely take less time than an external audit to review processes and identify the legislative amendments needed. Many changes would likely be able to be achieved through changes in processes, policy, or bylaws without the need to change legislation. It is expected that extensive member and stakeholder engagement will be undertaken as part of this process.

While existing work would need to be reprioritized to accommodate this review it is unlikely that additional staff resources would be required, though a senior staff person would need to hold responsibility for overseeing the effort. As it is an internal assessment and external auditors are not involved, the costs would be related to reprioritization and/ or addition of staff resources rather than consultants . Budget would also be needed to support focus groups, experts, and incidental expenses ($100K - $200K). It is likely this activity could be completed in 12 – 18 months depending on the resources dedicated to it.

Pros:

- Release of any findings would be controlled by Council as no requirement to publish externally.

Cons:

- Review would not be as robust as a PSA audit and learnings that could be obtained by using an international expert will not be realized.
- Review may have less credibility with stakeholders including Government as it is not substantiated by an external source.
- Some internal programs would need to be put on hold if we were to take this on ourselves.
- Expenses are broad estimates and could be difficult to manage, particularly staff time.

Option 3: Set up an Expert Legislative Review Steering Committee

Another option that could support this effort is an Expert Steering Committee supported by senior staff. The Committee would define the problem and scope of work; develop and oversee the process and its budget; appoint sub-committees and working groups as needed; direct the engagement of, select and provide strategic direction to appropriate resources (such as lawyers or external auditors). They would also ensure that the necessary research and consultations are undertaken, progress reports are made to Council and the members, and that a final report with recommendations is written for Government in the format it requires.

The Steering Committee members would have expertise such as legal training, experience working with organizations governed by legislation, strong professional reputation and credibility, and the ability to direct process, analyze information and make credible, independent recommendations. They would not necessarily be members of Engineers and Geoscientists BC. The individuals could be compensated possibly on a per diem rate or per meeting honorarium.

Staff resources would be needed to inform and support the Committee throughout the process and to do research as required. It is expected that extensive member and stakeholder engagement will be undertaken as part of this process.

Pros:

- Comprehensive process led by those experienced in professional regulation.
- Opportunity to expand Engineers and Geoscientists BC's knowledge about practices of other regulators and recent case law.
- Enhanced credibility with stakeholders as not perceived to be staff driven.
- The expectation is that the report would be published and available to members and other stakeholders though this could be at Council's discretion.

Cons:

- Difficult to estimate budget until the experts are selected. Expect $50K - $150K.
- Focused staff resources required.
- Due to the level of expertise required for the Committee, scheduling meetings and expediting progress could be challenging due to competing demands for the experts' time.

Option 4: Set up a Member Task Force (e.g. Professional Renewal 2.0)

In 2007, Council created the Professional Renewal Task Force to determine whether Engineers and Geoscientists BC's programs were contributing to effective and responsible self-regulation that protects the public and to make recommendations to bring improvements to these programs. The task force was made up of a diverse group of members.

The Professional Renewal Program was developed in consultation with members and other major stakeholders. Using information gained through member surveys and research on best regulatory practices, a total of 38 recommendations were made in eight areas.

Setting up a similar task force is another means to achieve the current regulatory review being contemplated. Learnings from the previous Professional Renewal process could be incorporated to help streamline the process of a new review.

The previous Professional Renewal process consumed significant resources as staff devoted much time to research, writing reports and presenting to task force volunteers to inform them on Engineers and Geoscientists BC's processes and how they compared to the processes of other regulators.

To support a similar model, at least one senior level staff member dedicated to managing the process would be required. Senior staff time in each of the departments would need to be reallocated to this effort. Cost to support the task force meetings (e.g. travel, food, etc.) is estimated at ($30K – $50K).

The original professional renewal program took almost two years to develop and a further 5 years to substantially implement.

Pros:

- High level of stakeholder engagement.
- Publication of report is controlled by Engineers and Geoscientists BC.

Cons:

- Volunteers that would serve on the task force and make recommendations to Council are not experts so high level of effort required to inform.

- Additional staff required as significant effort to coordinate meetings, analyze research, present information, write report.
- Review would not be as robust as an external audit and learnings that could be obtained by using external experts will not be realized.
- Review may have less credibility with external stakeholders including government.

RECOMMENDATIONS

Four options with pros and cons have been presented for consideration with the recommendation of the Executive Committee being Option 1: Engagement of the Professional Standards Authority to conduct an external audit of Engineers and Geoscientists BC's functions.

MOTIONS

1. That Council approves Option 1, Engagement of the Professional Standards Authority to conduct an external audit of Engineers and Geoscientists BC's functions.

2. That Council directs that stakeholder engagement occur both at the audit and recommendation implementation phases.

ENGINEERS & GEOSCIENTISTS
BRITISH COLUMBIA

OPEN SESSION

ITEM 6.6

DATE	August 21, 2017
REPORT TO	Council for Decision
FROM	Janet Sinclair, Chief Operating Officer
SUBJECT	Government Relations Strategy 2017
LINKAGE TO STRATEGIC PLAN	To uphold and protect the public interest through the regulation of the professions; Establish, maintain and enforce qualifications and professional standards; Promote and protect the professions of engineering and geoscience.

Purpose	To focus Engineers and Geoscientists BC's government relations activities.
Motion	That Council approve the 2017 Government Relations Strategy.

BACKGROUND

The Government Relations Strategy identifies Engineers and Geoscientists BC's priorities with respect to government. This strategy is in place to assist the association in maintaining a productive relationship with government and in achieving the priorities set out in the strategic plan. An ongoing assessment of progress and challenges encountered will support a flexible and responsive strategy, and will maximize its effectiveness.

The Government of BC is one of Engineers and Geoscientists BC's most important stakeholders. The association is a creation of legislation through the *Engineers and Geoscientists Act* and is accountable to government for regulating the practices of professional engineering and professional geoscience.

Engineers and Geoscientists BC works with government to achieve policy objectives related to engineering and geoscience. Government's awareness of how Engineers and Geoscientists BC fulfills its regulatory responsibility to the public is achieved through regular interaction with government officials at all levels including ministers, MLAs, deputy ministers, and other government staff. The purpose of these interactions is to continually inform government about the association's regulatory role as well as how the association and its members can contribute to developing public policy and carry out government objectives related to the professions.

KEY BENEFITS ENGINEERS AND GEOSCIENTISTS BC BRINGS TO GOVERNMENT

- Ensures engineering and geoscience practitioners are appropriately qualified and licensed to be accountable for engineering and geoscience work in BC.
- Regulates practitioners to maintain high standards of practice for engineering and geoscience work.
- Provides advice, assistance (e.g. guidelines, policy development, etc.) and acts as a non-partisan voice on matters related to engineering and geoscience from a public safety, economic and labour force development perspective.

STRATEGIES

1. **Raise awareness of the value Engineers and Geoscientists BC provides to government and the public.**
   - Engage government officials regarding the collaborations Engineers and Geoscientists BC is currently and has recently participated in across a variety of ministries and government agencies.

2. **Seek involvement in government activities where professional engineering and/or geoscience is involved.**
   - Advise as to:
     - How Engineers and Geoscientists BC could be involved to assist government in achieving its policy goals.
     - The non-partisan role Engineers and Geoscientists BC plays in protecting public health and safety.
     - The benefits and concerns related to the professional reliance model in BC.
     - Local and national efforts to facilitate national and international mobility.
   - Seek government funding for initiatives as appropriate.

3. **Pursue modernization of the Engineers and Geoscientists Act.**
   - Inform and remind government officials and political decision makers about the benefits of modernizing the Act to support government objectives and to effectively regulate the professions in the 21st century.

IMPLEMENTATION ACTIVITIES:

1. Communicate the strategy to key stakeholders in Engineers and Geoscientists BC.
2. Build core competencies within Council, staff and branch volunteers to carry out the strategy (e.g. how to connect effectively with government).
3. Continually monitor government policy, actions, and connections with Engineers and Geoscientists BC.
4. Resource the strategy for success.

ASSESSMENT OF STRATEGY SUCCESS

Measurable outcomes include:

1. Requested changes to the Engineers and Geoscientists Act are made.
2. Government regularly engages Engineers and Geoscientists BC on matters related to the practice of engineering and geoscience in the province and gives significant weight to its input.

MOTION

That Council approve the 2017 Government Relations Strategy.

OPEN SESSION

ITEM 6.7

DATE	August 25, 2017
REPORT TO	Council for Information
FROM	Jennifer Cho, CPA, CGA, Director of Finance & Administration
SUBJECT	Pros & Cons to Approval of Miscellaneous Expenses for Council to liaise with members on member/Council issues
LINKAGE TO STRATEGIC PLAN	To promote and protect the professions of engineering and geoscience.

Purpose	To provide pros and cons to Council regarding Councilor expenses for liaison with members
Motion	No motion.

BACKGROUND

Councilor Ross Rettie, P.Eng, FEC, has submitted a request (Form A) to Council to request for a small budget of $3,000 ($300 per each of the 10 elected Councilors) be approved for miscellaneous expenses to liaise with members on issues of importance to members and/or Council.

This request went forward to the Executive Committee at the August 24, 2017 meeting and the Committee has requested that staff put together a pros and cons memo to be distributed with Councilor Rettie's request for information for the discussion.

DISCUSSION

In consideration of approval of miscellaneous expenses for Councilors to liaise with members the following are pros and cons to the request:

<u>Pros:</u>

- Provides funding to enable Councilors to directly understand member concerns, liaise/consult with members and promote Association messaging
- Funding signifies importance of Council to Member relations
- Expenses that are deemed directly related to promoting or furthering the Association's Strategic Plan should be treated like all other expenses

Cons:

- This type of expense may be perceived as discretionary or meals/entertainment expense by members/public as an unnecessary expense and not good use of membership dollars
- Poses an issue with internal controls – a process will need to be put in place for criteria of reimbursement, authorization procedures, accountability of expenses and consequences

Possible ways to mitigate the cons

To ease the members/public's perception of such expenses, clear guidelines of the intention and plans for the use of funds would need to be created. Alignment of Association communications and program messaging would be necessary for such meetings.

With the internal controls issue, specific processes would need to be created to clearly indicate what criteria expenses would be reimbursable; identification of who would authorize such expenses and if expenses are not deemed to be reimbursable what the procedure/consequence would be.

Form A – Councilor Ross Rettie, P.Eng., FEC Agenda Item Request Form

Agenda Item Request Form
Item Title:
Small Budget for Councilor's Expense Items for Liaison with Members on Issues of Importance to members and/or Council.
Short Description of Issue:
Over the last six months, I have been asked by a member representing the fire protection engineering area of practice, wishing to discuss this particular area of engineering practice regarding a common concern that since there is no longer a vehicle to provide training in this sector, some members are attempting to practice in this area without adequate training and experience and to make matters worse, such members do not even realize that they do not possess the expertise required for competent practice. My involvement has involved several meetings without the authorized ability to recover mileage or other minor meeting expenses. In a second case, I was met with a group of several members to get CPD views. on CP their views on the C
What specific decision needs to be made?
Establish a small budget to cover miscellaneous expenses of Council members while undertaking the work of a Councilor(s) meeting with members on Council or members issues.

How is this issue related to the strategic plan?	
Strategic Plan Principles: 4. We consult our members and stakeholders. 7. We provide sufficient resources to fulfill our responsibilities. 8. We provide effective support and recognition for volunteers,	
Have you raised this item with the related committee/ division/ branch?	Yes/No N/A
Have you raised this item with the staff member responsible for this program area?	Yes/ No N/A
Requested by: Ross Rettie, P.Eng., FEC	
Date: August 2, 2017	

OPEN SESSION

ITEM 6.8

DATE	August 23, 2017
REPORT TO	Council for Decision
FROM	Ann English, P.Eng., Chief Executive Officer and Registrar
SUBJECT	Past Presidents' Forum Survey Results
LINKAGE TO STRATEGIC PLAN	Ongoing communication and engagement with members and other stakeholders

Purpose	To determine whether to continue with the Past Presidents Forum.
Motion	To be determined.

BACKGROUND

The purpose of the Past Presidents' Forum is to provide information for Council consideration and raise questions or issues that may warrant Council attention. Following the June 16, 2017, Past Presidents' Forum, questions were raised as to the value received and whether the forum should continue. To gather feedback, a survey of Council members was conducted and the majority of respondents indicated that they would like to discuss the matter at an upcoming Council meeting.

Ten of the 17 members of Council responded to the survey (58.8%). Highlights include:

- 70% (7) of respondents believe that the views of past presidents are important information for Council to know.
- 60% (6) of respondents believe that the forums are a useful way to engage past presidents and gain their insights
- 70% (7) of respondents believe that direct engagement with the past presidents should be continued

A summary of the survey responses is included in Appendix A.

A similar survey of past presidents was conducted in May 2016. Past presidents were consulted on the forum timing, content and the value they gain through forum participation. A total of 17 past presidents completed the survey. A summary of the results is provided below:

Meeting Logistics

- 94% felt that two meetings per year is “just right” and a majority preferred Vancouver as the location
- 65% preferred a late afternoon forum followed by a dinner

Meeting Value

- 71% of respondents were satisfied with the forums providing a linkage to Council to provide information for Council consideration
- 71% of respondents were satisfied with the value they gain from participating in the forums

The past presidents were also provided an opportunity to add comments on how the forums could be improved and any other suggestions. Some of the highlights from the comments sections are listed below:

- Preference for the meeting to be less structured/ more opportunity for open discussion and debate
- Would like to know what issues that Council would like some input on / need to identify issues that Council is dealing with
- Need for more feedback from Council on the past presidents input

There are currently 36 past presidents of the association. In recent years, attendance at the forum has declined. In 2015, 16 past presidents participated. In 2016, 14 participated in the spring session and the fall 2016 forum was cancelled due to low participation. The spring 2017 had 9 participants (quorum is 10). The cost of the dinner event is approximately $5,000, plus staff time to organize.

Council has indicated an interest in further discussing the Past Presidents’ Forums. This will be the third time in the past five years that this topic has been re-visited. Staff is requesting direction from Council on how to proceed.

APPENDIX A – Council Survey Summary

Appendices

Item 5.4	Appendix A Appendix B
Item 5.5.2	Appendix A Appendix B
Item 5.5.3	Appendix A Appendix B
Item 5.5.4	Appendix A Appendix B
Item 5.5.5	Appendix A Appendix B
Item 5.5.6	Appendix A Appendix B
Item 5.6	Appendix A
Item 5.7	Appendix A
Item 5.10	Appendix A Appendix B Appendix C
Item 6.3	Appendix A Appendix B Appendix C Appendix D Appendix E
Item 6.8	Appendix A

Professional Engineers and Geoscientists of BC
www.apeg.bc.ca

TERMS OF REFERENCE

1. Name: Board of Examiners

2. Type/Reporting Relationship:

2.1 Type:
Statutory Board (Engineers and Geoscientists Act (the Act)[1] Section 15)

2.2 Reporting Relationship:
The Board is appointed by the Council and is advisory to the Registration Committee.

3. Purpose:

3.1 To examine the academic qualifications of individual candidates for admission to engineering membership or licence[2], who do not meet the requirements as set out in the Act, in Bylaws 11(e)(1) and 11(e)(7)[3] and in policies approved by the Council.

3.2 To provide advice on academic matters as required.

4. Authorities of the Board:

The Board has no authority other than as described in its Function and Deliverables.

5. Function/Deliverables:

5.1 To examine and make recommendations to the Registration Committee with respect to the academic qualifications of individual candidates for admission to engineering membership or licence, who do not meet the requirements as set out in the Act, in Bylaws 11(e)(1) and 11(e)(7) and in policies approved by the Council.

5.2 To evaluate the academic program of such candidates (see 5.1) for compliance with the Engineers Canada Uniform Syllabus of Examinations (the Syllabus)[4] and to recommend to the Registration Committee the assignment of a program of

[1] Engineers and Geoscientists Act [RSBC 1996] CHAPTER 116
[2] From the Act: Definitions and interpretation 1(1) “licence” means the official authorization given under the seal of the association that permits a nonresident person who meets the requirements of section 13(4) and (5) to practise professional engineering or professional geoscience
[3] Bylaws of the Association
[4] Engineers Canada Uniform Syllabus of Examinations is endorsed by council through policy – see http://www.engineerscanada.ca/e/pu_syllabus.cfm and http://www.apeg.bc.ca/reg/engsyllabi.html .

qualifying examinations and/or courses to address non-compliance with the Syllabus.

5.3 To make recommendations regarding candidates evaluated under APEGBC's policy on special consideration.

5.4 To advise the Registration Committee on matters of academic policy as requested by the Registration Committee, including endorsement of the Syllabus.

5.5 To provide advice to the Registration Committee on other academic matters as required.

5.6 To set or provide guidance on examination of applicants, as required.

6. Resources

6.1 Except as set out above and as allocated in the Association's annual budget, the Board has no budget authority beyond reasonable expenses for travel, teleconference or ancillary expenses.

7. Membership:

7.1 Typically, a minimum of one professional engineer member of the Association for each engineering discipline of evaluation for registration or licence. A Board member may be appointed to examine candidates from more than one discipline as appropriate.

7.2 A member of the Board of Examiners is also normally a member of an engineering faculty at a British Columbia ~~university~~ institution of higher learning.

8. Term of Office:

8.1 Appointments are normally for two years, renewable twice unless otherwise extended by the Council.

9. Selection of Officers:

9.1 Board members are appointed by Council on the recommendation of the Registration Committee.

9.2 The Associate Director, Admissions selects one of the Board members to chair the annual meeting of the Board and advises Council accordingly.

10. Quorum:

10.1 For recommendations regarding individual candidates for registration; one member may provide a recommendation to the Registration Committee

10.2 For matters of academic policy, 50% of the members.

11. Frequency of Meetings:

11.1 Meetings are held at least one time per annum or at the call of the Chair.

12. Conduct of Meetings:

12.1 The Committee may meet in person and/or by telephone conference, webcast or other electronic communications media where all members may simultaneously hear each other and participate during the meeting.

12.2 The Committee may also meet by fax, email or other electronic media where communication may not be simultaneous, provided all members of the Committee have access to the medium chosen and all communication to and from one member is broadcast to all other members of the Committee.

13. Minutes:

13.1 Minutes, notes and transmission of Board recommendations to the Registration Committee are the responsibility of the Associate Director, Admissions

13.2 Minutes involving the personal information of candidates for registration or licence are confidential.

14. Review of Terms of Reference:

14.1 The Board shall review its Terms of Reference on an annual basis and submit the results of that review to the Governance Committee on a bi-annual basis.

15. Staff Support: Associate Director, Admissions and Registration support staff.

Approved by Council:	December 2, 1987	(Minute #CO 88-37)
	November 30, 2012	(Minute #CO 13-14)
	September 8, 2017	(Minute #CO 17-XX)

ENGINEERS & GEOSCIENTISTS
BRITISH COLUMBIA

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[3] Bylaws of the Association

5.2. To evaluate the academic program of such candidates (see 5.1) for compliance with the Engineers Canada Uniform Syllabus of Examinations (the Syllabus)4 and to recommend to the Registration Committee the assignment of a program of qualifying examinations and/or courses to address non-compliance with the Syllabus.

5.3. To make recommendations regarding candidates evaluated under APEGBC's policy on special consideration.

5.4. To advise the Registration Committee on matters of academic policy as requested by the Registration Committee, including endorsement of the Syllabus.

5.5. To provide advice to the Registration Committee on other academic matters as required.

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[4] Engineers Canada Uniform Syllabus of Examinations is endorsed by council through policy – see http://www.engineerscanada.ca/e/pu_syllabus.cfm and http://www.apeg.bc.ca/reg/engsyllabi.html .

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September 9, 2017	(Minute #CO 17-XX)

Registration

● Policy ❍ Procedure

■ Policy Re: Non-Accredited Reputable International Programs

PURPOSE

Internally extend academic qualification to graduates from engineering programs from Non-Accredited Reputable International Programs based on reputable academic rankings

CREATED

BY:	Date:	Reference:
COUNCIL	September 9, 2011	CO 11
	September 8, 2017	CO XX

POLICY:

APEGBC maintains a list of Non-Accredited Reputable International Programs which:

a) Are listed on ~~CEQB Foreign Institutions Degree List or~~ the International Institutions and Degrees Database;

b) Are not considered to be substantially equivalent to be accredited under a CEAB Mutual Recognition Agreement (e.g. Washington Accord, CTI) prior to 2013; and

c) Are from universities having been listed on

i. The Top 50 institutions from the Times Higher Education World University Ranking in Engineering and Technology; and/or

ii. The Top 50 institutions from the Shanghai Jiao Tong University Academic Ranking of World Universities in Engineering; and/or

iii. The Top 50 institutions from the QS World University Rankings in Engineering and Technology

The 2017 List of Non-Accredited Reputable International Programs is provided in Table A. Please see Table B for a list of the corresponding reasons and programs offered for each of the institutions listed in Table A.

Any applicant who applied for registration prior to the approval date of this policy will continue to be assessed under the previous version of the policy. An applicant applying who graduated prior to 2017 will continue to be assessed under the previous degree title as listed on the previous version of the policy and list

This policy should be reviewed two years after the approval date.

CROSS-REFERENCES

Policy Re: Minimum Academic Requirements for Registration
Engineers and Geoscientists Act [RSBCC 1996] Chapter 116
Bylaws of the Association

Table A. List of Non-Accredited Reputable International Institutions and Degrees		
Institution	**Country**	**Degree**
Aalborg University*	Denmark	M. Sc.
Catholic University of Leuven (KU)*	Belgium	M. Sc.
Chalmers University of Technology*	Sweden	M. Sc.
Chinese University of Hong Kong	Hong Kong	B. Eng.
Delft University of Technology*	Netherlands	M. Sc.
~~Ghent University~~	~~Belgium~~	~~Ingénieur civil plus specialty*~~
~~Harbin Institute of Technology~~	~~China~~	~~B.Sc.(Eng.) or B.Eng.~~
Hong Kong Polytechnic University	Hong Kong	B. Eng.
Hong Kong University of Science and Technology	Hong Kong	B.Eng.
Huazhong University of Science and Technology	China	B. Eng.
Indian Institute of Technology Kharagpur	India	B.Tech
Karlsruhe Institute of Technology (KIT)*	Germany	M. Sc. (Eng.)
King Abdulaziz University	Saudi Arabia	B. Sc. (Eng.)
~~Korea Advanced Institute of Science and Technolo~~	~~Korea~~	~~B.Sc.(Eng.)~~
KTH Royal Institute of Technology*	Sweden	M. Sc. (Eng.)
~~Kyoto University~~	~~Japan~~	~~Kogakushi~~
Nanjing University	China	B. Eng or B. Sc (Eng)
~~Nanyang Technological University~~	~~Singapore~~	~~B.Eng.~~
~~National Cheng Kung University~~	~~Taiwan~~	~~B.Eng~~
~~National Chiao Tung University~~	~~Taiwan~~	~~B.Eng.~~
~~National Taiwan University~~	~~Taiwan~~	~~B.Sc. in (Eng.)~~
~~National Tsing Hua University~~	~~Taiwan~~	~~B.Sc. in Engineering~~
~~National University of Singapore~~	~~Singapore~~	~~B.Eng., B.Sc. (Chem. Eng.)~~
~~Osaka University~~	~~Japan~~	~~Kogakushi~~
Peking University	China	B. Eng.
~~Pohang University of Science and Technology~~	~~Korea~~	~~B.Sc.(Eng.)~~
Polytechnic Institution of Milan*	Italy	M. Sc.
~~Polytechnic University of Turin~~	~~Italy~~	~~Dottore Ing. (Laurea)*~~
RWTH Aachen University*	Germany	M. Sc. (Eng.)
~~Seoul National University~~	~~Korea~~	~~B.Sc. or B.Eng.~~
Shanghai Jiao Tong University	China	B. Sc. (Eng.)
South China University of Technology	China	B. Eng.
Southeast University	China	B. Sc. (Eng.)
Swiss Federal Institute of Technology Lausanne*	Switzerland	M. Sc.
Swiss Federal Institute of Technology Zurich*	Switzerland	M. Sc.
Technical University Munich*	Germany	M. Sc.
Technical University of Berlin (TU Berlin)*	Germany	M. Sc. (Eng.)
Technical University of Denmark*	Denmark	M. Sc.
Technion-Israel Institute of Technology	Israel	B. Sc. (Eng.)
Tel Aviv University	Israel	B. Sc. (Eng.)
~~Tohoku University~~	~~Japan~~	~~Kogakushi~~
~~Tokyo Institute of Technology~~	~~Japan~~	~~Kogakushi~~
Tsinghua University	China	B. Eng.
~~University of Hong Kong~~	~~Hong Kong~~	~~B.Eng.~~
University of Science and Technology of China	China	B.Sc. (Eng.) or B.Eng.
~~University of Tokyo~~	~~Japan~~	~~Kogakushi~~
~~University of Twente~~	~~Netherlands~~	~~Ingénieur (Ir.)*~~
Zhejiang University	China	B.Sc. (Eng.) or B.Eng.

* Under the Bologna Accord, the five year degrees have been replaced by two cycles of studies: bachelors and masters; only second cycle masters level degrees are accepted as fulfilling the academic qualification for P.Eng. registration.

Table B. List of Non-Accredited Reputable International Programs and Reasons

Institution	Programs Offered		Reason for Acceptance
Aalborg University*	1. Architectural Engineering 2. Biomedical Engineering and Informatics 3. Chemical Engineering 4. Energy Engineering 5. Entrepreneurial Engineering 6. Environmental Engineering	7. Operations and management Engineering 8. Structural and Civil Engineering 9. Sustainable Energy Engineering 10 Urban Design Engineering 11. Water and Environmental Engineering	Tong University 2016 ENG Ranked 26-50
Catholic University of Leuven (KU Leuven)*	1. Biomedical Engineering 2. Chemical Engineering 3. Electrical Engineering 4. Engineering: Energy 5. Materials Engineering	6. Mechanical Engineering 7. Mathematical Engineering 8. Nanoscience, Nanotechnology and Nano engineering 9. EIT-KIC Master in Energy	On original Reputable Program List, Tong University 2016 ENG Ranked 51-75, Times Higher Ed ENG 2016/17 Ranked 26-50
Chalmers University of Technology*	1. Automotive Engineering 2. Biomedical Engineering 3. Communication Engineering 4. Electric Power Engineering 5. Infrastructure and Environmental Engineering 6. Innovative and Sustainable Chemical Engineering	7. Materials Engineering 8. Naval Architecture and Ocean Engineering 9. Production Engineering 10. Software Engineering and Technology 11. Structural Engineering and Building Technology 12. Wireless, Photonics and Space Engineering	On original Reputable Program List, Tong University 2016 ENG Ranked 51-75
Chinese University of Hong Kong	1. Biomedical Engineering 2. Computer Engineering 3. Electronic Engineering 4. Energy and Environmental Engineering	5. Information Engineering 6. Mechanical and Automation Engineering 7. Mathematics and Information Engineering 8. Systems Engineering and Engineering Management	On original Reputable Program List, Times Higher Ed ENG 2016/17 Ranked 76-100, Tong University 2016 ENG Ranked 51-75, QS Top Uni 2017 ENG Ranked 26-50
Delft University of Technology*	1. Aerospace Engineering 2. Biomedical Engineering 3. Chemical Engineering 4. Civil Engineering 5. Computer Engineering 6. Construction Management and Engineering	7. Electrical Engineering 8. Engineering and Policy Analysis 9. Materials Science & Engineering 10. Metropolitan Analysis, Design and Engineering 11. Systems Engineering, Policy Analysis and Management	On original Reputable Program List, Tong University 2016 ENG Ranked 100-150, QS Top Uni 2017 ENG Ranked 1-25
Hong Kong Polytechnic University	1. Aviation Engineering 2. Electrical Engineering 3. Electronic and Information Engineering 4. Mechanical Engineering	5. Product and Industrial Engineering 6. Transportation Systems Engineering	On original Reputable Program List, Tong University 2016 ENG Ranked 51-75
Hong Kong University of Science and Technology	1. Chemical Engineering 2. Chemical and Bio molecular Engineering 3. Chemical and Environmental Engineering 4. Civil Engineering 5. Civil and Environmental Engineering	6. Computer Engineering 7. Computer Science Engineering 8. Electronic Engineering 9. Industrial Engineering and Logistics management 10. Aerospace Engineering 11. Mechanical Engineering 12. Computer Science	On original Reputable Program List, Times Higher Ed ENG 2016/17 Ranked 26-50, Tong University 2016 ENG Ranked 26-50, QS Top Uni 2017 ENG Ranked 1-25
Huazhong University of Science and Technology	1. Mechanical Science and Engineering 2. Electronics and Information Engineering 3. Chemical Engineering and Technology 4. Material Science and Engineering 5. Civil Engineering	6. Engineering Mechanics 7. Traffic Engineering 8. Energy and Power Engineering 9. Engineering Science 10. Environmental Science and Engineering 11. Hydropower and Information Engineering	Tong University 2016 ENG Ranked 26-50
Indian Institute of technology Kharagpur	1. Aerospace engineering 2. Agricultural and Food Engineering 3. Chemical Engineering 4. Civil Engineering 5. Computer Science and Engineering	6. Electrical Engineering 7. Industrial and Systems Engineering 8. Mechanical Engineering 9. Metallurgical and materials Engineering 10. Mining Engineering	On original Reputable Program List
Karlsruhe Institute of Technology (KIT)*	1. Electrical Engineering and Information Technologies 2. Water Science and Engineering 3. Energy Engineering 4. Green mobility Engineering	5. Electronic Systems Engineering and management 6. Service management and Engineering 7. Financial Engineering 8. Energy Engineering and Management	QS Top Uni 2017 ENG Ranked 26-50
King Abdulaziz University	1. Aeronautical Engineering 2. Chemical and Materials Engineering 3. Civil Engineering 4. Electrical and Computer Engineering	5. Industrial Engineering 6. Mechanical Engineering 7. Mining Engineering 8. Nuclear Engineering	Tong University 2016 ENG Ranked 1-25
KTH Royal Institute of Technology*	1. Civil and Architectural Engineering 2. Environmental Engineering 3. Environmental Engineering and Sustainable Infrastructure 4. Electrical Power Engineering 5. Medical Engineering 6. Innovative Sustainable Energy Engineering 7. Management and Engineering of Environment and Energy 9. Sustainable Energy Engineering 10. Computer Simulations for Science and	12. Software Engineering of Distributed Systems 13. Chemical Engineering for Energy and Environment 14. Molecular Science and Engineering 15. Engineering Materials Science 16. Aerospace Engineering 17. Engineering Design 18. Engineering Mechanics 20. Production Engineering and Management 21. Railway Engineering	QS Top Uni 2017 ENG Ranked 26-50

Registration

● Policy ○ Procedure

Institution	Programs Offered		Reason for Acceptance
Nanjing University	1. Applied Chemistry 2. Electronic Information Science and Technology 3. Communication Engineering 4. Biomedical Engineering 5. Micro- Electronics Science and Engineering 6. Optoelectronic Information Science and Engineering 7. New Energy Science and Engineering	8. Environmental Engineering 9. Hydrology and Water Resources Engineering 10. Geological Engineering 11. Digital Media Technology 12. Groundwater Science and Engineering 13. Software Engineering 14. Automation 15. Industrial Engineering 16. Information Engineering	On original Reputable Program List, Tong University 2016 ENG Ranked 100-150
Peking University	1. Biomedical Engineering 2. Energy and Resources Engineering 3. Industrial Engineering and Management 4. Materials Science and Engineering 5. Mechanics and Engineering Science 6. Energy and Resource Engineering - Water Resources	7. Energy and Resource Engineering - Clean Energy Science and Engineering 8. Energy and Resource Engineering - Efficient utilization of Resources Recycling 9. Aerospace Engineering 10. Biomedical Engineering 11. Materials Science and Engineering	On original Reputable Program List, Tong University 2016 ENG Ranked 51-75, Times Higher Ed ENG 2016/17 Ranked 26-50, QS Top Uni 2017 ENG Ranked 1-25
Polytechnic Institute of Milan*	1. Aeronautical Engineering 2. Automation and Control Engineering 3. Biomedical Engineering 4. Building and Architectural Engineering 5. Building Engineering 6. Chemical Engineering 7. Civil Engineering 8. Civil Engineering for Risk Management 9. Computer Science and Engineering 10. Design and Engineering 11. Electrical Engineering 12. Electronics Engineering	13. Energy Engineering 14. Engineering Physics 15. Environmental and Land Planning Engineering 16. Geoinformatics Engineering 17. Management Engineering 18. Materials Engineering and Nanotechnology 19. Mathematical Engineering 20. Mechanical Engineering 21. Nuclear Engineering 22. Safety and Prevention Engineering in the Process Industry 23. Space Engineering 24. [illegible]	QS Top Uni 2017 ENG Ranked 1-25
RWTH Aachen University*	1. Industrial Engineering Materials and Process Engineering 2. Metallurgical Engineering 3. Materials Engineering 4. Raw Materials Engineering 5. Civil Engineering	6. Industrial Engineering 7. Environmental Engineering 8. Mechanical Engineering 9. Computational Engineering Science	QS Top Uni 2017 ENG Ranked 26-50
Shanghai Jiao Tong University	1. Naval Architecture, Ocean and Civil Engineering 2. Mechanical Engineering 3. Materials Science and Engineering	4. Electronic, Information and Electrical Engineering 5. Chemical Engineering 6. Biomedical Engineering 7. Environmental Science and Engineering	On original Reputable Program List, Tong University 2016 ENG Ranked 1-25, QS Top Uni 2017 ENG Ranked 1-25
South China University of Technology	1. Mechanical and Automotive Engineering 2. Civil Engineering and Transportation 3. Electronic and Information Engineering 4. Automation Science and Engineering 5. Materials Science and Engineering	6. Chemical Engineering 7. Light Industry and Engineering 8. Food Science and Engineering 9. Computer Science and Engineering 10. Software Engineering 11. Environmental Science and Engineering 12. Bioscience and Bioengineering	Tong University 2016 ENG Ranked 1-25
Southeast University	1. Computer Science and Engineering 2. Information and Communication Engineering	3. Electrical Engineering	Tong University 2016 ENG Ranked 1-25
Swiss Federal Institute of Technology Lausanne*	1. Civil Engineering 2. Environmental Sciences & Engineering 3. Electrical & Electronic Engineering 4. materials Science & Engineering 5. Mechanical Engineering 6. Micro Engineering	7. Chemical Engineering & Biotechnology 8. Computational Science & Engineering 9. Nuclear Engineering 10. Bioengineering 11. Financial Engineering	On original Reputable Program List, Times Higher Ed ENG 2016/17 Ranked 26-50, QS Top Uni 2017 ENG Ranked 1-25, Tong University 2016 ENG Ranked 1-25
Swiss Federal Institute of Technology Zurich*	1. Civil Engineering 2. Environmental Engineering 3. Geomatics Engineering 4. Biomedical Engineering 5. Electrical Engineering and Information Technology	6. Mechanical Engineering 7. Nuclear Engineering 8. Process Engineering 9. Chemical and Bioengineering 10. Computational Science and Engineering	On original Reputable Program List, Tong University 2016 ENG Ranked 26-50,Times Higher Ed ENG 2016/17 Ranked 1-25, QS Top Uni 2017 ENG Ranked 1-25
Technical University Berlin (TU Berlin)*	1. Civil Engineering 2. Structural Engineering 3. Biomedical Engineering 4. Chemical Engineering 5. Computer Engineering 6. Electrical Engineering 7. Energy Engineering and Process Engineering 8. Vehicle Engineering 9. Building Energy Engineering	10. Computational Engineering Sciences 11. Mechanical Engineering 12. Patent Engineering 13. Engineering Science 14. Process Energy and Environmental Systems Engineering 15. Production Engineering 16. Naval Architecture and Ocean Engineering 17. Industrial Engineering and Management	QS Top Uni 2017 ENG Ranked 26-50
Technical University Munich*	1. Aerospace Engineering 2. Automotive Software Engineering 3. Electrical Engineering and Information Technology 4. Energy and Process Engineering 5. Ergonomics - Human Factors Engineering 6. Product Development and Engineering design 7. Mechanical Engineering and Management 8. Engineering Geology and Hydrogeology 9. Informatics: Games Engineering	10. Neuroengineering 11. Medical Technology and Engineering 12. Mathematics in Science and Engineering 13. Power Engineering 14. Physics (Applied and Engineering Physics) 15. Pharmaceutical Bioprocess Engineering 16. Environmental Planning and Ecological Engineering 17. Environmental Engineering 18. Software engineering	On original Reputable Program List, Tong University 2016 ENG Ranked 51-75, Times Higher Ed ENG 2016/17 Ranked 26-50, QS Top Uni 2017 ENG Ranked 1-25

Institution	Programs Offered	Reason for Acceptance
Technical University of Denmark*	1. Architectural Engineering 2. Biomedical Engineering 3. Chemical and Biochemical Engineering 4. Civil Engineering 5. Computer Science and Engineering 6. Digital Media Engineering 7. Earth and Space Physics and Engineering 8. Electrical Engineering 9. Engineering Acoustics 10. Engineering Design and Applied Mechanics 11. Environmental Engineering 12. Industrial Engineering and Management 13. Materials and Manufacturing Engineering 14. Petroleum Engineering 15. Pharmaceutical Design and Engineering 16. Photonics Engineering	On original Reputable Program List, Tong University 2016 ENG Ranked 26-50, QS Top Uni 2017 ENG Ranked 26-50
Technion-Israel Institute of Technology	1. Civil and Environmental Engineering 2. Mechanical Engineering 3. Electrical Engineering 4. Chemical Engineering 5. Biotechnology and Food Engineering 6. Aerospace Engineering 7. Industrial Engineering and Management 8. Materials Engineering 9. Biomedical Engineering	On original Reputable Program List, Tong University 2016 ENG Ranked 51-75
Tel Aviv University	1. Electrical and Electronics Engineering 2. Electrical and Electronics Engineering and Computer Science 3. Mechanical Engineering 4. Biomedical Engineering 5. Industrial Engineering 6. Materials Science and Engineering	On original Reputable Program List, Tong University 2016 ENG Ranked 51-75
Tsinghua University	1. Civil Engineering 2. Mechanical Engineering 3. Hydraulic and Hydropower Engineering 4. Hydro science and Engineering 5. Environmental Engineering 6. Water Supply and Wastewater Engineering 7. Micro-electro-mechanical Systems Engineering 8. Vehicle Engineering 9. Industrial Engineering 10. Energy and Power Engineering 11. Engineering Mechanics 12. Electronic Information Engineering 13. Microelectronics Science and Engineering 14. Software Engineering 15. Engineering Physics 16. Nuclear Engineering and Nuclear Technology 17. Chemical Engineering and Industrial Biological Engineering 18. Polymer Materials and Engineering 19. Materials Science and Engineering 20. Biomedical Engineering	On original Reputable Program List, Tong University 2016 ENG Ranked 1-25, Times Higher Ed ENG 2016/17 Ranked 26-50, QS Top Uni 2017 ENG Ranked 1-25
University of Science and Technology of China	1. Polymer Materials and Engineering 2. Precision machinery and Instrumentation 3. Thermal Science and Energy Engineering 4. Safety Science Engineering 5. Electronic Engineering and Information Science 6. Automation Engineering 7. Information Security Engineering 8. Nuclear Science and Technology Engineering 9. Software Engineering 10. Optics and Optical Engineering 11. Materials Science and Engineering 12. Engineering Science	On original Reputable Program List, Tong University 2016 ENG Ranked 26-50
Zhejiang University	1. Mechanical Engineering 2. Energy Engineering 3. Chemical and Biological Engineering 4. Polymer Science and Engineering 5. Materials Science and Engineering 6. Civil Engineering and Architecture 7. Electrical Engineering 8. Optical Science and Engineering 9. Information Science and Electronic Engineering 10. Control Science and Engineering 11. Biomedical Engineering and Instrument Science 12. Bio systems Engineering and Food Science	On original Reputable Program List, Tong University 2016 ENG Ranked 1-25, QS Top Uni 2017 ENG Ranked 26-50

ENGINEERS & GEOSCIENTISTS
BRITISH COLUMBIA

POLICY	Non-Accredited Reputable International Programs
DATE OF POLICY	September 9, 2011
APPROVED BY	Council (CO-11)

POLICY STATEMENT

A list of Non-Accredited Reputable International Programs is maintained by Engineers and Geoscientists British Columbia. This policy outlines the rationale used to establish this list.

PURPOSE

Internally extend academic qualification to graduates from engineering programs from Non-Accredited Reputable International Programs based on reputable academic rankings

APPLICATION AND SCOPE

Engineers and Geoscientists BC maintains a list of Non-Accredited Reputable International Programs which:

a) Are listed on CEQB Foreign Institutions Degree List or the International Institutions and Degrees Database;

b) Are not considered to be substantially equivalent to be accredited under a CEAB Mutual Recognition Agreement (e.g. Washington Accord, CTI) prior to 2013; and

c) Are from universities having been listed on

   i. The Top 50 institutions from the Times Higher Education World University Ranking in Engineering and Technology; and/or

   ii. The Top 50 institutions from the Shanghai Jiao Tong University Academic Ranking of World Universities in Engineering; and/or

   iii. The Top 50 institutions from the QS World University Rankings in Engineering and Technology

The 2017 List of Non-Accredited Reputable International Programs is provided in Table A. Please see Table B for a list of the corresponding reasons and programs offered for each of the institutions listed in Table A.

Any applicant who applied for registration prior to the approval date of this policy will continue to be assessed under the previous version of the policy. An applicant applying who graduated prior to 2017 will continue to be assessed under the previous degree title as listed on the previous version of the policy and list

This policy should be reviewed two years after the approval date.

CROSS REFERENCE

Policy Re: Minimum Academic Requirements for Registration

Engineers and Geoscientists Act, [RSBCC 1996] Chapter 116

Bylaws of the Association

REVIEW DATES

By Council September 9, 2011 (CO-11)

By Council September 8, 2017 (CO-XX)

Table A. List of Non-Accredited Reputable International Institutions and Degrees		
Institution	**Country**	**Degree**
Aalborg University*	Denmark	M. Sc.
Catholic University of Leuven (KU)*	Belgium	M. Sc.
Chalmers University of Technology*	Sweden	M. Sc.
Chinese University of Hong Kong	Hong Kong	B. Eng.
Delft University of Technology*	Netherlands	M. Sc.
Hong Kong Polytechnic University	Hong Kong	B. Eng.
Hong Kong University of Science and Technology	Hong Kong	B.Eng.
Huazhong University of Science and Technology	China	B. Eng.
Indian Institute of Technology Kharagpur	India	B.Tech
Karlsruhe Institute of Technology (KIT)*	Germany	M. Sc. (Eng.)
King Abdulaziz University	Saudi Arabia	B. Sc. (Eng.)
KTH Royal Institute of Technology*	Sweden	M. Sc. (Eng.)
Nanjing University	China	B. Eng or B. Sc (Eng)
Peking University	China	B. Eng.
Polytechnic Institution of Milan*	Italy	M. Sc.
RWTH Aachen University*	Germany	M. Sc. (Eng.)
Shanghai Jiao Tong University	China	B. Sc. (Eng.)
South China University of Technology	China	B. Eng.
Southeast University	China	B. Sc. (Eng.)
Swiss Federal Institute of Technology Lausanne*	Switzerland	M. Sc.
Swiss Federal Institute of Technology Zurich*	Switzerland	M. Sc.
Technical University Munich*	Germany	M. Sc.
Technical University of Berlin (TU Berlin)*	Germany	M. Sc. (Eng.)
Technical University of Denmark*	Denmark	M. Sc.
Technion-Israel Institute of Technology	Israel	B. Sc. (Eng.)
Tel Aviv University	Israel	B. Sc. (Eng.)
Tsinghua University	China	B. Eng.
University of Science and Technology of China	China	B.Sc. (Eng.) or B.Eng.
Zhejiang University	China	B.Sc. (Eng.) or B.Eng.

* Under the Bologna Accord, the five year degrees have been replaced by two cycles of studies: bachelors and masters; only second cycle masters level degrees are accepted as fulfilling the academic qualification for P.Eng. registration.

Table B. List of Non-Accredited Reputable International Programs and Reasons

Institution	Programs Offered		Reason for Acceptance
Aalborg University*	1. Architectural Engineering 2. Biomedical Engineering and Informatics 3. Chemical Engineering 4. Energy Engineering 5. Entrepreneurial Engineering 6. Environmental Engineering	7. Operations and management Engineering 8. Structural and Civil Engineering 9. Sustainable Energy Engineering 10 Urban Design Engineering 11. Water and Environmental Engineering	Tong University 2016 ENG Ranked 26-50
Catholic University of Leuven (KU Leuven)*	1. Biomedical Engineering 2. Chemical Engineering 3. Electrical Engineering 4. Engineering: Energy 5. Materials Engineering	6. Mechanical Engineering 7. Mathematical Engineering 8. Nanoscience, Nanotechnology and Nano engineering 9. EIT-KIC Master in Energy	On original Reputable Program List, Tong University 2016 ENG Ranked 51-75, Times Higher Ed ENG 2016/17 Ranked 26-50
Chalmers University of Technology*	1. Automotive Engineering 2. Biomedical Engineering 3. Communication Engineering 4. Electric Power Engineering 5. Infrastructure and Environmental Engineering 6. Innovative and Sustainable Chemical Engineering	7. Materials Engineering 8. Naval Architecture and Ocean Engineering 9. Production Engineering 10. Software Engineering and Technology 11. Structural Engineering and Building Technology 12. Wireless, Photonics and Space Engineering	On original Reputable Program List, Tong University 2016 ENG Ranked 51-75
Chinese University of Hong Kong	1. Biomedical Engineering 2. Computer Engineering 3. Electronic Engineering 4. Energy and Environmental Engineering	5. Information Engineering 6. Mechanical and Automation Engineering 7. Mathematics and Information Engineering 8. Systems Engineering and Engineering Management	On original Reputable Program List, Times Higher Ed ENG 2016/17 Ranked 76-100, Tong University 2016 ENG Ranked 51-75, QS Top Uni 2017 ENG Ranked 26-50
Delft University of Technology*	1. Aerospace Engineering 2. Biomedical Engineering 3. Chemical Engineering 4. Civil Engineering 5. Computer Engineering 6. Construction Management and Engineering	7. Electrical Engineering 8. Engineering and Policy Analysis 9. Materials Science & Engineering 10. Metropolitan Analysis, Design and Engineering 11. Systems Engineering, Policy Analysis and Management	On original Reputable Program List, Tong University 2016 ENG Ranked 100-150, QS Top Uni 2017 ENG Ranked 1-25
Hong Kong Polytechnic University	1. Aviation Engineering 2. Electrical Engineering 3. Electronic and Information Engineering 4. Mechanical Engineering	5. Product and Industrial Engineering 6. Transportation Systems Engineering	On original Reputable Program List, Tong University 2016 ENG Ranked 51-75
Hong Kong University of Science and Technology	1. Chemical Engineering 2. Chemical and Bio molecular Engineering 3. Chemical and Environmental Engineering 4. Civil Engineering 5. Civil and Environmental Engineering	6. Computer Engineering 7. Computer Science Engineering 8. Electronic Engineering 9. Industrial Engineering and Logistics management 10. Aerospace Engineering 11. Mechanical Engineering 12. Computer Science	On original Reputable Program List, Times Higher Ed ENG 2016/17 Ranked 26-50, Tong University 2016 ENG Ranked 26-50, QS Top Uni 2017 ENG Ranked 1-25
Huazhong University of Science and Technology	1. Mechanical Science and Engineering 2. Electronics and Information Engineering 3. Chemical Engineering and Technology 4. Material Science and Engineering 5. Civil Engineering	6. Engineering Mechanics 7. Traffic Engineering 8. Energy and Power Engineering 9. Engineering Science 10. Environmental Science and Engineering 11. Hydropower and Information Engineering	Tong University 2016 ENG Ranked 26-50
Indian Institute of technology Kharagpur	1. Aerospace engineering 2. Agricultural and Food Engineering 3. Chemical Engineering 4. Civil Engineering 5. Computer Science and Engineering	6. Electrical Engineering 7. Industrial and Systems Engineering 8. Mechanical Engineering 9. Metallurgical and materials Engineering 10. Mining Engineering	On original Reputable Program List
Karlsruhe Institute of Technology (KIT)*	1. Electrical Engineering and Information Technologies 2. Water Science and Engineering 3. Energy Engineering 4. Green mobility Engineering	5. Electronic Systems Engineering and management 6. Service management and Engineering 7. Financial Engineering 8. Energy Engineering and Management	QS Top Uni 2017 ENG Ranked 26-50
King Abdulaziz University	1. Aeronautical Engineering 2. Chemical and Materials Engineering 3. Civil Engineering 4. Electrical and Computer Engineering	5. Industrial Engineering 6. Mechanical Engineering 7. Mining Engineering 8. Nuclear Engineering	Tong University 2016 ENG Ranked 1-25
KTH Royal Institute of Technology*	1. Civil and Architectural Engineering 2. Environmental Engineering 3. Environmental Engineering and Sustainable Infrastructure 4. Electrical Power Engineering 5. Medical Engineering 6. Innovative Sustainable Energy Engineering 7. Management and Engineering of Environment and Energy 8. Nuclear Energy Engineering 9. Sustainable Energy Engineering 10. Computer Simulations for Science and Engineering 11. Engineering Physics	12. Software Engineering of Distributed Systems 13. Chemical Engineering for Energy and Environment 14. Molecular Science and Engineering 15. Engineering Materials Science 16. Aerospace Engineering 17. Engineering Design 18. Engineering Mechanics 19. Maritime Engineering 20. Production Engineering and Management 21. Railway Engineering 22. Vehicle Engineering	QS Top Uni 2017 ENG Ranked 26-50

Institution	Programs Offered		Reason for Acceptance
Nanjing University	1. Applied Chemistry 2. Electronic Information Science and Technology 3. Communication Engineering 4. Biomedical Engineering 5. Micro- Electronics Science and Engineering 6. Optoelectronic Information Science and Engineering 7. New Energy Science and Engineering	8. Environmental Engineering 9. Hydrology and Water Resources Engineering 10. Geological Engineering 11. Digital Media Technology 12. Groundwater Science and Engineering 13. Software Engineering 14. Automation 15. Industrial Engineering 16. Information Engineering	On original Reputable Program List, Tong University 2016 ENG Ranked 100-150
Peking University	1. Biomedical Engineering 2. Energy and Resources Engineering 3. Industrial Engineering and Management 4. Materials Science and Engineering 5. Mechanics and Engineering Science 6. Energy and Resource Engineering - Water Resources	7. Energy and Resource Engineering - Clean Energy Science and Engineering 8. Energy and Resource Engineering - Efficient utilization of Resources Recycling 9. Aerospace Engineering 10. Biomedical Engineering 11. Materials Science and Engineering	On original Reputable Program List, Tong University 2016 ENG Ranked 51-75, Times Higher Ed ENG 2016/17 Ranked 26-50, QS Top Uni 2017 ENG Ranked 1-25
Polytechnic Institute of Milan*	1. Aeronautical Engineering 2. Automation and Control Engineering 3. Biomedical Engineering 4. Building and Architectural Engineering 5. Building Engineering 6. Chemical Engineering 7. Civil Engineering 8. Civil Engineering for Risk Management 9. Computer Science and Engineering 10. Design and Engineering 11. Electrical Engineering 12. Electronics Engineering	13. Energy Engineering 14. Engineering Physics 15. Environmental and Land Planning Engineering 16. Geoinformatics Engineering 17. Management Engineering 18. Materials Engineering and Nanotechnology 19. Mathematical Engineering 20. Mechanical Engineering 21. Nuclear Engineering 22. Safety and Prevention Engineering in the Process Industry 23. Space Engineering	QS Top Uni 2017 ENG Ranked 1-25
RWTH Aachen University*	1. Industrial Engineering Materials and Process Engineering 2. Metallurgical Engineering 3. Materials Engineering 4. Raw Materials Engineering 5. Civil Engineering	6. Industrial Engineering 7. Environmental Engineering 8. Mechanical Engineering 9. Computational Engineering Science	QS Top Uni 2017 ENG Ranked 26-50
Shanghai Jiao Tong University	1. Naval Architecture, Ocean and Civil Engineering 2. Mechanical Engineering 3. Materials Science and Engineering	4. Electronic, Information and Electrical Engineering 5. Chemical Engineering 6. Biomedical Engineering 7. Environmental Science and Engineering	On original Reputable Program List, Tong University 2016 ENG Ranked 1-25, QS Top Uni 2017 ENG Ranked 1-25
South China University of Technology	1. Mechanical and Automotive Engineering 2. Civil Engineering and Transportation 3. Electronic and Information Engineering 4. Automation Science and Engineering 5. Materials Science and Engineering	6. Chemical Engineering 7. Light Industry and Engineering 8. Food Science and Engineering 9. Computer Science and Engineering 10. Software Engineering 11. Environmental Science and Engineering 12. Bioscience and Bioengineering	Tong University 2016 ENG Ranked 1-25
Southeast University	1. Computer Science and Engineering 2. Information and Communication Engineering	3. Electrical Engineering	Tong University 2016 ENG Ranked 1-25
Swiss Federal Institute of Technology Lausanne*	1. Civil Engineering 2. Environmental Sciences & Engineering 3. Electrical & Electronic Engineering 4. materials Science & Engineering 5. Mechanical Engineering 6. Micro Engineering	7. Chemical Engineering & Biotechnology 8. Computational Science & Engineering 9. Nuclear Engineering 10. Bioengineering 11. Financial Engineering	On original Reputable Program List, Times Higher Ed ENG 2016/17 Ranked 26-50, QS Top Uni 2017 ENG Ranked 1-25, Tong University 2016 ENG Ranked 1-25
Swiss Federal Institute of Technology Zurich*	1. Civil Engineering 2. Environmental Engineering 3. Geomatics Engineering 4. Biomedical Engineering 5. Electrical Engineering and Information Technology	6. Mechanical Engineering 7. Nuclear Engineering 8. Process Engineering 9. Chemical and Bioengineering 10. Computational Science and Engineering	On original Reputable Program List, Tong University 2016 ENG Ranked 26-50,Times Higher Ed ENG 2016/17 Ranked 1-25, QS Top Uni 2017 ENG Ranked 1-25
Technical University Berlin (TU Berlin)*	1. Civil Engineering 2. Structural Engineering 3. Biomedical Engineering 4. Chemical Engineering 5. Computer Engineering 6. Electrical Engineering 7. Energy Engineering and Process Engineering 8. Vehicle Engineering 9. Building Energy Engineering	10. Computational Engineering Sciences 11. Mechanical Engineering 12. Patent Engineering 13. Engineering Science 14. Process Energy and Environmental Systems Engineering 15. Production Engineering 16. Naval Architecture and Ocean Engineering 17. Industrial Engineering and Management	QS Top Uni 2017 ENG Ranked 26-50
Technical University Munich*	1. Aerospace Engineering 2. Automotive Software Engineering 3. Electrical Engineering and Information Technology 4. Energy and Process Engineering 5. Ergonomics - Human Factors Engineering 6. Product Development and Engineering design 7. Mechanical Engineering and Management 8. Engineering Geology and Hydrogeology 9. Informatics: Games Engineering	10. Neuroengineering 11. Medical Technology and Engineering 12. Mathematics in Science and Engineering 13. Power Engineering 14. Physics (Applied and Engineering Physics) 15. Pharmaceutical Bioprocess Engineering 16. Environmental Planning and Ecological Engineering 17. Environmental Engineering 18. Software engineering	On original Reputable Program List, Tong University 2016 ENG Ranked 51-75, Times Higher Ed ENG 2016/17 Ranked 26-50, QS Top Uni 2017 ENG Ranked 1-25

Institution	Programs Offered		Reason for Acceptance
Technical University of Denmark*	1. Architectural Engineering 2. Biomedical Engineering 3. Chemical and Biochemical Engineering 4. Civil Engineering 5. Computer Science and Engineering 6. Digital Media Engineering 7. Earth and Space Physics and Engineering 8. Electrical Engineering	9. Engineering Acoustics 10. Engineering Design and Applied Mechanics 11. Environmental Engineering 12. Industrial Engineering and Management 13. Materials and Manufacturing Engineering 14. Petroleum Engineering 15. Pharmaceutical Design and Engineering 16. Photonics Engineering	On original Reputable Program List, Tong University 2016 ENG Ranked 26-50, QS Top Uni 2017 ENG Ranked 26-50
Technion-Israel Institute of Technology	1. Civil and Environmental Engineering 2. Mechanical Engineering 3. Electrical Engineering 4. Chemical Engineering 5. Biotechnology and Food Engineering	6. Aerospace Engineering 7. Industrial Engineering and Management 8. Materials Engineering 9. Biomedical Engineering	On original Reputable Program List, Tong University 2016 ENG Ranked 51-75
Tel Aviv University	1. Electrical and Electronics Engineering 2. Electrical and Electronics Engineering and Computer Science 3. Mechanical Engineering	4. Biomedical Engineering 5. Industrial Engineering 6. Materials Science and Engineering	On original Reputable Program List, Tong University 2016 ENG Ranked 51-75
Tsinghua University	1. Civil Engineering 2. Mechanical Engineering 3. Hydraulic and Hydropower Engineering 4. Hydro science and Engineering 5. Environmental Engineering 6. Water Supply and Wastewater Engineering 7. Micro-electro-mechanical Systems Engineering 8. Vehicle Engineering 9. Industrial Engineering 10. Energy and Power Engineering	11. Engineering Mechanics 12. Electronic Information Engineering 13. Microelectronics Science and Engineering 14. Software Engineering 15. Engineering Physics 16. Nuclear Engineering and Nuclear Technology 17. Chemical Engineering and Industrial Biological Engineering 18. Polymer Materials and Engineering 19. Materials Science and Engineering 20. Biomedical Engineering	On original Reputable Program List, Tong University 2016 ENG Ranked 1-25, Times Higher Ed ENG 2016/17 Ranked 26-50, QS Top Uni 2017 ENG Ranked 1-25
University of Science and Technology of China	1. Polymer Materials and Engineering 2. Precision machinery and Instrumentation 3. Thermal Science and Energy Engineering 4. Safety Science Engineering 5. Electronic Engineering and Information Science 6. Automation Engineering	7. Information Security Engineering 8. Nuclear Science and Technology Engineering 9. Software Engineering 10. Optics and Optical Engineering 11. Materials Science and Engineering 12. Engineering Science	On original Reputable Program List, Tong University 2016 ENG Ranked 26-50
Zhejiang University	1. Mechanical Engineering 2. Energy Engineering 3. Chemical and Biological Engineering 4. Polymer Science and Engineering 5. Materials Science and Engineering 6. Civil Engineering and Architecture	7. Electrical Engineering 8. Optical Science and Engineering 9. Information Science and Electronic Engineering 10. Control Science and Engineering 11. Biomedical Engineering and Instrument Science 12. Bio systems Engineering and Food Science	On original Reputable Program List, Tong University 2016 ENG Ranked 1-25, QS Top Uni 2017 ENG Ranked 26-50

Registration

● Policy ❍ Procedure

■ Selection and Training of Registration Volunteers and Staff

PURPOSE

Volunteer training and allocation of adequate resources to this training is essential to ensure fair, equitable and consistent application of the Act and Bylaws and Registration Policies.

CREATED

BY:	Date:	Reference:
COUNCIL	December 7, 2007	CO 08-21
COUNCIL	September 14, 2012	CO 12-111[1]
COUNCIL	November 27, 2015	CO 16-10
COUNCIL	November 25, 2016	CO 17-28

POLICY:

The Act and Bylaws will be applied in a manner that is fair and equitable. Experience Review Panel members, Competency Assessors, Reviewers, Interviewers, the Registration Committee and others responsible for making recommendations on the qualification of applicants for registration will follow a predictable and uniform approach to evaluation of applicants according to APEGBC policies and internal procedures

APEGBC staff and volunteers will be given adequate training to ensure they are qualified and knowledgeable of legislation, policies and procedures affecting the registration process, the applicants they are evaluating, and the environment in which they are operating.

Experience Review Panel members including Competency Assessors and EIT/GIT online reviewers will be professional engineers, professional geoscientists, or engineering or geoscience licensees registered or licensed in a Canadian jurisdiction. They should have, at a minimum:

a. five years of experience as a professional engineer or professional geoscientist or engineering or geoscience licensee in their stated field or scope of practice; and

b. completed appropriate training in the conduct of experience reviews (including competency assessments) and the application of APEGBC policy.

In the case that an exceptional candidate is found, who has less than the minimum required number of years of experience, they will be brought to the Registration Committee for discussion and possible approval.

Interviewers should also have, at a minimum:

[11] Consequential change re: renaming of Applications Committee to Experience Review Panel

a. five years of experience as a professional engineer or professional geoscientist or engineering or geoscience licensee in their stated field or scope of practice;

b. acted as observer/interviewer at least two interviews prior to acting as a primary interviewer or chair of an interview; and

c. completed appropriate training in the conduct of experience reviews (including competency assessments) and the application of APEGBC policy.

In the case that an exceptional candidate is found, who has less than the minimum required number of years of experience, they will be brought to the Registration Committee for discussion and possible approval.

APEGBC will allocate sufficient staff, information technology, trainer and training support resources to ensure compliance with this policy.

ENGINEERS & GEOSCIENTISTS
BRITISH COLUMBIA

POLICY	Selection and Training of Registration Volunteers and Staff
DATE OF POLICY	November 25, 2016
APPROVED BY	Council (CO-17-XX)

POLICY STATEMENT

Volunteers for the positions of Experience Review Panel members including Competency Assessors and EIT/GIT online reviewers as well as interviewers shall meet the requirements set out in this polic

PURPOSE

Volunteer training and allocation of adequate resources to this training is essential to ensure fair, equitable and consistent application of the Act and Bylaws and Registration Policies.

APPLICATION AND SCOPE

The Act and Bylaws will be applied in a manner that is fair and equitable. Experience Review Panel members, Competency Assessors, Reviewers, Interviewers, the Registration Committee and others responsible for making recommendations on the qualification of applicants for registration will follow a predictable and uniform approach to evaluation of applicants according to Engineers and Geoscientists BC policies and internal procedures

Engineers and Geoscientists BC staff and volunteers will be given adequate training to ensure they are qualified and knowledgeable of legislation, policies and procedures affecting the registration process, the applicants they are evaluating, and the environment in which they are operating.

will be professional engineers, professional geoscientists, or engineering or geoscience licensees registered or licensed in a Canadian jurisdiction. They should have, at a minimum:

a. five years of experience as a professional engineer or professional geoscientist or engineering or geoscience licensee in their stated field or scope of practice; and

b. completed appropriate training in the conduct of experience reviews (including competency assessments) and the application of Engineers and Geoscientists BC policy.

In the case that an exceptional candidate is found, who has less than the minimum required number of years of experience, they will be brought to the Registration Committee for discussion and possible approval.

Interviewers should also have, at a minimum:

a. five years of experience as a professional engineer or professional geoscientist or engineering or geoscience licensee in their stated field or scope of practice;

b. acted as observer/interviewer at least two interviews prior to acting as a primary interviewer or chair of an interview; and

c. completed appropriate training in the conduct of experience reviews (including competency assessments) and the application of Engineers and Geoscientists BC policy.

In the case that an exceptional candidate is found, who has less than the minimum required number of years of experience, they will be brought to the Registration Committee for discussion and possible approval.

Engineers and Geoscientists BC will allocate sufficient staff, information technology, trainer and training support resources to ensure compliance with this policy.

REVIEW DATES

By Council December 7, 2007 (CO 08-21)

By Council September 14, 2012 (CO 12-111)

By Council November 27, 2015 (CO 16-10)

By Council November 25, 2016 (CO 17-28)

Transition to Competency-Based Reporting of Engineering Experience

PURPOSE

To set out end-of-transition requirements for the conditions under which Engineers-in-Training and applicants for professional engineer registration or licence must report their experience in accordance with Council's Competency Framework, using APEGBC's online competency-based reporting and assessment system.

CREATED

BY:	Date:	Reference:
Council	February 13, 2015	CO 15-34
	September 8, 2018	~~CO 17-XX~~

POLICY:

Effective September 8, 2017, applicants for professional engineer registration or licence ~~The following individuals~~ are required to report qualifying experience for registration in accordance the APEGC Competency Framework, using APEGBC's online competency-based reporting and assessment system in accordance with the following end-of-transition schedule.

With the exception of those listed as exempt from this policy, all applicants:
:

(i.) who apply for registration, or licence after September 8, 2017 will be required to complete a competency assessment

(ii.) whose application status is inactive will be required to complete a competency assessment when they reactivate their applications, whether or not they previously have submitted experience details using the Satisfactory Engineering Experience template;

(iii.) who have not submitted any experience details or the required references as of January 1, 2018 will be required to complete a competency assessment; and

(iv.) who were assigned experience prior to January 1, 2016 and have not reapplied for registration as of September 8, 2017 will be advised that they must a. submit their updated experience using the Satisfactory Engineering Experience template and b. provide references by January 1, 2018, failing which they will be required to complete a competency assessment when they reapply for registration; and

(v.) effective July 1 2019, must complete a competency assessment, regardless of their prior experience reporting route or status of their experience reporting – including those whose experience was approved using the Satisfactory Engineering Experience template; but who have not completed academic examinations, the Professional Practice Examination of the Professional Engineering and Geoscience Practice in BC Seminar.

All affected applicants will be informed of these changes after approval by Council of the policy.

~~1. all applicants for Professional Engineer registration or licence whose application is received on or after April 1, 2015; and~~
~~2. current Members-in-Training and other who have applied for registration or licence as a professional engineer prior to April 1, 2015 and who, at April 1, 2015 have two or fewer years of experience following graduation from a university level engineering, geoscience, technology or science program.~~

Exceptions

The following applicants are exempt from the above requirements~~ in 1 and 2 above~~:

a. applicants currently registered or licensed as professional engineers in good standing in another jurisdiction in Canada;
b. applicants eligible to apply under an Engineers Canada full professional mobility agreement with Engineers Ireland, Engineers Australia or the Hong Kong Institution of Engineers.
c. U.S. Professional Engineers who hold a current state board licence and provide a current NCEES Record to APEGBC;
d. applicants who are not required to complete a competency assessment in accordance with the Return to Practice Policy
~~e. Members-in-Training who are reporting experience on the EIT/GIT online experience reporting system until 2016; and~~

~~*Current Applicants Continue to Report Experience using Either Method*~~
~~Except as detailed above, applicants who apply for professional engineer registration or licence prior to April.1, 2015 will be permitted to continue to report qualifying experience for registration using the Satisfactory Engineering Experience template (traditional experience reporting) or the APEGBC Competency Framework.~~

~~*Transition of Version 1 Competency Tool Users to Version 2*~~
~~Applicants and Engineers-in-Training reporting experience in accordance with APEGBC's Competency Framework using Version 1 (2012) of the online reporting and assessment tool will be permitted to continue with Version1 to complete and submit their competency assessment by the date that Version 1 ceases to be supported; failing which they will be transitioned to Version 2 (2015).~~

EITs in other Jurisdictions
Engineers-in-Training from other Canadian jurisdictions who have been receiving credit for experience with their home jurisdiction will be encouraged to continue on that system until their experience has been approved for registration as a professional engineer.

~~*Advising Affected Applicants and Engineers in Training*~~
~~In addition to publicizing this policy on APEGBC's Website and other publications to members, all current Engineers-in-Training, applicants fewer than 2 years past post-secondary graduation, and Version 1 Competency Tool users will be individually contacted and advised of these requirements following approval of this policy.~~

~~*Policy Review & Update*~~

~~This policy will be reviewed in two years with respect to the cohort of applicants and their experience reporting and progress, and to establish a date by which traditional experience reporting will conclude.~~

CROSS REFERENCES

Guidelines for Developing and Implementing Registration Policy

~~APEBC~~ Engineers and Geoscientists BC Competency Framework

~~APEGBC~~ Engineers and Geoscientists BC Satisfactory Engineering Experience Guideline

Registration Committee Policy re: Phase out of EIT/GIT Online Experience Reporting System

Engineers and Geoscientists BC Return to Practice Policy

ENGINEERS & GEOSCIENTISTS
BRITISH COLUMBIA

POLICY	Transition to Competency-Based Reporting of Engineering Experience
DATE OF POLICY	September 8, 2017
APPROVED BY	Council (CO-17-XX)

POLICY STATEMENT

All applicants for Professional Engineer registration or licence must report their experience in accordance with the method set out in this policy.

PURPOSE

To set out end-of-transition requirements for the conditions under which Engineers-in-Training and applicants for professional engineer registration or licence must report their experience in accordance with Council's Competency Framework, using APEGBC's online competency-based reporting and assessment system.

APPLICATION AND SCOPE

Effective September 8, 2017, applicants for professional engineer registration or licence are required to report qualifying experience for registration in accordance the APEGC Competency Framework, using APEGBC's online competency-based reporting and assessment system in accordance with the following end-of-transition schedule.

With the exception of those listed as exempt from this policy, all applicants:

i. who apply for registration, or licence after September 8, 2017 will be required to complete a competency assessment;

ii. whose application status is inactive will be required to complete a competency assessment when they reactivate their applications, whether or not they previously have submitted experience details using the Satisfactory Engineering Experience template;

iii. who have not submitted any experience details or the required references as of January 1, 2018 will be required to complete a competency assessment;

iv. who were assigned experience prior to January 1, 2016 and have not reapplied for registration as of September 8, 2017 will be advised that they must a. submit their updated experience using the Satisfactory Engineering Experience template and b. provide references by January 1, 2018, failing which they will be required to complete a competency assessment when they reapply for registration; and

v. effective July 1 2019, must complete a competency assessment, regardless of their prior experience reporting route or status of their experience reporting – including those whose experience was approved using the Satisfactory Engineering Experience template; but who have not completed academic examinations, the Professional Practice Examination of the Professional Engineering and Geoscience Practice in BC Seminar.

All affected applicants will be informed of these changes after approval of the policy by Council.

Exceptions

The following applicants are exempt from the above requirements:

a. applicants currently registered or licensed as professional engineers in good standing in another jurisdiction in Canada;
b. applicants eligible to apply under an Engineers Canada full professional mobility agreement with Engineers Ireland, Engineers Australia or the Hong Kong Institution of Engineers.
c. U.S. Professional Engineers who hold a current state board licence and provide a current NCEES Record to APEGBC;
d. applicants who are not required to complete a competency assessment in accordance with the Return to Practice Policy

EITs in other Jurisdictions

Engineers-in-Training from other Canadian jurisdictions who have been receiving credit for experience with their home jurisdiction will be encouraged to continue on that system until their experience has been approved for registration as a professional engineer.

CROSS REFERENCES

Guidelines for Developing and Implementing Registration Policy

Engineers and Geoscientists BC Competency Framework

Engineers and Geoscientists BC Satisfactory Engineering Experience Guideline

Registration Committee Policy re: Phase out of EIT/GIT Online Experience Reporting System

Engineers and Geoscientists BC Return to Practice Policy

REVIEW DATES

By Council September 8, 2017 (CO 17-XX)

By Council February 3, 2015 (CO 15-34)

Registration

● Policy ○ Procedure

■ Currency of Experience

PURPOSE	To provide meaning to the currency of experience requirement in the evaluation of an applicant's experience pursuant to the Bylaws of the Association (the "Bylaws").		
CREATED	BY: COUNCIL	Date:	Reference:

POLICY AND PROCEDURE:

For experience to be valid for registration, the applicant must show that his or her engineering or geoscience experience is current, in order for the applicant to demonstrate familiarity with current Canadian codes, legislation, technical standards and regulations.

The following outlines the pathways for applicants whose experience was not directly preceding his or her application.

a) If the applicant has four (4) years of experience within the last seven (7) years immediately preceding the application date and two (2) of those four (4) years of experience occurred within the last four (4) years immediately preceding the application date, he or she must:
   - Provide a letter of explanation as to why the member does not have experience to report during all of this time period;
   - Supply an updated professional experience record, for review by the Council; and
   - Supply professional references who can attest to the character and practice competency of the member or former member;

b) If the applicant has four (4) years of experience within the seven (7) years immediately preceding the application date but does not have any experience to report in the last four (4) years immediately preceding the application date, he or she must:
   - Provide a letter of explanation as to why the member does not have experience to report during all of this time period;
   - Supply an updated professional experience record, for review by the Council;
   - Supply professional references who can attest to the character and practice competency of the member or former member;
   - Write and pass the Professional Practice Examination if not written and passed previously; and
   - Work under professional supervision for a period and on such terms as set by the Council and provide references from a professional supervisor.

c) If the applicant does not have any experience to report in the seven (7) years immediately preceding the application date, then the applicant's experience does not meet the required standard.

The Association reserves the right to deny credit for experience gained early in the career of an applicant whose work has since been outside the profession.

Please note that applicants must meet all other standards for registration prior to admission to membership.

Applicants, who apply for professional registration or licence prior to the approval date of this policy, will be permitted to continue their application pursuant to the previous Currency of Experience Policy wording that "experience must be current to be meaningful."

CROSS REFERENCES:

APEGBC – List of all key Competencies & Generic Indicators

Previous Currency of Experience Policy

Return to Practice Policy

Special Task Force on Alternative Admissions/Registration Systems (SAARS) Final Report to Council and Appendices, April 11 2014

Registration

● Policy ❍ Procedure

■ Currency of Experience

PURPOSE

To provide meaning to the currency of experience requirement in the evaluation of an applicant's experience pursuant to the Bylaws of the Association (the "Bylaws").

CREATED

BY:	Date:	Reference:
COUNCIL		

POLICY AND PROCEDURE:

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   - Provide a letter of explanation as to why the member does not have experience to report during all of this time period;
   - Supply an updated professional experience record, for review by the Council; and
   - Supply professional references who can attest to the character and practice competency of the member or former member;

b) If the applicant has four (4) years of experience within the seven (7) years immediately preceding the application date but does not have any experience to report in the last four (4) years immediately preceding the application date, he or she must:
   - Provide a letter of explanation as to why the member does not have experience to report during all of this time period;
   - Supply an updated professional experience record, for review by the Council;
   - Supply professional references who can attest to the character and practice competency of the member or former member;
   - Write and pass the Professional Practice Examination if not written and passed previously; and
   - Work under professional supervision for a period and on such terms as set by the Council and provide references from a professional supervisor.

c) If the applicant does not have any experience to report in the seven (7) years immediately preceding the application date, then the applicant's experience does not meet the required standard.

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Please note that applicants must meet all other standards for registration prior to admission to membership.

Applicants, who apply for professional registration or licence prior to the approval date of this policy, will be permitted to continue their application pursuant to the previous Currency of Experience Policy wording that "experience must be current to be meaningful."

CROSS REFERENCES:

APEGBC – List of all key Competencies & Generic Indicators

Previous Currency of Experience Policy

Return to Practice Policy

Special Task Force on Alternative Admissions/Registration Systems (SAARS) Final Report to Council and Appendices, April 11 2014

ENGINEERS &
GEOSCIENTISTS
BRITISH COLUMBIA

POLICY	Transition to Competency-Based Reporting of Engineering Experience
DATE OF POLICY	September 8, 2017
APPROVED BY	Council (CO-17-XX)

POLICY STATEMENT

All applicants for Professional Engineer registration or licence must report their experience in accordance with the method set out in this policy.

PURPOSE

To set out end-of-transition requirements for the conditions under which Engineers-in-Training and applicants for professional engineer registration or licence must report their experience in accordance with Council's Competency Framework, using APEGBC's online competency-based reporting and assessment system.

APPLICATION AND SCOPE

Effective September 8, 2017, applicants for professional engineer registration or licence are required to report qualifying experience for registration in accordance the APEGC Competency Framework, using APEGBC's online competency-based reporting and assessment system in accordance with the following end-of-transition schedule.

With the exception of those listed as exempt from this policy, all applicants:

i. who apply for registration, or licence after September 8, 2017 will be required to complete a competency assessment;

ii. whose application status is inactive will be required to complete a competency assessment when they reactivate their applications, whether or not they previously have submitted experience details using the Satisfactory Engineering Experience template;
iii. who have not submitted any experience details or the required references as of January 1, 2018 will be required to complete a competency assessment;
iv. who were assigned experience prior to January 1, 2016 and have not reapplied for registration as of September 8, 2017 will be advised that they must a. submit their updated experience using the Satisfactory Engineering Experience template and b. provide references by January 1, 2018, failing which they will be required to complete a competency assessment when they reapply for registration; and
v. effective July 1 2019, must complete a competency assessment, regardless of their prior experience reporting route or status of their experience reporting – including those whose experience was approved using the Satisfactory Engineering Experience template; but who have not completed academic examinations, the Professional Practice Examination of the Professional Engineering and Geoscience Practice in BC Seminar.

All affected applicants will be informed of these changes after approval of the policy by Council.

Exceptions

The following applicants are exempt from the above requirements:

a. applicants currently registered or licensed as professional engineers in good standing in another jurisdiction in Canada;
b. applicants eligible to apply under an Engineers Canada full professional mobility agreement with Engineers Ireland, Engineers Australia or the Hong Kong Institution of Engineers.
c. U.S. Professional Engineers who hold a current state board licence and provide a current NCEES Record to APEGBC;
d. applicants who are not required to complete a competency assessment in accordance with the Return to Practice Policy

EITs in other Jurisdictions

Engineers-in-Training from other Canadian jurisdictions who have been receiving credit for experience with their home jurisdiction will be encouraged to continue on that system until their experience has been approved for registration as a professional engineer.

CROSS REFERENCES

Guidelines for Developing and Implementing Registration Policy

Engineers and Geoscientists BC Competency Framework
Engineers and Geoscientists BC Satisfactory Engineering Experience Guideline
Registration Committee Policy re: Phase out of EIT/GIT Online Experience Reporting System
Engineers and Geoscientists BC Return to Practice Policy

REVIEW DATES

By Council September 8, 2017 (CO 17-XX)

By Council February 3, 2015 (CO 15-34)

ENGINEERS & GEOSCIENTISTS
BRITISH COLUMBIA

POLICY	Transition to Competency-Based Reporting of Engineering Experience
DATE OF POLICY	September 8, 2017
APPROVED BY	Council (CO-17-XX)

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v. effective July 1 2019, must complete a competency assessment, regardless of their prior experience reporting route or status of their experience reporting – including those whose experience was approved using the Satisfactory Engineering Experience template; but who have not completed academic examinations, the Professional Practice Examination of the Professional Engineering and Geoscience Practice in BC Seminar.

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Exceptions

The following applicants are exempt from the above requirements:

a. applicants currently registered or licensed as professional engineers in good standing in another jurisdiction in Canada;
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c. U.S. Professional Engineers who hold a current state board licence and provide a current NCEES Record to APEGBC;
d. applicants who are not required to complete a competency assessment in accordance with the Return to Practice Policy

EITs in other Jurisdictions

Engineers-in-Training from other Canadian jurisdictions who have been receiving credit for experience with their home jurisdiction will be encouraged to continue on that system until their experience has been approved for registration as a professional engineer.

CROSS REFERENCES

Guidelines for Developing and Implementing Registration Policy

Engineers and Geoscientists BC Competency Framework

Engineers and Geoscientists BC Satisfactory Engineering Experience Guideline

Registration Committee Policy re: Phase out of EIT/GIT Online Experience Reporting System

Engineers and Geoscientists BC Return to Practice Policy

REVIEW DATES

By Council September 8, 2017 (CO 17-XX)

By Council February 3, 2015 (CO 15-34)

Registration

● Policy ❍ Procedure

■ Inter-~~Association~~ Provincial/Territorial Mobility ~~Agreement~~

PURPOSE

To facilitate the registration of professional engineers already registered in another constituent association/ordre of Engineers Canada or Geoscientists Canada ~~the Canadian Council of Professional Engineers (CCPE)~~.

CREATED

BY:	Date:	Reference:
COUNCIL	September 8, 2017	CO 17-XX
	September 12, 2008	CO 08-99-1
	January 14, 2005	CO 05-11-1
	March 24th, 2004	CO 04-73
	October 24, 2002	CO 02-141
	January 13, 1994	CO 94-25
	March 21, 1989	CO 89-111

POLICY:

1. Candidates who ~~are~~ apply~~ing~~ for registration or licence in accordance with an internal trade agreement including:
   a. The Canadian Free Trade Agreement (CFTA) and
   b. The New West Partnership Trade Agreement (NWPTA) among the provinces of British Columbia, Alberta, Saskatchewan and Manitoba.~~under the Canadian Council of Professional Engineers (CCPE) Inter-Association Mobility Agreement (IAMA)~~

   and are ~~already~~ registered or licensed in good standing* with an Engineers Canada or Geoscientists Canada ~~CCPE~~ constituent ~~A~~association/ordre must submit to Engineers and Geoscientists BC ~~APEGBC~~:
   - a completed online application ~~form~~
   - a certified copy of a government-issued document that confirms ~~proof of~~ Canadian Citizenship, Permanent Resident status or citizenship in another country (citizenship card, birth certificate, ~~or~~ current Canadian passport, other country passport or Canadian Permanent Resident card). Certification by another constituent association/ordre that government-issued documentation is held by it for the applicant and confirmation by the constituent association/ordre of the candidate's legal name, date of birth, Canadian citizenship or Permanent Resident status or citizenship in another country, may be accepted in lieu of a certified copy Certification of legal name; and ~~or Permanent Resident status~~
   - an application fee
   - ~~a completed Demographic Information Form~~

2. Engineers and Geoscientists BC ~~APEGBC~~ will confirm with the applicable constituent association(s)/ordre that the candidate is a member or licensee in

good standing* and will request confirmation of other information relevant to: (i) mobility qualification under the internal trade agreements and (ii) applicant demographic information. Information that will be collected includes: legal name, legal status in Canada, date of birth, basis of academic qualification, completion of a professional practice examination, date of issue of registration or licence, discipline of evaluation and disciplinary history.

~~In addition, such candidates must arrange for a completed Confirmation Request Form(s) from all of his or her registered Associations/ordre to be sent directly to the Association.~~

3. The qualifications of a candidate applying under the terms of an internal trade agreement will be subject to further scrutiny ~~The notwithstanding clause of the Inter Association Mobility Agreement will be invoked only~~ if he or she ~~an applicant~~:
   a. has not applied within the discipline of registration or licence or in the case of a limited licence candidate, within the scope of practice approved by the constituent home association(s)/ordre in which he or she is registered or licensed;
   b. is the subject of information that has been received that may compromise Engineers and Geoscientists BC ~~APEGBC~~'s duty to protect the public interest; or
   c. has confirmed to Engineers and Geoscientists BC ~~APEGBC~~ that he or she has been subject to current or past issues related to good character such as criminal charges or convictions, disciplinary sanctions by professional regulatory bodies and outstanding or refused registration or licence applications with another regulatory body.
   ~~a. or~~
   ~~b. has submitted a confidential letter for review by Council detailing past conviction of a criminal offence or past disciplinary action taken by another professional Association/ordre.~~

~~1.~~ Furthermore~~, ,~~
~~the review and approval of registration will be delegated to the Director, Registration and Licensing; and~~
in the spirit of the ~~CCPE IAMA~~ internal trade agreements, Engineers- and Geoscientists-in-Training of other ~~CCPE~~ Engineers Canada and Geoscientists Canada associations/ordres who are confirmed to Engineers and Geoscientists BC ~~APEGBC~~ as:
   a. being in good standing*; and
   b. having met the academic qualifications for registration or licence

will be accepted for enrolment as Engineers- or Geoscientists-in-Training. ~~as academically qualified for registration without further review of their academic background~~.

*In Good Standing means that the candidate is in compliance the statutory obligations of membership including payment of dues and fees and professional development requirements; and is not subject to any form of sanction, suspension or other form of disciplinary censure.

CROSS REFERENCES

~~APEGBC Application Guide, January 2006~~

~~CCPE Inter Association Mobility Agreement for Engineers~~

~~CCPG Inter Association Mobility Agreement for Geoscientists Canadian Free Trade Agreement~~

New West Partnership Trade Agreement

Registration Committee Terms of Reference

Policy on Minimum Academic Requirements for Registration

~~(see also Policy: Minimum Academic Requirements for Application)~~

ENGINEERS & GEOSCIENTISTS
BRITISH COLUMBIA

POLICY	Inter-Provincial/Territorial Mobility
DATE OF POLICY	September 8, 2017
APPROVED BY	Council (CO-17-XX)

POLICY STATEMENT

Applicants from other Provinces or Territories need to be registered in accordance with existing trade agreements and registration policies.

PURPOSE

To facilitate the registration of professional engineers already registered in another constituent association/ordre of Engineers Canada or Geoscientists Canada.

APPLICATION AND SCOPE

1. Candidates who apply for registration or licence in accordance with an internal trade agreement including:

    a. The Canadian Free Trade Agreement (CFTA) and

    b. The New West Partnership Trade Agreement (NWPTA) among the provinces of British Columbia, Alberta, Saskatchewan and Manitoba.

and are registered or licensed in good standing* with an Engineers Canada or Geoscientists Canada constituent association/ordre must submit to Engineers and Geoscientists BC:

- a completed online application
- a certified copy of a government-issued document that confirms Canadian Citizenship, Permanent Resident status or citizenship in another country (citizenship card, birth certificate, current Canadian passport, other country passport or Canadian Permanent Resident card). Certification by another constituent association/ordre that government-

issued documentation is held by it for the applicant and confirmation by the constituent association/ordre of the candidate's legal name, date of birth, Canadian citizenship or Permanent Resident status or citizenship in another country, may be accepted in lieu of a certified copy Certification of legal name; and

- an application fee

2. Engineers and Geoscientists BC will confirm with the applicable constituent association(s)/ordre that the candidate is a member or licensee in good standing* and will request confirmation of other information relevant to: (i) mobility qualification under the internal trade agreements and (ii) applicant demographic information. Information that will be collected includes: legal name, legal status in Canada, date of birth, basis of academic qualification, completion of a professional practice examination, date of issue of registration or licence, discipline of evaluation and disciplinary history.

3. The qualifications of a candidate applying under the terms of an internal trade agreement will be subject to further scrutiny if he or she:

   a. has not applied within the discipline of registration or licence or in the case of a limited licence candidate, within the scope of practice approved by the constituent home association(s)/ordre in which he or she is registered or licensed;
   b. is the subject of information that has been received that may compromise Engineers and Geoscientists BC's duty to protect the public interest; or
   c. has confirmed to Engineers and Geoscientists BC that he or she has been subject to current or past issues related to good character such as criminal charges or convictions, disciplinary sanctions by professional regulatory bodies and outstanding or refused registration or licence applications with another regulatory body.

Furthermore, in the spirit of the internal trade agreements, Engineers- and Geoscientists-in-Training of other Engineers Canada and Geoscientists Canada associations/ordres who are confirmed to Engineers and Geoscientists BC as:

a. being in good standing*; and
b. having met the academic qualifications for registration or licence

will be accepted for enrolment as Engineers- or Geoscientists-in-Training.

*In Good Standing means that the candidate is in compliance the statutory obligations of membership including payment of dues and fees and professional development requirements; and is not subject to any form of sanction, suspension or other form of disciplinary censure.

REVIEW DATES

By Council September 8, 2017 (CO 17-XX)

By Council September 12, 2008 (CO 08-99-1)

By Council January 14, 2005 (CO 05-11-1)

By Council March 24, 2004 (CO 04-73)

By Council October 24, 2002 (CO 02-141)

By Council January 13, 1994 (CO 94-25)

By Council March 21, 1989 (CO 89-111)

PROFESSIONAL PRACTICE GUIDELINES - LEGISLATED FLOOD ASSESSMENTS IN A CHANGING CLIMATE IN BC

V2.0 SEPTEMBER XX, 2017

ENGINEERS & GEOSCIENTISTS BRITISH COLUMBIA

TABLE OF CONTENTS

PREFACE

These Professional Practice Guidelines - Legislated Flood Assessments in a Changing Climate in BC were commissioned by the British Columbia Ministry of Forests, Lands and Natural Resource Operations (MFLNRO). They have been written with the intent to guide professional practice for flood assessments, to identify the circumstances when risk assessments are appropriate and to emphasize the need to consider climate change and land use changes in such assessments.

The goals of the MFLNRO *flood hazard* management program are to reduce or prevent injury, human trauma, and loss of life and to minimize property damage from flooding events in BC. In ~~their~~ its ongoing effort to achieve these goals, the Ministry has played a leadership role in working with the Association of Professional Engineers and Geoscientists of British Columbia (APEGBC) to develop these and other guidelines. The development of such guidelines is consistent with one of the primary objectives of APEGBC which is to establish, maintain and enforce good practice of professionals regulated by APEGBC. These guidelines complement the existing APEGBC Guidelines for Legislated Landslide Assessments for Proposed Residential Developments in BC.

The Ministry and APEGBC assembled a team of specialists from government and the engineering and geoscience community to prepare these guidelines. The application of these guidelines will result in consistent and comprehensive flood assessment reports being submitted to government authorities.

Specific objectives of these guidelines are to:

(i) outline the professional services that should generally be provided by APEGBC *members* conducting ~~this type of~~ legislated flood assessments~~work~~;
(ii) describe the standards of practice APEGBC members should follow in providing professional flood assessment services ~~in the field of flood hazard and risk assessments~~;
(iii) specify ~~the~~ tasks that should be performed by APEGBC members to meet an appropriate standard of care when preparing flood ~~hazard and risk~~ assessment reports, and which fulfills the members' professional obligations under the *Engineers and Geoscientists Act* (the *Act*). These obligations include the members' primary duty to protect the safety, health and welfare of the public and the environment;
(iv) describe the roles and responsibilities of the various participants/stakeholders involved in ~~such~~ flood assessment work. These guidelines will assist in delineating the roles and responsibilities of the various participants/stakeholders;
(v) identify various methodologies that can be used when dealing with *tolerable* and *acceptable risk*;
(vi) provide consistency in the reports and other documents prepared by APEGBC professionals when providing professional flood assessment services ~~in this field of practice~~; and
(vii) describe the appropriate knowledge, skill sets and experience that professionals should have who are working in this field.

DEFINITIONS

Acceptable Risk
A risk, which, for the purposes of life or work, we are prepared to accept as it is with no special management. Society does not generally consider expenditure to further reduce such risks to be justifiable.

Active and Inactive Alluvial Fan
An *active alluvial fan* is a fan on which the surface is subject to periods of aggradation and channel incision, and avulsions may occur. An *inactive alluvial fan* can be defined as a fully trenched (from fan apex to distal section) fan on which fluvial processes are limited to the present channel and its banks. Avulsions on the fan surface are considered extremely unlikely.

Alluvial Fan
An accumulation of sediment where a steep stream channel flows out onto a valley floor of reduced gradient, often fan-like in shape, subject to further additions of sediment. Strictly, an alluvial fan is the product of sediment transported and deposited by water floods (including debris floods), but the term is often applied also to debris flow fans, those constructed from the deposits of debris flows, and many fans incorporate deposits of both types.

Approving Authority
Approving Officer, Building Inspector, or Planners and/or Councils of a local government.

Approving Officer
An official who is appointed under the *Land Title Act* (Section 77) and acts independently to (1) ensure that subdivisions comply with provincial acts and regulations and local bylaws, and (2) protect the best interests of the public. There are four jurisdictions of Approving Officers in British Columbia:

Approving Officers	**Appointed by**	**Jurisdiction**
Municipal Approving Officers	Municipal Councils	Subdivision approvals within municipal boundaries
Regional District and Islands Trust Approving Officers	Regional District Boards or the Islands Trust Council	Subdivision approvals within the boundaries of those local governments that have assumed the rural subdivision approving authority*
BC Ministry of Transportation Approving Officers	Provincial Cabinet	Subdivision approvals outside municipal boundaries and within those Regional Districts and the Islands Trust boundaries that have not assumed the rural subdivision approving authority*
Nisga'a Lands Approving Officers	Nisga'a Lisims Government	Subdivision approvals within Nisga'a Lands, including Nisga'a Village Lands

*~~,~~No Regional District, nor the Islands Trust, has assumed responsibility for rural subdivision approvals~~,~~; ~~and~~ therefore, that authority is still held by the Ministry of Transportation.

Client
An individual or company who engages a Qualified Professional (QP) to conduct a flood assessment.

Consequence
The outcomes or potential outcomes arising from the occurrence of a flood expressed qualitatively or quantitatively in terms of loss, disadvantage or gain, damage, injury, or loss of life.

Construction
Either new construction of a building or structure, or the structural alteration of or addition to an existing building or structure. Construction does not include the repair of an existing building or structure.

Covenant
A registered agreement, established by the *Land Title Act* (Section 219), between a land owner and the local or provincial government that sets out certain conditions for a specific property with regards to building use, building location, land use, property subdivision, and property sale.

Design Flood
A hypothetical flood representing a specific likelihood of occurrence (for example the 200-year or 0.5% annual probability flood). The design flood may comprise two or more single source dominated floods.

Dike
A dike is defined in the *Dike Maintenance Act* as "an embankment, wall, fill, piling, pump, gate, floodbox, pipe, sluice, culvert, canal, ditch, drain or any other thing that is constructed, assembled or installed to prevent the flooding of land." Dikes can include alluvial/debris fan training berms, basins and barriers. Structures that are primarily for erosion protection, drainage or municipal stormwater control are typically not considered to be regulated dikes. For practical purposes, the Inspector of Dikes has published a provincial flood protection structure data base which currently includes approximately 210 dike structures that are considered to be regulated under the *Dike Maintenance Act*.

Elements at Risk
The population, buildings or engineering works, economic activities, public services, utilities, infrastructure, and environmental features in the area potentially affected by floods or landslides.

Flood Hazard
The potential for loss of life or injury and potential damage to property resulting from flooding. The degree of flood hazard varies with circumstances across the full range of floods.

Flood Hazard Map
A map that displays the extent of historic as well as potential future flood events of variable probability, illustrating the intensity and magnitude of the hazard at an appropriate scale. A flood hazard map forms the basis of considerations and determinations in land use control with respect to potential flooding, floodproofing of construction, and flood awareness and preparedness.

Flood Intensity
A set of spatially distributed parameters related to the destructive power of a flood. The parameters may be described quantitatively or qualitatively and may include the area inundated, the maximum flow velocity, total channel scour, sedimentation, and impact force.

Flood Proofing
The alteration of land or buildings to reduce flood damage, including, the use of building setbacks from water bodies to maintain a floodway and to allow for potential erosion. Flood-proofing may be achieved by either, or a combination of, the following:

- building on structural fill, provided such fill does not interfere with flood flows of the watercourse, and is adequately protected against floodwater erosion and scour;
- building raised by foundation walls, columns or piles.

Flood Risk
The combination of the probability of a flood event and the potential adverse consequences to human health, the environment, and economic activity associated with a flood event.

Flood Risk Map
A map that combines the consequences of a flood with a flood hazard. For example, a flood risk map can show the likely economic losses for a 500-year return period event under a given hazard scenario (dike overtopping or dike breaches). A flood risk map could also show the population at risk for a given return period flood, or show likely fatalities for evacuated and non-evacuated hazard scenarios.

Freeboard
A vertical distance added to the actual calculated flood level to accommodate uncertainties (hydraulic and hydrologic variables), potential for waves, surges, and other natural phenomena.

Hazard Scenario
A specific scenario that could lead to an undesirable consequence (flooding, boulder impact, scour). As an example, a hazard scenario can be a dike breach for a specified return period or a glacial lake outburst flood.

Hydroclimatic Event
A rainstorm, snowfall event or rain-on-snow event that is temporally limited (typically to one or a few days); also referred to as a synoptic event.

Hydrogeomorphic Process
Any process in which flowing water leads, by erosion, transport and deposition of earth materials, to the modification of a landform.

Individual Risk
The risk of fatality or injury to any identifiable individual who lives within the zone impacted by the flood; or who follows a particular pattern of life that might subject him or her to the consequences of the flood.

Inspector of Dikes and Deputy Inspectors of Dikes
Appointed provincial employees with the statutory authority to oversee maintenance of dikes by diking authorities, set diking standards and approve new dikes and changes to existing dikes.

Member
Professional Engineer or Professional Geoscientist. A Member of the Association of Professional Engineers and Geoscientists of British Columbia.

Municipality
A corporation into which the residents of an area are incorporated under the *Local Government Act* or another act, or the geographic area of the municipal corporation.

Official Community Plan
A statement of objectives and policies to guide decisions on planning and land use management within the area covered by the plan, respecting the purposes of the local government (*Local Government Act*, Part 14, Division 4).

Orphan Dikes and Works
Orphan works are flood protection works that are not being maintained by an owner or diking authority. Orphan dikes are orphan works that are considered by the Inspector of Dikes to be regulated under the *Dike Maintenance Act*.

Private Dike
A private dike is defined in the *Dike Maintenance Act* as "a dike built on private property that protects only that property." While private dikes are not regulated by the province under the *Dike Maintenance Act*, these professional practice guidelines still apply.

Professional Engineer
An engineer who is a registered or licensed member in good standing with APEGBC and typically is registered in the disciplines of geological engineering, mining engineering or civil engineering, which are designated disciplines of professional engineering.

Professional Geoscientist
A geoscientist who is a registered or licensed member in good standing with APEGBC and typically is registered in the disciplines of geology or environmental geoscience, which are designated disciplines of professional geoscience. Until 2000, APEGBC referred to the discipline of environmental geoscience as geotechnics.

Qualified Professional (QP)
A professional engineer, professional geoscientist, licensee, including limited licensees with the appropriate level of education, training, and experience to conduct flood assessments for residential development as described in these guidelines and licensed to practice by APEGBC.

Regional District
A district incorporated under the *Local Government Act*, or the geographic area of the district, that has authority to enact subdivision servicing and zoning bylaws.

Residential Development
As defined by various pieces of provincial legislation, either (1) the subdivision of property, (2) the new construction of a building or structure, or (3) the structural alteration of, or addition to, an existing building or structure.

Risk
A measure of the probability and severity of an adverse effect to health, property or the environment. Risk is often estimated by the product of probability and consequence. A more general interpretation of risk involves a comparison of the probability and consequences in a non-product form.

Risk Analysis
The use of available information to estimate the risk to individuals, or populations, property, or the environment, from hazards. Risk analyses contain scope definition, hazard identification, and risk estimation.

Risk Assessment
The process of risk analysis and risk evaluation.

Risk Evaluation
The stage at which values and judgments enter the decision process, explicitly or implicitly, by including consideration of the importance of the estimated risks and the associated social, environmental, and economic consequences, in order to identify a range of alternatives for managing the risks.

Standard Dikes
Those dikes considered by the Inspector of Dikes to meet minimum provincial standards including:
- design and construction to contain the designated flood;
- design and construction completed under the supervision of a QP engineer;
- an effective dike management and maintenance program by a local diking authority (typically local government); and
- legal access (rights of way or land ownership) for the diking authority to maintain the dike.

Note that new dikes or major upgrades to existing dikes may need to meet additional standards, e.g., seepage, seismic and sea level rise.

Structural Mitigation Works
Dedicated engineering works that reduce the impacts of floods including dams, dikes, training berms, floodwalls, seawalls, bank protection works, flood retention basins, sediment basins, river diversions, floodways, channel modifications, sediment management, debris barriers, pump stations, and floodboxes, but not including building flood proofing measures such as structural fill and erosion/scour protection works to raise and protect building foundations (see definition for flood-proofing).

Tolerable Risk
A risk that society is willing to live with so as to secure certain benefits in the confidence that it is being properly controlled, kept under review and further reduced as and when possible.

Vulnerability
The degree of loss to a given element or set of elements within the area affected by the flood hazard. It is expressed on a scale of 0 (no loss) to 1 (total loss). For property, the loss will be the value of the damage relative to the value of the property; for persons it will be the probability that a particular life will be lost given that the person is subject to the flood, debris flood or debris flow.

1.0 INTRODUCTION

By the year 2035, the population of BC is predicted to grow from the current 4.5 million to approximately 6 million, with the greatest growth and highest population densities likely occurring in Greater Vancouver, the Fraser Valley, on Vancouver Island and in the Okanagan Valley. Lack of urban affordability in the future will increase development pressure in areas that are potentially subject to flooding.

Over time, the frequency of floods on some rivers may also increase due to factors that include riverbed aggradation, river channel alterations, land use change, insect infestation, wild fire, and climate change.

To this point, BC's flood management has been largely standard-based, with a focus on particular flood magnitudes (the 200-year return period flood in general, and the flood-of-record for the Fraser River). The role of the provincial government has lessened in the area of development approvals in *flood hazard* areas, with an increasing role for local governments and consultants. Some guidance for professionals is provided by the 2004 Flood Hazard Area Land Use Management Guidelines (BC, 2004, with 2014 draft amendment), but there remains a need to provide direction that incorporates *flood risk* management, climate change and land use.

Figure 1-1 exemplifies the apparent conflict of the constancy of the design standard against an increase in flood risk due to increasing floodplain development, climate change leading to higher peak flows, or river channel bed aggradation (Jakob and Church, 2012). A *risk*-based flexible mitigation approach could thus be considered.

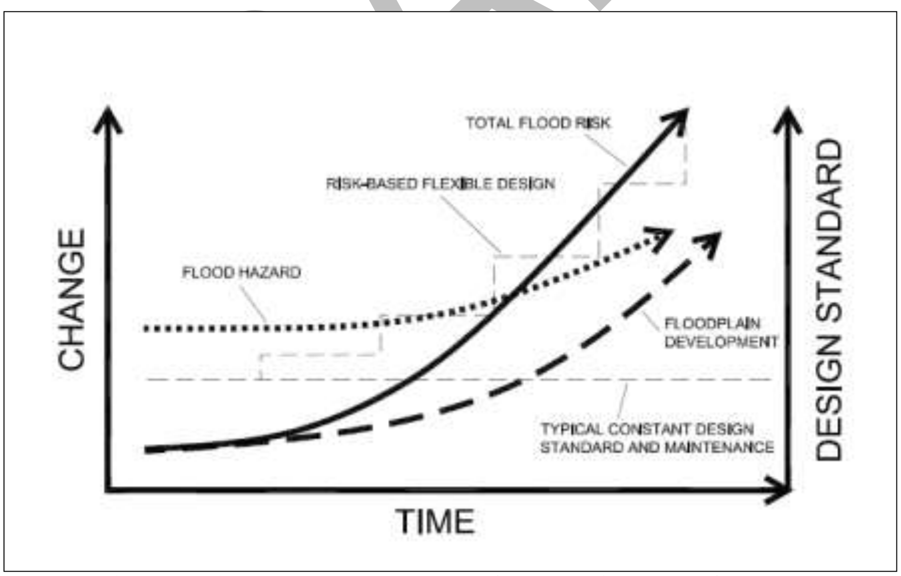

Figure 1-1: Changes in flood hazard and risk over time (Jakob and Church, 2012).

Further challenges are presented by global climate change that is also affecting BC. Increasingly, non-stationary data series invalidate traditional statistical analysis of flood frequency.

1.1 Purpose and Outline

These guidelines are primarily intended to provide direction to the *Qualified Professional (QP)* ~~for~~regarding professional practice for flood assessments. In summary, the QP~~)~~ should:

- undertake flood assessments consistently and transparently;
- ~~provide for~~ undertake appropriate consultation with approving authorities;
- use a level of effort and approach appropriate for the nature of the ***elements at risk***;
- ~~standardize the flood assessments to make them directly comparable within BC;~~
- ~~consider~~ provide recommendations to suit existing regulations and the level of protection provided by ***structural mitigation works***;
- increasingly consider "*risk* management" and "adaptation" as opposed to solely "protection" and "defense";
- consider a broad~~er~~ range of issues and broad~~er~~ range of analytical techniques to help achieve improved social and environmental outcomes as part of development;
- include predicted changes in the hydroclimate as well as natural and anthropogenic changes to channel morphology and watersheds in the flood assessment; and
- identify situations that require expert input.

Flood assessments may be relevant to residents, property and land owners, development consultants, planners, approving authorities, local governments, as well as provincial and federal government ministries. Many of these parties require and rely on flood assessments prepared by a QP. The ~~content of the~~se guidelines may also be of assistance to these parties.

By necessity, there is some overlap between these guidelines and APEGBC's Guidelines for Legislated Landslide Assessments for Proposed Residential Developments in BC, and other guidelines produced by the provincial government (see Appendix D). Flood assessments may have to address other engineering, forestry, fishery and/or other related issues. For example, some landslide processes affect channel changes, which can impact flood characteristics while other landslide processes such as landslide dams may directly be the cause of a flood. If other relevant guidelines exist ~~for these areas~~, they should also be considered.

1.2 Role of APEGBC

These guidelines have been formally adopted by the Council of the APEGBC and form part of APEGBC's ongoing commitment to maintaining the quality of services that its *members* provide to their *clients* and the general public. *Professional engineers* and *professional geoscientists* are professionally accountable for their work under the *Act* (RSBC 1996, Chapter 116, as amended), which is enforced by APEGBC. A member must exercise professional judgment when providing professional services. As such, application of these guidelines will vary depending on the circumstances.

APEGBC supports the principle that a member should receive fair and adequate compensation for professional services including services provided to comply with these guidelines. Insufficient fees do not justify services that fail to meet the intent of the guidelines. These guidelines may be used to assist in establishing the objectives, type of flood assessment to be carried out, level of effort and terms of reference of a member's agreement with his/her client.

By following these guidelines a QP should fulfill his/her professional obligations when preparing flood assessments, ~~carrying out these types of professional activities~~ especially with regards to the APEGBC Code of Ethics Principle~~-~~ 1 (hold paramount the safety, health and welfare of the public, protection of the environment and promote health and safety in the workplace[1]). Professionals who diverge from guidance provided herein should document their decisions to do so. Failure of a member to meet the intent of these guidelines could be evidence of unprofessional conduct and lead to disciplinary proceedings by APEGBC.

Of relevance to these guidelines, the role of APEGBC is summarized as follows:

- ~~generally administer~~governs the professions under the authority of the *Engineers and Geoscientists Act*, Bylaws and Code of Ethics;
- establishes the boundaries of practice for professional engineers and professional geoscientists;
- develops, maintains and updates ~~these~~practice standards ~~and other related~~including professional practice guidelines;
- supports members and approving authorities in work pursuant to the professional practice guidelines; and
- ~~deal with~~addresses professional practice issues as they arise (up to and including investigation and discipline).

The intention of APEGBC professional practice guidelines is to provide a framework for professional practice that will result in a high level of professional practice that serves the public interest and meets the requirements of all levels of government.

1.3 Scope of the Document

This document provides guidance for~~ese guidelines summarize the~~ professional practice related to legislated flood assessments (see Appendix C~~D~~ for a summary and discussion of the legislative framework).

The ~~i~~Introduction (Section 1) identifies the need and purpose of these guidelines, clarifies the role of APEGBC, introduces salient terms, and ~~points towards~~ documents the applicability of these guidelines.

~~The second s~~Section 2 guides the ~~practitioner~~ QP on how flood assessments can be organized and clarifies the responsibilities of the client, the *~~A~~approving ~~a~~Authority*, and the ~~professional~~ QP with regard to completion of a flood assessment~~conducting the study~~.

Section 3 is the backbone of these guidelines~~, and~~ and provides~~es~~ guidance on flood assessment procedures and accounting for ~~anticipated~~ climate change and land surface change. ~~-~~It also provides ~~and~~ a comparison of standard-based and risk-based approaches. Section 3 should be read in conjunction with Appendices D~~E~~, ~~F~~E and ~~G~~F, which provide further guidance on the specifics of flood assessments.

Similar to the Guidelines for Legislated Landslide Assessments for Proposed Residential Developments in BC (“the APEGBC Landslide Guidelines”) (APEGBC, 2010) Section 4 provides informations~~s~~ on quality assurance and control. ~~and~~ Section 5 explains the requirements for registration, education, training, and experience~~.~~, and Section 6 provides references.

These guidelines are complemented by a set of appendices:

[1] ~~For t~~The APEGBC Code of Ethics ~~see http://www.apeg.bc.ca/library/actbylawscode.html~~is available on the Association’s website. The Code of Ethics, along with accompanying Guidelines and Commentary, are published in the current (1994) edition of the APEGBC *Guidelines for Professional Excellence*.

- Appendix A provides a description of floods and flood-related hazards in BC~~which provides a glossary of selected terms (Appendix A),~~;
- Appendix B provides a summary of the current flood management practices in BC ~~and provides a description of floods and flood-related hazards in BC (Appendix B)~~;
- Appendix C provides a summary of current flood management legislation and guidelines in BC;
- ~~provides a summary of the current flood management approach in BC (Appendix C),~~;
- Appendix D provides a detailed description of Flood Hazard Assessments (FHAs);
- Appendix E describes the details of a Flood Risk Assessment (FRA); ~~provides a summary of current flood management legislation and guidelines in BC (Appendix D),~~;
- ~~AAppendix E provides a detailed description of Flood Hazard Assessments (FHAs) (Appendix E) followed by~~;
- ~~A~~Appendix F specifies considerations for flood assessments for development approvals;~~which describes the details of a Flood Risk Assessment (FRA).~~;
- Appendix G describes professional practice in view of potential climate change and land surface condition impacts on flooding;~~specifies considerations for flood assessments for development approvals. It is followed by~~;
- Appendix H provides an overview of flood management in other jurisdictions; ~~that describes professional practice in light view of potential climate change and land surface condition impacts on flooding.~~;
- Appendix I includes a Flood Assurance Statement; ~~provides an overview of flood management in other jurisdictions.~~;
- Appendix J provides case studies; and ~~includess a Flood Hazard and Risk Assurance Statement,~~;
- Appendix K lists the contributors to these guidelines.~~provides case studies,; and~~
- ~~Appendix L lists the contributors to these guidelines.~~

These guidelines ~~are directed to~~ focus on flood assessments for proposed development (residential, institutional, commercial, industrial, ~~and~~ resource development~~; associated and non-associated~~, and infrastructure~~; emergency response; and in some situations existing residential development~~). They do not address other potential natural hazards such as landslides (APEGBC, 2010), soil erosion, subsidence or snow avalanches, except as related to flooding. In addition to utilising these guidelines, some flood assessments (~~i.e~~i.e., debris flow situations on steep mountain creeks) may also need to utilize the APEGBC Landslide Guidelines.

The 2017 update to these guidelines was undertaken to ensure consistency with the new APEGBC Floodplain Mapping Guidelines. Some general improvements in wording and updating of technical components was also undertaken at this time.

1.4 Applicability of the Guidelines

Notwithstanding the purpose and scope of these guidelines, a professional engineer's or *professional geoscientist's* decision not to follow one or more aspects of the guidelines does not necessarily mean a failure to meet required professional obligations. Such judgments and decisions depend upon weighing facts and circumstances to determine whether another reasonable and prudent QP, in a similar situation, would have conducted himself/herself similarly.

Although the ~~client~~client is often a landowner or development consultant, flood assessments are usually carried out at the request of the local government or the provincial or federal government who may specify ~~the individual~~ requirements for a flood assessment, or leave it to the ~~consultant~~ QP to determine ~~the~~ an appropriate approach. Following these guidelines, however, does not ensure that the conclusions and recommendations contained within the flood assessment report will automatically be accepted by the approving authority. These guidelines do not replace any guidelines provided by the federal, provincial or local government or an approving authority, but it is possible that the ~~two sets of~~ various guidelines may be used in conjunction with each other.

These guidelines reference, but do not replace, current legislation, regulations and guidelines~~,~~ ~~but do not replace current legislation~~. The~~y~~ guidelines will be influenced by advances in knowledge, ~~and~~ evolution of general professional practices, and regulatory changes ~~in BC~~). As such, this is a dynamic document and will require occasional updating.

These guidelines are not intended to provide step-by-step instruction on carrying out flood assessments.

1.5 Introduction of Terms

~~Appendix A~~The definitions section explains many of the terms used in these guidelines. This section~~e following~~ introduces some ~~of the more~~ common terms.

For the purpose of these guidelines a QP is a professional engineer or professional geoscientist or licensee with appropriate education, training and experience to conduct flood assessments as described in this guideline (see Section 3). Typically, such a professional engineer or licensee will be practising civil or geological engineering[2]; and such a professional geoscientist or licensee will be practising environmental geoscience[3].

The Canadian Standards Association (CSA 1997) defines a hazard as “a source of potential harm, or a situation with a potential for causing harm, in terms of human injury; damage to health, property, the environment, and other things of value; or some combination of these.”

A flood is a condition in which a watercourse or body of water[4] overtops its natural or artificial confines and covers land not normally under water. When a flood becomes a source of potential harm it becomes a hazardous flood.

In BC high water levels of creeks, rivers, streams, ponds, lakes, reservoirs and the ocean can result from a number of different causes. Typical causes include:

- rainfall;
- snowmelt;
- ice jams, ice runs, log jams, beaver dams;
- landslide dams;
- extreme tides;
- storm surges; and
- tsunamis.

In addition to the conventional floods described above, there are several other flood-related hazards in BC including:

- debris flows and debris floods or~~/~~ hyperconcentrated flows;
- channel avulsions;
- bank erosion;
- sediment deposition;

[2] Geological engineering, and civil engineering are disciplines of engineering registration within APEGBC.
[3] Geology and environmental geoscience are disciplines of geoscience registration within APEGBC. Until 2000, APEGBC referred to the discipline of environmental geoscience as geotechnics.
[4] Watercourses includes creeks, streams and rivers; bodies of water includes ponds, lakes, reservoirs and oceans.

- breaching of ice jams, log jams, beaver dams;
- breaching of landslide dams and moraine dams, and glacial lake outburst floods;~~,~~ and
- breaching of earth embankments such as dams and tailings impoundments.

In these guidelines, both conventional floods and other flood-related hazards are collectively referred to as floods or hazardous floods. Floods can affect floodplains, *alluvial fans*, shorelines and coastlines or any other riparian land.

Floods and flood-related hazards can be ~~either~~ predictable or may occur without warning. Apart from inundating land with all the associated *consequences*, other consequences not directly associated with flood inundation are bank erosion and sediment deposition.

The different types of floods and flood-related hazards in the province, their typical causes and effects, and their basic characteristics are summarized in Appendix A~~B~~.

The term flood hazard as used in these guidelines refers to the probability, likelihood or frequency of a hazardous flood event occurring, but sometimes also refers to a physical condition. The term flood risk combines the probability of a hazardous flood occurring and the potential consequences to elements at risk.

Flood management refers to mitigation measures considered or implemented to reduce the effects of a hazardous flood, either by changing the probability, likelihood or frequency of a hazardous flood occurring or by effecting change to the consequences.

The term flood assessment is used throughout the guidelines and can include FHAs, FRAs and/or flood risk mitigation reports.

Development, as defined by various pieces of provincial legislation, includes:

- subdivision of property;
- land use designation and zoning;
- *construction*, including construction of new buildings or structures; and
- structural alteration of, or addition to, existing buildings or structures.

1.6 ACKNOWLEDGEMENTS

These guidelines were prepared on behalf of APEGBC by a Committee of ~~QP~~QPs and was reviewed by several diverse parties and stakeholders as members of an APEGBC Review Task Force. The authors and reviewers are listed in Appendix K~~L~~. APEGBC and the authors thank the reviewers for their constructive suggestions. ~~In addition APEGBC would like to acknowledge the contribution made by Lawrence Francois, M.Sc. (UK) who reviewed these guidelines during their development.~~ Authorship and review of these guidelines does not necessarily indicate the individual and/or their employer endorses everything in these guidelines.

APEGBC thanks Natural Resources Canada (NRCan), MFLNRO, and the Fraser Basin Council. NRCan and MFLNRO funded the preparation of these guidelines and facilitated the review process. The Fraser Basin Council administered the funding and facilitated project coordination between NRCan and MFLNRO.

The 2017 update of these guidelines was prepared on behalf of APEGBC by ~~some of the~~an original author~~s~~, with input from the authors and some reviewers ~~editors~~ of the APEGBC Floodplain Mapping Guidelines. The changes were brought forward to various APEGBC Professional Practice Committees and Divisions for an additional level of review.

2.0 PROJECT ORGANIZATION AND RESPONSIBILITIES

2.1 COMMON FORMS OF PROJECT ORGANIZATION

Flood assessments for building permits, subdivision approvals, and other land development activities are typically initiated by a local government or the provincial government requesting the project proponent retain a QP to carry out some form of flood assessment and prepare a report. The project proponent then forwards that report in support of a land development application. The report may be subject to review by the approving authority, occasionally with assistance being obtained from an independent QP.

Typically, the landowner or development consultant is the client, and the QP establishes an agreement for professional services with that party. The QP should be aware however, that any report submitted will ultimately be reviewed by an approving authority, and possibly another QP.

The client should be aware that the findings and recommendations of the QP could result in a development requiring modification, the approving authority requiring a restrictive *covenant*, or the development being disallowed. In this regard, it is useful if the flood assessment is commenced early in the development planning process, and includes consultation with the approving authority

The role of the QP in relation to the client and the approving authority should be clearly defined. The QP should inform the client about land development approval processes and these guidelines, especially if the client has not previously been involved in land development or flood assessments, nor engaged a QP. In such situations the QP should consider reviewing with the client the typical responsibilities listed below, to assist in establishing an appropriate agreement for professional services, and to inform the client of the expectation of appropriate and adequate compensation (APEGBC Code of Ethics Principle 5).

2.2 RESPONSIBILITIES

Sections 2.2.1 to 2.2.3 describe some of the typical responsibilities of a client, QP and approving authority. Section 2.2.4 describes some of the typical responsibilities of a QP when asked by an approving authority or client to review a flood assessment report prepared by another QP.

2.2.1 The Client

The client may be the landowner, a development consultant, the local government, the provincial government, a First Nation or the Federal Government. Prior to a flood assessment it is helpful, and will likely reduce the cost of professional services, if the client is knowledgeable about, and can provide the QP with the following:

- process, procedures and requirements for the applicable land development application within the area of jurisdiction;
- legal description of the property, as registered with the Land Title Office and Survey Authority, ;
- a copy of the current land registration including any relevant restrictive covenants;
- a survey plan of the property and the location of the legal property boundary markers on the ground (this may require a BC Land Surveyor);
- plans of existing buildings or structures, location of the proposed development and drawings of the proposed development;

- proposed and anticipated land use changes (for example forestry activities, insect infestations, forest fires, mining) on and beyond the property;
- information on past or existing flooding and related issues (for example bank erosion, riverbed aggradation, channel migration);
- relevant background information (written or otherwise) related to the property and the existing and proposed *residential development*, including previous assessment reports conducted for the client or available to the client, and
- unrestricted access to the property and, if possible, relevant areas beyond the proposed development property.

The client should recognize that the flood assessment is based on the proposed development and subsequent changes to that development may require changes to, or invalidate, the assessment.

The QP should enter into a professional services agreement with the client prior to undertaking work on the project. In order to protect both parties, the agreement should be based on a proven standard agreement such as the Master Municipal Construction Documents (MMCD) Client-Consultant Agreement or Association of Consulting Engineering Companies - Canada (ACEC) Document 31. Some specific points for consideration regarding the agreement are as follows:

- in recognizing that natural hazards projects inherently have high potential liability, the agreement should establish appropriate limitation of liability;
- the agreement should confirm the scope to the extent that it is known at the time of agreement (natural hazards projects typically involve several scope modifications during the project which should be documented);
- the agreement should dictate that the QP report may only be relied upon for the project for which it was prepared;
- the agreement should establish a budget estimate, either for hourly services, lump sum or otherwise (recognizing that modifications to scope will typically impact the budget); and
- the budget estimate should reflect the need for an appropriate level of review (internal project review and possibly independent peer review).

The agreement should also include a clause that deals with potential disclosure issues due to the obligation of the QP under APEGBC Code of Ethics Principle 1 (hold paramount the safety, health and welfare of the public, the protection of the environment, and promote health and safety in the workplace). In certain circumstances the QP may have to convey adverse assessment findings to parties who may not be directly involved, but who have a compelling need to know. Following is suggested wording for such a clause:

> "Subject to the following, the QP will keep confidential all information, including documents, correspondence, reports and opinions, unless disclosure is authorized in writing by the client. However, in keeping with APEGBC's Code of Ethics, if the QP discovers or determines that there is a material risk to the environment or the safety, health and welfare of the public or worker safety, he/she shall notify the client as soon as practicable of this information and the need that it be disclosed to the appropriate parties. If the client does not take the necessary steps to notify the appropriate parties in a reasonable amount of time, the QP shall have the right to disclose that information to fulfill his/her ethical duties and the client hereby agrees to that disclosure."

After the assessment it is helpful if the client:

- reviews the assessment report, and understands the limitations and qualifications that apply;
- discusses the report with the QP and seeks clarification if desired;
- discuss the need for~~rects~~ the QP to complete an ~~assessment~~ assurance statement (Appendix I~~J~~) in view of approving authority requirements;
- ~~, and~~ provide~~s~~ the flood assessment report, and if applicable, the assurance statement ~~and the assessment report~~ to the approving authority;
- allows the QP to confirm that his/her recommendations have been followed so that the applicable Letters of Assurance (Schedules A, B, C-A and C-B) under the BC Building Code or other applicable codes can be prepared if necessary; and
- notifies the QP if land use, site development or other conditions change or vary from those described in the report.

The assessment report and any assurance statement are the property of the QP until outstanding invoices of the QP are fully paid by the client.

2.2.2 The Qualified Professional

The QP is responsible for carrying out the flood assessment and, if required/appropriate, outlining proposed measures to protect the proposed development.

Prior to carrying out a flood assessment the QP should:

- be knowledgeable about any applicable approval processes for the proposed land development project;
- confirm that he/she has appropriate training and experience to carry out the assessment in view of the terrain characteristics, the type of potential flood hazard, and the type of mitigative works potentially needed;
- appropriately educate the client regarding pertinent aspects of flood assessments;
- consult with the approving authority as to whether the proposed development may be considered in view of regulations, planning considerations, and local issues;
- ~~consult with the approving authority regarding applicable regulations, available information, application of the guidelines, role of structural mitigation works, applicability of *risk assessment* and requirements for development approval;~~
- determine whether the scope of work should include a hazard assessment, a risk assessment, a mitigation plan and/or design of engineering works;
- consider the need for and scale of investigations to~~hat~~ address land use changes and climate change;
- consider the need for the involvement of other specialists;
- establish an appropriate mechanism for internal checking and review;
- consider the need for independent peer review;
- ~~where possible and appropriate, review the draft report with the approval authority and the technical advisory staff;~~
- ~~when a report recommends a significant variance from a guideline (e.g., variance of a bylaw Flood Construction Level (FCL) that covers a wide area), it is suggested that variance be discussed with the approval authority prior to final submission;~~
- obtain a copy of any bylaws, guidelines, or regulations that are pertinent to carrying out a~~n~~ flood assessment~~, and/or preparing an assessment report~~; and
- if ~~one exists~~applicable, obtain the adopted level of flood hazard or flood risk tolerance, or other assessment approval criteria, for the proposed development in the approving jurisdiction (otherwise, seek direction as to whether it would be appropriate to apply a standard-based approach versus a risk-based approach).

QP's must recognize the practice areas of professional engineering and professional geoscience, and ensure that they work only within their licenced area of practice. -While there is some overlap in the professions (such as hydrology), there are other areas that are the practice area of one of the professions (i.e. specification and design of structural mitigation works is within the area of professional engineering). -If there is any confusion regarding areas for professional practice, a QP should consult APEGBC.

The QP should comply with the requirements of APEGBC Bylaw 17 regarding professional liability insurance.

During preparation of the flood assessment the QP should follow the guidance provided in Section 3 and relevant appendices. ~~).~~ Furthermore, the QP should:

- assist the client in obtaining relevant information such as listed in Section 2.2.1;
- make reasonable attempts to obtain from the client and others all relevant information related to flood hazards on and beyond the property;
- notify the client as soon as reasonably possible if the project scope and/or budget estimate requires modification;
- write the report clearly, concisely and completely to conform to applicable guidelines and regulations;
- ensure that appropriate steps are outlined to effectively implement recommendations (i.e., pertaining to design and construction of any structural mitigation works);
- identify any final review or certification that may be required prior to the development being occupied;
- ensure that the project work and flood assessment report are subject to appropriate checking and review by qualified personnel;
- where appropriate, obtain an independent peer review;
- where possible and appropriate, review the draft report with the client, approving authority and technical advisory staff;
- when a report recommends a significant variance from a guideline (e.g., variance of a bylaw requirement), it is suggested that variance be discussed with the approving authority prior to final submission; and
- address any significant comments arising from the reviews. ~~; and~~
- ~~where appropriate, submit a draft report for review by the client and other parties.~~

Some flood assessment cases will lend themselves to a single QP Report (with appropriate checking and review) that addresses the entire issue at hand.

In some complex cases, one QP may function as the "lead QP", with his/her QP report relying on one or more supporting reports that are independently prepared, reviewed, signed, and sealed. -Some examples of such a situation are:

- a complex hazard that warrants in-depth review by a specialist who is not the lead QP;
- a multiple-*hazard scenario* where at least one hazard type is not within the expertise of the lead QP, and is subject to a specialist assessment; or
- some detailed aspect of the flood assessment being subject to a specialist assessment.

In a multiple-hazard scenario, ~~the above-noted~~this -lead QP approach is most appropriate if the hazards are related (i.e., floods and debris flows). -If the hazards are completely independent (i.e., floods and rock fall), it may be appropriate for the QP reports to be kept separate, with two independent QP's.

When the project work is complete, the QP may submit a signed, sealed and dated copy of the final report, which should explicitly indicate the reviews that were performed. If directed by the client or the ~~-~~approving authority, the report ~~-~~should be supplemented with a flood hazard and risk assurance statement as specified in Appendix I~~J~~. The QP should avoid using the assurance statement from the APEGBC Landslide Guidelines for purely flood assessment reports. -Even if an assurance statement does not need to be submitted to the approving authority, the QP should review the various assurance statement items as a check that all appropriate steps were undertaken in preparing the flood assessment report.

It is appropriate for a QP to specify a limitation period (perhaps 1 year) in which an approving authority may rely on the QP Assurance Statement for the purpose of development approval, beyond which the approving authority would need to contact the QP regarding possible resubmittal of the Assurance Statement to reflect current physical and regulatory conditions.

After the assessment the QP should:

- clarify questions the client and/or approving authority may have with regards to the assessment, report, and/or flood hazard and risk assurance statement, and
- carry out follow-up work if agreed with the client.

If the QP delegates some aspect~~s~~ of the flood assessment ~~areis delegated by the QP, (to another QP in the same firm, or to a subconsultant QP in another firm), they~~ such work should ~~only~~ be carried out under direct supervision of ~~the~~ the ~~supporting QP~~QP, who also assumes responsibility for ~~all work~~ the delegated work (refer to Section 4.2), ensuring appropriate checking and review.

If the flood assessment report is followed by the construction of mitigative works, the ~~QP~~QP should either oversee such works~~,~~ or be satisfied that a mechanism for appropriate oversight is in place.

According to APEGBC Code of Ethics Principle 8, a member should clearly indicate to his/her client possible consequences if recommendations are disregarded. In such a situation, t~~T~~o fulfill APEGBC Code of Ethics Principle 1 (hold paramount the safety, health and welfare of the public, the protection of the environment, and promote health and safety in the workplace) and Principle 9 (report to APEGBC or another appropriate agency any hazardous, illegal or unethical professional decisions or practices by a QP or others if a *client* fails or refuses to accept the conclusions and recommendations of the report), the QP should:

- advise the client in writing of the potential consequences of the client's actions; and
- consider whether the situation warrants notifying APEGBC, the landowner (if different from the client) and/or appropriate authorities.

The above considerations are especially relevant if the QP identifies in the work done on behalf of the client a new flood hazard or provides the first detailed study of a known flood hazard that is within an area where developments are regulated by an authority having jurisdiction.

The above actions should be taken particularly if loss of life and/or other significant negative consequences are a possibility, or if workplace safety or the environment is potentially jeopardized.

2.2.3 The Approving Authority

For flood assessments, the approving authority is most often a local government as represented by the *approving officer*, b~~B~~uilding inspector or other representative. Within *regional districts*, the role of approving officer rests with the provincial government, although the building inspector is within the regional district. For sale or lease of Crown lands, MFLNRO lands officers act as the approving authority.

Where a flood assessment proposes physical mitigation measures (works in and around a stream or the construction of engineering works), other provincial and federal approval authorities may become involved. Such situations are generally outlined in Appendix ~~C~~B.

At the time of formal adoption of these guidelines by APEGBC (June 2017~~2~~), the legislative environment in BC assigns to local and regional governments the authority to implement bylaws and other measures for natural hazard mitigation with due consideration of provincial guidelines. While some have adopted generic bylaws with simple setback and elevation requirements, very few have adopted advanced bylaws to address steep mountain creeks, debris-flow hazards and flood risk considerations.

Approving Authority ~~–~~Regulation of Land Development Projects

As a prerequisite for development in a flood-prone area, the approving authority may require the proponent to obtain a report by a QP. The report may be required for the following purposes:

- to determine whether there is a potential flood hazard on the property;
- to meet the requirements of a local government bylaw;
- to confirm appropriate implementation of conditions in an existing restrictive covenant; or
- to ensure that the land is suitable for the intended use in the absence of a bylaw, restrictive covenant or other applicable regulation.

It is recognized that few local governments presently have comprehensive bylaws to guide flood assessments. Over time, it is expected that many local governments will adopt such bylaws considering these and other guidelines. In the absence of a national or provincial standard, it is also expected that local governments will establish an appropriate local standard (adopted level of flood safety) to guide preparation of QP flood assessment reports. This may include some or all of the following (for various types of hazards and/or development types):

- minimum design return periods;
- risk assessment criteria (such as discussed in Appendix E~~F~~); and
- direction on when a QP may apply a standard-based approach versus a risk-based approach.

Such standards may appropriately provide ~~a~~ more stringent criteria for new development, as opposed to redevelopment or infill development.

The approving authority may assist the client in defining the terms of reference for the study. Before the flood assessment is initiated, it is helpful if the approving authority:

- informs the client why a flood assessment is required;
- informs the client, if applicable, of the adopted level of flood safety (level of tolerable flood hazard or flood risk) in the approving jurisdiction~~;~~ (or in the absence of such level, identify flood assessment approaches that may be acceptable);
- provides the client with any applicable guidelines and regulations for carrying out a flood assessment and/or preparing a flood assessment report;

- identifies known flood hazard information and reports relevant to the project (such as flood reports and maps) and describes how to access the documents;
- provides the client with information regarding existing structural mitigation works and input on the need for additional works;
- advises the client of any key policies or procedures that have the potential to affect the outcome of the assessment (~~. F~~for example, at least one regional district has a policy that states that it will not assume the role of a Diking Authority);
- ensures the client is aware of the implications of the *Dike Maintenance Act* and *Water Sustainability Act*; ~~and~~
- provides an indication of any desired interaction with the ~~QP~~QP during preparation of the report; and
- advises whether an assurance statement (Appendix ~~J~~I) will be desired or required to accompany the flood assessment report.

After the assessment is submitted the approving authority should:

- review the assessment report;
- if necessary, discuss the report with the client and/or QP; and
- outline any applicable next steps in the land development process.

The approving authority may act to implement any recommended mitigation measures. This will typically include registration of a restrictive covenant pursuant to Section 219 of the *Land Title Act*. Where the mitigation measures include engineering works, the approving authority will need to ensure that appropriate arrangements are made for design, construction, operation and maintenance (where appropriate in consultation with other jurisdictions).

Approving ~~a~~Authority ~~– Engineering~~ Issues Related to Structural Mitigation Works

The QP may recommend upgraded or new structural mitigation works as part of a mitigation strategy. In this case, approvals will be required from various federal and provincial government agencies. For structural mitigation works to proceed, the ~~proposed works~~ client must obtain or ensure:

- local government approval, both as development reviewer and the local authority who will likely operate and maintain the works;
- applicable local, regional, provincial or federal environmental approvals;
- approval from the *Inspector of Dikes* as the provincial regulator for flood protection works *(Dike Maintenance Act*);
- approval from the provincial MFLNRO (*Water Sustainability Act*) if construction will involve works in or about a stream, or if a water licence is required;
- approval from Fisheries and Oceans Canada if in-stream or riparian construction could result in a Harmful Alteration, Disruption, or Disturbance (HADD) of fish habitat;
- there is compliance with the *Heritage Act*;
- First Nations are consulted if applicable; and
- approval from Transport Canada if the works could impact a navigable watercourse.

At the project outset, all of the above should be considered as potential approving authorities and input should be sought at the earliest possible opportunity. Any or all of the above may have regulations or requirements concerning scope, extent, timing, design, operation, maintenance, compensation, and/or reporting.

For any structural mitigation works that are constructed, there is generally a need to ensure that such works meet the criteria of a standard dyke. In addition to meeting engineering standards, this includes the need for the works to be located on a right-of-way and under the jurisdiction of a local government maintenance authority. An operation and maintenance manual must be provided for this purpose.

Approving~~al~~ Authority ~~–~~Reviews of Flood Assessment Reports

~~In some cases, t~~The approving authority may use in-house experts or directly retain an independent QP to provide advisory services before or during a flood assessment, or to review a submitted flood assessment report. Such a ~~professional~~ QP may provide advice regarding the type of flood assessment that would be appropriate, review any documents submitted by a ~~QP~~QP retained by a project proponent, advise on improving the local flood management approach, and develop~~ing~~ new local guidelines and regulations.

In the event that a report submitted by a QP does not meet the requirements of the approving authority, or has an obvious deficiency such as lack of checking and review, it is suggested that the approving authority return the report to the QP with a suitable explanation. -Prior to submitting a revised report, the QP would best consult with other expert professionals, the provisions of these guidelines, and possibly APEGBC staff. -In some cases, the approving authority may wish to bring the matter to the attention of APEGBC.

An approving authority or client may also obtain an independent peer review of a report submitted by a QP. The need for an independent peer review on behalf of the approving authority is determined on a case-by-case basis, and may depend on:

- the credentials and experience of the author;
- the presence (or lack) of scientific consensus in understanding the relevant hazards;
- the capability of the approving authority to review and respond to the report;
- past precedent and/or the present state of local practice;
- the complexity of the report subject matter;
- the degree of judgment incorporated in the flood assessment;
- the apparent sufficiency of checking and review in preparation of the flood assessment report;
- the concept and scale of any engineering works proposed for mitigation; and
- the size of the at-risk population, the nature of the elements at risk, and the extent of potential consequences for the spectrum of flood hazard scenarios considered.

In order for the independent peer reviewer to carry out an appropriate review, it is helpful if the requesting approving authority:

- is aware of the APEGBC Code of Ethics Principle 7; specifically, guideline (c), which states that a member should not, except in cases where review is usual and anticipated, evaluate the work of a fellow member without the knowledge of, and without communicating with, that Member where practicable;
- provides the reviewer with any applicable bylaws, guidelines and regulations for carrying out an assessment and/or preparing an assessment report;
- explains the purpose of the peer review~~er's involvement~~;
- defines the ~~role and~~ scope of the review;
- provides relevant background information and reports;
- defines any intended interaction with the QP retained by a client;
- reviews any documents prepared by the reviewer;
- if necessary, discusses any review documents with the reviewer; and
- adopts an appropriate means of communicating the work of the reviewer to the QP responsible for the initial report.

An independent peer reviewer should also enter into an appropriate professional services agreement with the requesting ~~a~~Approv~~al~~ing ~~a~~Authority or the client in view of the relevant provisions noted in Section 2.2.1.

The reviewing QP should consider whether there may be a conflict of interest and act accordingly (APEGBC Code of Ethics Principle 4), and conduct the review with fairness, courtesy and good faith towards colleagues and provide honest and fair comment (APEGBC Code of Ethics Principle 7).

Following guideline (c) of APEGBC Code of Ethics Principle 7, the reviewing QP should:

- if appropriate and authorized, inform the QP responsible for the initial report of the review, and the reasons for the review, and document in writing that the QP was so informed;
- ask the QP responsible for the initial report if the reviewing QP should know about unreported circumstances that may have limited or qualified the assessment and/or the report; and
- with the client's authorization, contact the QP who prepared the report if the results of the review identify safety or environmental concerns, in order to allow an opportunity for the QP to comment prior to further action.

The reviewing QP should submit a signed, sealed and dated review letter or corresponding report including:

- limitations and qualifications with regards to the review; and
- results and/or recommendations arising from the review.

~~The reviewer should clarify any questions the Approving Authority or client may have with regards to the review letter or report.~~

Any peer review performed for the approving authority is additional to the review required in submittal of a QP report. -In other words, all QP reports are required to be reviewed and signed by another qualified QP, regardless of whether the approving authority initiates any additional review.

Occasionally, a QP is retained to provide a second fully independent assessment. This role goes beyond that of reviewing the work of the original QP. In such cases, the second QP should carry out sufficient office work, field work, analysis and comparisons, as required, to accept full responsibility for his/her independent flood assessment.

3.0 GUIDELINES FOR PROFESSIONAL PRACTICE FOR FLOOD ASSESSMENTS

3.1 GUIDING PRINCIPLE

~~QP~~QPs are required to carry out activities to meet their obligations under the *Act*, including their primary duty to protect the safety, health and welfare of the public and the environment.

3.2 OBJECTIVES

The objectives of a flood assessment may be guided by legislated requirements for subdivision approval, development permits, building permits, or floodplain bylaw variance or exemption. This section offers a practical approach to prepare flood assessments for:

- obtaining building permits;
- subdivision developments;
- rezoning applications; and
- the sale or lease of Crown lands.

These guidelines not only provide guidance to the practitioner with regard to conducting such assessments but also inform approving~~al~~ authorities such that regulatory approaches may be improved over time.

3.3 OVERVIEW

This section provides guidance for meeting professional obligations for a QP commissioned to carry out flood assessments. The chapter closely follows the flow chart below (Figure 3-1). It is structured chronologically into the phases of the study including Project Initiation, Flood Hazard Assessment, Regulatory Considerations, Flood Risk Assessment, Recommendation of Structural Mitigation Works, and Reporting. Generalities of the approach are presented in this chapter and specifics on the execution of the work are summarized in Appendices D~~E~~, ~~F~~E and F~~G~~.

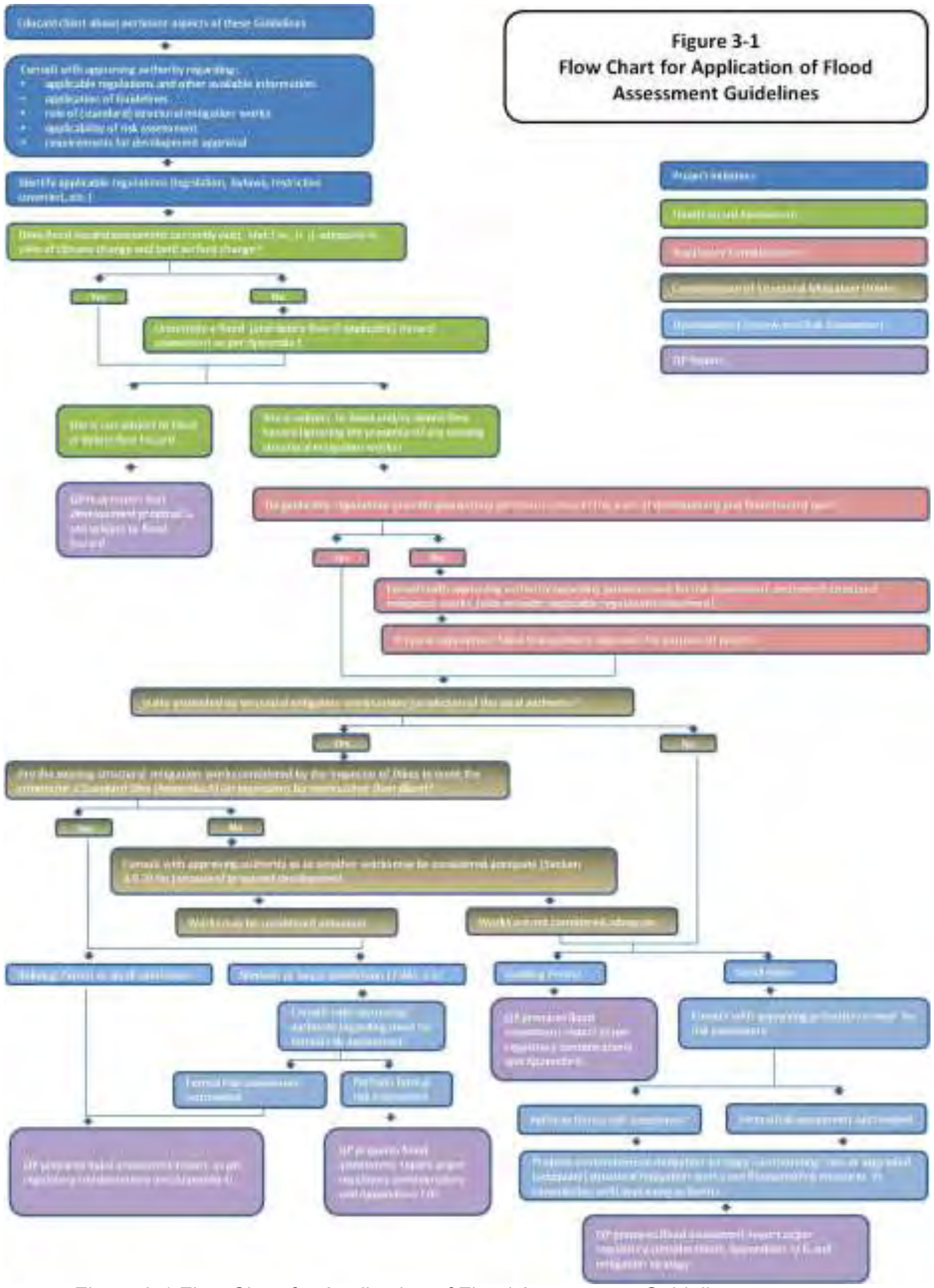

Figure 3-1 Flow Chart for Application of Flood Assessment Guidelines

3.4 Project Initiation

At the onset of any flood assessment, the client should be informed about these guidelines and how they apply to the desired development project. The role of the approving authority is defined in Section 2. The QP should consult with the approving authority at this stage to:

- confirm that the proposed project may be considered for approval;
- define the study area;
- obtain background information;
- clarify the application of these guidelines;
- clarify the role of standard and non-standard structural mitigation works;
- determine whether a level of flood safety (or any related standard) has been adopted;
- clarify the role and applicability of either a standard-based or ~~formal~~ risk-based approach ~~assessment~~; and
- clarify the requirements for a development approval.

3.4.1 Study Area

The study area should be determined by the study objective, the proposed development area ~~size of the parcel of land or the size of the specific site, the elements at risk~~, existing and proposed assets ~~the number and types of structures~~ to be protected, and the nature of the flood processes involved. The study area should not be limited to the prop~~erty~~osed development area ~~or to the specific site~~, and ~~where relevant,~~ may ~~include~~include other sites, properties, or watershed areas that could potentially contribute to the flood hazard or be affected as a result of any changes to the flooding condition that may be created by the proposed development. Where deemed relevant, consideration ~~must~~ should be given to the potential impact of flood hazards ~~which~~ that cross jurisdictional boundaries. ~~The QP should report on any hazards the proposed development may pose to other properties and infrastructure and, if requested, provide options for mitigating these effects.~~ The QP should also ~~assess~~ consider hazards associated with flooding from all adjacent hydraulically-linked sources. The abov~~these~~ issues will ~~also~~ determine the ~~size~~ extent of the study area ~~to be considered~~.

~~As a result, the study area can encompass a large variety of spatial scales ranging from a single lot to a major drainage basin, while the development to be protected may be very limited in spatial extent.~~

3.4.2 Background Information

It is the responsibility of the QP to obtain and review the available background information. Prior to field work, the QP should collect, possibly with the help of the client or approving authority, existing information associated with the study area. The QP should consider the items in Table 3-1 as possible sources of ~~existing~~ information.

Table 3-1: Background information for flood assessments

Previous Assessments	• *fFlood hazard maps* and reports, terrain maps; • floodplain map~~sping~~ and alluvial fan map~~sping~~; • other resource inventory maps and reports; • previous flood assessment reports~~,~~; • relevant geological and geotechnical reports ~~that address the study area and, if available, neighbouring areas~~; • sedimentation records and reports; and • hydrogeology reports.

~~Basem~~Map ~~Data~~Information	• ~~l~~Large and small scale topographic and cadastral maps;~~,~~ • LiDAR maps; • channel, lake/ocean bathymetry; • maps that show existing and proposed land use, infrastructure such as transportation routes, utilities, surface drainage, in-ground disposal of stormwater, and in-ground disposal of wastewater ~~and/or sewage~~; • air photos ~~of~~from different years (historical to present) and scales; • bedrock and surficial geology; and • in forested areas of ~~logging~~the watershed: forest cover maps, forest development/stewardship plans, watershed assessments, past and proposed forest road construction and logging, and other relevant logging-related information.
Legal Data, Elements at Risk	• ~~l~~Locations and characteristics of existing development, including residential and non-residential, and associated infrastructure locations and characteristics of proposed development (if relevant).
Historic Data	• ~~e~~Evidence and history of flooding in the area; • newspaper articles; • historic information available from local libraries; • data from ~~locations and number of~~ Water Survey of Canada ~~gauges~~ hydrometric stations and ~~climate stations of the~~ Meteorological Service of Canada climate stations ~~used for hydrologic and hydro-climatic analysis~~; • ~~streamflow~~ hydrometric and ~~precipitation~~ climate data ~~gathered~~ collected by municipalities, BC Hydro, Ministry of Forests, mining companies and others; and • evidence and history of wildfires and insect infestations in the area.

Previous ~~F~~flood assessment reports from neighbouring areas can be useful to the QP and, in this regard, the local and provincial governments are encouraged to make such reports available to the QP since they are not always publicly accessible. In using such reports, it is important to respect any expressed limitations of use (typically, previous reports by others are to be used only for the project purpose at the time of preparation and are not to be relied upon for other projects and purposes).

The QP should check whether there is a restrictive covenant pertaining to flooding registered against the land title. It may also be beneficial to check whether restrictive covenants are registered against other land titles in the vicinity.

Information can also be obtained from published and non-published sources from federal and provincial agencies, local governments and other local sources. Newspaper archives may provide valuable information on past flooding but the credibility of such sources will need to be scrutinized.

For flood assessments of larger areas, obtaining project-specific information, in addition to existing background information, may be useful. Examples are air photos, high-resolution satellite imagery, and Light Detection and Ranging (LiDAR) images that can be used for topographical mapping and geomorphological or geological mapping. Regional flood frequency curves, ~~I~~intensity-~~D~~duration-~~F~~frequency (IDF) rainfall graphs and other existing information on flood and rainfall frequencies should also be obtained.

Background information should be reviewed prior to undertaking subsequent phases, and the QP should consider the reliability of such information. If information is known to be available and the QP did not (or was not able to) obtain it, the circumstances should be reported.

In or near urban centres a wealth of information is available that can help the ~~QP~~QP ~~in answering a study's objectives~~. This information can span diverse fields such as climatology, meteorology, geology, flora, and include information on fire history, land use, previous flood reports, media reports, and mapping of different variables at a variety of scales.

Included with these guidelines are references that can be used in completing a check of the relevant background information to be compiled and interpreted. These references can be used to confirm that the background information gathered is sufficiently comprehensive for the specific flood assessment being completed.

3.4.3 Level of Effort

The level of effort for a flood assessment depends largely on the size of the development and the scale/complexity of the potential flood hazard (i.e., whether there is risk of injury or death)~~, because larger developments imply higher potential consequences to severe floods~~.

On the lower end of the development spectrum, one may consider, for example, a request for relaxation of a bylaw floodplain setback for a house adjacent to a small creek fan or a river channel ~~floodplain area~~. In these cases, the level of effort will be very site-specific, ~~and may be~~ possibly limited to a short ~~(perhaps an hour to a day)~~ field visit by the QP ~~and~~ followed by a qualitative flood assessment. Details on what such an assessment may entail are provided in Appendices D~~E~~ and E~~G~~.

In the middle of the spectrum of development scales, consider a study of a steep creek. Here the contributing study area may be a 2 km^2 size watershed, while the local study area may be a small number of buildings situated on the creek~~'s~~ fan. Peak flows would need to be determined for floods, and/or debris floods and debris flows, as well as total debris volumes for the latter two processes if they are considered a possible hazard. The watershed would be examined for land use changes, forest road stability, hydrologic effects of ski area developments and perhaps even the potential effects of insect infestations or stand-replacing forest fires. The fan area would need to be studied with respect to the effects of the *hydrogeomorphic process* in terms of hazard frequency, magnitude and intensity and, where ~~requested~~appropriate, the potential consequences and thus risk to people and infrastructure on the fan.

At the high development spectrum scale, consider a study of flood hazard for a new ~~township~~ community of several hundred homes. The study area can be categorized into a contributing study area and the local study area or consultation zone (the designated development zone). The contributing area would need to be considered for flood frequency analysis and would need to account for long-term changes in the watershed and, where applicable, the adjacent ocean. The former involves an analysis of changes in snow distribution and snow-water equivalents, synoptic weather pattern and land use. The latter requires a review of anticipated sea level rise, changes in the frequency or magnitude of storm surges, and, where applicable, possible submarine delta front landslides and ~~their~~ potential for bore generation.

3.5 Anticipating Climate Change and Land Surface Change

These guidelines acknowledge that global climate change is affecting the hydrologic regime in BC and encourage the QP to include climate change considerations together with land surface changes in flood assessments where appropriate.

3.5.1 The Problem

Global and regional climates are now changing on time scales typical for many engineering and land use projects. Since climate and hydrology are closely linked the prospect for changed hydrological conditions must be incorporated into estimates of future flood hazards. Furthermore, the changeable condition of the land surface may influence runoff formation and flood potential in significant ways. Design for protection against future flooding must consider these factors.

Natural and anthropogenic causes of climate change are complex and difficult to determine, so predictions of change are subject to significant uncertainty. For this reason, the term "projection" is favoured in these guidelines. It is even more difficult to predict the changes in factors that can affect flooding at the watershed scale because local factors (i.e., land use change, insect infestations, stand-replacing forest fires, widespread windthrow) are superimposed on regional estimates of climate change. Appropriate professional practice requires that the effects of climate change be considered when carrying out flood hazard and/or risk assessments and that significant potential changes in land surface conditions be considered so far as they are foreseeable. Consideration of such factors will allow local government and provincial approving officials to incorporate climate change effects into flood hazard and land development decisions. This section identifies various methodologies and resources that can be accessed for incorporating the specific effects of climate change into flood hazard and/or risk assessments. A more detailed discussion is provided in Appendix ~~H~~G.

The following summarizes the principal climate change effects relating to hydrology and hydro-geomorphic processes currently expected to be experienced in BC by the end of this century:

- average temperatures are expected to increase by approximately 2.8°C; warmer than most of the warmest years in recorded history (Rodenhuis et al., 2009);
- the average annual precipitation is expected to increase between 6% and 17%, the increase primarily occurring during winter months and in the mountains (BC, 2007);
- for larger watersheds, surface runoff is expected to increase in the winter months, an earlier spring freshet is expected, and drier conditions are expected in the summer months;
- for smaller watersheds, rain-dominated floods are expected (Schnorbus et al., 2010a) with potentially higher peak flows due to increased storm precipitation intensity;
- it is projected that a net sea level rise of as much as 1 m will occur along the BC coast (BC, 2007; Ausenco Sandwell, 2011a);
- warmer winters are expected to raise winter snowlines; however, high elevation snowpacks may increase in depth because of wetter conditions;
- increases in winter precipitation and precipitation intensities will result in increases in the likelihood of shallow landsliding in coastal BC although this effect will remain significantly below that of, for example, clearcut logging (Jakob and Lambert, 2009);
- glaciers will continue to reduce their mass; in the northwest mostly by thinning and in central and southern BC dominantly by frontal retreat (Moore et al., 2009). High elevation snowpacks may maintain many glaciers in a new equilibrium but with reduced area (Moore et al., 2009);
- a changed climate is expected to shift the ranges of forest species and result in an increased incidence of pest infestation; and
- increases in temperature, lightning strikes and summer droughts will increase the potential for forest fires (BC, 2007).

Some climate change effects lead to land cover changes such as increased frequency or severity of forest fires or insect infestations. However, increased urbanization and sealing of pervious ground as well as diking can lead to significant changes in the runoff regime which need to be incorporated in flood assessments.

Additional details are provided in Appendix G~~H~~, sections G~~H~~-2 and G~~H~~-3.

It is expected that the foregoing changes will result in an increase in the frequency of floods in small and medium drainage basins that will be dominated by rainfall runoff, and flood events will typically be more intense (higher peak flows, flow velocities, flow depths, areas inundated) and of a larger magnitude (flow volume). Large drainage basins in which the hydrology is dominated by the spring snowmelt freshet may experience diminished flood magnitude in many years and more frequent low flows. However, the potential for a historically high flood will remain since an exceptionally large winter snow accumulation followed by a sudden spring heat wave might still create extremely high runoff.

Climate change means that hydrometeorological and hydrological data sequences will continue to change so that traditional methods of predicting the frequency of floods and levels of flood flows based on historical records (assumption of data stationarity) are increasingly unreliable (Milly et al., 2008). Hydro-climatological model-based forecasting of flood flows will become more important, but its appropriate use will require a better understanding of the processes causing climate change. Hydro-climatological modelling is an expert activity; the responsibility of the QP is to be familiar with current model-based projections, including the specified precision of those projections. Professional judgment must be exercised to extract the most appropriate design parameters for particular projects from currently available climatic projections. Results should, of course, be compared with the historical record to determine whether they are plausible for the project site.

3.5.2 Sources of Information on Climate Change

The Pacific Climate Impacts Consortium (PCIC) is a government-supported research group based at the University of Victoria tasked with continuing study of climate change in BC. The mandate of the group includes projecting future trends in runoff. Their reports are archived online ~~at~~ (pacificclimate.org) and should be consulted before making estimates for future flood flows.

Through PCIC, the MFLNRO, along with the Ministries of Transportation and Infrastructure, and Agriculture are working together with BC Hydro and Rio Tinto Alcan under a formal agreement to make long-term meteorological data available for professional users involved in climate change analysis and adaptation. The mandate of this program is to collaborate on collection of climate data in BC, discussing everything from monitoring technologies~~,~~ and data quality ~~and~~ to data sharing. PCIC is developing a data portal which will provide access to observed time series of temperature, precipitation and other climate variables for BC extending more than a century into the past, and including stations operated by all the partners in the program. An overview of the program is available at: www.env.gov.bc.ca/epd/wamr/crmp.htm.

The Pacific Institute for Climate Solutions (PICS) (Available at: ~~www.~~pics.uvic.ca/~~index.php~~) is a useful technical resource focusing on climate issues and solutions, with an emphasis on economic and social implications of climate change. The PICS News Scan provides a weekly summary of the major climate-change related science, technology and policy advances of direct relevance to BC and Canada and, more generally, to businesses, government and civil society. ~~QP~~QPs engaged in flood hazard and risk analyses should regularly refer to this site.

The University of Washington Climate Impacts Group (Available at: ~~http://cses.washington.edu/pubs/allpubs.shtml~~cig.uw.edu) is an interdisciplinary research group studying the impacts of natural climate variability and global climate change ("global warming") in the western U.S., with most work focused on the Pacific Northwest. Reports from this group are relevant to the heavily populated areas of southern BC.

Other useful sources of information and reports include:

- BC State of Environment reporting (Available at: www2.gov.bc.ca/gov/content/environment/research-monitoring-reporting/reporting/environmental-reporting-bc);
- Environment and Climate Change Canada (Available at:~~www.ec.gc.ca/sc-cs/Default.asp?lang=En&n=56010B4-1~~ec.gc.ca);
- Ouranos (Available at: ouranos.ca), a consortium of scientists and organizations based in Quebec with a mandate to study climate change and social and economic adaptations; and
- Compendium of Forest Hydrology and Geomorphology in British Columbia, Pike et al. (2010) (Available at: www.for.gov.bc.ca/hfd/pubs/docs/lmh/lmh66/lmh66_frontmatter.pdf) provide an authoritative review of forest hydrology, including expected effects of climate change.

3.5.3 Analytical Considerations

Current climatic projections for future precipitation are mainly expressed in terms of expected changes in its amount. However, precipitation intensity is the critical input for making flood projections, especially in smaller drainage basins with short response times. IDF curves are a standard method to estimate the probability that a given average rainfall intensity will occur at various event return periods. IDF curves are based on historic precipitation at a particular climate station and, like flood frequency analyses, depend on the statistical principle of data stationarity. Given that such data stationarity may no longer be valid under consideration of climate change scenarios, IDF curves based on past conditions should be interpreted with caution when used as design inputs for long-term (>30- year design life) infrastructure.

Currently, the short-term and local precipitation data required to construct IDF curves cannot be discerned by regional climate models, which typically report results at monthly or longer time and regional spatial scales. Methods to overcome this problem include the use of weather scenarios (Prodanovic and Simonovic, 2007) and correlation of rainfall intensity with monthly rainfall totals (BGC, 2009; 2010). A basis for adjusting IDF curves is presented by Burn et al. (2011) in an analysis of rainfall totals for 1-12 hours for long-term recording stations in BC. See Appendix G~~H~~ for further details.

Most projections of future hydroclimate are couched in terms of changes in mean conditions and, possibly, expected extremes. If one expects only a shift in the mean, forecasts based on past experience might be used if consideration is given to changing frequencies of events, but if variance also changes, then future distributions of events will be quite unlike those of the past. Given the uncertainty associated with model projections, models are run repeatedly with small perturbations of input conditions to determine the range of sensitivity of the model. Projections of future climate or runoff are best assessed in terms of the mean and range of outputs from an ensemble of model runs. Such results must be obtained from climatologists who specialize in model analysis, from the sources listed in section 3.6.2 or from specialized consultants. In the absence of applicable hydroclimate model results, magnitude-frequency analyses based on recent experience (approximately 30 years) may remain valid for short-term (<30 years) projections, provided no trend is evident in the historical sequence of flood flows.

Practitioners should ~~recognise~~recognize that the effect of changes in land use, hence storm runoff, may have to be superimposed on projections of hydroclimatic change to arrive at the most appropriate estimates of future flood flows. This is particularly important in urbanizing areas, where dramatic changes in storm runoff accompany land use conversion. Extensive knowledge has been generated on this topic in urban, agricultural and forest environments and it should be considered as an additional adjustment to be made to the hydroclimatic projection. It is also important in areas where extensive changes are occurring in forest condition, such as widespread insect or fungus-induced die-off and extensive forest harvest.

Historical records should continue to be examined as a source of valuable information. Analysis of the record for trends in magnitude and frequency of flood events should be the first procedure in determining a *design flood* for future protection measures (see Appendix G~~H~~ for more discussion).

The following procedures are recommended when it is necessary to project expected flood magnitudes for design of protective works or mitigation procedures.

- By time series analysis of historical precipitation and flood records, determine whether any statistically significant trend is currently detectable in storm precipitation and in flood magnitude and/or frequency. If the subject water course has limited or no record, analyze nearby records from drainage basins of similar character.

If no historical trend is detectable,

- when IDF curves are to be applied, review current IDF curves and apply results of stormwater runoff modelling appropriate for expected land surface conditions; or
- when local or regional streamflow magnitude-frequency relations are used, apply a 10% upward adjustment in design discharge to account for likely future change in water input from precipitation.

In the analyses just proposed it should be recognized that, while climatological forecasts are couched in terms of expected changes in total or seasonal precipitation, it is storm-period inputs that are of paramount importance for flood planning. However, simple correlations can be constructed, using historical data, between precipitation totals (such as monthly precipitation) and variable of interest, such as short-period rainfall intensity, and these could become the basis for some estimates of possible future conditions.

If a statistically significant trend is detected:

- in large (seasonally driven) basins, adjust expected flood magnitude and frequency according to the best available regionally downscaled projections of annual precipitation and snowpack magnitude, assuming that the precipitation increment will all be added to peak runoff. For snowpack, compare projections with historical records of runoff from snowpacks of similar magnitude. Consider potential effects of plausible land use change. Combine the various effects if considered necessary;
- in smaller basins adjust IDF curves for expected future precipitation climate and apply results of stormwater runoff modelling appropriate for expected future land surface conditions, or;
- adjust expected flood magnitude and frequency according to the projected change in runoff during the life of the project, or by 20% in small drainage basins for which information of future local conditions is inadequate to provide reliable guidance. Consider potential effects of land use change in the drainage basin.

The QP must be aware that all estimates of climate and hydrological trends are tentative and changes must be expected. It is the responsibility of the QP to be aware of current best projections.

3.6 Flood Assessment Procedures

3.6.1 Flood Hazard Assessment (FHA)

Regardless of whether a standards-based approach and/or a risk-based approach is utilized, it is important that an appropriately detailed FHA is undertaken.

A FHA characterizes the flood process, identifies the existing and future elements at risk and determines the *flood intensity* characteristics that may damage the proposed development.

Provincial, regional or local standards or bylaws may specify a flood return period for which mitigation measures should be designed. Appendix D~~E~~ provides supplemental information in this regard. A *freeboard* allowance is typically added to account for uncertainties in the analysis. Appendix D~~E~~ provides details as to the requirements and applications for different development~~s~~ types. It differentiates between conventional floods and unconventional floods, including~~,~~ debris flows, landslide dam and glacial outbreak floods.

The FHA will determine whether the proposed development is subject to flood, debris flood, ~~or~~ debris flow, or other hazards. If it is not, the QP may summarize ~~this~~a finding of no flood hazard in the flood assessment report to be submitted to the client and approving authority. In general, sites on fan or floodplain landforms would not be able to be considered as "no hazard" areas.

3.6.2 Regulatory Considerations

Flood assessments that pertain to development approval must comply with legislative requirements (federal and/or provincial). Reports must also comply with local bylaw requirements (recognizing that they typically include a formal process for variance or relaxation). Legislative and local bylaw requirements may evolve over time, requiring that the QP remains informed.

Flood assessments must also comply with existing restrictive covenants registered against a land title, unless discharge or modification of the covenant can be achieved through a formal process (this will involve a lawyer, and consultation with the parties to the covenant).

While legislation and bylaw requirements provide some guidance for flood assessments, the QP ought to consider the sufficiency and appropriateness of such requirements in view of the type and scale of the proposed project, as well as the nature, frequency, intensity and potential consequences of the flood hazard. In cases where appropriate regulations are absent, or considered to be insufficient, the QP should consult with the approving authority regarding an appropriate approach for the proposed development. Such a consultation may require the QP to:

- confirm that the approving authority is conversant with these guidelines;
- encourage the approving authority to conduct ~~studies~~ work that may lead to an appropriate bylaw or land use regulation;
- encourage the approving authority to consider establishing a tolerable limit for flood safety (which could be standard-based and/or risk-based);
- inform the approving authority of some standards from elsewhere that may be applicable; and
- endeavour to obtain direction for the flood assessment to be performed.

Definitions of different development types as used in Figure 3-1 and elsewhere in the Guidelines are provided in Table 3-2.

Table 3-2: Definitions of different development types

Development Type	Examples
Building Permit	renovations, expansions, new single house, new multi-family house
Small Subdivision	Subdivision into separate lots (3 to 10 single family)
Medium Subdivision	Subdivision into ≥10-100 single family lots, new subdivisions
Large Subdivision	>100 single family lots, new subdivisions
Very Large Subdivision (new community)	>>100 single family lots, new subdivisions

3.6.3 Consideration of Structural Mitigation Works

Structural mitigation works may include *dikes*, bank protection works, debris barriers and other works. The presence of a standard dike or other structural mitigation works is a key consideration for development approval. Protection of a development by a standard dike implies that the local authority is responsible for dike maintenance, upgrading and repair. This provides a high level of assurance to property owners and residents that the dike protection is to a high standard which will continue in perpetuity. However, it is important for QPs to recognize in flood assessment work that a standard dike can potentially be breached or overtopped during extreme events. Therefore, floodproofing measures ~~and risk assessment principles are also~~ remain important, and risk assessment principles may still be warranted.

A QP should consult with the local authority and/or the Inspector of Dikes to determine whether existing structural mitigation~~flood control~~ works meet current Ministry or local government standards. In some cases, ~~an~~ existing ~~structure or~~ works may not meet all applicable ~~be constructed to high~~ standards, but may still be considered ~~appropriate~~ adequate for the project purposes~~following the risk assessment~~.

Figure 3-1 illustrates alternative procedures depending on whether the existing structural mitigation works are considered standard. Appendix F~~G~~ outlines a range of approaches that can be undertaken depending on the scale of development and whether flood protection works can be classified as standard or adequate~~works are present~~.

For building permit or small subdivision developments that are protected by a standard dike, Appendix F~~G~~ ~~provides for~~ outlines a practical standards-based approach that may be used in a flood assessment report. In most cases, floodproofing measures will be defined without the need for a formal risk assessment.

For a medium or larger subdivision that ~~are~~ is protected by a standard dike or other flood control works, Appendix F~~G~~ advises the QP to consult with the approval authority regarding the need for a formal risk assessment~~,~~ and proceed accordingly. If no direction is received, a QP may propose a standards-based approach or a risk-based approach that is appropriate to the situation. A proposed approach should be submitted to the ~~Approving Authority~~approving authority for consideration and approval. ~~-~~In the event of a risk-based approach, it is important to note that many of the mitigative provisions of Appendix F~~G~~ will remain applicable.

For a development project on a fan or floodplain that is not protected by a standard dike or equivalent structural mitigation works, the QP may advise the client to construct structural mitigation works. Appendix F~~G~~ provides some recommendations for flood protection measures for building permits in the absence of ~~major flood control~~ structural mitigation works.

For a subdivision on a fan or floodplain that is not protected by a standard dike or equivalent structural mitigation works, Appendix F~~G~~ provides for the QP to consult with the approval authority regarding the need for a formal risk assessment, and proceed accordingly. Some limited provision is made for subdivision approval in such areas in the absence of standard works. However, ~~in most situations~~unless acceptable to the approving authority, subdivision requires a comprehensive mitigation strategy that incorporat~~ing~~es standard structural mitigation works as part of the development. ~~-~~Unless acceptable to the approving authority, this provision for standard works is not conditional on the results of a risk assessment.

3.6.4 Comprehensive Mitigation Strategy

The preferred components of a comprehensive mitigation strategy are as follows:

- outline a comprehensive approach to mitigating flood-related hazards appropriate to the nature and scale of the proposed project;
- provide engineering designs and specifications for any structural works or non-structural strategies proposed as a primary level of protection;
- identify an appropriate maintenance authority (generally the local government) for any proposed structural works;
- define secondary protective measures within the proposed development area;
- consider the potential for impacts to neighbouring properties and transfer of risk;
- document the need for land tenure in favour of the maintenance authority; and
- outline future operation and maintenance measures by the maintenance authority in order for the works to be effective over the long term.

Flood assessments that propose structural mitigation works should endeavour to follow this approach.

3.7 Standard-Based and Risk-Based Approaches

3.7.1 Standard-Based Approach

In some areas local government bylaws and covenants specify flood protection measures and in some areas flood assessment design thresholds have been established based on the 200-year return period (Q_{200}) design (Appendix F~~G~~). There are no such~~set~~ criteria for the assessment of erosion hazards.

A typical application is the use of flood frequency analysis to determine the Q_{200} ~~200-year return period~~ flood magnitude on a river. This is followed by numerical analysis of the cross-section of the river and, if found insufficient to carry the design flood plus freeboard, may lead to an upgrade or construction of dikes to meet the required standard. After such upgrade/construction, and implementation of appropriate FCL, safety (up to the design level) is assumed and considering some additional rules (Appendix ~~G~~F), the development is typically considered approvable ~~as per the assessment of the~~ on the basis of a QP report and acceptance by the approving authority ~~the regulatory agency's judgment~~.

In cases where development approval applications are proposed behind a standard dike in an area where floodplain bylaws exist that prescribe FCL and setback requirements, compliance with those bylaws ~~will~~ may lead to development approval ~~even~~ in the absence of a QP report. ~~by a QP.~~

The adoption of a standard-based approach incorporates an element of risk. For example, the 200-year return period design flood assumes that the residual risk of a higher magnitude flood, even if it would most likely overcome existing or proposed flood mitigation measures, is tolerable to the client, approving agency and society at large. It also includes implicit risks arising from the possibility that the magnitude or frequency of the design flood is uncertain and that the frequency-magnitude relation may change during the lifetime of the proposed development and even that different hazard scenarios might incorporate different levels of residual risk. Therefore, all flood assessments, even the standard-based approach, include the element of *risk evaluation*, whether explicitly analyzed or implicitly assumed.

3.7.2 Risk-Based Approach

In contrast to the standard-based approach, a formal risk-based approach systematically quantifies flood consequences which are combined with hazard scenarios to estimate flood risk. Human safety, economic and environmental losses are typically the most important consequence categories but loss of cultural values and mental stress associated with property loss can be included. The resulting risk estimates are then evaluated through comparison with existing local or provincial risk tolerance criteria, or, in absence of those, against applicable international criteria. Figure 3-2 summarizes how hazard and consequences are combined in a comprehensive risk assessment.

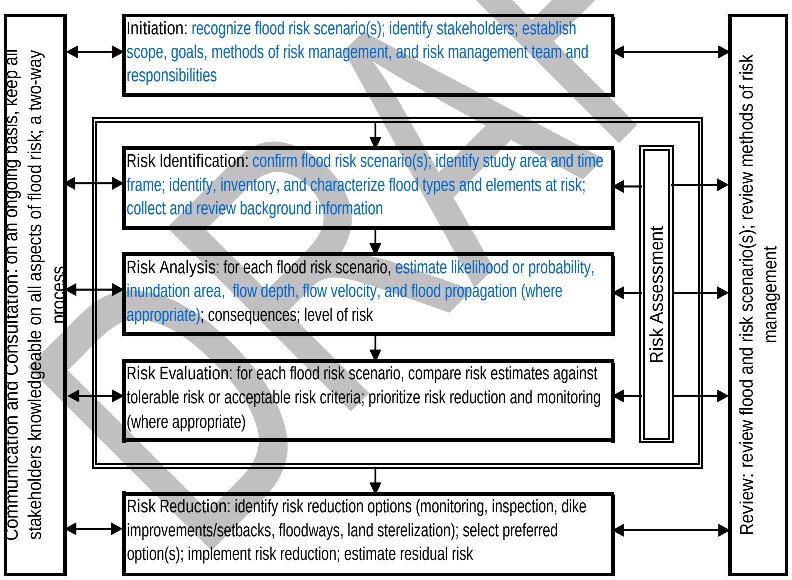

Figure 3-2: Generalized risk-based approach for flood risk management (modified from CAN/CSA-Q850-97). Elements of FHA are highlighted in blue.

3.7.3 Risk Tolerance

At this time, BC has not developed formal flood risk tolerance criteria. As noted above, professional practice standards have emerged that imply some level of risk tolerance. These have been codified in existing guidelines (BC, 2004). However, those standards make little provision for changes in either hazard or consequence; and may not be suited to environments where total risk is increasing either due to upward trends in the flood hazard or flood consequences (Jakob and Church, 2012).

Risk tolerance must be viewed over varying spatial scales. For example, significant flood damage to a single home in an extreme flood may be tolerable to society as this constitutes hardship mainly to the owner and may not have a significant effect on society at large. However, if many homes are impacted, losses are increasingly deferred to taxpayers. For extreme losses (in the billions of dollars), the total risk for all flood consequences may become intolerable to individuals and society alike, particularly when flood consequences directly or indirectly affect a large portion of the population. An example would be a catastrophic flood on the lower Fraser River.

Current flood (risk) management in BC does not account systematically for cumulative losses as flood management has largely been transferred to municipalities or regional districts. Within the provincial government, only the Ministry of Transportation and Infrastructure subdivision Approving Officers and MFLNRO lands officers still regulate land use. At the present time economic risk to the individual and local governments is addressed through the flood damage compensation program with Emergency Management BC (EMBC). If the local government and/or individual builds to Q_{200} FCL and meets minimum erosion setbacks and a flood larger than Q_{200} occurs then disaster financial assistance is available from the provincial and federal governments.

This issue is a regulatory one that cannot be addressed by a QP. However, this discussion evokes consideration of the area that should be included in the flood assessment and how it could affect the overall flood risk for the larger region. This concept has been used for landslides (Hungr and Wong, 2007).

The geographic area considered for a FRA is the consultation zone, defined as “a zone that includes all existing and proposed development and that contains the largest credible area potentially affected by a flood or related phenomenon”. Application of this definition would at least allow approving agencies to consider total risk in their assessments.

Further information on risk tolerance and risk evaluation is provided in Appendix ~~F~~E. At the end of a flood assessment the QP may be required to state that “the land may be used safely for the use intended”. Through this statement, the QP declares that the risks consequent for a given hazard scenario are tolerable or acceptable[5]. Herein lies a significant paradox: Statement of risk tolerance or acceptance cannot be made by a QP but only by the regulatory agency unless the owner wishes to design and construct to higher safety standards. This statement is required through current regulations (see Appendix ~~D~~C). APEGBC recommends that “safety” be clearly defined by the QP in the flood assessment.

3.7.4 Selection of Approach for QP Flood Assessment Report

As a preferred approach, QP flood assessment reports should follow published requirements of an approving authority, or directives received from approving authority staff. In the absence of such requirements or directives, a QP should further consult with the approving authority regarding possible implementation of a standards-based or risk-based approach, and proceed accordingly. Where such consultation does not result in direction being received, a QP may propose an appropriate approach that may be standards-based and/or risk-based.

[5] “tolerable” risks are those that society can live with given the perceived or real benefit that emerges by developing in a hazardous area. However, these risks require monitoring and usually call for further reduction. “Acceptable” risks are those that are broadly accepted by society and typically do not require further reduction.

If a QP proposes a standards-based approach in the absence of an approving authority's requirement or directive, some general guidance is as follows:

- a standards-based approach should not incorporate less than a 200-year design return period for any flood-related hazard;
- debris flow and debris flood hazards should be subject to greater than a 200-year design return period (at least 500-year return period, preferably 2500-year return period as discussed further in Appendix D~~E~~);
- creek-related hazards having greater than a 10,000-year return period can generally be considered sufficiently improbable to not require mitigation; and
- it is important to recognize that some level of residual risk will remain after mitigation, regardless of which design return period is adopted.

If a QP proposes a risk-based approach in the absence of an approving authority's requirement or directive, some general guidance is as follows:

- risk tolerance and risk acceptability criteria for life loss risk should be based on those from another jurisdiction as considered appropriate to the circumstances;
- hazard probabilities having greater than a 10,000-year return period may be excluded from the risk assessment and appropriately considered a residual risk; and
- for subdivision and new community developments, standard flood protection works should be provided to the satisfaction of the Inspector of Dikes and the approving authority, in addition to any measures to meet the risk tolerance standards from the risk assessment.

In either case, appropriate secondary flood protection measures (building elevation etc.) should be proposed on the basis of local considerations, the flood assessment and Appendix F~~G~~.

While the above two approaches ~~that~~ may be proposed by a QP in the absence of an approving authority's requirement or directive, it remains prudent to appropriately work with the approving authority during preparation of the report, ~~such that~~so the final report is likely to be acceptable to the approving authority.

3.8 Flood Assessment Reports

This section contains a checklist of issues that may be included in a flood assessment report. A flood assessment report may be a hazard assessment, ~~or~~a risk assessment, ~~or~~ a flood mitigation report, or some combination of these. The following bullets provide guidance as to the key elements of such reports.

The QP has a responsibility to convey the level of effort applied. This ensures that the approving~~al~~ authority understands the basis for choosing the analytical method selected. The level of documentation to be included in a report should be sufficient to assure repeatability of the work. In addition, the documentation provided as part of the report must be sufficient to facilitate report reviewers being able to understand how the QP arrived at his/her conclusions.

A flood hazard report could assume the following structure (~~further guidance is provided in~~see also ~~-~~Appendix D~~E~~):

- introduction and objectives, definitions of qualitative terms, technical terms, concepts and variables, information as specified in the agreement with the client, or as required in jurisdictional guidelines;
- study area with a legal description of the subject property (consultation zone) and a listing of all elements at risk and location map or description of the consultation zone relative to floodplains, alluvial/colluvial fans and relevant geomorphic features, terrain or physical

description of the contributing area, existing flood/erosion protection, structures, roads, businesses, infrastructure and surface drainage;
- description of background information available, collected and reviewed, and its relevance ~~including land use~~;
- recognition and characterization of flood processes (e.g., rainfall/snowmelt generated floods, ice related floods, debris floods, debris flows, glacial lake outburst floods, composite processes) within and, if required, beyond the development boundaries (see Appendix A~~B~~ for descriptions of flood types);
- description of methods of FHA and level of effort;
- reporting of results of the FHA with flood hazard maps showing, for example, area inundated, flow depths and flow velocities for different hazard scenarios;
- conclusions including, if applicable, a local level of partial risk tolerance;
- recommendations if requested and as required, to ~~reduce~~ mitigate the flood hazards and for further work;
- references including maps and airphotos, reports, manuals, guidelines and scientific papers;
- limitations and qualifications of the assessment and report, assumptions, error limits and uncertainties of the hazard assessment; and
- consideration of land use and climate change.

Typically, a flood risk report should include the following elements in addition to those listed above for flood hazard reports. However, this depends on the level of risk assessment specified (see Appendix E~~F~~, Table E~~F~~-~~6~~2):
- a local, provincial or federal level[6] of flood risk tolerance for comparison with determined risk values;
- results of the ~~FRP~~ FRA presented in numeric format and as *vulnerability* and/or risk maps;
- recommendations, if requested and as required, to reduce the flood risks;
- an estimate of the associated residual risks if the recommendations are implemented;
- limitations and qualifications of the assessment and report, assumptions, error limits and uncertainties of the risk assessment; and
- determination of the changes in risk in a changing climate.

A flood assessment report that includes provision for structural mitigation works may typically include the following:
- the objectives and basis for determination of the proposed concept for hazard mitigation (~~i.e.,~~ if applicable, with reference to the established risk tolerance criteria ~~that were established as part of the project~~);
- references to any applicable local standards or provincial guidelines pertaining to hazard mitigation (e.g., MFLNRO dike design and *Dike Maintenance Act* approval guidance documents);
- reference to any relevant standards or guidelines for hazard mitigation from an outside jurisdiction (particularly where there are no local standards or guidelines);
- identification of any potential or suspected natural hazard types that are not addressed in the mitigation plan;
- an overview of the proposed concept for hazard mitigation (potentially including primary flood defence measures and on-site secondary floodproofing measures);
- discussion of possible risk-transfer issues (and counter-measures if applicable);
- design and specifications of proposed mitigative measures (in some cases this would be in a separate report) with consideration to applicable standards for such works;

[6] Note that as of the date of publication no formal *flood risk* tolerance criteria have been defined locally, provincially or federally.

- measures to be considered in ~~the~~ construction of structural mitigati~~ve~~on works~~measures~~, including a final certification at the completion of construction;
- construction and maintenance cost estimates;
- identification of a proposed maintenance authority for any proposed mitigative measures (generally local government);
- identification of operation and maintenance measures that will be required for the mitigative measures (a separate operation and maintenance manual will ultimately be required for this purpose); and
- attention to land tenure and other such operational issues.

The specific effort spent on each of the bulleted items may be reduced in relation to the objective and spatial scale of the individual assignment.

Differences exist in how results are aggregated in the analysis and reporting stages. For assignments covering small areas, potential damage may be reported for individual buildings. For large areas, aggregating results within larger spatial units (e.g., census blocks) may provide a more reasonable approach given uncertainties of hazard data, characteristics of elements at risk, and estimated relations between flood intensity and levels of damage or loss. This approach is taken by the United States Federal Emergency Management Agency's (FEMA) loss estimation program HAZUS (FEMA, 2011) which has been adapted for Canadian use (see Appendix E~~F~~, Section E~~F~~-2.3.2).

Reports should be accompanied by drawings, figures, sketches, photographs, model results, test hole or test pit logs where applicable, laboratory test results, other tables and/or other supporting information as required. Graphic information should be consistent with the information in the text. Maps or plans should delineate the contributing area and the consultation zone in relation to existing and proposed residential development.

The report should be clearly written with sufficient detail to allow non-expert readers, including the client, ~~Approving Authority~~approving authority and others reviewing the report, to understand the methods, information used and supporting rationale for conclusions and recommendations, without necessarily visiting the property or site. F~~HA~~lood assessment reports are frequently included as part of a covenant on the land ~~T~~title, and should be written accordingly.

All work incorporated in a flood assessment report must be appropriately checked by qualified personnel. The report must also be reviewed and signed by another appropriately qualified ~~QP~~ person. Such review is to be explicitly evident in the report submittal. The need for such review is not diminished in the event that some other type of peer review is undertaken through the approving authority.

3.9 Limitations and Qualifications of Flood Hazards, Risk and Climate Change Impact Assessments

The limitations and qualifications provided with flood hazard and risk ~~studies~~ assessments can be based on a range of factors including the data available, the record length of data received, insufficient resolution of climate change impacts, sources of error stemming from field or analytical techniques as well as others. Each flood assessment report should describe such limitations with the goal to avoid the illusion of exactness. Sensitivity analyses are recommended to acknowledge these limitations and assess the worst case scenario. This is particularly important for formal FRAs in which a series of hazard scenarios ought to be carried to a risk assessment to provide a spectrum of possible risk scenarios and their respective losses.

3.10 Specialty Services

Complex flood hazard and risk assignments increasingly demand a multi-disciplinary approach to meet their objectives. It cannot reasonably be expected that a single QP has a broad enough background to address every specialty service required in order to complete a flood assessment.

~~Specialties can include q~~Quaternary sciences can be applied to date certain flood, debris flood or debris flow events. The dating of hydrogeomorphic events can be carried out using absolute dating methods such as varve chronology, radiometric dating of organic materials and dendrochronology. Each of these techniques requires specialized knowledge and cannot be completed without prior training.

The science of fluvial geomorphology is inseparably linked with flood hazard studies. An understanding of channel evolution, sediment transport mechanisms and river bank stability at various temporal and spatial scales needs to be linked to the channel hydraulics and is required to understand how flood hazard has evolved in parallel with river and floodplain changes.

One, two and three-dimensional numerical simulations are increasingly applied to assess flood hazard. In most consulting firms, modelling is completed by those specialized in this task and managed by others. Both the modeller and the managing QP will need to understand the model's best applications and limitations. With ever-increasing model sophistication, intense collaboration between the hydraulic modeller, the hydrogeomorphic process specialists and those who will apply the output in risk studies is crucial.

Risk assessments require a different skill set than that for hazard assessments. The QP responsible for determining economic losses requires not only access to high quality data on housing and infrastructure but also must have a comprehension of the various losses that may be associated with different flood stages and flow velocities. Furthermore, losses to the local and regional economies may need to be evaluated. This task may lie outside the expertise of the QP completing the FRA. If this is the case, additional qualified specialists should be retained, such as economists, or government institutions such as BCStats.

Similarly, cost-benefit analyses (CBA) or multi-criteria analyses (MCA) require at least some background in economics. For more sophisticated flood risk studies, CBA or MCA should be carried out by economists in collaboration with professional geoscientists or professional engineers.

Loss of life calculations also require specialized skill with a strong background in the various methods that have been proposed. These methods rely on very different input and are structured around different levels of sophistication, starting at very basic mortality statistics that hinge on water depth only and end at computing the loss of life potential for individuals living or working in the potentially flooded area. A summary of various loss of life estimation methods can be found in Jonkman (2005). As previous studies have shown, there are order-of-magnitude differences in the likely outcomes of loss of life studies. Sensitivity analyses and probabilistic assessment may be required to extract the most plausible scenarios that would be incorporated into a Class 3 risk assessment (see Table D~~F~~-2).

3.11 Assurance Statement

In the case of land development approvals, an approving authority may require a QP to submit a Flood Assurance Statement in the form of Appendix I~~J~~, or some other form. ~~-~~It should be noted that a different form of Assurance Statement is provided in the APEGBC Landslide

Guidelines. Care should be taken to ensure use of an appropriate Assurance Statement for the situation. Recognizing that these guidelines will evolve over time, a QP should also ensure that the most recent form of Assurance Statement is obtained and used.

In completing the Assurance Statement, a QP should ensure the following:

- the specific requirements of the approving authority must be determined through appropriate consultation at an early stage in the work;
- where the approving authority has not established a level of flood safety (flood hazard or flood risk tolerance), alternative approaches should be explored in consultation with the approving authority;
- all relevant items should be completed on the form; and
- the Assurance Statement must be consistent with the flood assessment report.

Whether or not it is explicitly stated on the Assurance Statement, a QP should ensure that the statement has been appropriately reviewed, most likely by the same QP who reviewed the flood assessment report.

4.0 QUALITY ASSURANCE/QUALITY CONTROL

A QP should carry out quality assurance/quality control (QA/QC) for all phases of a ~~FHA~~ flood assessment. ~~Appendix J provides a quality assurance statement for the QP.~~ This section outlines some key points in addition to those noted in Section 2.

4.1 APEGBC QUALITY MANAGEMENT BYLAWS

As a minimum, a QA/QC program must satisfy the requirements of APEGBC Quality Management Bylaws 14(b)(1), (2) and (3) with regards to:

- the work being performed under the direct supervision of a QP;
- retention of complete project documentation for a minimum of 10 years;
- documented checking of engineering and geoscience using a quality control process; and
- documented internal or external review of a flood assessment report.

These minimum requirements may be supplemented by an independent peer review where appropriate.

4.2 DIRECT SUPERVISION

The *Act* (Section 1 (1)) states that direct supervision means taking responsibility for the control and conduct of the engineering or geoscience work of a subordinate. With regard to direct supervision, the QP having overall responsibility should consider:

- the complexity of the project and the nature of the flood hazards and/or flood risks;
- which aspects of the flood hazard and/or risk assessment, and how much of those aspects, should be delegated;
- training and experience of individuals to whom work is delegated; and
- amount of instruction, supervision and review required.

Field work is one of the most critical aspects of a flood hazard and/or risk assessment. Therefore, careful consideration must be given to delegating field work. Due to the complexities and subtleties of flood hazard and/or risk assessments, direct supervision of field work is difficult and care must be taken to ensure that delegated work meets the standard expected by the QP. Such direct supervision could typically take the form of specific instructions on what to observe, check, confirm, test, record and report back to the QP. The QP should exercise judgment when relying on delegated field observations by conducting a sufficient level of review to be satisfied with the quality and accuracy of those field observations.

4.3 CHECKING AND REVIEW

As referenced in Section 4.1 of the guidelines and consistent with the requirements of APEGBC Quality Management Bylaw 14(b)(2), as a minimum, a flood assessment must undergo a documented checking and review process before being finalized and delivered to the client and/or approving authority. This documented checking and review process would normally involve an internal review by another QP within the same firm. Where an appropriate internal reviewer is not available, such as for a sole practitioner, an external reviewer ~~may~~ will need to be engaged. Such an internal/external review ~~should~~ must be explicitly documented in the report. The level of review should be discussed with the client but is based on the professional judgment of the QP. Considerations should include the complexity of the site, the nature of the flood hazard, type of development under consideration, elements at risk, availability, quality and reliability of background information and field data, the degree of judgment on which the assessment is based, and the QP's training and experience.

4.4 INDEPENDENT PEER REVIEW

An independent peer review is an additional level of review beyond the minimum requirements of Bylaw 14(b)(2) that may be undertaken for a variety of reasons (such as those listed above) by an independent QP not previously involved in the project. At the discretion of the QP, in consultation with the reviewer(s) involved in the regular checking/review process outlined above, such an additional level of review may be deemed appropriate. Alternatively, a local government or other approving authority may request an independent peer review to support project approval. An independent peer review may be undertaken by another QP within the same firm, or an external QP.

The independent peer review process should be more formal than the checking/review process carried out under Bylaw 14(b)(2). An independent reviewer should submit a signed, sealed and dated letter or report, to be either included with the report or put on file, that includes the following:

- limitations and qualifications with regard to the review; and
- results of the review.

In cases where an independent peer review is carried out, such review should generally be appended to the flood assessment report.

When an independent peer review is carried out, the QP who signed the flood hazard and/or risk assessment report remains the Engineer of Record or Geoscientist of Record.

The independent peer review discussed above is not the same as an independent review or advisory service provided by a QP who is retained by an approving authority, or sometimes a client (see Section 2.2.1).

5.0 PROFESSIONAL REGISTRATION; EDUCATION, TRAINING, AND EXPERIENCE

5.1 PROFESSIONAL REGISTRATION

As summarized in Appendix C~~D~~, the following are the professional registration requirements for legislated flood assessments for proposed developments in BC:

- *Local Government Act* (Section 491~~920~~(5~~11~~)) indicates that, for a development permit, the local government may require a report from a professional engineer "with experience relevant to the applicable matter".
- *Local Government Act* (Section 524~~910~~(7~~5~~)) indicates that, for floodplain bylaw exemption, a professional engineer or professional geoscientist "experienced in geotechnical engineering" is required.
- The provincial document associated with the *Local Government Act* ~~*(Section 910)*~~ (Ministry of Water, Land and Air Protection, c2004) indicates that a QP is a professional engineer or professional geoscientist with "geotechnical engineering experience and expertise in river engineering and hydrology, and in appropriate cases, … debris flow … processes."

A professional engineer as described above is typically registered with APEGBC in the discipline of geological engineering or civil engineering and has developed expertise in hydrotechnical engineering which includes hydrology.

A professional geoscientist as described above is typically registered with APEGBC in the discipline of geology or environmental geoscience[7]. Although the *Land Title Act* and the *Local Government Act* refer to a professional geoscientist "experienced in geotechnical engineering," by definition a geoscientist is not experienced in engineering. APEGBC interprets the *Land Title Act* and the *Local Government Act* to mean a "Professional Geoscientist experienced in geotechnical study," similar to that expressed in the Community Charter.

Not all professional engineers registered in the disciplines of geotechnical engineering or civil engineering are necessarily appropriately knowledgeable in geohazard assessments, river engineering, hydrology and/or debris flow processes. Similarly, not all professional geoscientists registered with APEGBC in the disciplines of geology or environmental geoscience are necessarily knowledgeable in geohazard assessments including debris flows and floodplain assessments. It is the responsibility of the professional engineer or professional geoscientist to determine whether he/she is qualified by training or experience to undertake and accept responsibility for flood hazard and/or risk assessments for proposed developments (APEGBC Code of Ethics Principle 2). ~~Consideration should be given by APEGBC to creating a special designation for a Flood Assessment QP, possibly with sub-categories, that would formalize the recognition of appropriate individuals.~~

As noted previously, as the complexity of the flood hazard increases, site characterization and a sound understanding of the geology and hydrogeological processes at work becomes more critical.

With regard to the distinction between professional engineering and professional geoscience, the following is an excerpt under Principle 2 of the Code of Ethics Guidelines (APEGBC 1994; amended in 1997):

[7] Until 2000, APEGBC referred to the discipline of environmental geoscience as geotechnics.

> "The professions are distinct and registration in one does not give a member the right to practice in the other; however, the Association recognizes that there is some overlap of the practices of engineering and geoscience.
>
> Nothing in this principle authorizes a professional engineer to carry on an activity within the area of professional geoscience which goes beyond the practice of professional engineering and nothing in this principle authorizes a professional geoscientist to carry on an activity within the area of professional engineering which goes beyond the practice of professional geoscience."

On this basis, the QP who recommends, designs and oversees the construction of structural mitigation works to mitigate the impact of flood hazards and/or mitigate flood hazard risks requires registration with APEGBC as a professional engineer. The QP who investigates or interprets complex hydrogeological conditions and geomorphic processes in support of FHAs is typically registered with APEGBC as a professional geoscientist in the discipline of geology or environmental geoscience, or as a professional engineer in the discipline of civil engineering.

5.2 Education, Training, and Experience

Flood hazard and risk assessments, as described in these guidelines, require minimum levels of education, training and experience in many overlapping areas of geoscience and engineering as well as economics and biology. A QP must adhere to the APEGBC Code of Ethics Principle 2 (to undertake and accept responsibility for professional assignments only when qualified by training or experience), and therefore must evaluate his/her qualifications and possess appropriate education, training and experience consistent with the services provided.

Education, training and experience can vary depending on the QP's background and whether specialty services are being provided. It also depends on the level of study as shown in Appendix D~~E~~. Each higher level will require a larger skill set that is typically achieved by increasing the study team with the respective specialists. Whether carrying out a flood hazard and risk assessment or providing specialty services, appropriate experience can only be gained by working under the direct supervision of a suitably knowledgeable and experienced professional engineer or professional geoscientist. Typical qualifications for a QP, or a team of professionals, who carry out FHAs for may include education and experience in:

- 1-D and 2-D hydrodynamic modelling;
- knowledge of fluvial geomorphology principles and applications;
- watershed hydrology;
- groundwater geology;
- extreme value statistics and trend analyses;
- understanding of the effects of climate change on the watershed in question which involves appropriate training, education and experience;
- ice effects;
- flood hazard mitigation structure design and operation;
- air photograph interpretation;
- stream channel hydraulics; and
- ~~varve chronology~~absolute dating methods

Typical qualifications for a QP, or a team of professionals, who carry out debris flood and debris flow hazard assessments may include education and experience in:

- air photograph and satellite imagery interpretation;

- absolute dating methods (dendrochronology, radiometric dating, varve chronology);
- relative dating methods where applicable (lichenometry, soil development, etc.);
- modelling techniques for landslide dam outbreaks;
- basics of hillslope geomorphology and hillslope processes;
- understanding of frequency-magnitude analyses of hydrogeomorphic processes;
- sedimentology;
- basics of soil mechanics;
- calculations of impact forces for infrastructure and houses; and
- design of debris flood and debris flow mitigation structures.

For formal FRAs, appropriate qualifications may include:

- database management;
- cost-benefit analyses;
- personal injury and loss of life
- ~~*risk analysis*;~~
- environmental surveying techniques; and
- aquatic resource inventory techniques.

Where structural mitigation works are contemplated, appropriate qualifications may include:

- current dike design guidelines and requirements;
- right-of-way requirements for structural mitigation works;
- engineering design requirements for a standard dike;
- operation and maintenance requirements for structural mitigation works;
- environmental requirements for design, construction and operation;
- ~~principals~~ principles of seismic design; and
- ~~principal~~ principles of tsunami science.

The academic training for the above skill sets can be acquired through formal university or college courses, or through continuing professional development. There may be some overlap in courses and specific courses may not correlate to specific skill sets. A QP should also remain current, through continuing professional development, with the evolving topics of flood hazard and risk assessments and specialized services offered (refer to APEGBC Code of Ethics Principle 6). Continuing professional development can include taking formal courses; attending conferences, workshops, seminars and technical talks; reading new texts and periodicals; searching the web; and participating in field trips.

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~~APPENDIX A: GLOSSARY OF SELECTED TERMS~~

~~Acceptable Risk~~
~~A risk for which, for the purposes of life or work, we are prepared to accept as it is with no special management. Society does not generally consider expenditure to further reduce such risks to be justifiable.~~

~~Active and Inactive Alluvial Fan~~
~~An active alluvial fan can be defined as being subject to channel avulsions and where the main fan surface is still undergoing periods of aggradation and channel incision. An inactive alluvial fan can be defined as a fully trenched (from fan apex to distal section) fan on which fluvial processes are limited to the present channel and its banks. Avulsions of the fan surface are considered extremely unlikely.~~

~~Alluvial Fan~~
~~An accumulation of sediment where a steep stream channel flows out onto a valley floor of reduced gradient, often fan-like in shape, subject to further additions of sediment. Strictly, an alluvial fan is the product of sediment transported and deposited by water floods (including debris floods), but the term is often applied also to debris flow fans, those constructed from the deposits of debris flows, and many fans incorporate deposits of both types.~~

~~Approving Authority~~
~~Approving Officer, Building Inspector, or Planners and/or Councils of a local government.~~

~~Approving Officer~~
~~An official who is appointed under the Land Title Act (Section 77) and acts independently to (1) ensure that subdivisions comply with provincial acts and regulations and local bylaws, and (2) protect the best interests of the public. There are four jurisdictions of Approving Officers in British Columbia:~~

~~Approving Officers~~	**~~Appointed by~~**	**~~Jurisdiction~~**
~~Municipal Approving Officers~~	~~Municipal Councils~~	~~Subdivision approvals within municipal boundaries~~
~~Regional District and Islands Trust Approving Officers~~	~~Regional District Boards or the Islands Trust Council~~	~~Subdivision approvals within the boundaries of those local governments that have assumed the rural subdivision Approving Authority*~~
~~BC Ministry of Transportation Approving Officers~~	~~Provincial Cabinet~~	~~Subdivision approvals outside municipal boundaries and within those Regional Districts and the Islands Trust boundaries that have not assumed the rural subdivision~~
~~Nisga'a Lands Approving Officers~~	~~Nisga'a Lisims Government~~	~~Subdivision approvals within Nisga'a Lands, including Nisga'a Village~~

~~*As of February 2006 no Regional District, nor the Islands Trust, has assumed responsibility for rural subdivision approvals, and therefore that authority is still held by the Ministry of Transportation.~~

~~Client~~
~~An individual or company who engages a QP to conduct a landslide~~ flood ~~assessment.~~

~~Consequence~~
~~The outcomes or potential outcomes arising from the occurrence of a flood expressed qualitatively or quantitatively in terms of loss, disadvantage or gain, damage, injury or loss of life.~~

~~Construction~~
~~Either new construction of a building or structure, or the structural alteration of or addition to an existing building or structure. Construction does not include the repair of an existing building or structure.~~

~~Covenant~~
~~A registered agreement, established by the Land Title Act (Section 219), between a land owner and the local or provincial government that sets out certain conditions for a specific property with regards to building use, building location, land use, property subdivision and property sale.~~

~~Design Flood~~
~~A hypothetical flood representing a specific likelihood of occurrence (for example the 200-year or 0.5% annual probability flood). The design flood may comprise two or more single source dominated floods.~~

~~Dike~~
~~A dike is defined in the as "an embankment, wall, fill, piling, pump, gate, floodbox, pipe, sluice, culvert, canal, ditch, drain or any other thing that is constructed, assembled or installed to prevent the flooding of land." Dikes can include alluvial/debris fan training berms, basins and barriers. Structures that are primarily for erosion protection, drainage or municipal stormwater control are typically not considered to be regulated dikes. For practical purposes, the Inspector of Dikes has published a provincial flood protection structure data base which currently includes approximately 210 dike structures that are considered to be regulated under the .~~

~~Elements at Risk~~
~~The population, buildings or engineering works, economic activities, public services, utilities, infrastructure and environmental features in the area potentially affected by floods or landslides.~~

~~Flood Hazard~~
~~The potential for loss of life or injury and potential damage to property resulting from flooding. The degree of flood hazard varies with circumstances across the full range of floods.~~

~~Flood Hazard Map~~
~~A map that includes historic as well as potential future flood events of variable probability, illustrating the intensity and magnitude of the hazard at an appropriate scale. A flood hazard map forms the basis of considerations and determinations in land use control with respect to potential flooding, floodproofing of construction and flood awareness and preparedness.~~

~~Flood Intensity~~
~~A set of spatially distributed parameters related to the destructive power of a flood. The parameters may be described quantitatively or qualitatively and may include the area inundated, the maximum flow velocity, total channel scour, sedimentation, and impact force.~~

~~Flood Proofing~~
~~The alteration of land or buildings to reduce flood damage and includes the use of building setbacks from water bodies to maintain a floodway and to allow for potential erosion. Flood proofing may be achieved by either, or a combination of the following:~~

- ~~building on structural fill, provided such fill does not interfere with flood flows of the watercourse, and is adequately protected against floodwater erosion and scour;~~
- ~~building raised by foundation walls, columns or piles.~~

~~Flood Risk~~

~~The combination of the probability of a flood event and the potential adverse consequences to human health, the environment and economic activity associated with a flood event.~~

~~**Flood Risk Map**~~
~~A map that combines the consequences of a flood with a flood hazard. For example, a flood risk map can show the likely economic losses for a 500-year return period event under a given hazard scenario (dike overtopping or dike breaches). A flood risk map could also show the population at risk for a given return period flood, or show likely fatalities for evacuated and non-evacuated hazard scenarios.~~

~~**Freeboard**~~
~~A vertical distance added to the actual calculated flood level to accommodate uncertainties (hydraulic and hydrologic variables), potential for waves, surges, and other natural phenomena.~~

~~**Hazard Scenario**~~
~~A specific scenario that could lead to an undesirable consequence (flooding, boulder impact, scour). As an example, a hazard scenario can be a dike breach for a specified return period or a glacial lake outburst flood.~~

~~**Hydroclimatic Event**~~
~~A rainstorm, snowfall event or rain-on-snow event that is temporally limited (typically one or a few days); also referred to as a synoptic event.~~

~~**Hydrogeomorphic Process**~~
~~Any process in which flowing water leads, by erosion, transport and deposition of earth materials, to the modification of a landform.~~

~~**Individual Risk**~~
~~The risk of fatality or injury to any identifiable individual who lives within the zone impacted by the flood; or who follows a particular pattern of life that might subject him or her to the consequences of the flood.~~

~~**Inspector of Dikes and Deputy Inspectors of Dikes**~~
~~Appointed provincial employees with the statutory authority to oversee maintenance of dikes by diking authorities, set diking standards and approve changes to existing dikes and new dikes.~~

~~**Member**~~
~~Professional Engineer or Professional Geoscientist. A Member of the Association of Professional Engineers and Geoscientists of British Columbia.~~

~~**Municipality**~~
~~A corporation into which the residents of an area are incorporated under the Local Government Act or another Act, or the geographic area of the municipal corporation.~~

~~**Official Community Plan**~~
~~A statement of objectives and policies to guide decisions on planning and land use management within the area covered by the plan, respecting the purposes of the local government (Local Government Act, Part 26, Division 2).~~

~~**Orphan Dikes and Works**~~

~~Orphan works are flood protection works that are not being maintained by an owner or diking authority. Orphan dikes are orphan works that are considered by the Inspector of Dikes to be regulated under the Dike Maintenance Act.~~

~~**Private Dike**~~

~~A private dike is defined in the as “a dike built on private property that protects only that property.” While private dikes are not regulated by the province under the , these professional practice guidelines still apply.~~

~~**Professional Engineer**~~

~~An engineer who is a registered or licensed member in good standing with APEGBC and typically is registered in the disciplines of geological engineering, mining engineering or civil engineering, which are designated disciplines of professional engineering.~~

~~**Professional Geoscientist**~~

~~A geoscientist who is a registered or licensed member in good standing with APEGBC and typically is registered in the disciplines of geology or environmental geoscience, which are designated disciplines of professional geoscience. Until 2000, APEGBC referred to the discipline of environmental geoscience as geotechnics.~~

~~**Qualified Professional (QP)**~~

~~A *professional engineer*, professional geoscientist, licensee, including limited licensees with the appropriate level of education, training and experience to conduct flood assessments for residential development as described in these guidelines and licensed to practice by APEGBC.~~

~~**Regional District**~~

~~A district incorporated under the Local Government Act, or the geographic area of the district, that has authority to enact subdivision servicing and zoning bylaws.~~

~~**Residential Development**~~

~~As defined by various pieces of provincial legislation, either (1) the subdivision of property, (2) the new construction of a building or structure, or (3) the structural alteration of, or addition to, an existing building or structure.~~

~~**Risk**~~

~~A measure of the probability and severity of an adverse effect to health, property or the environment. Risk is often estimated by the product of probability and consequence. A more general interpretation of risk involves a comparison of the probability and consequences in a non-product form.~~

~~**Risk Analysis**~~

~~The use of available information to estimate the risk to individuals, or populations, property, or the environment, from hazards. Risk analyses contain scope definition, hazard identification, and risk estimation.~~

~~**Risk Assessment**~~

~~The process of risk analysis and risk evaluation.~~

~~**Risk Evaluation**~~

~~The stage at which values and judgments enter the decision process, explicitly or implicitly, by including consideration of the importance of the estimated risks and the associated social,~~

~~environmental, and economic consequences, in order to identify a range of alternatives for managing the risks.~~

~~Standard Dikes~~

~~Those dikes considered by the Inspector of Dikes to meet minimum provincial standards including:~~

- ~~design and construction to contain the designated flood;~~
- ~~design and construction completed under the supervision of a QP engineer;~~
- ~~an effective dike management and maintenance program by a local diking authority (typically local government); and~~
- ~~legal access (rights of way or land ownership) for the diking authority to maintain the dike.~~

~~Note that new dikes or major upgrades to existing dikes may need to meet additional standards, e.g., seepage, seismic and sea level rise.~~

~~Structural Mitigation Works~~

~~Dedicated engineering works that reduce the impacts of floods including dams, dikes, training berms, floodwalls, seawalls, bank protection works, flood retention basins, sediment basins, river diversions, floodways, channel modifications, sediment management, debris barriers, pump stations and floodboxes, but not including building flood proofing measures such as structural fill and erosion/scour protection works to raise and protect building foundations (see definition for flood proofing).~~

~~Tolerable Risk~~

~~A risk that society is willing to live with so as to secure certain benefits in the confidence that it is being properly controlled, kept under review and further reduced as and when possible.~~

~~Vulnerability~~

~~The degree of loss to a given element or set of elements within the area affected by the flood hazard. It is expressed on a scale of 0 (no loss) to 1 (total loss). For property, the loss will be the value of the damage relative to the value of the property; for persons it will be the probability that a particular life will be lost given that the person is subject to the flood, debris flood or debris flow.~~

~~A~~APPENDIX A~~B~~: ~~—~~FLOODS AND FLOOD-~~R~~RELATED HAZARDS IN BC

A~~B~~1 INTRODUCTION

A flood is a condition in which a watercourse or body of water[8] overtops its natural or artificial confines and covers land not normally under water. When a flood becomes a source of potential harm it becomes a hazardous flood. In these guidelines, we address two types of floods: Conventional and unconventional floods. The former refers to recurring floods that are either meteorologically or tidally driven. The latter addresses floods that are typically unexpected and poorly predictable and include river avulsions and dam breaches.

In BC high water levels of creeks, rivers, streams, ponds, lakes, reservoirs and the ocean can result from a number of different causes. Typical causes include:

- rainfall;
- snowmelt;
- ice jams, ice runs, log jams, beaver dams;
- extreme ocean tides;
- storm surges; and
- tsunamis.

In addition to the conventional floods listed above, there are several other flood-related hazards in BC including:

- debris flows and debris floods/hyperconcentrated flows;
- channel avulsions;
- breaching of ice jams, log jams, beaver dams;
- landslide dams;
- breaching of landslide dams and moraine dams, and glacial lake outburst floods; and
- breaching of anthropogenic *dikes*, dams and tailings impoundments.

In these guidelines, both conventional floods and other flood-related hazards are collectively referred to as floods or hazardous floods. Conventional floods can affect floodplains, *alluvial fans*, shorelines and coastlines and all floods may, exceptionally, affect land outside the reach of normally expected water levels.

Floods and flood-related hazards can be either predictable or occur without warning. Besides inundating land, other common effects include erosion of land adjacent to the watercourse or body of water and deposition of sediment.

A~~B~~2 FLOOD HAZARDS

A~~B~~2.1 Meteorological/Climatic Precedents for Conventional Floods

There are various common meanings of the word flood. For our purposes, a flood will be considered to occur when the volume of water exceeds the bankfull capacity of the stream channel or water body to accommodate the water, so that water flows outside the channel or overflows the water body. However, a river is often said to be in flood when flows are sufficiently large and powerful to effect substantial erosion of the river banks in a short period of time. This condition has important practical *consequences* even though it does not conform to the definition for flood just suggested.

[8] Watercourses includes creeks, streams and rivers; bodies of water includes ponds, lakes, reservoirs and oceans.

River banks are not uniform, so a river does not go overbank everywhere along its course at the same time. However, once outside its banks at some point, downstream flooding may ensue because the floodplain topography prevents water from getting back into the channel.

River channels adapt their form over time to accommodate the range of normally experienced flows, so that hazardous floods are relatively exceptional events. Many efforts have been made to define the frequency with which floods may be expected to occur – that is, to define the frequency or return period for overbank flow. It has been supposed that some relatively frequently recurring flow, such as mean annual flood, might index flood frequency, but no consistent correlation has been found in western North America (see Williams, 1978, who found overbank return periods to vary from less than 1 year to more than a century in the region). Reasons for this are found in the history of individual rivers. In BC many rivers are slightly incised into glacial period sediments, hence the return period for overbank flows may vary between a few years and many decades. However, many streams are sufficiently deeply incised that the valley fill is a true terrace and overbank flooding does not occur.

A related concept of relevance to river management is the idea of channel-forming discharge – that flow capable of effecting significant erosion and sedimentation so as to modify the form of the channel. In mainly sand-transporting alluvial channels this event may occur frequently and correspond approximately with mean annual flood, but in many upland channels with cobble and boulder beds, bed mobilising flows are much more rare.

The most common causes of flooding, and the causes often exclusively considered in water resources management, are high runoff resulting from extreme precipitation and/or snowmelt. In small to medium sized drainage basins (<10 000 km^2 in BC, is a representative figure, but this is by no means an absolute limit), the runoff from individual meteorological events usually dominates the flood record. In the largest drainage basins in the province, however, the flood regime is dominated by seasonal snowmelt. There are regional variations, with larger basins on the coast and in the eastern mountains apt to be affected by severe synoptic events, while on the subhumid plateaus of the central portion of the province, seasonal snowmelt-generated flooding continues to dominate somewhat smaller rivers than on the coast. Some rivers have mixed regimes in which both seasonal and synoptic events may be important. In the long term, synoptic events create the most extreme flows in such basins because the amount of water that may be delivered by storm precipitation exceeds potential maximum daily snowmelt. Church (1988) reviews flood-generating mechanisms.

The area over which significant runoff may be generated at any one time conditions the dominant runoff-generating mechanism. Synoptic storms rarely produce their heaviest precipitation over more than a few thousand square kilometres at a time (although if the storm drifts along the axis of a large drainage basin it may have severe effects) whereas snowmelt may simultaneously occur over a very large area in regionally warm weather. In both regimes, however, complex events may produce the most extreme flows. In smaller drainage basins, rain and rain-on-snow events produce extreme flows. In large basins, the occurrence of a major cyclonic storm during a period of strong regional snowmelt creates extreme runoff. In a warmer future, extreme flows in mid-winter due to rain-on-snow events may become more common and may significantly affect larger drainage areas.

A~~B~~2.1.1 Rainfall Flood Regime

Rainfall floods are generated by discrete weather events, or by a linked set of such events (such as a sequence of North Pacific storms impinging in rapid succession on coastal BC). The effect of such events depends not only on the precipitation they deliver, but also on the prior state of the drainage basin. If soils are already near saturation from previous events, the effect of an individual storm is more severe than if the storm is a seasonal first or isolated occurrence.

In small drainage basins (<50 km^2), the most severe events consist of heavy rainfall from convection cells incorporated into squall lines on cold fronts. There is no apparent scale dependence of the runoff since rainfall may be delivered at a simultaneously high rate to areas of up to 50 km^2 (cell diameter <10 km). In larger drainage basins, precipitation is rarely equally severe over the entire basin and a scale effect is evident for maximum runoff. In the absence of a long gauge record, the magnitude of extreme runoff can be estimated on a regional basis and provides a first-order estimate for the maximum rainfall flood to be expected from a given drainage area.

A~~B~~2.1.2 Seasonal Flood Regime

The most severe floods in larger drainage basins are produced by spring snowmelt. This is most particularly the case for larger rivers draining the plateaus of central BC where relatively uniform elevation produces maximum snowmelt over extensive areas at the same time.

Flood frequency curves in snowmelt dominated drainage basins are relatively flat (i.e., record flows do not exceed relatively common high flows by more than a modest factor) because there is a limit imposed on how much snow may be melted in one day and contribute to runoff (with a fully water-primed snowpack), a limit imposed by solar radiation intensity and daylight length. Therefore, even in drainage basins of up to 100 000 km^2 (which covers most drainage basins in the province), an exceptionally large cyclonic storm might eventually produce the record flow (e.g., the June 1990 storm in the upper Peace River basin, a severe cyclonic depression that moved along the axis of the basin).

A~~B~~2.2 Other Flood Types

A~~B~~2.2.1 Alluvial Fans/Avulsions

Active alluvial fans (and some river floodplains, deltas, and montane river channels) are subject to channel avulsion, a process in which the main channel of the river switches position when the former main channel becomes choked with deposited sediment and/or wood debris. There usually follows a short period of general flooding and then the establishment of a new channel. The new channel is very often a former channel that previously was abandoned. However, the most dangerous avulsions are ones that take the river entirely outside its former (or recent) channel zone. Avulsion frequency may be roughly periodic because it is driven by sedimentation rate, but the sequence of floods in the stream modulates the inter-event period because it determines sedimentation.

Alluvial fans are also produced by the deposits of debris flow. An important distinction in BC is between alluvial fans in the humid mountains and ones found in the subhumid interior of the province. Many of the latter are debris flow fans or fans built from mixed processes that were active in early postglacial times, but that have not experienced active sedimentation for a long time. On many such fans, the active stream is well incised through the upper and middle reaches of the fan so that much of the fan surface clearly is not subject to flooding. In other cases, the activity of the fan may be difficult to ascertain. On active fans, topography, distribution of active and inactive channels, sediments, vegetation and watershed condition must all be appraised to characterize the *flood hazard*. Most avulsions reoccupy former channels or divert water into anomalously low areas on the fan. These circumstances aid in the identification of hazard zones.

Because active alluvial fans are aggrading systems, stream channels are inherently unstable so that traditional stage-frequency Flood Hazard Assessments (FHAs) are of very limited value. The active channel zone and all recently occupied channels should be regarded as hazardous. The most effective way to identify former channels likely to be reoccupied and to forecast the likelihood for an avulsion to occur is to prepare a detailed morphological map of the fan surface and to inspect the channel regularly to note the occurrence of significant sediment deposition in-channel.

Guidelines for flood hazard management on alluvial fans have been presented by Thurber Consultants (1983) and a discussion of flood hazard management on fans is given by Kellerhals and Church (1990). A hazard zoning system is advocated to identify zones of current and potential hazard. Morphological methods for estimating *design floods* on mountain streams are presented by Jakob and Jordan (2001), while Wilford et al. (2005) have discussed alluvial fan characteristics in BC forest environments.

A~~B~~2.2.2 Debris Flows

Debris flows are perhaps the most hazardous process in steep (>~15° average channel slope) mountain creeks. By definition, debris flow is a landslide process. However, since debris flows occur in stream channels subject also to fluvial processes, it is appropriate to include them here. There is a close link between hillslope processes and the fluvial regime. Debris flows are most often triggered by shallow (<1 m thickness) debris avalanches on hillslopes that run into channels and lead to fluidization of the channel debris. Debris flows can entrain channel debris at a rate that can produce final event volumes orders of magnitude higher than the initiating debris avalanches. Peak discharge of debris flows can be up to three orders of magnitude higher than the 200-year return period flood discharge that forms the design basis of many in-stream or stream-spanning structures (Jakob and Jordan, 2001). For this reason the recognition and quantification of frequency-magnitude characteristics is very important to avoid under-design of bridge or culvert crossings and floodplain or fan protection structures. Jakob and Hungr (2005) is a basic reference for debris flow phenomena.

Debris flow hazards are not always easily recognized, particularly on fans or along channels that are subject to high magnitude, low frequency events. A discriminating criterion for initial reconnaissance identification of drainage basins that may be subject to debris flow in the BC mountains is $H/\sqrt{A_d} > 0.3$, where H is drainage basin relief, A_d is contributing drainage area, and L_d is drainage basin length (Jackson, jr. et al., 1987; confirmed by D. Boyer, pers. comm., 2012). For $0.2 < H/\sqrt{A_d} < 0.6$, debris flood (see below) may occur instead (e.g., Wilford et al., 2004). For $H/\sqrt{A_d} < 0.2$, ordinary flooding is normally to be expected, but may still lead to rapid aggradation within channels. Exceptions exist: the Quaternary volcanoes of the province yield debris flows from channels with low ratios because of weak rock composition and fine textured debris. Furthermore, drainage basins that originate on plateau surfaces but have steep intermediate reaches where they plunge into incised valleys may give rise to debris flows despite a low overall ratio. Where development is anticipated, field inspection of fan stratigraphy by an experienced geoscientist must be undertaken to confirm any initial diagnosis.

Assigning debris flow potential to a given creek changes the way a hazard assessment is to be conducted. A debris flow hazard analysis requires a special set of diagnostic and analytical skills because of the uniqueness of each individual debris flow situation. A general treatment of debris flow hazard analysis can be found in Jakob (2005). Special skills are required to conduct frequency-magnitude assessments because statistical analysis of annual runoff data or regional analysis of peak flows does not yield sufficient or adequate data for a sound hazard assessment. Jakob (2010a) summarizes the application of dendrochronology for debris flow science and Chiverrell and Jakob, (2010a) describe radiocarbon dating of debris flow deposits on fans. Jakob (2010b) discusses the requirements to produce reliable frequency-magnitude relationships on fans. Hungr et al. (2005) and Iverson (2010) address the issue of debris entrainment. See Jakob et al. (2005) for discussion of channel recharge rates, Vallance (2005) for volcanic debris flows, and Rickenmann (2005) for debris flow prediction models.

Debris flow *risk assessment* is still in its infancy as few studies have been conducted that attempted to quantify *risk* for loss of life or economic losses. Such studies required very detailed frequency-magnitude analyses (i.e., Jakob and Friele, 2009), numerical modelling and specialized risk assessment techniques.

A~~B~~2.2.3 Debris Floods/Hyperconcentrated Flows

Debris floods or their rheologically better defined equivalent hyperconcentrated floods form a transition between purely water floods and debris flows. Debris floods may contain between approximately 4 and 20% sediment by volume (Waananen et al., 1970; Pierson, 2005). They can be triggered by a variety of processes including landslide dam and glacial lake outbreak floods, beaver dam breaks, tailings or water retention dam failures, water pipeline ruptures, snow avalanche dams, hillslope and channel erosion, dilution and selective deposition at the heads and tails of debris flows and inputs of large sediment volumes by landslides. Debris floods, though typically not as destructive as debris flows, have some characteristics that are distinctly different from clear water floods and debris flows, the potential of which needs to be recognized to quantify the hazard and provide for risk reduction measures.

Debris floods are not necessarily a singularly-acting *hydrogeomorphic process* but can devolve from debris flows through water dilution. Debris floods can also evolve from purely flood flow through entrainment of debris. Debris floods can therefore be viewed as a spatially and temporally transient flow type. A reconnaissance criterion for identifying channels potentially prone to debris flood is given above (section B.2.2.2). Discrimination between processes post-event is possible only through an interpretation of sedimentary deposits and is best done by experts. For information on interpretation of sedimentary deposits associated with debris floods, see Pierson (2005) and Cronin et al. (2000).

Some distinguishing characteristics of debris floods are:
- high erosivity, particularly along steep channels through scour which will at least partially depend on sediment concentration;
- potential for excessive riverbed aggradation in places where channel gradients decrease or channels widen, which in turn can lead to avulsion, reduction of flood conveyance capacity and burial of low-lying areas and structures; and
- potential for avulsions that can lead to riverbank erosion well after the debris flood has passed.

Debris FHAs will therefore need to account for a series of processes, few of which can be reliably modelled using commercially available software. A good portion of expert judgment will be required in assessing the various consequences of a debris flood, as illustrated in Jakob and Weatherly (2007). In almost all cases it will require a multi-disciplinary approach that combines geomorphology, Quaternary dating methods and hydrodynamic modelling to arrive at reasonably reliable results.

A~~B~~2.2.4 Log Jam and Beaver Dam Outbreak Floods

Log jams are pervasive features along forest streams in BC. Many log jams are the product of landslide entry into the channel or debris flows incorporating a high volume of woody debris. Log jams may be classified into two types: (i) in channels confined by adjacent hillslopes, jams build vertically and may reach elevations of 5 to 10 m; the stream must flow over the jam; (ii) in streams with an adjacent valley flat, the jams build horizontally and the stream commonly outflanks the jam, so that the jam creates a channel avulsion. Log jam formation is usually associated with abundant sediment movement, so the upstream area rapidly fills with sediment. If there are in-channel or channel bank installations, this may pose severe problems both of siltation and water stage. Jams are, however, sometimes permeable, so that there is only modest interference with normal water flows. Jams have high integrity for periods of a decade or two, but by 30 years wood decay and channel adaptation render the jam less effective in trapping sediment and diverting water flow. Debris flows can then erode such jams in one event, leading to a sudden release of stored sediment that may then bulk the debris flow to very high volume.

Beaver dams are found on low gradient streams. The animals use mud to reduce dam permeability leading to their intended effect; the inundation of a more or less extensive area upstream which may pose a significant inconvenience to adjacent landowners.

In extreme circumstances, log jams and beaver dams may fail quickly. In the case of log jams this is most likely to create a downstream surge of sediment stored behind the dam with a modest surcharge of flood water. In the case of beaver dams, water flows may increase in proportion to the size of the draining pond (see section B2.2.5 for reconnaissance assessment methods). Beaver dam failures are more widespread than realized (Butler and Malanson, 2005).

A~~B~~2.2.5 Landslide Dams, Moraine Dams, and Small Earthen Dams

Landslides may block the course of a river or stream. Cases in BC vary from small forest streams temporarily blocked by a debris slide up to historic blockage of the Thompson River and prehistoric blockage of the Fraser River. The flooding hazard associated with landslide dams is twofold: (i) flooding in the upstream impoundment; (ii) outburst flooding downstream if the dam fails rapidly. Glacial moraines commonly impound lakes after the glacier retreats from the moraine. Small earthen dams have been built on many streams in BC to provide domestic or irrigation water supplies or industrial water supply. In addition, tailings dams at many minesites can hold substantial decant water and much under-consolidated sediment of potentially toxic composition.

All of these dam types might possibly fail rapidly. Old earthen dams, in particular, may be susceptible to failure due to low design standards at the time of *construction*, lack of engineering inspections and progressive deterioration. Landslide dams are prone to fail because they are irregularly placed with no consolidation. In many steep mountain creeks, naturally caused or human-caused landslides (most often the consequence of road-building activities) are a frequent occurrence and many of these have the potential of damming creeks, albeit sometimes for only minutes or hours.

Upstream inundation after the formation of a major landslide dam may pose a hazard if the valley is settled or constitutes an essential communications or transport route. Rates of inundation depend on the discharge of the inflowing stream and, for a large dam may vary from hours to months – that is, there will usually be time for emergency evacuation of people and securing of resources not affected by the initial landslide.

Moraine-dammed lakes are common in many glacierized mountainous regions of the world and in the Cordillera of western Canada. Clague and Evans (2000) illustrate the principal features of moraine-dammed lakes and phenomena associated with their failure. The geotechnical characteristics of moraine dams make them prone to rapid incision and failure.

Some moraines are ice-cored or within permafrost zones characterized by interstitial ice. These are of particular interest in a changing climate as the ice core or the interstitial ice may melt which would result in a drop of the moraine crest elevation with respect to the impounded waterbody and likely destabilization of the moraine. McKillop and Clague (2007a, 2007b) have presented a statistical criterion for estimating the probability that a moraine dam will fail. Recent developments associated with forestry, mining, independent power projects and recreational activities have increased the need to understand the processes involved.

Landslide, moraine and earthen dams most frequently fail by overtopping during an extreme runoff event, although they may also fail by piping. Seismic shaking might also cause dam failure if portions of the dam are partially or fully saturated. Waves set up by a landslide into the impoundment or, in the case of moraine dams, by an ice-fall into the lake from an overhanging glacier may, in some instances, initiate erosion in the outlet channel leading to dam failure. Kershaw et al. (2005) provide a detailed description of one such failure. In many cases, failure begins relatively slowly and then accelerates rapidly to reach peak discharge immediately before exhaustion of the water supply. This is the consequence of progressive erosion caused by the continually increasing outflow. Downstream, the flood wave is modified by channel and overbank water storage. If the lake discharges into a sufficiently steep channel, failure may be succeeded by a debris flow or debris flood.

Reconnaissance estimates of possible flood magnitude immediately downstream from the dam may be made by simple scaling relations based on historical floods. The most comprehensive collection of data for this purpose has been made by Walder and O'Connor (1997). They quote envelope relations, reported in Table ~~B~~A-1, for various dam types. Moraine dam failures are more sensitive to lake volume than the other two types, probably because the usually rather narrow base is conducive to rapid breach enlargement. It should be realized, however, that there is no strictly physical basis for these scaling relations. They are useful insofar as they provide a first estimate of the potential hazard that the dam presents. A more elaborate analysis, based on the erosion rate in the dam breach is presented by the same authors while Fread (1989) and Singh (1996) have summarized numerical simulation models of dam breach floods. Comprehensive reviews of dam breaches in earth and rock materials are provided by O'Connor and Beebee (2009) and by the ASCE/EWRI Task Committee on Dam/Levee Breaching (2010).

Table A~~B~~-1: Envelope relations for estimated peak discharge following dam failure

Dam type	Coefficient	Exponent	n
Landslide	46	0.46	15
Moraine	0.22	0.66	32
Constructed	8.5	0.46	9

From Walder and O'Connor (1997) Table 1. Relations are based on upward displacement to envelope position of best-fit regression equations of the form $Q_P = aV_o^b$, in which Q_P is the peak discharge (m^3s^{-1}) and V_o (m^3) is the initial volume of the impoundment. n is the number of cases.

Assessments of lake outbreaks and subsequent debris flows and debris floods require the following steps to be considered:

1. Definition of the study area and remote sensing of existing lakes and locations where lakes may form as a consequence of glacier retreat.
2. Definition of *hazard scenarios* based on remote sensing techniques.

3. Field work to determine the stability of the dam itself. The level of effort for such study would hinge on the downstream *elements at risk*.
4. Once the likelihood of a trigger mechanism and the likelihood for dam failure have been assessed and probability estimates developed for different hazard scenarios, an evaluation can be made of the downstream effects.

A~~B~~2.2.6 Glacial Lake Outbreak Floods

Glacial lake outbreak floods include breaches of ice -dammed lakes and drainage of so-called supraglacial lakes which are defined as lakes that form on top of glacial ice, often dammed by a larger trunk glacier. Occasionally, subglacial reservoirs also drain rapidly, but their volume is usually relatively small. Drainage of such lakes occurs either by surface channels over or, more frequently, along the edge of ice, or via subglacial passages. Supraglacial lakes usually drain via crevasses to the glacier bed before discharging from the glacier front. The pattern of drainage is similar to that of earthen dams, beginning slowly and continuously accelerating to a peak just before exhaustion of the impoundment. The erosive mechanism in this case is thermal erosion of ice, which occurs along the extended drainage route rather than at a specific outlet. Consequently, the peak flow may be preceded by a long period (weeks) of developing drainage. Peak discharge exceeds flows estimated by traditional hydrological methods. The lake must, of course, have a normal drainage path, usually along the ice margin or sub-marginally – that is, under ice but along the glacier margin. This is sometimes but not invariably the route for rapid drainage. Often, these routes are difficult or impossible to assess for lack of access.

The outlet of some glacially dammed lakes, after drainage, reseals by ice movement, so that the lake refills and eventually drains again. One such extended history in BC is summarized by Mathews and Clague (1993) for Summit Lake at Salmon Glacier. In other cases, drainage occurs only once (see an example by Clague and Evans, 1997) or perhaps twice.

In many respects the hazard assessment for glacially dammed lakes is similar to that for landslide and moraine dams except that specialist knowledge of glacial hydrology may be required. As for landslide and moraine dams, scale relations have been developed for glacial dam failures. Data of Walder and Costa (1996) led to envelope relations:

$$Q_P = 0.014V_o^{0.66}$$

for fully subglacial drainage (QP in m^3s^{-1} and V_o in m^3), and

$$Q_P = 3.5V_o^{0.46}$$

for surface drainage, probably including marginal cases. Again, more physically rigorous relations are pursued by Walder and Costa that require more comprehensive data.

Future decades will likely see significant retreat of alpine ice in BC. It is conceivable that glacial lake drainage events may increase and, combined with increased extension of settlement and economic activity into the mountains, may pose a substantially increased hazard compared with the past.

A~~B~~2.2.7 Ice Jams and Ice Runs

In rivers subject to significant winter ice formation, high water levels may be created by ice jams. While some features of ice jams exhibit a degree of regularity (e.g., the places along a river where jams tend to develop, which is related to the channel morphology), the progress of an individual jam is a singular event so that water levels are difficult to forecast. On rivers subject to significant ice jams, the highest water levels usually are associated with ice jam floods independent of the river discharge. Hence a historical stage-frequency analysis, not the usual (flow) magnitude-frequency analysis, is the basic statistical tool to gauge hazard.

Ice runs (or ice drives) may do significant damage along riverbanks and to instream installations (such as bridge piers). Driven ice may be piled up metres above water level, so damage may extend to high elevations. An important aspect of ice jam floods is the rapidity with which they develop. On a large river a stage rise of up to several metres may develop in less than an hour.

The ice regime of a river comprises three periods: (i) freeze-up; (ii) mid-winter; and (iii) break-up. Freeze-up and break-up are relatively short periods that can produce significant flooding and riparian damage due to the effects of moving ice and fluctuating water levels. In comparison, mid-winter tends to be a time of relatively stable low flows and stable ice cover. On regulated rivers, however, fluctuating flows may destabilize the ice cover, producing damaging mid-winter ice runs. Occasional thaws in mid-winter can also result in ice jams.

Freeze-up begins with the formation of frazil ice in the water, disc-shaped millimetre scale ice crystals that grow and stick together to form slush pans. Frazil ice may also stick to the riverbed and banks, forming anchor ice. Slush pans agglomerate into larger units that grow out from the channel edge to the point that they lodge across the channel and bridge it. In cold conditions, they then freeze to form a juxtaposed ice cover. The cover stops downstream running pans and the ice cover progresses upstream. This process is relatively quiet and produces only a modest stage rise as the flowing water encounters the increased flow resistance posed by the ice cover. In fast water, however, frazil ice and slush may be drawn under the edge of the cover, where it sticks in a downward growing hanging ice dam which interferes with water conveyance to create significant stage rises. This, in turn, may break up the developing cover, which then runs into a larger jam downstream. This consolidated ice cover can cause significant flooding and damage along the channel margins.

At break-up, there are similarly two scenarios. A thermal break-up occurs when ice melts in situ and remaining ice floats out without obstruction. Little damage is done. Thermal break-ups occur when warm weather melts ice before the spring freshet. If, however, rising flows break a still competent ice cover, the resulting drive of large slabs may pile ice into large jams with accompanying extreme high stages. Jams eventually break under the force of oncoming water and ice and then a surge of ice and water occurs downstream – a damaging ice run. Such a mechanical or dynamic ice break-up usually exhibits a series of jams and surges downstream, the jams occurring at similar places each year where the channel geometry makes ice passage more difficult. Hence, the most extreme damage may be quite localized and the probable locations well known. In general, northward flowing rivers are more prone to significant ice jam flooding than southward flowing ones since ice forms earlier and breaks up later downstream.

Observations of ice-scoured river banks, arrested riparian vegetation succession and damage to riparian vegetation are important means to diagnose the characteristic levels of flooding associated with ice along rivers with few or no records. Importantly, damage to trees may be dated by dendrochronological means.

The 21st century prospect is for warmer winters so that one may judge that, in general, ice will become a less pervasive problem along BC rivers. Mid-winter break-ups and flooding may, however, become more common on northern rivers that have an extended ice season. In this circumstance historical information remains a useful guide for planning and forecasting purposes. Reviews on ice jams and ice jam flooding in the Canadian context have been given by Beltaos (1995; 2008). Forecasting potential ice problems can be aided by a model that predicts the advance and retreat of ice cover on a river (Chen et al., 2006).

A~~B~~2.2.8 The Sea

Low-lying coastal areas may be subject to flooding from the sea, which is subject to astronomic tide cycles. Extreme high sea level can arise from storm surge, wind set-up, wave effects, and other local effects. Sea level is increasing over time due to sea level rise (SLR).

Determination of an appropriate design sea level should be subject to site-specific analysis, with addition of an appropriate *freeboard* allowance. New development areas in BC are typically required to be designed for the Year 2100 SLR condition.

In addition to high water levels, coastal areas can be subject to significant erosion from waves and currents.

A~~B~~2.2.~~8~~9 Tsunamis

Tsunamis are waves created when a large body of water is rapidly displaced by processes such as earthquakes or landslides. Tsunamis have previously impacted the BC coast and adjacent coastlines with wave heights and runups that far exceed other processes such as storm surges.

The largest tsunamis impacting the BC coast have been triggered by submarine earthquakes originating around the tectonically unstable Pacific Rim. Although geologic evidence indicates that much larger tsunamis have occurred in the past, the most significant historical event was triggered by the March 27, 1964 Alaska earthquake, which caused about $10 million damage in BC (1964 dollars), mainly to communities on the west coast of Vancouver Island (Clague, 2003). Landslide-triggered tsunamis have also been responsible for damage to BC communities, including an 8.8 m high tsunami that impacted Kitimat Village in 1975 (Campbell and Skermer, 1975).

Earthquake-triggered tsunamis potentially affecting the BC coast are monitored by the Pacific Tsunami Warning Center located in Ewa Beach, Hawaii and the West Coast and Alaska Tsunami Warning Center in Palmer, Alaska. These warning centres use tide gauges to check if a tsunami has formed and then forecast the future of the tsunami, issuing warnings if needed. More information on the warning centres can be found on the PTWC website at ptwc.weather.gov.

A recent modelling study (Xie et al., 2012) based on the known 1700 event suggests that, for a major earthquake on the Cascadia fault – the subduction zone fault lying of the west coast of Vancouver Island – (a so-called mega-earthquake), time for a tsunami wave to reach the west coast of Vancouver Island would be about 1 hour; propagation into the mainland shore along the Strait of Georgia would require 1.5 to 2 hours. Maximum wave height near Esquimalt Harbour is estimated to be about 25 m. However, experience of the 1964 Alaska earthquake in Alberni Inlet shows that extreme wave amplification may occur in coastal inlets. However, amplitude in the Strait of Georgia is expected to be reduced (Clague, 2003). Based on available evidence, a major Cascadia earthquake is thought to be a millennial event, but there is insufficient information to formulate a magnitude-frequency relation.

Tsunamis triggered by submarine landslides associated with liquefaction of collapsible sediment in submarine Fraser River delta deposits may represent a potential hazard. Locations where submarine landslides have been reported include Howe Sound (Terzaghi, 1956; Prior et al., 1981) and the Fraser River delta (Hamilton and Wigen, 1987; McKenna et al., 1992).

Assessment of riverine *flood risk* should include an assessment of potential tsunami hazard where the study area extends to ocean coastlines, but such study will require a different set of analytical skills. Regarding hazard assessment, a maximum probable event approach, based on historical or sedimentological evidence, can be implemented whereas there is, at present, insufficient historical information to permit magnitude-frequency analysis for locations on the BC coast.

A~~B~~2.3 Erosion and Sedimentation

A~~B~~2.3.1 Erosion Susceptibility

The susceptibility of riverbanks, ocean shores and lakeshore to erosion depends on local conditions best investigated in the field, and on the physiographic setting and longer term history of channel/shoreline changes at and near the subject site. In a river, erosion susceptibility depends upon the following local conditions:

- site situation (outside of meander bend; opposite a developing gravel bar; downstream from bank-armoured reach or training structure);
- strength of materials that make up the channel banks;
- bank vegetation cover and condition;
- direction and force of attack of the river current;
- bank geometry (bank angle; depth immediately offshore);
- debris loading across the bank and/or at the base of the bank;
- seasonal ice effects;
- water seepage out of the bank, associated with bank stratigraphy;
- land use adjacent to the bank, especially livestock activity;
- rapid variations in flow (which promotes sloughing of the bank).

Longer-term factors that affect riverbank susceptibility to erosion include:

- active aggradation or degradation;
- active braiding, meandering;
- effects of a dam or other control structure upstream;
- land use and stream management.

These factors are investigated by studying the history of channel shifting by making use of historical air photography, which for most locations in the province, extends back at least 6~~0~~5 years. Air-photo inspection may also reveal distinct former channels of the river, indicating a propensity for avulsion, and it can reveal the recent trend of channel shifting that may permit reasonable forecasting of likely erosion in the near-term future (how far into the future will depend on the level of river activity and current channel form). For this work, specialist advice should be sought from a fluvial geomorphologist or river engineer.

A preliminary classification of places along a river where erosion susceptibility is high can be obtained from terrain mapping (to determine materials; Howes and Kenk, 1997) and inspection of air photos to determine channel style and recent history.

On coasts, erosion susceptibility depends local factors similar to those listed above except that the directions and strength of wave attack replaces factors associated with river currents. It remains possible, though, that strong long-shore currents may influence coastal stability since they promote systematic movement of sediments. Wave attack depends on fetch, which in turn depends on coastline orientation and coastal geography, and on the local exposure. Headlands are subject to strongly focused wave attack but, for that reason, are usually composed of relatively erosion-resistant rock. Bays and inlets are more sheltered but wave attack may still be strong in steadily narrowing inlets. Specialized coastal classifications have considered erosion susceptibility. At site scale, field inspection is, again, the most effective indicator. The consequences of coastal location and wave fields are studied by map analysis to determine wave climate.

It should be recognised that, on sandy shores at many locations, there is significant seasonal movement of sand onshore and offshore, so that apparent shore zone condition may depend on the time of year at which inspection is made.

A~~B~~2.3.2 River Erosion and Sedimentation

Erosion and deposition of sediment influences water levels along rivers, hence the incidence of floods. This is particularly obvious on active alluvial fans – sites of chronic accumulation of sediment at the base of steep mountain channels. On larger rivers, the processes are much more subtle and may escape notice for substantial periods.

Sedimentation style and attendant flooding problems vary systematically through the drainage network. In mountain headwaters, steep channels that accumulate sediment are prone to mass movement in a debris flow. Debris flows may be triggered in channels steeper than about 15°, although many initiation zones are much steeper. Debris flows may run out onto gradients of order 10% in the case of relatively coarse, easily drained debris, but 1 or 2% for muddy flows. Sediment deposition on the colluvial or alluvial fan at the slope base fills channels and promotes diversion of the debris flow outside the current channel. Debris floods, often associated with the onward transport of material initially mobilized in a debris flow, may similarly spread sediment outside channel limits, even farther than debris flow deposits because of their highly fluid nature (see Appendix ~~B,~~A Section 2.2.3). The fans are the product of persistent sediment deposition from debris flows and debris floods.

Rivers in the mountain valleys of BC normally have gravel beds and carry gravel as bedload. The gravel is staged downstream from bar to bar during successive high flows. The river currents cannot lift gravel to a very high level, so sediment deposited in the channel is stacked laterally on bar edges, which grow outward into the channel. The river current is pushed against the opposite bank and, to maintain conveyance, the river erodes that bank (so that sediment is moved on downstream). The rivers consequently have an irregular lateral style of instability and bank erosion is a common problem. Bank erosion is a normal part of the natural sediment transfer process along the river. The problem is particularly severe in the uppermost part of the main trunk valleys, where many upland tributaries converge to produce significant sediment influx.

In contrast, rivers flowing in finer-grained sediments gain bank strength as the result of sediment cohesion. They adopt a more regular meandered style where the erosive attack of waters is more systematically applied on the outside of successive bends and is more predictable, at least in the short to intermediate term.

Vegetation roots form a critical reinforcement mechanism (sometimes called root cohesion) for riverbank stability. Many tree species in BC, however, including most conifers, have a laterally spreading root development and lack a strong, deep taproot. Hence they are effective only along the banks of relatively shallow streams. In BC, it is widely observed that root cohesion is effective to a depth of about 0.5 to 1 metre below the surface. Deeper streams can undercut the banks in unreinforced sediment and topple trees. Turf and peat banks provide effective surface cohesion but may be undercut, leading to block failure of the bank.

It usually is possible to estimate a channel zone within which normal processes of lateral channel shifting occur. In meander-form channels, the width of the meander belt gives such a measure. In wandering or braided gravel-bed rivers, a width of two to three times current channel zone width is a common range for lateral activity. Within this zone, the bar surfaces and floodplain should be recognized as part of the channel zone, eventually to be reclaimed by the river through lateral erosion – that is, the proper channel zone of a bed-sediment transporting river should be recognized to extend beyond the limits of the currently occupied channel. This would not preclude development near apparently stable channels (ones with strong or strongly defended banks and no recorded history of significant lateral movement).

Rivers do not normally aggrade uniformly; sediment is deposited in preferred places along the channel where currents slacken. Hence aggradation may occur locally for some time, to be followed by degradation as sediment moves along the channel. Over time, these positions change because the deposits themselves influence the evolution of the channel and the river currents. Aggradation in certain places along the channel creates upstream backwater and rising flood levels. The upstream distance over which this phenomenon persists depends upon the size of the river, the general gradient of the channel and the severity of the aggradation, but can be several kilometres on a large river.

Persistent aggradation/degradation, accompanied by a definitive change in water levels, occurs only if there is ongoing net loss or gain of sediment in the reach. Extreme aggradation leads to channel avulsion. The latter case is particularly important on alluvial fans. Conversely, degradation leads to incision of the river channel and to reduced water levels for a given flow, thus reducing flood hazard. Degradation may nevertheless cause local problems such as the undermining of bridge piers and isolation of water intakes.

A special circumstance in mountain valleys is that alluvial fans deposited by tributaries sometimes spread across the valley floor and constrict the main river, so that backwater and rising water levels occur upstream in the main river, even though it may not be primarily aggrading. In some places these backwatered reaches have given rise to ecologically valuable wetlands because of chronic inundation of the valley floor. The phenomenon creates a stepped profile along the rivers of mountain valleys, with backwater upstream of successive tributary fans, and spill over the fan toe on a locally steeper gradient. This may induce systematic variation in flood hazard along the valley that may be identified by morphological evidence in the field, by historical reports of flooding extent, or by a numerical model that encompasses both river channel and floodplain.

There are two principal means by which to detect water level effects of erosion and sedimentation:

1. specific gauge analysis at a stream gauging station;
2. repeated survey of cross-sections.

The former method is restricted to places on a river with a substantial history of gauging. Furthermore, once trends are established at the gauge point, it remains to interpret the result in terms of causes and probable effect along an extended reach of channel. Repeated surveys are expensive and apt to be restricted to reaches known to be aggrading or degrading. In BC, for example, this includes the lower Chilliwack/Vedder River. Qualitative indications of sedimentation trends can be gained from examination of river morphology. Furthermore, observant local citizens (river guides, fishers, boaters) may possess useful knowledge.

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APPENDIX B~~C~~: CURRENT FLOOD MANAGEMENT APPROACH IN BC

B~~C~~1 INTRODUCTION

Flood management refers to mitigation measures considered or implemented to reduce the effects of a hazardous flood, either by changing the likelihood of a flood occurring, or by effecting change to the *consequences*. Measures can be broadly divided into non-structural and structural measures. These are discussed in the following sections.

Regardless of the measures used, flood management has a number of limitations arising from design, implementation and performance. Failure to acknowledge these limitations can lead to increased development in flood-prone areas.

B~~C~~1.1 Non-Structural Measures of Flood Management

Non-structural measures include avoiding development in flood-prone areas by means of land use planning and zoning, restrictive *covenants* on land titles, enforcement of flood *construction* levels and minimum building elevations, and floodproofing. Typically, non-structural measures are the preferred means of flood management.

Over time, the regulation of floodplain development has evolved to include awareness of floods and the management of proposed development on floodplains. Unfortunately, existing development on floodplains limits policy options for changing inappropriate land use.

Throughout the province, several formal land use planning programs have been implemented to manage proposed development on floodplains. These include:

- the Lower Mainland Regional Planning Board, and its 1966 Official Regional Plan;
- the provincial Agricultural Land Commission created in 1973;
- the provincial Floodplain Development Control Program, which operated between 1975 and 2003, and subsequently has been delegated to local governments; and
- the Floodplain Mapping Program, funded by the provincial government from 1974 to 1998, and subsequently delegated to local governments.

B~~C~~1.2 Structural Measures of Flood Management

Structural measures of flood management typically refer to dedicated structures that separate watercourses or bodies of water from areas to be protected. Examples of structural measures include *dikes* and training berms, floodwalls and seawalls, bank protection works, flood retention basins, sediment basins, river diversions, floodways, meander construction, debris barriers and basins, and dams. Structural measures can also include integral infrastructure such as pump stations and floodboxes. Despite their temporary nature, in-stream sediment management and removal activities are often considered a structural approach because they represent a physical intervention within the natural fluvial system.

Most structural flood mitigation works are regulated by the province under the *Dike Maintenance Act,* which defines a dike as an embankment, wall, fill, piling, pump, gate, floodbox, pipe, sluice, culvert, canal, ditch, drain or any other thing that is constructed, assembled or installed to prevent flooding of land. The Inspector of Dikes has published a provincial flood protection structure database, which currently includes approximately 210 dike structures that are considered to be regulated under the *Dike Maintenance Act*. Dikes can include alluvial/debris fan training berms, basins and barriers. Structures that are primarily for erosion protection, drainage or municipal stormwater control are typically not considered to be regulated dikes.

The 1948 flood on the Fraser River resulted in the establishment of the federal-provincial Fraser Valley Diking Board that co-ordinated an emergency dike rebuilding program. The Board ceased operations in 1950.

Also following the 1948 Fraser River flood, the Dominion-Provincial River Board (changed to the Fraser River Board in 1955) was established to recommend development of water resources and options for flood control and hydroelectric power generation on the Fraser River. The Fraser River Board concluded in 1963, and was succeeded in 1968 by the Fraser River Flood Control Program, established under a new Canada/BC agreement. A number of government cost-sharing programs have evolved since the conclusion of the Fraser River Flood Control Program in 1995. Examples of such programs include the Flood Protection Assistance Program (1999-2005) and Urgent Mitigation Works completed in 2007.

In 2007, the Flood Hazard Protection Fund, a provincial cost-sharing program, was created and is managed by Emergency Management BC under the Ministry of Justice.

The provincial Dike Safety Program was established in the 1950s, following the experience of the 1948 floods, with the adoption of the *Dike Maintenance Act*. The office of the Inspector of Dikes, through administration of the *Dike Maintenance Act* oversees maintenance of dikes by local diking authorities, sets diking standards, and approves changes to existing dikes and new dikes.

Structural measures on First Nations lands are owned and operated by First Nations, and have been funded primarily by ~~Indian~~ Indigenous and Northern Affairs Canada. In addition, there are over 100 historic orphan structural flood protection works that are currently not being operated or maintained by a local diking authority. These ***orphan works*** comprise a variety of structures including berms, erosion protection, and other works of varying construction standards, including approximately 60 that are considered to be dikes under the *Dike Maintenance Act* (i.e., any changes to these *orphan dikes* would require a *Dike Maintenance Act* approval).

The length of orphan works totals over 85 km and these works provide a measure of protection for at least 6,000 hectares of land in 75 communities around the province. These works have been constructed typically as a response to the threat of immediate flooding. As many of the works were constructed under emergency conditions, they generally lack adequate planning and engineering design. These structures are not inspected or maintained and many have deteriorated with time. Sudden failure of these works could exacerbate flood damage and increase *risk* of injury and loss of life.

The following sections describe various aspects of the flood management approach in BC.

B~~C~~2 History of Floodplain Management in BC

BC's rugged terrain promoted the early development of flat floodplain areas. Over time, public policy regarding floodplain development has evolved to include awareness of *flood hazards* and the need for risk management. Unfortunately, in many cases historical development still limits the ability of authorities to drive policy changes in land use planning. This section describes some of the formal programs that have evolved to manage development in *flood risk* areas.

B~~C~~2.1 Lower Mainland Regional Planning Board

The Lower Mainland region was a leader in the early adoption of floodplain risk management practices in BC. In August 1966, the Lower Mainland Regional Planning Board's Official Regional Plan (covering the area from Hope to the Georgia Strait) was approved. The Plan included a policy that floodplains were to be kept free of urban uses, save where urban development was already present. Further urban development was to include floodproofing measures. Future development on floodplains was to be limited to uses that would not be highly susceptible to flood damage. The Lower Mainland Regional Planning Board was dissolved in 1969 and its planning functions divided amongst four *regional districts*.

B~~C~~2.2 Agricultural Land Commission

Some floodplain areas of BC are classified as part of the Agricultural Land Reserve (ALR), a provincial zone where farming is recognized as the primary use. The Agricultural Land Commission (ALC) is an independent provincial agency created in 1973, which governs the use of ALR land for other purposes. Past and present pressures to develop floodplains for uses other than agriculture have meant that the ALC has had a considerable effect in preventing development within agricultural floodplains.

The ALC remains an active agency and continues to exercise control over development in floodplain areas within the ALR.

~~C~~B2.3 Floodplain Development Control Program

The large Fraser River flood of 1972 and resulting damage in the BC interior (particularly on the North Thompson River near Kamloops) was a catalyst for new legislation, policies, and procedures at the provincial level. These initiatives were aimed at controlling development on the floodplain and reducing potential damages. From 1975 to 2003, the province managed development in designated floodplain areas under the Floodplain Development Control Program.

The Floodplain Development Control Program fulfilled a key term of the Fraser River Flood Control Program Agreement between BC and Canada, which committed the province “to a program of land use zoning and *flood proofing* to diminish potential losses in the area covered by [the] Agreement.”

Central to this program was a requirement that Ministry of Transportation and Infrastructure (MTI) Subdivision Approval Officer was required to refer all subdivision plans for lands subject to flood hazards to MFLNRO and MFLNRO was involved in assisting local governments with the preparation of floodplain bylaws. This authority has since been delegated to local governments, and the MTI no longer refers subdivision applications to MFLNRO although the MFLNRO still provides guidance in the form of the Flood Hazard Area Land Use Management Guidelines (discussed in Appendix E~~D~~).

~~C~~B2.4 Floodplain Mapping Program

BC’s floodplain mapping program commenced in 1974 as a provincial initiative aimed at identifying flood risk areas. The program was accelerated considerably in 1987 with the signing of the Canada/British Columbia Agreement Respecting Floodplain Mapping. The Agreement provided shared federal-provincial funding for the program through 1998 and included provisions for termination of the Agreement as of March 31, 2003.

The floodplain mapping program was responsible for identifying designated floodplain areas so that development in these areas could be controlled appropriately. Under the Canada/BC Agreement, both governments were restricted from further undertakings in designated floodplain areas. ~~Canada and BC also agreed not to provide financial assistance for flood damage to any new undertaking in a designated floodplain unless it was floodproofed in accordance with provincial floodplain development policy.~~ Measures were also provided to encourage local authorities to reduce their exposure. Throughout its tenure the program designated 89 floodplain areas throughout the province and produced over 560 map sheets.

On January 1, 2004 the responsibility for developing and applying floodplain mapping tools was transferred to local government as part of the legislative changes described below. The terms of the Canada/BC agreement were not renewed and are no longer in effect.

The MFLNRO has recently worked with consultants to develop Coastal Floodplain Mapping - Guidelines and Specifications (KWL 2011) that provide a methodology to determine Flood Construction Levels considering storm surge, wave action and sea level rise. These guidelines are available at: www.env.gov.bc.ca/wsd/public_safety/flood/structural.html#coastal.

B~~C~~2.5 2003/2004 Legislative Change

A major shift in policy occurred in 2003, corresponding with the end of the Floodplain Development Control Program. This policy change involved a significant change in how the MFLNRO participated in land use regulation in flood prone areas. Post-2003, each local government has the authority to exercise a degree of discretion in developing their own policies for zoning, development permits, subdivision approvals, bylaws, and building permits through the statutory authority described in Appendix ~~D~~C. The MTI Subdivision Approval Officer continues its role as the approval authority for subdivisions in flood prone areas in rural areas without the benefit of MFLNRO referrals and they still address flood hazard in their approval process.

B~~C~~2.6 Hazard Maps

Steep mountain creeks and creek fans are subject to hazards beyond clear-water flooding such as debris flows, debris floods and avulsions (see Appendix A~~B~~ for descriptions of these phenomena). In such areas hazard maps are an appropriate means of summarizing information critical to making good floodplain management decisions.

Hazard maps are a more general tool than floodplain maps. While floodplain inundation will typically be shown on a hazard map, the map may also address a broader range of hazards and may provide complementary information (such as hazard likelihood and/or key risk parameters such as velocity).

Hazard maps are useful for understanding the balance of risk in a multi-hazard area, and can identify other external processes that need to be considered by a local government developing a risk management strategy. Hazard maps are highly site-specific and as such, no comprehensive program has been developed for hazard mapping at the provincial level.

Flood hazard maps developed by the provincial government under the BC Floodplain Development Control Program (discontinued in 2003) represent an existing and useful set of hazard maps. These remain publicly available as unsupported legacy documents. In light of ongoing environmental change, a QP who consults such legacy documents must always be aware of their date of production and consider changes to the indicated conditions that may have occurred since.

In addition, active floodplains were systematically identified on terrain analysis maps produced by the former Resource Analysis Branch, BC Ministry of Environment (ca.1975-1990) and on maps commissioned by Forest Renewal BC. These maps may identify many smaller floodplains not covered by the provincial floodmapping program but the basis for identification is restricted to landform interpretation, often only from air photography.

~~C~~B3 NON-STRUCTURAL MEASURES TO REDUCE FLOOD AND EROSION RISKS

Non-structural flood protection refers to measures that mitigate flood risk without the use of a dedicated flood protection structure. The most effective means of non-structural flood protection is to avoid development in flood-susceptible areas. However, non-structural flood protection can also include elevation and design of a building, often also referred to as floodproofing. Erosion protection is sometimes necessary to safeguard floodproofing fill and/or building foundations during an inundation event, and should be considered an integral part of non-*structural mitigation works*.

Floodproofing requirements and development controls (such as setbacks, no-build areas, FCL and Minimum Building Elevations (MBE)) are typically identified in an engineering report and adopted by local government. Common tools for implementing non-structural mitigation works include land use zoning, development permits, bylaws, and/or covenants on land title.

Non-structural mitigation measures provide a common secondary defence against flood risk in areas protected by primary structural works such as dikes. In such cases, routes to convey water away from the dike in the event of a breach (floodways) can also be part of the non-structural mitigation portfolio.

The section below provides additional information for some non-structural mitigation measures.

~~C~~B3.1 Land Use Planning and Zoning

Land use planning and zoning, commonly through bylaws or development permits implemented under the local *Official Community Plan*, represent a local government's primary tool for controlling development and managing flood risk in their community. These tools are supported by a variety of legislation discussed in Appendix ~~D~~C.

The goal of the process is to manage risk by limiting the extent to which development is exposed to the flood hazard. Local governments, developers, and constituents must all recognize that flood hazards are not necessarily static and public policy including established FCL and MBE may need to be adapted to changing conditions. For example, the potential for sea level rise is currently driving extensive changes in local flood risk management policies in coastal communities around BC. Some communities are attempting to incorporate the time-dependent evolution of sea level rise into their plans for successive cycles of community re-development.

~~C~~B3.2 Covenants on Land Title

Covenants on land title, primarily administered under Section 219 of the *Land Title Act*, outline conditions regarding development and are permanently attached to the legal title of a property parcel. Typical clauses in a Section 219 covenant may include specification of permanent no-build areas (e.g., flood setbacks from a watercourse), MBE or FCL for the lowest finished floor or habitable space, and/or exemptions allowing construction of certain elements below the MBE or FCL (e.g., garages without electrical equipment). Covenants also typically include an indemnification for the local authority and/or the Crown against any future claims for flood damages.

The covenant is attached to the land title in perpetuity and is transferred along with title during sale, subdivision, or other dispensation. Long-term consequences must always be considered when preparing a covenant, and legal review by all named parties is strongly recommended.

~~BC~~BC3.3 Flood Construction Levels and Minimum Building Elevations

The FCL is defined as the *design flood* level plus an allowance for *freeboard*. In BC, the standard design flood for flood protection purposes is the flood with a 0.5% chance of being exceeded in any given year (the 200-year flood). Some local jurisdictions may specify a different (typically more conservative) design flood condition. Examples of this include the Fraser River, where the design flood is the 1894 flood of record, and other areas where geohazards (debris flows or debris floods) coexist with clear-water flood hazards. The minimum allowance for freeboard is typically 0.3 m above the instantaneous design flood level or 0.6 m above the daily average design flood level, whichever results in the higher FCL. However, for many BC rivers, freeboard has been set higher than these minimum values to account for sediment deposition, debris jams, and other factors.

Where the design flood level cannot be determined or cannot be reasonably used to set flood protection standards, an assessed height above the natural boundary of the water body or above the natural ground elevation may be used.

MBE has a less formal definition and simply refers to the minimum required elevation for a habitable area. MBE is typically used in areas where the flood hazard is not defined by a design flood event. This can include areas protected by primary structural flood protection works (i.e., dikes) but also includes creek fans where the possibility of avulsion (rapid change in channel geometry) means that flood hazards may not be limited to the existing channel.

For areas with primary flood protection, MBE is typically determined through a dike breach analysis. The MBE will also depend to some degree on the size and extent of floodways and the drainage characteristics, if any, for the protected area. The MBE may or may not include a specified allowance for freeboard.

Both MBE and FCL elevations are commonly referenced to the underside of a wooden floor system or the top of a concrete slab those areas that are used for habitation, or storage of goods damageable by floodwaters.

Some local jurisdictions provide exemptions from MBE or FCL construction requirements for special-use (non-habitable) buildings; however, practicing professionals should be aware that some of these exemptions might not be consistent with the exemptions provided in the Flood Hazard Area Land Use Management Guidelines.

A higher standard of protection should be considered where critical infrastructure (e.g., hospitals, fire halls, and schools), population centres (e.g., shopping malls), or areas with difficult evacuation procedures (e.g., correctional centres) must be situated in a floodplain.

BC~~C~~4 History of Structural Mitigation

BC~~C~~4.1 Diking Projects in the Early 1900s

Following the Fraser River flood of 1894, early diking works were constructed to protect farmland from routine spring flooding. Works were also established in other prime agricultural valleys. These earliest flood protection works were generally built by local landowners and were not subject to design standards or a controlled construction program. Over time, the first diking and drainage improvement districts began to emerge as agricultural efforts expanded. The provincial office of the Inspector of Dikes was established in the early 1900s to oversee the operation and maintenance of dikes by local diking authorities.

B~~C~~4.2 Fraser River Diking Board

The 1948 flood on the Fraser River caused dike failures and inundated widespread areas of the Fraser Valley, Kamloops, Quesnel, and Prince George. In response, the federal and provincial governments created the Fraser River Diking Board to co-ordinate an emergency dike rebuilding program.

Between 1948 and 1950, the Board reconstructed over 200 km of dikes and added about 45 km of new dike works. This is generally acknowledged as the first co-ordinated large-scale construction program for flood protection works in BC. The Fraser River Diking Board effectively ceased operations in 1950.

B~~C~~4.3 Fraser River Board

Established following the 1948 Fraser River flood, the Dominion-Provincial Board was set up to recommend options for water resources development and flood control in BC. At the beginning of its tenure, the Board recognized a widespread lack of data and worked for several years to fill gaps in the knowledge base.

In 1955, the federal and provincial governments replaced the Dominion-Provincial Board with the more focused Fraser River Board, with the goal of evaluating options for flood control and hydroelectric power generation on the Fraser River. The Board studied several options for upstream storage as well as improvements to the diking system.

The work of the Fraser River Board formally concluded with a final report in 1963 recommending five storage reservoirs and one diversion for both flood management and power.

B~~C~~4.4 The Fraser River Joint Advisory Board and the Fraser River Flood Control Program

In 1968, the Fraser River Flood Control Program Agreement was signed between the provincial and federal governments. The scope of the agreement included rehabilitation of existing dikes, construction of new dikes, extensive bank protection, and improvement of internal drainage facilities. Of the 44 projects initially proposed, 19 were completed and three partially completed on the basis of cost-benefit analysis. Many of the unsuccessful candidate projects were on First Nations reserves, where projects were found to provide insufficient benefits to justify the proposed expenditures.

Between 1968 and 1994, the Fraser River Flood Control Program constructed over 250 km of dikes and related works to the 1894 design flood levels (plus freeboard) at a cost of about $300M (1994). The federal and provincial governments provided 50/50 cost sharing for capital works, while local governments were required to provide rights-of-way and accept ongoing responsibility for operation and maintenance.

Under the 1968 Agreement the Joint Advisory Board also agreed to review a program of upstream storage to provide further flood protection. The Board’s final Fraser River Upstream Storage Review Report December, 1976 concluded that:

- The completion of the current diking program (Fraser River Flood Control Program) will only increase the reliability of protection up to the 1894 level and that greater floods can and will occur;
- Additional flood protection by upstream storage or diversion is essential.

The report recommended construction of the Lower McGregor River Diversion as well as further implementation of flood forecasting and floodplain management. The McGregor Diversion (to the Peace River watershed) did not proceed due to fisheries impact concerns. The *BC Water Protection Act* currently prohibits such large scale water transfers between major watersheds.

B~~C~~4.5 Dike Safety Program

The office of the Inspector of Dikes administers the provincial dike safety program. Through this program, the Inspector of Dikes is responsible for approving all new dikes and modifications to existing dikes, monitoring and auditing dike management programs, and issuing Orders under the *Dike Maintenance Act* to protect public safety. The authority of the Inspector of Dikes applies to all dikes and appurtenant works except *private dikes* and those located on First Nations reserves. The intent of the program is to set design standards for dike upgrades and new dike construction, provide oversight for the management of existing structures, and approve the design and construction of new flood protection works. The program also provides technical information and support for major multi-jurisdictional flood issues (e.g., Fraser River Hydraulic Model, Nooksack River, Vedder River). The program itself does not fund operation and maintenance or capital spending on any flood protection structures.

The Dike Safety Program has recently worked with consultants to develop the Seismic Design Guidelines for Dikes (Golder Associates 2011) and the Climate Change Adaptation Guidelines for Sea Dikes and Coastal Flood Hazard Land Use (Ausenco Sandwell, 2011).

B~~C~~4.6 Orphan Flood Protection Works (also see Section ~~C1~~B1.2)

Throughout BC, there are over 100 historic flood protection works that do not have a designated local authority responsible for operation and maintenance. The provincial government continually seeks opportunities to have these structures adopted by a local authority where they are found to provide benefit to a new or existing community.

The office of the Inspector of Dikes will not issue a *Dike Maintenance Act* approval for a major upgrade of an orphan dike, except where the local government has acquired the necessary legal access to land and has agreed to own and maintain the dike.

B~~C~~4.7 Recent BC Flood Protection Initiatives

Often, local diking authorities lack the necessary capital resources to pursue significant upgrades and expansions. A number of government cost-sharing programs have evolved since the conclusion of the Fraser River Flood Control Program. Examples of such programs include the BC Ministry of Environment's Flood Protection Assistance Program (1999-2005) and Urgent Mitigative Works completed prior to the 2007 freshet.

In the fall of 2007, the province announced the Flood Hazard Protection Fund, which will provide $100M over 10 years to help local governments complete capital projects for flood protection. The program does not fund f~~F~~lood hazard assessments~~HAs~~, *risk assessments*, or other technical studies, but does fund detailed engineering design. The Flood Hazard Protection Fund is managed through Emergency Management BC under the Ministry of Justice.

Under the current program, the local authority is responsible for cost sharing up to 33% of capital costs as well as providing rights-of-way and ongoing funding for operation and maintenance activities. As a result, not all local authorities have had the resources to allow them to participate. Nonetheless, project proposals have significantly exceeded the available funding in each year of the program to date.

B~~C~~4.8 Recent Canada Flood Protection Initiatives

In recognition of increasing disaster risks and costs, Budget 2014 earmarked $200 million over five years to establish the National Disaster Mitigation Program (NDMP) as part of the Government's commitment to build safer and more resilient communities. The NDMP will address rising flood risks and costs, and build the foundation for informed mitigation investments that could reduce, or even negate, the effects of flood events.

The NDMP fills a critical gap in Canada's ability to effectively mitigate, prepare for, respond to, and recover from, flood-related events by building a body of knowledge on flood risks in Canada, and investing in foundational flood mitigation activities. Knowledge that is up-to-date and accessible will not only help governments, communities, and individuals to understand flood risks and employ effective mitigation strategies to reduce the impacts of flooding, but will also further discussions ~~on~~about developing a residential flood insurance market in Canada.

B~~C~~4.8 Structural Mitigation Works for First Nations

Structural mitigation works owned and operated by First Nations vary significantly in importance and condition. Most First Nations works are not eligible for the senior government funding programs open to other local authorities. Rather, funding applications must be made through ~~Aboriginal Affairs and Northern Development Canada (AANDC~~Indigenous and Northern Affairs Canada (INAC), typically in the form of a Capital Funding Submission. Capital Funding Submissions are considered on the merits of each project, compared to other critical infrastructure initiatives (e.g., potable water, schools, or wastewater systems).

~~AANDC~~ INAC can and does fund flood protection works as required on an emergency basis; for example, extensive Urgent Mitigative Works programs were undertaken prior to the 1999 and 2007 floods.

Flood mitigation projects on First Nations reserves can have social and cultural benefits that are very important to local residents. These benefits are often difficult to represent in terms of the cost-benefit accounting typically used to screen and evaluate candidate projects.

B~~C~~5 STRUCTURAL MITIGATION WORKS

Structural flood protection involves a dedicated linear structure such as a dike or training berm that separates a watercourse from a protected area. The structure is designed such that water levels along the watercourse can exceed the local ground elevation inside the protected area. In some situations, structural measures may include integral appurtenant infrastructure such as pump stations and floodboxes. This section provides an overview of different approaches to structural mitigation.

B~~C~~5.1 Dikes and Berms

A dike is commonly a linear compacted earthfill structure intended to protect a designated area from inundation caused by high water conditions on an adjacent watercourse or floodplain. These dikes typically tie in to high ground at both the upstream and downstream ends and must be geotechnically stable under long-duration hydrostatic conditions associated with a protracted design flood event without allowing seepage to overwhelm internal drainage capacity. To this end, many dikes include impermeable core materials, seepage cutoffs, landside toe berms, relief wells, and other works to promote stability and control seepage ~~(see definition of dike in Appendix A)~~.

Training berm dikes are typically used to confine shorter, more transient flood, debris flood, and debris flow events within a designated channel. As such, training berm design poses lesser challenges with regard to seepage. Erosion protection is usually critical, since shorter flood events are typically associated with higher flood velocities and debris transport. These structures may also be tied in to high ground only at the upstream end.

Earth embankment dikes are designed to the local FCL (described above) such that they will preserve a freeboard allowance during the design flood. There is growing concern about the behaviour of major dike systems during a major earthquake. Many local authorities, particularly in potential liquefaction areas around the Lower Mainland, have undertaken seismic studies and seismic upgrading programs. Design of new structures must consider relevant seismic standards before obtaining approval from the Inspector of Dikes. Climate change, discussed elsewhere in these guidelines, is also an area of significant concern, particularly with regard to the potential for sea level rise and/or increased climate variability to increase the FCL.

Historically, structural flood mitigation measures have isolated watercourses from their floodplains in an attempt to preserve the maximum amount of land for development. This approach has a number of effects, including:

- increased water levels associated with the loss of floodplain storage;
- increased peak discharge due to the loss of storage attenuation; and
- increased velocity within the confined channel.

More recent mitigation projects have recognized these flood hazards and the many environmental benefits associated with preserving a wider natural corridor. New dikes and berms are usually set back from the current creek or river channel. Nonetheless, the design must protect the structural works against erosion hazards both direct (against the slopes) and indirect (through undermining or outflanking).

BC~~C~~5.2 Floodwalls and Seawalls

In some special cases, forclosure sections, or where there is insufficient space to construct an earthen embankment between a potential flood hazard and existing development a floodwall may be appropriate for a short section of the dike. A typical form is to have fill on one side of a vertical, near-vertical, stepped, or angled structural face composed of erosion-resistant materials. Like dikes and berms, seawalls and floodwalls are typically constructed to the FCL.

Because these structures are unique, it is not appropriate to provide a detailed description. However, free-standing floodwalls have several design limitations (high basal seepage gradients, inflexible with regard to future height increases, cannot be raised during floods, susceptibility to differential settlement or ground movement, may require erosion protection at base) and should only be used where it is impractical to use a conventional earth embankment. The Inspector of Dikes will generally not authorize a free-standing floodwall or seawall where land can be acquired to accommodate a standard earth dike.

BC~~C~~5.3 Bank Protection Works

Many of BC's rivers and creeks follow relatively steep, high-energy channels, and can be laterally unstable. In their natural state, most river channels change slowly over time through gradual bank erosion. Higher velocities during flood events can increase the energy of the river, leading to increased potential for bank erosion and, in some cases, rapid channel change referred to as avulsion. Debris transport can be significant during major floods, creating potential impact hazards that can accelerate local erosion.

Where erosion is a threat, bank protection works may be used to reduce property damage and risk to the public. The most common form of bank protection is the riprap revetment, a flexible apron of angular rock that is sized to resist disturbance under design flood conditions. A filter material used behind the revetment will prevent the finer dike, berm, or bank material from being washed out between the riprap voids. A toe is required to protect the revetment against undermining if the channel downcuts during high flows.

By definition, construction of bank protection creates a relative "hard point" along the riverbank. This raises flow velocities past the protected bank, which in turn sweep sediment, formerly deposited on the opposite bar, downstream to the next bend, where the problem repeats itself. Some erosion protection works are later threatened by outflanking as this process changes the channel alignment, profile, or planform. In some cases, there is little option but to extend the hard point of erosion protection further along the stream; however, there is a growing recognition of the potential impacts of this approach on both environmental and channel morphology processes. Caution must be taken that bank protection works do not simply relocate problems to a location further downstream.

B~~C~~5.4 Bioengineered Bank Protection Works

High environmental values sometimes conflict with conventional bank protection works (e.g., installation of a permanent inorganic blanket through a valuable riparian zone). Alternatives to conventional bank protection works can include planting with resilient native vegetation species (usually for lower-velocity river systems) or a range of bioengineering alternatives.

Bioengineering refers to the use of natural materials and vegetation in an engineering design framework, sometimes integrated with more typical engineering techniques and materials. While bioengineered bank protection works offer environmental benefits, the risks associated with this approach often involve a shorter project life span, more intensive maintenance requirements, and possible mobilization and/or downstream displacement of protective structures. Without careful consideration of the complete life-cycle of these alternatives under all conditions, bioengineered works have the potential to compromise public safety and affect other properties.

Bioengineered works must be implemented with due regard for their mitigation context. For example, soft timber type structures should not be considered as primary bank protection for critical assets such as homes. However, the same approach may be acceptable in another context, such as protecting productive farmland.

B~~C~~5.5 Appurtenant Structures (Pump Stations and Floodboxes)

Structural flood protection works interrupt the natural hydraulic connectivity between the protected floodplain area and the adjacent watercourse. Provision must be made to allow natural runoff to drain out of the protected area through the structure, usually in the form of culverts through an earthfill dike.

During a flood event, water levels outside the protected area are higher than those inside and gravity drainage of internal runoff is not possible. Backflow protection is typically required on drainage culverts to prevent water ingress.

The most common form of culvert backflow protection is a flapgate, a free-swinging gate hinged at top or side that is held closed by differential water pressure during a high water event. An automatically-controlled hydraulic or mechanical gate that allows controlled inundation during moderate high water but closes during floods is referred to as a tide gate. Some manufacturers have developed duck-bill type rubber check valves that can replace a conventional flapgate. Manual gates (e.g., slide gates) are also used in some systems but are less common due to their reliance on human intervention to function during a flood. A culvert combined with a flapgate, tide gate, or duck-bill check valve or manual gate system is referred to as a floodbox.

When water rises outside the dike system, the floodboxes close and gravity drainage ceases for the duration of the flood event. If there is significant internal drainage to a low point within the protected area, a pump station is required to evacuate water and avoid internal flooding. Pump stations have the potential for mechanical or electrical failures and are normally inspected frequently during a flood. The discharge capacity of a pump station will vary throughout a flood due to changes in internal and external water levels.

Both floodboxes and pump stations involve pipes and other elements that pass through or reside within the dike cross-section. Therefore, floodboxes and pump stations are an integral part of the associated structural flood mitigation works. Care must be taken that drainage works do not create preferential seepage pathways through the structure that could lead to internal erosion.

B~~C~~5.6 Design of Buildings behind Dikes and Berms

Notwithstanding the provision of primary structural flood protection, buildings in *flood hazard* areas should be designed with secondary floodproofing measures, including elevation to the applicable FCL or MBE, erosion protection/foundation treatments, and the appropriate placement of key services and utilities.

~~C~~B5.7 Floodways

Floodways play a key role in conveying floodwaters that have circumvented primary flood protection defences. This is generally achieved by providing an intentional flow path that avoids critical areas and limits inundation. A local government may designate floodways as part of ongoing development in the floodplain. A distinction is made between floodways within a dike-protected area and dedicated bypass channels used in other jurisdictions (e.g., Red River Floodway in Winnipeg, Manitoba), which in BC would be considered a river diversion. Key considerations in defining floodways should include the definition of FCL and MBE for adjacent development, as well as emergency access routes while the floodways are in use.

B~~C~~5.8 Sediment Removal

Aggradation of an active creek bed due to natural sediment transport and deposition can increase flood hazards on fans and floodplains, promote avulsion, and compromise the standard of protection provided by structural mitigation works. Where riverbed aggradation is an ongoing issue, an environmentally appropriate in-stream sediment management program can be an important part of a local authority's flood hazard mitigation program. Local authorities should monitor sediment accumulation in the river channel to determine whether deposition has reduced discharge capacity as a pre-requisite to the planning and consultation process.

In select situations where there are no economically and/or environmentally superior alternatives for reducing flood risk, environmental agencies may permit the local government or engaged provincial agency to remove some of the gravel accumulating within the channel. Removals are considered more favourably when the sediment balance is well known (so that the amount necessary to remove can be determined) and when the benefit can effectively be demonstrated. An ongoing program of river surveys, sediment budget reviews, and flood profile modelling is usually required. The permitting process for such removals will involve both the provincial government (represented by MFLNRO) and federal government (represented by Fisheries and Oceans Canada).

Sediment transport is a natural process. Human interference (in the form of sediment removal) can result in unintended consequences, such as erosion or sediment deposition in inconvenient places, siltation or degradation that threatens river-oriented facilities, and destruction of aquatic habitat. Consideration should be given to the scale of intended actions in the planning and design process. For example, removal of riverbed sediments in smaller amounts that, over several years, equal the bed material influx can be considered as a strategy for maintaining the river's flood profile at an acceptable level. Conversely, removing sediments in quantities sufficient to immediately adjust the flood profile typically entails much larger excavations with greater environmental impact and more potential for unintended consequences.

The temporary nature and high environmental disturbance associated with in-stream sediment management makes it a practice best left to situations where historical development patterns preclude other options for flood risk management. Where sediment management is an integral and ongoing part of a flood risk management strategy, it should be incorporated into the applicable operation and maintenance manuals for related structural flood protection works.

B~~C~~5.9 River Diversions and Meander (Re)Construction

Historically, river diversions have been implemented to promote efficient hydroelectric power production, facilitate drainage, or shorten navigation routes. Diversions of large rivers can also decrease flood risk by cutting off meanders, thereby increasing channel slope and conveyance. Diversions are also used to supply water to fish hatcheries and irrigation projects.

Diverting water from a channel can cause an initial reduction in the flood hazard. However, if the diversion fails to capture a comparable proportion of the sediment load, aggradation may cause flood hazards to redevelop.

The diverted water may increase erosion potential in the receiving channel, with corresponding aggradation problems emerging farther downstream as the river seeks to adjust to the new flow regime.

In recent decades, research has provided a growing understanding of the ecological impacts of river diversions. River diversions have also been noted to result in flood waves proceeding more rapidly downstream. In many jurisdictions, focus has shifted to restoring old channels, reactivating old cutoff meanders, and reclaiming lost ecological spaces wherever feasible.

A common practice in river restoration or channel realignment projects is to specify a regularly meandering channel, designed to pass expected flood flows. The viability of this solution will depend upon how the channel performs given the actual charge of both water and sediment. In general, some sediment of bed material calibre will be deposited, at least initially, within the channel, which may destabilise the channel if the banks remain erodible, and will in any case raise flood water levels.

B~~C~~5.10 Dams

Dams modulate the flow regime and interrupt sediment transport down a river. Modulation of the flow regime commonly reduces downstream flood hazards, but can also increase flood hazards in areas inundated by the upstream reservoir. In general dams make the definition of a designated "design" flood for downstream areas more complex. BC's Flood Hazard Area Land Use Management Guidelines require that the designated flood below the dam be established on a site-specific basis. Hydrologic and hydraulic modelling is often required, as the design flood can be affected by reservoir operation and available storage as well as natural inflow. Certain operating regimes might exacerbate ice run problems and ice jam flooding in winter.

In some cases, the QP will have an obligation to consider the dam classification in the context of development issues, particularly with regard to whether a new development might change the consequence classification of the upstream facility.

The interruption of sediment transfer by a dam often results in clear water releases from the dam promoting scour and degradation in the downstream channel. On some of BC's gravel-bed rivers, the regulated peak flows are incapable of moving the bed sediment and natural scour is reduced. Sediments entering the main stream from tributaries can create fans that move into the main channel, creating raised backwater levels upstream. The net effect of these changes may increase or decrease flood hazards.

Emergency releases from the dam into a river that has been regulated for many years, and has consequently adjusted its channel morphology to the regulated regime, may cause flooding onto surfaces where it is no longer expected, typically onto former bar surfaces and lower floodplain areas.

B~~C~~5.11 Other Structural Measures

BC's environment of steep mountain creeks creates the potential for debris floods and debris flows. Existing or proposed development in some at-risk areas has resulted in the development of specialized structural mitigation measures generally referred to as debris barriers. The goal of a debris barrier is to dissipate the energy associated with debris mass movement and retain all or part of the transported debris. A debris barrier can take a variety of forms and serve a range of functions. Debris breakers, deflection berms and retention basins can all help to reduce debris flow or debris flood risk. Debris barriers should be designed by a team of professionals with experience in geohazard mitigation.

On smaller channels carrying high sediment loads – for example channels on *alluvial fans* – sediment traps may be constructed to focus sediment management activities at a particular location. These sediment basins typically take the form of channel expansions, which cause a slackening of the current and deposition of the coarser part of the sediment load. The retained sediment is excavated periodically under controlled conditions, usually by implementing dedicated flow diversion or bypass works. Environmental agencies should be involved as stakeholders at the feasibility stage and throughout the design process.

Flood detention and retention features (e.g., ponds, swales, ditches, basins, wetlands, and rain gardens) are commonly employed as part of urban stormwater management strategies. As a result, these features can also have a mitigating effect on flood hazards where urban areas comprise a significant portion of the upstream watershed area. Flood detention features attenuate runoff and release it slowly over time, but do not alter the volume of runoff. Flood retention features permanently retain all or a portion of the runoff, which eventually infiltrates into the ground. Features may be designed to incorporate both retention and detention characteristics, and can also help to improve water quality when constructed in the form of semi-natural wetlands.

B~~C~~5.12 Limitations of Structural Mitigation

Structural mitigation measures have limitations in both design and performance. Failure to acknowledge these limitations can lead to increased development in flood-susceptible areas. Consequences can include damage such as was observed in New Orleans after Hurricane Katrina. Closer to home, dike failures on the Fraser River (Chilliwack) in 1948, North Thompson (Kamloops) in 1972, and Coal Creek (Fernie) in 1995 caused major damage. Other near misses include Michel Creek (1995) and Squamish (2003). The Fraser River and Skeena River freshets of 1999 and 2007 represented runoff from large snowpacks, which could have resulted in very severe and extensive flooding under different weather conditions. These failures and near-misses have brought the potential limitations of structural mitigation measures into public focus.

Structural mitigation measures can fail due to overtopping during a flood in excess of the design event. Mitigation structures can also fail due to erosion, such as the 1995 failure on Coal Creek, internal erosion (piping), or slope instability. Structural failure of primary works can expose development to the full range of hazards associated with the design event, or in some cases, a greater degree of hazard. In contrast, non-structural measures like floodproofing continue to mitigate damage regardless of event size, since the development would be impacted by a reduced depth of inundation above the design flood level.

In general, non-structural measures are preferred as a means of mitigating flood risk.

APPENDIX C~~D~~: CURRENT FLOOD MANAGEMENT LEGISLATION AND GUIDELINES IN BC

This appendix introduces the main legislation and guidelines that govern flood hazard management in BC.

C~~D~~1 OVERVIEW

Land use in flood prone areas is regulated under the following acts:

- *Local Government Act* (for development permits and floodplain bylaws, variances and exemptions),
- *Land Title Act* (for subdivision approval),
- *Bare Land Strata Regulations of the Strata Property Act* (for strata plan approvals),~~ and~~
- Community Charter (for building permits),
- Vancouver Charter (zoning and building bylaws), and
- *Environmental Management Act* (for guidelines, regulations, *flood hazard* management plans).~~.~~

The *construction* and maintenance of many of the flood control works in BC are regulated by the *Dike Maintenance Act*. There are approximately 100 diking authorities throughout the province, which are charged with the responsibility to operate and maintain these works. The majority of diking authorities are local governments so designated under the *Local Government Act* or the Community Charter. In the past a number of other entities have been recognized as diking authorities including improvement districts, diking districts (under the *Drainage, Ditch and Dike Act*), strata corporations, ratepayers associations, government agencies, non-government organizations, private corporations, and private individuals. However, approvals for new structures, as defined by the *Dike Maintenance Act*, will only be authorized where local government has agreed to be the diking authority.

Development and/or flood protection works proposed for construction in riparian areas[9] or within a watercourse may require approvals pursuant to the following environmental legislation:

- *Riparian Areas Regulation under the BC Fish Protection Act*,
- *BC Water Sustainability Act*,
- *Federal Fisheries Act*,
- provincial or federal *Environmental Assessment Act*,
- federal *Navigable Waters Act*.

Any works or activities proposed for construction on or for the use of Crown land, including the removal of gravel from a channel or foreshore requires authorization under the *Land Act*.

Integrated Land Management Branch of the MFLNRO Lands Officers may require flood assessments as a requirement for applications to lease and purchase Crown lands.

Flood management is guided at the local government level through *Official Community Plans*, bylaws, development permits, building permits, zoning restrictions, and other types of

[9] A riparian area is the interface between land and a watercourse or water body. Specifically, it is the land area directly adjacent to the watercourse or water body, the character of which is directly influenced by the presence of the water course or water body.

documents. Local governments may have additional requirements concerning public access to watercourses.

Development of floodplains on First Nations land can be subject to regulation by the local First Nation~~s~~ as well as ~~Aboriginal Affairs and~~Indigenous and Northern ~~Development~~ Affairs Canada. Local governments may be required to consult with local First Nations when developing floodplains adjacent to First Nations land, however, there is no legal framework for such consultations.

C~~D~~2 *Environmental Management Act* (Sections 5 and 138)

Sections 5(f) and 138 (3) (e) of the *Environmental Management Act* provide the Minister of Forests, Lands and Natural Resource Operations with broad flood management powers, including the authority to establish guidelines and regulations. The Minister may also require local governments and diking authorities to prepare plans with respect to flood protection *dikes* and the development of land subject to flooding. While no regulations have been established under this statute to date, the Ministry has published the Flood Hazard Area Land Use Management Guidelines (discussed in Section ~~D8~~C8) that must be considered by local governments when adopting floodplain bylaws under Section ~~910~~ 524 of the *Local Government Act*. These guidelines are periodically updated by MFLNRO.

C~~D~~3 *Land Title Act* (Section 86) – Subdivision Approvals

Section 86 of the *Land Title Act* (Section 86) allows the *approving authority* to address natural hazards issues during the subdivision application process. It contains provisions for "refusing to approve" a subdivision plan if the approving authority reasonably expects that the land could be subject to "flooding, erosion, land slip [landslide] or [snow] avalanche."

If the approving authority reasonably expects that the land may be subject to flooding, Section 86 allows the approving authority to require either or both of the following as condition(s) of approval:

- a report certified by a *professional engineer* or *professional* geoscientist experienced in geotechnical engineering that the land may be used safely for the use intended; and/or
- one or more registered covenants under Section 219 of the *Land Title Act* in respect of any lots created by the subdivision.

A restrictive covenant is attached to the property title. The *covenant* will typically specify conditions to which the development must adhere to reduce *flood risk* and to indemnify the Crown and the approving authority against future flood damages.

C~~D~~4 *Local Government Act* ~~(Sections 919.1 and 920~~~~524)~~ – Development Permits

The *Local Government Act* (Sections ~~919.1 and 920~~488) states that a local government Official Community Plan can establish a Development Permit Area to protect development from "hazardous conditions".

According to the *Local Government Act*, hazardous conditions include "flooding, mud flows, torrents of debris [debris flows], erosion, land slip [landslide], rock falls, subsidence, tsunami, [snow] avalanche or wildfire".

In a Development Permit Area, an owner must obtain a Development Permit from the local government before subdividing or altering the land, including constructing, adding to, or otherwise altering a building or other structure. A Development Permit may set out requirements, conditions or standards regarding the development itself or the sequence and timing of construction. In particular, a Development Permit can establish flood-prone areas that must remain free of development.

Before issuing a Development Permit, the local government may require the applicant to provide a report "certified by a Professional Engineer with experience relevant to the applicable matter, to assist the local government in determining the conditions or requirements".

A Development Permit precedes a related building permit. Both may be required in jurisdictions that have an Official Community Plan and where development may be exposed to flooding.

C~~D~~5 Bare Land Strata Regulations, *Strata Property Act* – Strata Plan Approvals

A Bare Land Strata Plan must be reviewed and found acceptable by a local government approving authority. The approving authority can refuse to approve the strata plan if it is considered that the land could reasonably be subject to "flooding, erosion, land slip [landslide] or [snow] avalanche". Alternatively, the approving authority can approve the plan "if the owner-developer agrees in writing to enter into such covenants registerable under section 182 of the *Land Title Act* as the approving authority considers advisable."

For Strata Title applications other than bare land strata, floods may be addressed through the Official Community Plan, re-zoning, and Development Permit process documented elsewhere in this appendix.

C~~D~~6 Community Charter (Section 56) – Building Permits

The Community Charter (Section 56) contains provisions governing the ability of a building inspector to issue a building permit for land that is likely to be subject to "flooding, mud flows, debris flows, debris torrents, erosion, land slip [landslide], subsidence, rock falls, or [snow] avalanche".

In areas where a bylaw exists regulating the construction of buildings and other structures, the building inspector may require an applicant proposing construction on flood-prone land to "provide the building inspector with a report certified by a QP that the land may be used safely for the use intended."

If the QP does not conclude the statement 'that the land may be used safely for the use intended', the building inspector may not issue the building permit.

Any conditions noted in the QP report necessary to render the land safe for the use intended are incorporated in a covenant registered under Section 219 of the *Land Title Act*. Usually, the QP report is registered in the covenant making the document publicly available.

C~~D~~7 *Local Government Act* ~~(Section 910524)~~ – Floodplain Bylaws, Variances, and Exemptions

The *Local Government Act* (Section ~~910~~524) addresses construction requirements in relation to floodplains. Specifically, this section of the *Local Government Act* empowers local government to enact a bylaw that designates a floodplain area and specifies corresponding flood levels and setbacks. Any new construction or reconstruction within the designated floodplain area must comply with these protection measures. (When dealing with building renovations, often the flood protection measures are not required if the renovation does not exceed 25% of the building footprint.)

In developing its bylaws, the local government must consider provincial guidelines as well as comply with the provincial regulations and any plan or program developed by the local government under those regulations. To date, there are no provincial regulations and therefore no local government plans or programs developed under regulation. However, the provincial document Flood Hazard Area Land Use Management Guidelines (discussed below) provides guidance for developing bylaws under Section ~~910~~ 524 of the *Local Government Act*. Through Section ~~910~~ 524 of the *Act*, local governments may, by bylaw, designate specific floodplain areas.

Section ~~910~~ 524 also indicates that a local government can grant a bylaw exemption if:

- the exemption is consistent with the provincial guidelines; or
- a report exists that the land may be used safely for the use intended, as certified by a professional engineer or professional *geoscientist* experienced in geotechnical engineering and expertise in river engineering and hydrology.

Historically, some jurisdictions have enacted bylaws under Division 5 ~~Section 903 of~~ of the *Local Government Act*, which governs zoning bylaws. However, it is preferable that a Section ~~910~~ 524 bylaw be used.

C~~D~~8 FLOOD HAZARD AREA LAND USE MANAGEMENT GUIDELINES

The Flood Hazard Area Land Use Management Guidelines (www.env.gov.bc.ca/wsd/public_safety/pdfs_word/guidelines.pdf) are published by the MFLNRO under the *Environmental Management Act* to assist local governments in developing and implementing management strategies for flood-prone areas. These guidelines are considered a key resource for implementing management practices at the local level, are referenced under Section ~~910~~ 524 of the *Local Government Act* and must be considered by local government in developing bylaws under that Section.

The Flood Hazard Land Use Management Guidelines (May 2004 with 2014 draft amendment) have five general sections, organized to address administration, floodplain mapping, application by natural hazard type, application by specific land use, and implementation measures.

The QP should also be familiar with the Floodplain Mapping Guidelines and Specifications (Fraser Basin Council, 2004), ~~and~~ Guidelines for Legislated Landslide Assessments for Proposed Residential Developments in BC (APEGBC, 2010) and Flood Mapping Guidelines (APEGBC, 2017) (see below).

As an important complement to the Flood Hazard Area Land Use Management Guidelines, the provincial government has developed a set of *flood hazard maps* and a registry of flood hazard reports based on information accumulated by the BC Floodplain Development Control program (discontinued in 2003). These maps and reports registry are available from the approving~~al~~ authority. Some approving~~al~~ authorities update the maps. However, for the most part, these maps remain as unsupported legacy documents that represent the state of knowledge and understanding of known hazards at the time the maps were initially produced. In light of ongoing environmental change, a ~~QP~~QP who consults such legacy documents must always be aware of their date of production and consider changes to the indicated conditions that may have occurred since.

C~~D~~9 Guidelines for Legislated Landslide Assessments for Proposed Residential Developments in BC

In 2006, APEGBC produced a comprehensive suite of guidelines aimed at assisting QPs retained to undertake landslide assessments in areas subject to rock falls, slumps, slides, avalanches, or creep; debris falls, slides, flows, or floods; earth falls, slumps, slides, flows, creep, and flow slides. Where flood hazards overlap with areas subject to one or more of the above hazards, the Guidelines for Legislated Landslide Assessments for Proposed Residential Developments in BC must be consulted in conjunction with these guidelines.

C~~D~~10 —APEGBC Flood Mapping Guidelines

With funding support from Emergency Management BC, APEGBC developed professional practice guidelines for flood hazard mapping in 2017. The guidelines are intended to provide guidance and information suitable for uses related to flood risk management, land use planning and management, emergency planning, and flood insurance.

The APEGBC Practice Guidelines – Flood Hazard Mapping in BC support the development of flood maps in a consistent manner, incorporating best practices.

The guidelines outline a common approach to be followed when carrying out a range of professional activities including data requirements and input, appropriate use and interpretation of data and flood modelling, typical hazard assessment methods, and climate/environmental considerations.

C~~D~~11 ~~0~~*Dike Maintenance Act*

The *Dike Maintenance Act* gives authority to the provincial Inspector of Dikes. Under the *Dike Maintenance Act*, the Inspector of Dikes may:

- access and inspect designated flood protection structures;
- require that a local authority repair, replace, renew, alter, add to, improve, or remove all or part of a flood protection or appurtenant structure; and
- require a diking authority to provide routine or special reports on the construction or maintenance of dikes for which the diking authority is responsible.

The Inspector of Dikes must give authorization in writing before a person or diking authority can:

(a) lower, or cause or allow to be lowered, the elevation of a dike or decrease, or cause or allow to be decreased, the width or cross-section of a dike;
(b) install, or cause or allow to be installed, any culvert, pipe, floodbox or any structure through a dike;
(c) construct, or cause or allow to be constructed, any works on or over a dike or dike right-of-way;
(d) alter, or cause or allow to be altered, the foreshore or stream channel adjacent to a dike;
(e) construct a new dike.

Specialized mitigative structures such as debris barriers may or may not be subject to the *Dike Maintenance Act*. Flood protection works located on private property that protect only that property may not be subject to regulation under the *Dike Maintenance Act*.

Interference with a flood protection structure and failure to co-operate with the Inspector of Dikes are defined as offences under the *Dike Maintenance Act*.

Although Inspector of Dikes sets design standards as a regulatory and enforcement authority, responsibility for designing, constructing, monitoring, and maintaining flood protection works remains with the designated local authority.

To obtain an approval under the *Dike Maintenance Act*, application requirements include:

- conformance with the Dike Design and Construction Guide: Best Management Practices for British Columbia, July 2003, as amended from time to time and other published guidelines;
- design, construction and as-constructed drawings certified by a suitably QP engineer;
- works to be planned and scheduled to ensure that the protection is not diminished during potential flood periods;
- the raising of dikes or the construction of new dikes or other works (e.g., bridge constrictions on diked channels) shall not impact the safety of other dikes, or increase the flood risk to others; and
- depending on the scope of works involved, an Operations and Maintenance (O&M) manual may be required.

New dikes will only be approved where the local government has agreed to act as the diking authority. Among other things, the diking authority must ensure ongoing, inspections, operation and maintenance and permanent legal access to the lands on which the new dike is to be constructed.

C~~D~~12 ~~1~~ OTHER LEGISLATION RELATED TO STRUCTURAL MITIGATIVE MEASURES

The *Drainage, Ditch and Dike Act* and the *Local Government Act*, Part 17~~23~~, have enabled the creation of autonomous diking and improvement districts for purposes such as drainage, ditching and diking. The improvement districts can design, construct (subject to approval from constituents), operate and maintain flood protection and drainage works, and raise money to support these activities through a tax levy on protected properties.

Improvement districts were historically created in rural areas where there was no alternative form of local government. Where a suitable local government exists, an improvement district is encouraged to transfer drainage and diking assets and responsibilities to that local government. Over time it is expected that services currently provided by improvement districts will be assumed by local governments.

Where mitigative structures are constructed on or within a watercourse channel, authorization must be obtained under the provincial *Water Sustainability Act* as well as the federal *Fisheries Act* and, if applicable, under the federal *Navigable Waters Act*. Major projects may be subject to review under the provincial or federal *Environmental Assessment Act*. Mitigative structures that occupy Crown land require some form of land tenure under the *Land Act*. The *Land Act* also provides authority for removing sediment from channels.

C~~D~~13 ~~2~~ KEY GUIDELINE DOCUMENTS

MFLNRO and its predecessors, through the office of the Inspector of Dikes, has prepared a number of guideline documents to assist experienced professional engineers in the design and implementation of structural mitigative measures. A QP should be thoroughly familiar with the following guidelines.

- Guidelines for Management of Flood Protection Works in British Columbia (1999);
- Environmental Guidelines for Vegetation Management on Flood Protection Works to Protect Public Safety and the Environment (1999);
- Flood Protection Works Inspection Guide (2000);
- Riprap Design and Construction Guide (2000);
- Dike Design and Construction Guide – Best Management Practices for British Columbia (2003);
- Guidance Document - Hydrologic and Hydraulic Report (2008);
- Guidance Document - Comprehensive Geotechnical Investigation and Design Report (2011);
- Seismic Design Guidelines for Dikes (Golder, 2011);
- Application Requirements - New Dikes and Upgrades to Existing Dikes (2011);
- Application Requirements - Pipe Crossing - Cut and Cover (2009);
- Application Requirements - Erosion Protection (2008); and
- Application Requirements - Exploratory Geotechnical Testing (2009).

Other relevant guidelines include the Flood Hazard Area Land Use Management Guidelines (BC Ministry of Water, Land and Air Protection, now BC Ministry of Environment, 2004, with 2014 draft amendment), the Guidelines for Legislated Landslide Assessments for Proposed Residential Developments in BC (APEGBC, 2010), the Floodplain Mapping Guidelines and Specifications (Fraser Basin Council, 2004), Flood Hazard Maps (MOE/Fraser Basin Council, 2004), ~~and~~ the Coastal Floodplain Mapping - Guidelines and Specifications (KWL, 2011) and the Flood Mapping Guidelines (APEGBC, 2017). While not yet adopted as provincial policy, the province has commissioned and released the report Climate Change Adaptation Guidelines for Sea Dikes and Coastal Flood Hazard Land Use (Ausenco Sandwell, 2011).

APPENDIX D~~E~~: FLOOD HAZARD ASSESSMENTS

This appendix should be read in conjunction with Section 3 of the guidelines. It provides additional information on how to execute Flood Hazard Assessments (FHAs). FHAs provide the basis for FRAs in that they quantify the likelihood and intensity of a potentially damaging event. The *risk assessment* (Appendix E~~F~~) combines the results of the hazard assessment with estimation of *consequences*.

D~~E~~1 INTRODUCTION

FHAs, by definition, determine the probability of floods of variable magnitudes and assess their intensities. Both of these considerations need to be addressed when carrying out a FHA. Magnitude, for example, can be indexed by one summary measure of flood size, usually river discharge or, in the case of coastal *flood hazard*, wave height or storm surge elevation. Flood extent can be expressed as the area inundated and the duration of the flood, while *flood* intensity is typically expressed as flow velocities and flow depths. These variables are not simply related. For example, river floods may be caused by high flows or by high stage due to backwater (as in ice jam or landslide dam backwater). It is arguable that, for rivers, stage should be the basic measure of flood magnitude.

Traditionally, in Canada, floods in diked river sections are simulated with one-dimensional steady or unsteady state models that focus on the stream channel and overbank areas and provide stage and average flow velocities. As described in the Floodplain Mapping Guidelines and Specifications (Fraser Basin Council, 2004), for diked rivers, flood levels in the floodplain are estimated by applying the computed water surface profile values within the river channel across the floodplain. This is a conservative approach as it not only assumes the *dike* is essentially ineffective but also constrains the water surface profile by the presence of the dike which results in floodplain water levels that are often higher than would occur if a dike is breached. For undiked rivers, 1-D models normally include the entire cross-section of the river and floodplain and no extrapolation is required. Two-dimensional models simulate the flow depth and area inundated and allow the user to examine the propagation of the flood wave across and downstream in the floodplain when dikes are overtopped. Such models, while still the exception rather than the rule, are encouraged as they provide crucial variables for FRAs. However, they are generally more costly and likely to be limited to the assessment of large developments that would have distinctly two-dimensional flow patterns.

These methodologies are well established and a large number of numerical models exist that fulfill the same functionality by using similar equations of flow. A comprehensive FHA, however, creates different flood *hazard scenarios* beyond a purely flood stage approach. For example, the implicit assumption in flood hazard studies in BC is that floodplain inundation will occur whether or not dike elevations are exceeded and as noted above, designated flood levels are often higher than what would actually occur if a dike is breached. Detailed dike breach modelling studies have been carried out on some rivers with large floodplains which has resulted in reduced designated flood levels in some areas in the floodplain for example, Agassiz, Matsqui Prairie and Squamish. In some cases these modelling studies have shown that the presence of a dike results in higher floodplain water levels than the river water surface profile at locations where water flows out of a floodplain over a dike and back into the river.

Dike breach analyses should be considered in areas of high potential risk (i.e., heavily urbanized areas and/or areas containing critical infrastructure where potential losses could be economic and social). Such breach analysis could allow for flood warning near strategic breach locations and preparation of emergency planning in the event of a breach.

Particularly for small-scale development cases, the ~~QP~~QP may be uncertain as to what level of effort is appropriate to determine if a proposed subdivision is “safe for the use intended”. These guidelines are designed to answer some of these questions without providing a precise manual on flood assessment.

D~~E~~2 IDENTIFICATION/CHARACTERIZATION OF ALLUVIAL FANS AND FLOODPLAINS

Floodplains and *alluvial fans* are surfaces constructed by the deposition of stream-borne sediments that are subject to normal flooding. Their identification is a key step in any flood hazard or FRA.

An alluvial fan is a conical accumulation of sediment deposited where a steep channel flows onto a much lower gradient so that much of the sediment load of the tributary is deposited. Alluvial fans typically occur where a mountain tributary enters a main valley. As such, they are widespread in BC mountain valleys, though they may be overlooked where they are covered in dense forest.

A floodplain is, by definition, the area of flat terrain bordering a river that is composed of sediments transported and deposited by the river, and subject to flooding by the river (in the absence of flood defences). Floodplains should be distinguished from the valley flat, which is the essentially flat surface in a valley bottom (a purely morphological definition) that may or may not be an active floodplain. How frequently a surface must be inundated in order to be classified as an active floodplain is a matter of debate. Williams (1978) found that recurrence intervals for bankfull or overbank flow in a sample of floodplains in western North America defined as active varied from 1 year to more than 25 years.

For practical management, it is worthwhile to distinguish floodplains according to their degree of activity. For example, floodplains apt to be inundated with a return period of 10 or fewer years might be designated frequently active; while ones apt to be inundated with a return period of 10-30 years (that is, in the period of a generation) might be termed episodically active. Floodplains inundated with a return period of 30 to 200 years might be termed infrequently active. Flood inundation exceeding 200-year return periods might be called exceptional. The distinction is important in BC where many floodplains and alluvial fans were formed at the end of the last glacial period and the streams that cross them are, today, mildly incised by subsequent degradation, so that they rarely or never overtop their banks. Surfaces that flood relatively rarely may be relatively exposed because, unless the likelihood of flooding has been firmly established, defences may be neglected. If it can be shown that a valley flat is unlikely to be flooded at all by normal streamflows, then it is designated a terrace. Many terraces are obvious features in BC valleys, but the transition from infrequently active floodplain to terrace is sometimes difficult to establish.

Floodplains and alluvial fans form distinctive landforms that can be delimited using geomorphological and sedimentological criteria. For example, they are distinct units in the BC Terrain Mapping Code (Howes and Kenk, 1997), hence are displayed on terrain maps. Criteria to identify an active floodplain include knowledge of historical inundation, the presence of (geologically) recent flood deposits, including cumulic soils, the occurrence of inundation-tolerant plants, and the presence and condition of drainage channels within the floodplain. In many sparsely settled areas, these indicators may be essential to confirm even frequently or episodically inundated surfaces. Howes and Kenk (1997) do not define activity level (active or inactive) in quantitative terms because the assessment of the frequency of most geomorphological processes (e.g., floods, landslides) is beyond the scope of the BC Terrain Mapping Code.

In an alternative approach, numerical models to predict water levels, driven by hydrologically derived estimates of flood flows and using bathymetry of channels and detailed topographical maps of the valley flat, may be used to predict limits of inundation. This method, which may be said to define a hydraulic floodplain is employed according to regulation in BC (see Appendix B~~C~~). It avoids the difficulty that sometimes attends the interpretation and dating of genetic indicators of flooding, but numerical models are unlikely to be perfect representations of the physical truth so that the availability of both techniques constitutes a critical combination for site investigation. Most numerical models cannot model channel change, ice jamming, bank erosion or other hazards, so significant expert judgment is needed in addition to numerical modelling. This is increasingly important because with more and increasingly sophisticated models non-critical reliance on models is increasing.

As an additional normal flood hazard factor, the likelihood for channel avulsion must be considered. This is particularly important in upper montane valleys where rivers often are aggrading due to the deposition of sediment flushed from steep tributaries, and on alluvial fans. The presence of large secondary channels is an indication of this phenomenon. Active alluvial fans are aggrading sediment bodies so that channel avulsion is the principal problem. Floods in anastomosed rivers and river deltas may share the characteristics of floods on alluvial fans – that is, avulsions or channel splitting are apt to occur. More generally, a change of flow division amongst anastomosed channels may increase flood hazard along one branch.

D~~E~~3 METHODS OF FLOOD HAZARD ANALYSIS

A typical FHA assessment may be structured as follows:

Introduction

- definition of the study area that includes the local region (consultation area) with a listing of the *elements at risk* and the contributing region (often the river's watershed);
- a literature search to obtain all relevant information such as land use, hydroclimatic variables, historical floods, geology; and
- if flood mitigation structures are already in place, examination of their state of maintenance and performance.

Methods

- a formulation of flood hazard scenarios (i.e., flood due to rainfall, snowmelt or both, sewers, groundwater, reservoirs, canals and other artificial sources);
- a frequency-magnitude analysis of the flood hazard;
- an assessment of the capacity of any pump stations, flap gates, drains or sewers, existing or proposed, on the site during various flood events;
- an assessment of the volume of surface water runoff to be generated from a proposed development; and
- modelling of the flood hazard at the desired return period(s) to obtain:
  - water depth;
  - the velocity of surface water flow;
  - the chronology in which various parts of the study area might flood;
  - the event duration; and
  - information on the extent and depth of previous flood events or on flood predictions.

The above items can be addressed using standard techniques. The following additional considerations should be addressed where relevant:

- Are there any other processes acting on the stream channel in question (i.e., ice jams, debris flows, debris floods, hyperconcentrated flows, landslide dam/glacier dam outbreak floods etc.)? If so, does the QP have the capacity to quantify those or does a specialist need to be consulted?

- Are there upstream structures existing that could fail and create a flood in excess of the *design flood* as determined by traditional methods? Could such structures be erected or dismantled during the timeframe considered for the study, and if so, how would this change the frequency-magnitude relations of floods?
- Is the data time series long enough to provide reasonable answers for long-term prediction? Have the errors associated with long-term extrapolations of the time series been adequately quantified and included in the conclusions?
- What is the likelihood that the frequency-magnitude relations will change drastically over the design life of the structure(s) in question due to anticipated land use changes, damming, climate change, urban development, densification or others?
- What is the potential for water repellent soils caused by fire leading to increased *risk* of debris flows and flooding?
- If climate change is likely to imprint on the regional hydrology, how can it be included in the statistics to account for a drying or wetting trend, a change in rainfall amounts and/or intensities, a change in the snowpack, its distribution and/or snow water equivalent and how will this affect the frequency and magnitude of extreme runoff events?
- Have fluvial geomorphic aspects been adequately considered in this study? What are the dominant sediment inputs and how have they changed over time and will likely change over time? Is there a long-term trend in river degradation or aggradation and how is it distributed spatially and at what rates? How will net aggradation or net degradation affect flood hazard over time? Is bank erosion occurring and at what rates?

The need to address these additional considerations should be responded to at the proposal stage and either formalized in the scope of work as specified by the *client* in conjunction with the approving agency, or formulated by the practitioner. This requires some background work so the proposal can be properly developed. It also allows the lead QP to identify additional specialists where required. This facilitates the preparation of a realistic budget for the project.

Flood hazard analysis can be approached in a number of ways. For streams with a history of gauging, statistical analysis of past extreme flows leads to estimates of the return period for flows of a specified magnitude. Historically this is the method used in planning flood protection. Where there is no history of gauging, a QP may consider regional flood frequency curves developed using data from nearby gauged basins. However, all approaches that refer to historical flood frequency curves carry two significant assumptions, which are not valid in the context of changing climate in BC:

a. the flood sequence is stationary (i.e., floods in the future will have characteristics similar to those in the past); and
b. the flood sequence is homogeneous (all floods are generated by similar hydrometeorological mechanisms).

In BC, flood sequences vary demonstrably on time scales which are as short as decades in length due to the occurrence of climate phases associated with the state of the adjacent North Pacific Ocean; furthermore, the climate is undergoing secular change.

Floods are generated by multiple mechanisms in many of the province’s rivers (for example, rainstorm runoff and snowmelt; see Church, 1988), necessitating the application of methods for analysing mixed distributions and separating flood types based on antecedent weather. As a result a modified approach to extreme flow analysis is required.

The estimation of extreme floods, with long recurrence intervals (greater than 200 years), requires professional judgment. Extrapolations from historical data can be used but are purely statistical in nature and do not necessarily represent what the experience will be.

A second method is to estimate the “probable maximum flood” (PMF) on the basis of precipitation history and drainage basin characteristics. This, however, is not appropriate for standard FHAs. The method is frequently used for small basins where there is no gauging history and where precipitation inputs can be assumed to be approximately constant over the basin (which, in BC, appears to be basins <50 km^2). This assumption no longer is credible for large basins, in which specific runoff clearly is scaled by area (Eaton et al., 2002). Application of the PMF methodology ~~required~~ requires estimation of the probability~~ly~~ maximum precipitation (PMP). It is standard practice to determine depth-area curves for the PMP that adjust for the fact that precipitation is not constant over large basins. The PMP/PMF methodology is applied in cases when it is imperative to obtain an estimate of an absolute safety criterion such as the design for dam spillways or sizing of tailings dam *freeboards*.

A third method for appraising extreme flood hazards is to analyse morphological evidence of former floods on the ground. This method is particularly useful in small, steep basins subject to debris flow, and on alluvial fans. Flood deposits, vegetation damage (dateable using tree ring histories) and dateable organic deposits provide useful evidence. The resulting frequency-magnitude pairs, however, are difficult to analyse with standard frequency statistical methods. Data needs to be fitted to various extreme value distributions and the fit tested before credible relations can be used for risk assessments or design of mitigation structures.

The choice of which approach to use depends on a number of factors including those identified above as well as the level of hazard and the elements at risk. The approach selected must provide results that are technically defensible. The flood hazard analysis should clearly state what assumptions underlie the analyses.

Generally any flood hazard analysis method requires substantial professional judgment, and assumptions and uncertainties should be carefully considered and clearly stated in the FHA report.

D~~E~~4 Flood Hazard Assessment – Level of Effort

The appropriate level of effort to be applied to a FHA is a function of the objectives. The type of assessment changes with the size of the study area and the potential elements at risk.

Recognition of the potential complexity of flood hazards suggests that a categorization of FHAs be considered as proposed in Tables D~~E~~-1 and D~~E~~-2. These tables provide guidance on the appropriate level of effort to be applied depending on the objective of the assessment, including the issues that need to be addressed, the level of detail that needs to be included, and the types of analyses to be conducted so specialists can be engaged if required. Table D~~E~~-1 provides guidance on rainfall and snowmelt generated floods while Table D~~E~~-2 focuses on unusual floods including debris flows that are, by definition, a landslide process. These two tables split hazard assessments into six classes, each one associated with a set of hazard assessment methods, deliverables, applications and return periods for *flood hazard maps*. The guiding principle is that increases in loss potential necessitate increasing effort and increasing return periods to account for extreme flood events that could lead to catastrophic loss.

The tables reflect the experience gained to date by a group of practitioners within BC carrying out FHAs. They are not intended to preclude a QP or an *approving authority* from selecting other procedures deemed to be appropriate when their use and application can be supported by a suitable level of analysis and relevant documentation.

Table D~~E~~-1: Types of Flood Hazard Assessments for rainfall and snowmelt-generated floods and ice jam floods.

Class	Typical hazard assessment methods and climate/environmental change considerations	Typical Deliverables	Applications	Return periods for flood hazard maps	Application for Development Type
0	• Site visit and qualitative assessment of flood hazard, • identify any very low hazard surfaces in the consultation area (i.e., river terraces) • estimate erosion rates along river banks	Letter report or memorandum with at least water levels and consideration of scour and bank erosion	Very low loss potential rivers and floodplains, loss of life very unlikely		Building permit: renovations, expansions, new single house, new duplex house
1	• all that was completed for Class 0, and • possibly 1-D modelling, qualitative description of fluvial geomorphic regime at the site and river stability, field inspections for evidence of previous floods • identify upstream or downstream mass movement processes that could change flood levels (e.g., landslides leading to partial channel blockages, diverting water into opposite banks) • conduct simple time series analysis of runoff data, review climate change predictions for study region, include in assessment if considered appropriate • quantify erosion rates by comparative air photograph analysis	Cross-sections with water levels, flow velocity and qualitative description of recorded historic events, estimation of scour and erosion rates where appropriate with maps showing erosion over time. If significant watershed changes (logging, beetle infestations, forest fires) have been detected, determine how this may affect watershed hydrology.	Possible loss of life even for single homes, scoping level studies for linear infrastructures, mines, urban developments		Small Subdivision: Subdivision into separate lots (3 to 10 single family)
2	• all that was completed for Class 1, and • 1-D or possibly 2-D modelling, modelling of fluvial regime and future trends in river bed changes, erosion hazard maps, possibly paleoflood analysis • Same as for Class 1, add factors to adjust for changes in runoff or model effects of climate change	Maps with area inundated at different return period, flow velocity, flow depth, delineation of areas prone to erosion and river bed elevation changes, estimates of erosion rates	Moderate loss potential rivers and floodplains	20-year 200-year 500 to 1000-year (where appropriate)	Medium Subdivision: Subdivision into ≥ 10-100 single family lots, new subdivisions
3	• all that was completed for Class 1, and • 2-D modelling of user-specified dike breach scenarios, modelling of fluvial geomorphic processes using 2-D morphodynamic models and their respective effects on flood hazard • Same as for Class 2 and consider watershed environmental changes	Same as for Class 2 and formulation of decision tree	High loss potential rivers and floodplains	200-year 1000-year 2500-year (where appropriate)	Large Subdivision: > 100 single family lots, new subdivisoins

4a	• all that was completed for Class 1, and • 2-D modelling with probabilistic dike breach routines including breach width and breach outflow discharge scenarios, 2-D morphodynamic models and their respective effects on flood hazard. • Same as for Class 3 and include findings from regional climate models	same as for Class 3 but with documentation of breach discharge and flood propagation times	Very high loss potential rivers and floodplains	200-year 1000-year 2500-year (where appropriate)	Very Large Subdivisions (new towns or townships): >> 100 single family lots, new subdivisoins
4b	• all that was completed for Class 4a but including modelling of different hazard scenarios (i.e., different breach locations, multiple breaches, sequential breaches) for different *flood risk* reduction strategies • Same as for Class 4a	same as for Class 3	Very high loss potential rivers and floodplains	200-year 1000-year 2500-year (where appropriate)	

Note, the methods and deliverables are to supplement those listed in Section E-1.3

Table D~~E~~-2: Types of Flood Hazard Assessments for debris floods, debris flows, glacial lake/moraine dam floods including alluvial fans.

Class	Typical hazard assessment methods and climate/environmental change considerations	Typical Deliverables	Applications	Return periods for hazard maps	Application for Development Type
0	• Site visit and qualitative assessment of flood hazard without modelling • identify any very low hazard surfaces in the consultation area (i.e., inactive fan surfaces) • Consider watershed scale environmental changes	Letter report or memorandum with water levels, approximate flow velocities and (where appropriate) loading conditions	Very low loss potential rivers and floodplains, loss of life very unlikely	Typically not needed	Building permit: renovations, expansions, new single house, new duplex house
1	• all that was completed for Class 0, and • qualitative description of process potential, preliminary estimates of process magnitude and frequency, mapping of hazard zones based on field evidence, separation into direct and indirect impact zones • Same as Class 0	maps showing hazard zones, report with water levels, approximate flow velocities and (where appropriate) loading conditions	Possible loss of life even for single homes, scoping level studies for linear infrastructures, mines, urban developments	20-year 200-year 500-year (for alluvial fans)	Small Subdivision: Subdivision into separate lots (3 to 10 single family)
2	• all that was completed for Class 1, and • qualitative failure mode assessment, frequency-magnitude assessment based on chronosequential air photograph assessment, judgment-based inundation mapping, empirically-based runout modelling and inundation mapping • Same as Class 1, consider how climate change could affect frequ/mag characteristics of hazard process	Maps with area inundated for design event, flow velocity, flow depth, delineation of areas prone to bank erosion and river/creek bed elevation changes	pre-feasibility studies for linear infrastructures, mines, urban developments	10-year 200-year 500-year where appropriate	Medium Subdivision: Subdivision into > 10-100 single family lots, new subdivisions
3	• all that was completed for Class 1, and • qualitative failure mode assessment, detailed frequency-magnitude assessment using one or more absolute dating methods, breach and or runout modelling for the design event as defined by return period and for the most likely failure scenario • Same as Class 2	Creation of frequency-magnitude graphs, mapping of area inundated for model run, flow velocity, flow depth, delineation of areas prone to bank erosion and river/creek bed elevation changes	Feasibility studies for linear infrastructures, mines, urban developments	200-year 1000-year 2500-year where appropriate	Large Subdivision: > 100 single family lots, new subdivisions
4a	• all that was completed for Class 1, and • probabilistic failure mode assessment, geotechnical analysis of failure mechanisms, detailed frequency-magnitude assessment using all applicable absolute dating methods, formulation of credible hazard scenarios and assigning of hazard scenario probabilities, breach modelling in 1-D and 2-D or 3-D runout modelling • same as Class 2	same as Class 3 with detailed reporting of geotechnical analyses, breach outflow hydrographs and model assumptions and errors, hazard intensity maps for different hazard scenarios and return periods.	input for quantitative risk assessments pre-design studies for large urban developments design-level studies for high value/vulnerable industrial assets	200-year 1000-year 2500-year	
4b	• all that was completed for Class 4a assessment but for different flood risk reduction scenarios • Same as Class 2	same as Class 4a for different risk reduction scenarios	as Class 4 assessment	200-year 1000-year 2500 year	

D~~E~~5 FLOOD INUNDATION AND FLOOD HAZARD MAPPING

The development, use, application and interpretation of floodplain maps~~flood hazard maps or floodplain mapping~~ are professional activities ~~which~~ that are crucial to the preparation of a quality FHA. The completion of these activities significantly and directly impacts the quality of flood assessment reporting.

Professional practice guidelines for preparation of flood maps are provided in APEGBC (2017).

Flood ~~hazard~~ maps underpin urban development decisions. They can be used by many different stakeholders and serve at least one of the three purposes of *flood risk* management:

- prevent the creation of new risks through planning or *construction*;
- reduce existing risks; and
- adapt to changing risks.

Flood ~~hazard~~ maps have very specific demands on content, scale, accuracy or readability and should specify the scale of application. They are primarily used for:

- flood risk management strategy (prevention and mitigation);
- land use planning and land management;
- emergency planning;
- raising public awareness; and
- flood insurance

D~~E~~5.1 Floodplain ~~and Flood Hazard~~ Maps in BC

In BC, the floodplain mapping program (1987-1998) was created as a joint initiative between the federal and provincial governments with the ultimate goal to minimize flood damage in BC (Floodplain Mapping Guidelines, 2004). The maps identify areas susceptible to flooding and were designated as floodplains by the federal and provincial environment ministers. The maps are now largely out-of-date and referred to as legacy documents. However, the maps are still used as administrative tools that designate minimum elevations for floodproofing that can then be incorporated into building bylaws, subdivision approvals and local government planning and regulations. There are 140 sets of designated floodplain maps on the MFLNRO (2016) website. The floodplains are no longer considered to be ‘designated’ by the Province.

On a BC floodplain map, a floodplain is defined as “the area that can be expected to flood, on average, once every 200 years or with an approximate annual probability of 0.5%”. However, as flood mitigation structures alongside the river are meant to contain a flood within those structures, and the floodplain map extends well beyond those artificial boundaries, such floodplain maps more accurately delineate areas that would flood in the absence of flood mitigation measures or as a result of a dike breach.

Floodplain maps show the location of the normal channel of a watercourse, surrounding features or developments, ground elevation contours, flood levels and floodplain limits (the elevation and horizontal extent of the high water marks of a computed 200-year flood). Within the floodplain, flood level isolines show the water elevation during a 200-year flood. The maps may also include the computed 20-year flood level, which is used in applying *Health Act* requirements for septic tanks. A flood level isoline is a line that spans the floodplain, plotting the location at which the floodwater is expected to reach the indicated elevation. The elevation of floodwater between each isoline can be interpolated.

The following should be noted regarding the 1987-1998 BC flood mapping system and if relevant addressed in the QP’s report:

- flood extents for flood return periods exceeding 200 years are not shown even though those floods will undoubtedly occur; the maps are thus instilling a false sense of safety;
- only the 200-year return period level and sometimes the 20-year level, may be shown even though the flood extent of other return periods may be associated with higher levels of flood risk;
- the accuracy of the base topography has a huge impact on the map's validity and accuracy;
- information is not always provided on site-specific hazards such as bank erosion or channel avulsions;
- a map is usually applicable only for floods, defined as floods generated by rainfall, snowmelt or a combination of those, but not debris floods or debris flows or floods due to ice or debris jams;
- a map provides a snapshot in time in terms of showing the potential flood extent at the time at which the input data were created (air photography, topographic mapping). Changes in floodplain development, channel planform and the channel bed due to fluvial geomorphic processes are not included;
- a map is based on data stationarity assumptions and therefore does not include the direct or indirect effects of climate change even though those effects are likely to change the return periods associated with map isolines.

An authority having jurisdiction may require additional services in the development of flood hazard maps or a QP may recommend as such to their client. The following section provides guidance when public safety issues or the client's needs demand additional services related to the development and use of flood hazard maps. Its contents advance beyond the approach presently used for flood management in BC so are not referenced in the current provincial or local legislations. Before proceeding with the application of advanced flood hazard mapping as discussed below, the professional services to be provided should be agreed to by the client and the QP.

Flood hazard mapping has been conducted in a number of jurisdictions in BC (Flood Hazard Mapping Program, 2004). For example, the Fraser Valley Regional District has developed hazard maps including debris flow fans. The maps are part of an information map where different layers including hazards can be selected. These maps which are kept up-to-date are available at:
http://www.fvrd.bc.ca/Services/Mapping/Pages/RegionalInformationMapTermsofUse.aspx.

The advantage of these maps is that different map information layers can be turned on or off (i.e., topography, land use, zoning, hydrology). Furthermore, a database of 690 geohazard reports (status June 2011) accompanies such maps. However, the QP cannot solely rely on such maps because not all areas subject to flood, debris flow and debris floods have been mapped to date. As such the map only serves as a first orientation tool and provides data on work that has been completed to date.

Similar flood hazard maps exist for the Kootenay Region at a scale of 1:50,000. These maps have been prepared by the Fraser Basin Council and the (former) Ministry of Water, Land and Air Protection to provide information originating from the Ministry's Floodplain Development Control Program files to local governments, land use managers and *Approving Officers* to help them begin the work of developing and implementing land use management plans and subdivision approvals for flood-prone areas without referrals to MWLAP. The maps show flood hazard features including debris floods and debris flows, usually as delineations of the 200-year floodplain and fans. They do not replace detailed hazard maps for each fan, which require expert knowledge. Information for the use of these maps can be found in the Flood Hazard Map User Guide that can be accessed at www.env.gov.bc.ca/wsd/public_safety/flood/fhm-2012/cabinet/flood_hazard_map_user_guide.pdf. The Flood Hazard Map User Guide is also accessible through local governments. Each map contains a long section on qualifications and limitations and the ~~QP~~QP is referred to those for further information.

Information on environmental protection in flood hazard zones can be found in Fraser Basin Council (2010).

In some areas of the province, flood profiles have recently been updated and detailed floodplain mapping produced. This new generation of floodplain maps contains information such as depth and velocity data, flood profiles corresponding to ice-related flooding, areas at risk from groundwater flooding, floodway extents, inundation progression, avulsion and erosion hazards. Where available, this information significantly reduces the effort required to assess flood hazards for a new development.

D~~E~~5.2. Proposed Flood Hazard Maps

Following the European example, flood hazard maps can follow at best three different probability scenarios: low (20 year), medium (100 and 200 years) and high (500, 1,000 and 2500 years) which are reflected in Tables D~~E~~-1, D~~E~~-2 and D~~E~~-3. These probabilities will, at least to some degree, hinge on the available data for the river or stream in question as well as the flood-producing process.

Table D~~E~~-3: Proposed frequency probability scenarios for different watershed areas

	Large river systems	**Moderate and small rivers and large streams or small streams with low gradients**	**Small steep streams subject to debris floods and debris flows**
Typical length of gauged record	> 50 years	0 - 50 years	rarely gauged record
Typical watershed area	> 1000 km^2	10-1000 km^2	0.1- 10 km^2
Flood-generating process	• rainfall • snowmelt • rain-on-snow • ice-related floods	• rainfall • snowmelt • rain-on-snow • landslide dam outbreak floods • volcanic debris flows • log jams • beaver dam failures • ice related floods	• landslide dam outbreak floods • debris flows • lahars • extreme rainfall
Proposed flood return periods** shown on hazard maps	• 20-year* • 100-year • 200-year • 1,000-year • 2,500-year***	• 20-year* • 100-year • 200-year • 500-year • 1,000-year	• 20-year* • 200-year • 500-year • 2,500-year***

* should only be considered for areas where there are no flood defence structures or where the existing ones are likely to fail or be overtopped for an event of this return period.
**The return periods serve as guides only and will need to be adjusted depending on the elements at risk on the floodplain to suit the objectives of the respective flood hazard or risk assessment. Also, the return period estimates

beyond 200 years only make sense if a reasonably long gauged record is available from the river in question or from regional analysis.
*** Peak flows, stages or debris volumes (debris flows) for return periods exceeding 1,000 years are exceedingly uncertain and are in many cases at the limits of the available Quaternary dating methods. Such extrapolations also must contend with significant climate variability and thus variability in the geomorphic response. The 2,500-year return period will thus only apply to Class 3 and 4 (Table D~~E~~-2) assessments.

Table D~~E~~-3 provides guidance on the range of return periods to be used for different flood-generating process and associated typical watershed sizes. For example, for Lillooet River in the Pemberton Valley, work by Friele et al. (2008) has shown that lahars (i.e., volcanic debris flows) may reach the township of Pemberton, on average, every 2,000 years and that, measured by risk tolerance standards developed elsewhere, risk to inhabitants in Pemberton is currently considered unacceptable. For this reason, a 200-year and 2,500-year floodplain map may be considered a reasonable compromise. Similarly, for the Squamish River (watershed area: 2330 km^2), large landslide dams from the Quaternary volcano Mt. Cayley have been dated using radiometric methods. For developments in the upper Squamish River valley, a 2,500-year return period landslide dam breach would form a reasonable basis for floodplain mapping.

For the Fraser River, given the very high potential consequences, flood hazard maps including a 1,000-year return period event and a 2,500-year event may be warranted as this river has been dammed by rock avalanches several times in the past in the Fraser Canyon. Outbreak floods from large landslide dams would likely result in greater flood depth than normal floods for some sections of the river. It is worthwhile comparing the 1,000-year and 2,500-year return period herein to return periods considered in the Canadian Dam Safety Guidelines (2007). For a High dam class with permanent population at risk and loss of life of <u><</u>10, the suggested return period for deterministic assessments of dam safety is defined as 1/3 between the 1,000-year return period flood and the PMF (Table, D~~E~~-4). The PMF has no associated annual exceedance probability (AEP). In the case of a landslide dam break and imperfect evacuation, given that there are currently no emergency management plans for such event, one could argue that the potential loss of life could be significantly higher (>100 people). In this case, the Canadian Dam Safety Guidelines proposed the PMF as the appropriate design flood level. Given these suggested design standards, the return period levels suggested above (1,000-year for snowmelt and rain-on-snow floods and 2,500-year for landslide dam outbreak floods) appear reasonable.

Table D~~E~~-4: Dam classification and suggested design return flood return periods (Canadian Dam Safety Guidelines, combined tables 2-1 and 6-1, 2007)

		Incremental losses			
Dam Class	**Population at risk** [note 1]	**Loss of life** [note 2]	**Environmental and cultural values**	**Infrastructure and economics**	**Design Flood Return Period***
Low	None	0	Minimal short-term loss No long-term loss	Low economic losses; area contains limited infrastructure or services	100
Significant	Temporary only	Unspec.	No significant loss or deterioration of fish or wildlife habitat Loss of marginal habitat only Restoration or compensation in kind highly possible	Losses to recreational facilities, seasonal workplaces, and infrequently used transportation routes	100 to 1000
High	Permanent	≤10	Significant loss or deterioration of important fish or wildlife habitat	High economic losses affecting infrastructure, public transportation, and commercial facilities	1/3 between 1,000 and PMF

			Restoration on compensation in kind highly possible		
Very High	Permanent	≤100	Significant loss or deterioration of critical fish or wildlife habitat Restoration or compensation in kind possible but impractical	Very high economic losses affecting important infrastructure or services (e.g., highway, industrial facility, storage facilities for dangerous substances)	2/3 between 1,000 and PMF
Extreme	Permanent	>100	Major loss of critical fish or wildlife habitat Restoration or compensation in kind impossible	Extreme losses affecting critical infrastructure or services (e.g., hospital major industrial complex, major storage facilities for dangerous substances)	PMF

Note 1. Definitions at risk:

None – There is no identifiable population at risk, so there is no possibility of loss of life other than through unforeseeable misadventure.

Temporary – People are only temporarily in the dam-breach inundation zone (e.g., seasonal cottage use, passing through on transportation routes, participation in recreational activities).

Permanent – The population at risk is ordinarily located in the dam-breach inundation zone (e.g., as permanent residents); three consequence classes (high, very high, extreme) are proposed to allow for more detailed estimates of potential loss of life (to assist in decision-making if the appropriate analysis is carried out).

Note 2. Implication for loss of life:

Unspecified – The appropriate level of safety required at a dam where people are temporarily at risk depends on the number of people, the exposure time, the nature of their activity, and other conditions. A higher class could be appropriate, depending on the requirements. However, the design flood requirement, for example, might not be higher if the temporary population is not likely to be present during the flood season.

***** PMF has no associated annual ~~exceedence~~exceedance probability

On the lower spatial spectrum, consider a small (<10 ha) fan that is subject to infrequent debris floods as preliminarily determined through consideration of the watershed morphometry and fan gradient. The fan contains two homes and the owner of one of those wishes to double the square footage of his house with liveable space. An Approving Officer needs to determine if such development can be permitted and seeks the help of a consultant. In this case, the QP would orient himself/herself on the last column in Table DE~~E~~-3. A site visit would likely include some machine-aided test pitting to at least 2 m depth and perhaps some dendrochronology of impact-scarred trees. If buried organic materials are found, a few samples should to be taken to obtain an idea as to the frequency of debris floods on the fan. The methods should allow an interpretation of debris flood magnitude for at least a 500-year return period (0.2% annual probability of occurrence). The APEGBC (2010) Guidelines for Legislated Landslide Assessments for Proposed Residential Developments in BC provides additional guidance as to requirements to conduct a debris flow or debris flood study.

For each of the above sample scenarios, the minimum requirement would be for the flood hazard map to show flood extent, the water depth, and where appropriate, the maximum flow velocities. This type of information is not provided in the floodplain maps that have previously been published by the MFLNRO.

DE~~E~~5.3 Proposed Basic Information

In order to be of use for planning processes and awareness campaigns an authority having jurisdiction or a QP may require the development of flood hazard maps, which include the following:

- title of the map with reference to the map content such as flood extent, depth, flow velocity, past event and flood probability;
- location of the map as part of the catchment or province with a small inset map;
- legend with all parameters shown on the map with easy to read symbols or colour schemes;

- responsible authority or institute with address, website (and/or telephone number);
- for digital maps, include various data layers in GIS format;
- base date for the data and date of publication; and
- a disclaimer, including remarks on the quality of information can be added.

It is not expected that for small-scale developments (single, multi-family housing) a precise hazard map needs to be generated. An existing map base with well-labelled sketches that show the dominant features (e.g., channels, test pit locations, old debris lobes and levees, the existing house and infrastructure) may suffice. For larger developments including subdivision infills and new subdivisions, more sophisticated maps are highly recommended including those generated by LiDAR that yield precise topographic information and allow recognition of paleochannels that are not evident on readily available government maps that are based on photogrammetry.

Freeboard is generally added to flood hazard maps and is defined by each ministry/jurisdiction. BC government freeboard ~~criteria~~ criterion is discussed in Appendix B~~C~~ 3.3.~~ and defined in Appendix A.~~

D~~E~~5.4 Proposed Map Content

The following variables could appear in a flood hazard map to maximize its use. The ~~QP~~QP is required to use some judgment as to which features ought to be included given the scale of development. This section adds some details on the suggested elements of hazard maps.

Each map could show the dominant infrastructure and housing as well as all existing flood defence structures. Clarification should also be provided if the flood hazard map addresses flood overtopping or dike breach scenario(s) and if so the maps should indicate the likely locations of the dike breach or overtopping scenario(s). Furthermore, the following information ought to be included in a flood hazard map:

- Flood depth for a given recurrence interval expressed in centimetres or metres, the increments chosen will vary from floodplain to floodplain. Flood depth is used for the planning of flood defence measures. For example, a flood risk study at Chilliwack used 1-m increments for flood depth ranging from <1 m to 9 m. Where flood depth does not exceed a maximum of 2 m for the return period analysed on the floodplain, increments of 0.3 m may be appropriate but need to be reconciled with the accuracy of the input topography.
- Flow velocity and flood propagation. Flow velocity estimates will require two-dimensional modelling. This is highly localized information that may need to be represented on a detailed scale for the development in question. Estimates should be shown as maximum velocities (adjusted from mean velocities that are the typical numerical model output) as those are likely to translate into the severest damage or loss of life. Flow velocities can be shown as vectors with the length or size of the vector symbolizing the flow velocity and flow direction. Alternatively, maximum flow velocities can be colour coded and contours of equal velocity (isotach lines) drawn. Flood propagation can be shown as equal arrival times of the flood in appropriate intervals (isochron). For large rivers, these may be shown in 6 or 12 hour intervals while for smaller rivers and streams, arrival times may best be presented in half hourly or hourly intervals. Flood propagation maps are an essential tool for floodplain emergency procedures. Flood propagation maps can be produced for different hazard scenarios (i.e., single or multiple dike/dam breaches) or for different return periods. Flood propagation maps are typically presented at scales of 1:50,000 or larger (i.e., more detailed).

- Hazard Intensity Maps. These maps may include several intensity variables such as flow velocity, flow depth or perhaps impact force especially for debris flows or debris floods. They are best presented as multi-coloured maps in which areas of equal hazard intensity are in the same colour. Such maps are particularly useful for areas prone to debris floods or debris flows. Hazard maps should be shown for several return periods (see Table 3-3) because the hazard intensity typically increases with larger floods. Hazard intensity maps are typically for areas at spatial scales of 1 ha to <10 km^2 and the appropriate mapping scale is likely to be between 1:1,000 and 1:10,000. Hazard maps should include houses and infrastructure, which will facilitate later risk mapping.
- Event Maps. These maps show the extent of previous floods or hydrogeomorphic events and thus provide an excellent tool for awareness building in flood risk management. The event map could be overlaid on any or all of the previous three map types with either a single line indicating the aerial extent of the event, or as separate maps showing flood depth, flow velocity/propagation and intensity, although for most events such detailed data do not exist.

Many international jurisdictions have created interactive web-based maps that are accessible to the general public (Table D~~E~~-5). Such interactive maps will allow the user to specify the return period of interest, flood depth, velocity, propagation and various other measures of intensity. Problems may occur due to false interpretations and a very clear explanation should be part of the interactive program. These maps could also include effects of climate change, for example for coastal areas, in which areas to be flooded by 2050, or 2100 could be delineated based on current understanding of rates of sea level rise. Guidelines for submission of digital data should be created separately to ensure consistency.

Table D~~E~~-5: Examples of flood hazard maps for different countries

Country	Ministry/Jurisdiction	Reference
US	FEMA	http://www.fema.gov/plan/prevent/fhm/rm_main.shtm
Austria	Hochwasser Risikozonierung Austria HORA	http://www.wassernet.at/
Flanders, Belgium	Geoloket Overstromingskaarten	http://geo-vlaanderen.agiv.be/geo-vlaanderen/overstromingskaarten/
England & Wales	Environment Agency	http://www.environment-agency.gov.uk
Scotland	Scottish Environment Protection Agency	http://www.multimap.com/~~client~~clients/places.cgi?~~client~~client=sepa
France	Ministère de l'écologie, de l'aménagement et du développement durables	~~(~~http://cartorisque.prim.net/index.html~~)~~
Baden-Württemberg Germany	Hochwassergefahrenkarten in Baden-Württemberg, Ministerium für Umwelt, Naturschutz und Verkehr	http://www.hochwasser.baden-wuerttemberg.de http://www.uvm.baden-wuerttemberg.de/servlet/is/1253/Leitfaden_HWGK_www.pdf
Bavaria, Germany	Informationsdienst Überschwemmungsgefährdete Gebiete in Bayern	http://www.iug.bayern.de
Rheinland-Pfalz, Germany	Atlas der Überschwemmungsgebiete im Einzugsgebiet der Mosel	http://www.gefahrenatlas-mosel.de

Sachsen, Germany	Various maps under the subject “Wasser“ (water)	www.umwelt.sachsen.de/de/wu/umwelt/lfug/lfug-internet/interaktive_karten_10950.html
Ireland	National Flood Hazard Mapping	http://www.floodmaps.ie/
Italy	Tevere River Basin Authority	(www.abtevere.it – (click on “cartografia on line”) or the other riverbasin Authority web-sites
Netherlands	Dutch Ministry of Interior	www.risicokaart.nl
Norway	Norwegian Water Resources and Energy Directorate (NVE)	http://webb2.nve.no
Spain	Catalan Water Agency	www.mediambient.gencat.net/aca/ca/planificacio/inundabilitat/delimitacio/pl_periode.jsp
Canton Zug, Switzerland	Naturgefahren Kanton Zug	http://www.zug.ch/forstamt/99_50.htm

DE6 References

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APPENDIX ~~E~~F: FLOOD RISK ASSESSMENT

~~E~~F1 INTRODUCTION

A FRA involves estimation of the likelihood that a flood will occur and cause some magnitude and type of damage or loss. The principal steps in the *risk assessment* are:

1. Identify *flood hazard* scenarios. These are defined as distinct outcomes from a given hazard that result in some direct *consequence* (e.g., fatalities, damage to a building, environmental damage, intangibles such as human suffering) and are based on the results of the hazard assessment described in Section E. They can include different return periods for the same hazard, variable flood extent or *flood intensity*, multi-hazard chains of events, or different consequence chains.
2. Estimate the probability of a *hazard scenario* resulting in some undesirable outcome. This is based on the estimated likelihood that the hazard will occur, reach the element at risk when it is present within the hazard zone, and cause the undesirable outcome. These may include a range of outcomes in categories such as economic loss, environmental damage, safety, and corporate or political reputation.
3. Estimate the consequences of the unwanted outcome including economic losses; human health and loss of life; environmental losses; cultural/historic losses; and intangibles such as psychological distress. Details are described in Section 2-2.
4. Define *tolerable risk* criteria.
5. Prioritize *risk* reduction strategies.

Flood risk can be expressed as: $R = P_H * P_{S:H} * P_{T:S} * V * E$

where:

- R = total flood risk;
- P_H = annual exceed~~e~~ance probability of a flood occurring;
- $P_{S:H}$ = spatial probability that the flood will reach the element at risk;
- $P_{T:S}$ = temporal probability that the element at risk will be present when the flood occurs (for fixed infrastructures and homes this is equal to one);
- V = the *vulnerability*, or probability of loss of life or the proportion of an asset loss to total loss; and
- E = the number of people at risk or the homes and infrastructures at risk.

The first three terms of Equation 1 define the flood hazard, the last two terms define the flood consequences.

FRAs are an extension of Flood Hazard Assessments (FHAs) and rely on frequency-magnitude analyses and flood modelling. FRAs add a quantity of consequence and combine it with the hazard. In this context it is worthwhile to remember the consequences of the 1948 flood on the Fraser River, during which 16,000 people were evacuated, 2,300 homes were damaged or destroyed, 1,500 residents were left homeless, 10 people died, and the recovery costs were approximately CAN $150 million in 2010 dollars (Watt, 2006). The consequences of a flood of similar or longer return period that would either overtop or breach *dikes* would dwarf those of the 1948 flood (approximately a 200-year return period flood) because of the much higher development density.

These guidelines follow the steps in the Canadian Standards Association's risk management process from initiation to risk control (CAN/CSA, 1997), Figure 3-1.

~~F~~E2 FLOOD CONSEQUENCES

Flood consequences can be expressed in different categories. Commonly used flood consequences are:

- physical damage to buildings, utilities, roads, and other infrastructure;
- physical damage to agricultural assets such as crops and livestock;
- direct economic losses due to loss of jobs, business interruptions, repair and reconstruction costs;
- social impacts including loss of shelter due to shelter damage or loss of essential services such as power, water, sewage, and communications;
- social impacts due to losses of facilities with historic or traditional value such as graveyards, celebration grounds and holy sites;
- environmental impacts to terrestrial and aquatic habitat including contamination by hazardous materials.

In addition to direct appraisal of these consequences, resulting flood risk management could also entail:

- an assessment of the safety of access and exit for routine and emergency use under frequent and extreme flood conditions;
- an assessment of the layout of development and its suitability for flood risk reduction;
- recommendations on how surface water could be managed to achieve effective drainage principles, including maintaining or reducing the runoff rate as a result of a development;
- an assessment of the likely impact of any displaced water on third parties caused by alterations to ground levels or raising embankments for flood protection;
- an assessment of a requirement of shelter for people replaced by flooding; and
- an assessment of the residual risks to the site after the *construction* of defences as well as guidance as to their management.

Of note is that construction of flood defences often leads to a false sense of security and safety that may be followed by excessive investments that are disproportional to the added risk. Safety cannot be guaranteed and is simply a matter of probabilities.

~~F~~E2.1 Economic Losses

Economic losses can be broadly separated into loss of assets and losses to the local or regional economy. Assets can be homes as well as industrial complexes and infrastructure. Losses for residential buildings are usually evaluated by stage-damage curves that, for example, have been published by the Federal Emergency Management Agency (FEMA) in the USA. In its simplest application, economic loss assessments will sum the losses per house for the area studied. In most cases it will be possible to homogenize areas with similar flood inundation depth if it can be shown that those will result in the same flood levels with respect to the building elevation. Economic losses for industry become more difficult to estimate, and such estimates have usually been done by the insurance industry that may not wish to share such information with third parties. Overland flood insurance is now available for ~~*resdiential*~~*residential developments*, but it does not cover damage from coastal floods, tsunamis, or dam breaks. Previously ~~F~~flood risk insurance ~~does not exist in Canada for residential developments and~~ applie~~s~~d only to businesses and industries.

Significant difficulty and uncertainty ~~is~~ are introduced when indirect economic losses are to be estimated such as unemployment, loss of business due to business shutdown and cost of rebuilding businesses. Furthermore, large floods can paralyze downstream economies particularly in cases where the flooded river valley also functions as the dominant economic artery of a region. In the Fraser River valley, major highways, oil and gas pipelines, the two national railways, power and telecommunications run through the floodplain and are thus to varying degrees vulnerable. Similarly, the Skeena River valley carries a major highway and railway as well as power. Comprehensive economic analyses will be very laborious, specialized and costly and may be applicable only to those rivers where anticipated losses are high.

E~~F~~2.2 Human Health and Loss of Life

Loss of life is very difficult to predict reliably because it largely depends on whether the flood or dike breach was predicted, and whether the affected population had been warned and evacuated. Even in cases where warning has been given and a majority of the population evacuated, catastrophic loss is still possible as amply shown by the 2005 hurricane Katrina that cost the lives of over 1,500 people. Life loss due to floods has been examined in detail by several researchers. Summaries can be found by Jonkman (2005) and Penning-Rowsell et al. (2005).

Tolerable risks are risks within a range that society accepts to secure certain benefits. The evaluation criteria for individual and societal risk are different, but some common general principles can be applied (Leroi et al., 2005):

- the incremental risk from a hazard to an individual should not be significant compared to other risks to which a person is exposed in everyday life;
- the incremental risk from a hazard should be reduced wherever reasonably practicable, i.e., the As Low As Reasonably Practicable (ALARP)[10] principle should apply;
- if the possible number of lives lost is high, the likelihood that the incident might actually occur should be low. This accounts for society's particular aversion to many simultaneous casualties, and is enshrined in societal risk tolerance criteria which have a strong negative slope towards high loss numbers;
- higher risks are likely to be tolerated for existing developments and hazards than for planned or proposed projects as mitigation against the former may exceed the financial capability of the jurisdiction; and
- tolerable risks may vary from country to country, and within countries, depending on historic exposure to natural hazards, the intrinsic value that is placed on the life of an ordinary citizen, and the system of ownership and control of floodplains, and other natural hazards areas.

Where the anticipated consequences include the potential for loss of life, the decision-making process requires that risks be compared against risk tolerance criteria as a way to prioritize flood hazard risk management activities.

For example, currently 350,000[11] people live on the Fraser River floodplain. In the Netherlands a 5% mortality is assumed for major floods (Jonkman, pers. comm., 2011). This would imply a potential life loss of 17,500 people, which is far in excess of what western societies currently consider tolerable risk.

E~~F~~2.3 Environmental Losses

Environmental losses include oil spills, spills of hazardous materials, flooding of farms that lead to uncontrolled release of manure and fertilizer as well as secondary effects such as decomposing dead animals. It is again very difficult to quantify the monetary losses associated with such environmental hazards but they can be included in flood consequence scenarios. This allows an improved planning approach to evacuate farm animals and provides impetus or bylaws to store hazardous materials safely above a specified flood stage.

[10] The ALARP principles are also known as ALARA, with the last letter standing for "achievable". Their use is interchangeable.

[11] A 2006 census and calculation by Fraser Basin Council determined a total floodplain population of 324,465 for 2006. The 350,000 reported here is considered a reasonable estimate.

Environmental losses can also include damage to or destruction of aquatic or terrestrial habitat, but should be balanced with the benefits of habitat creation and the re-establishment of natural floodplain ecology.

E~~F~~2.4 Cultural/Historic Losses

Cultural and historic losses cannot be quantified monetarily. They can, and should, however, be included in a comprehensive FRA as they may be elements of considerable importance to some stakeholders. Cultural or historic losses such as the flooding of graveyards, ancient buildings of historic value or grounds of cultural value can be included in risk assessments by assigning a consequence rating that can then be associated with a flood return period and included in a multi-criteria analysis that is based on a risk matrix.

E~~F~~2.5 Intangibles

Human suffering is almost always associated with damaging floods either through loss of assets or loss of life. Studies in the United Kingdom, for example, have shown that the suicide rate increased significantly in the aftermath of the 2002 floods. This observation indicates the high level of stress that is associated with floods and the post-flood period even in highly developed nations.

E~~F~~3 FLOOD RISK ANALYSIS

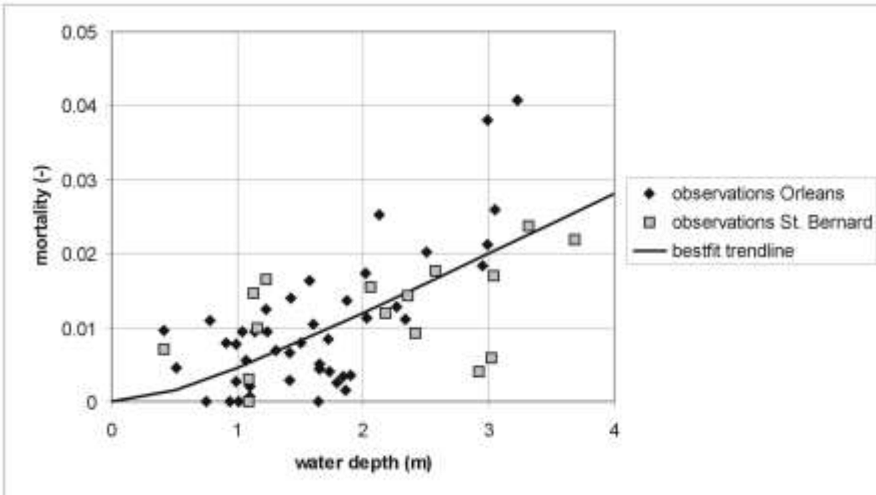
Once a decision has been made through stakeholder consultation that a formal risk assessment may be warranted, Table E~~F~~-1 provides guidance as to the scope of a *risk analysis*. This can be done by examining the value of developments and vulnerable population exposed to flood hazards, based on the outcome of the FHA. In Table E~~F~~-1 the value of developments is annualized by multiplication with the chosen flood frequency. Economic loss and life loss have been included as the dominant factors that drive most FRAs in the risk matrix shown in Table E~~F~~-1. This table provides a screening tool to guide the level of risk study as per Table E~~F~~-2.

Life losses can be estimated rapidly using Figure E~~F~~-1 as well as rough scaling of expected losses in the development area affected by floods. It needs to be recognized that Figure E~~F~~-1 is suitable as an approximation of flood losses but will need to be adjusted for specific situations. Particular reference should be made if the flood is likely to be forecast~~ed~~ and timely evacuation prescribed or if the process may occur without warning (for example debris flows, landslide dam, moraine dam and glacial dam outbreak floods).

Table E~~F~~-1: Matrix to determine the level of risk assessment needed based on the exposure of a development and vulnerable populations to flood hazards.

Potential Loss of Life for applied return period	**Annualized Potential Building Loss ($)**				
	< 1,000	1,000 to 10,000	10,000 to 100,000	100,000 to 1,000,000	> 1,000,000
>100	VH	VH	VH	VH	VH
10 to 100	H	H	VH	VH	VH
2 to 10	H	H	H	H	VH
1-2	M	M	M	H	H
0	VL	L	M	M	H

Figure ~~F~~E-1: Relationship between water depth and mortality for the Orleans and St. Bernard areas in New Orleans for the 2005 Hurricane Katrina flood (Jonkman et al., 2009). The vertical axis is expressed as a fraction (multiply by 100 to obtain a percentage).



Economic losses can be determined as per methods outlined in as described in Section 2.2.1.

Table E~~F~~-2 then suggests the appropriate level of study. For example, a Very High rating as determined by Table E~~F~~-1 would suggest a study level of 4a or 4b, while for a High rating, a minimum study level of 3 may be appropriate. Table E~~F~~-2 summarizes the methods, deliverables and contents for the different study levels.

Figure E~~F~~-2 provides guidance on data requirements for flood hazard and FRAs as well as flood risk management, optimization of flood risk reduction options, decision-making and risk reduction option implementation.

An important consideration in determining the appropriate level of FRA is that the level of risk assessment and the level of effort for the FHA are related. For example, a Class 1 FHA cannot provide sufficient input for a Class 2 risk assessment.

Table E~~F~~-2: Types of Flood Risk Assessments

Risk Level	Class	Typical Risk Assessment Methods	Deliverables	Applications	Flood Return Periods (years)
Very Low	0	• Includes a short site survey with qualitative assessment of potential consequences	• Memorandum or Letter • Sketch Maps	• Building permits	
Low	1	• provides qualitative descriptions or tabulation of potential economic losses associated with various consequence scenarios (see Figure E~~F~~-6)	• Report • Maps	• Low loss potential rivers and floodplains	
Moderate	2	• estimate direct economic losses using homogenized stage-damage curves • estimate mortality using empirical formulae under simplified assumptions • assess total risk via qualitative risk matrix • quantify risk to individuals and societal risk where required by local jurisdictions	• Method descriptions, maps of economic loss potential, inventory lists, lists of PDI[12]>tolerance threshold, FN[13]-graphs	• Moderate loss potential streams, rivers and floodplains	
High	3	• same as 2 for economic losses • inventory environmental hazards and likely environmental losses, cultural and historic values and intangibles (human suffering etc.), • assess risk via a semi-quantitative risk matrix (e.g., Figure E~~F~~-5), • compare risk to local tolerance criteria or with stakeholder-developed risk tolerance criteria • quantify risk to individuals and societal risk where required by local jurisdictions	• Detailed method descriptions, maps of economic loss potential, maps of human loss potential inventory lists, lists of PDI>tolerance threshold, FN-graphs	• High loss potential rivers and floodplains	20 200 1000
Very High	4a	• same as 3 for economic losses plus determine direct and indirect economic losses for area affected • model loss-of-life using one or more mortality models under different hazard scenarios • quantify environmental losses through modelling or empirical study • integrate all losses in semi-quantitative risk matrix (e.g., Figure E~~F~~-5) and compare to existing or developed risk tolerance criteria	• Detailed method descriptions, maps of economic loss potential, inventory lists, lists of PDI>tolerance threshold, FN-graphs	• Very High loss potential rivers and floodplains	
Very High	4b	• same as Class 3 assessment for different risk reduction studies • provide cost-benefit analysis for selected flood risk reduction options	• Same as Class 3 with CBA	• Same as Class 3	

[12] PDI stands for probability of death of an individual
[13] FN graphs exemplify group *risk* with the number of potential deaths on the horizontal axis and the cumulative frequency of deaths plotted on the vertical axis.
* applies only to areas subject to debris floods and debris flows that may occur without warning

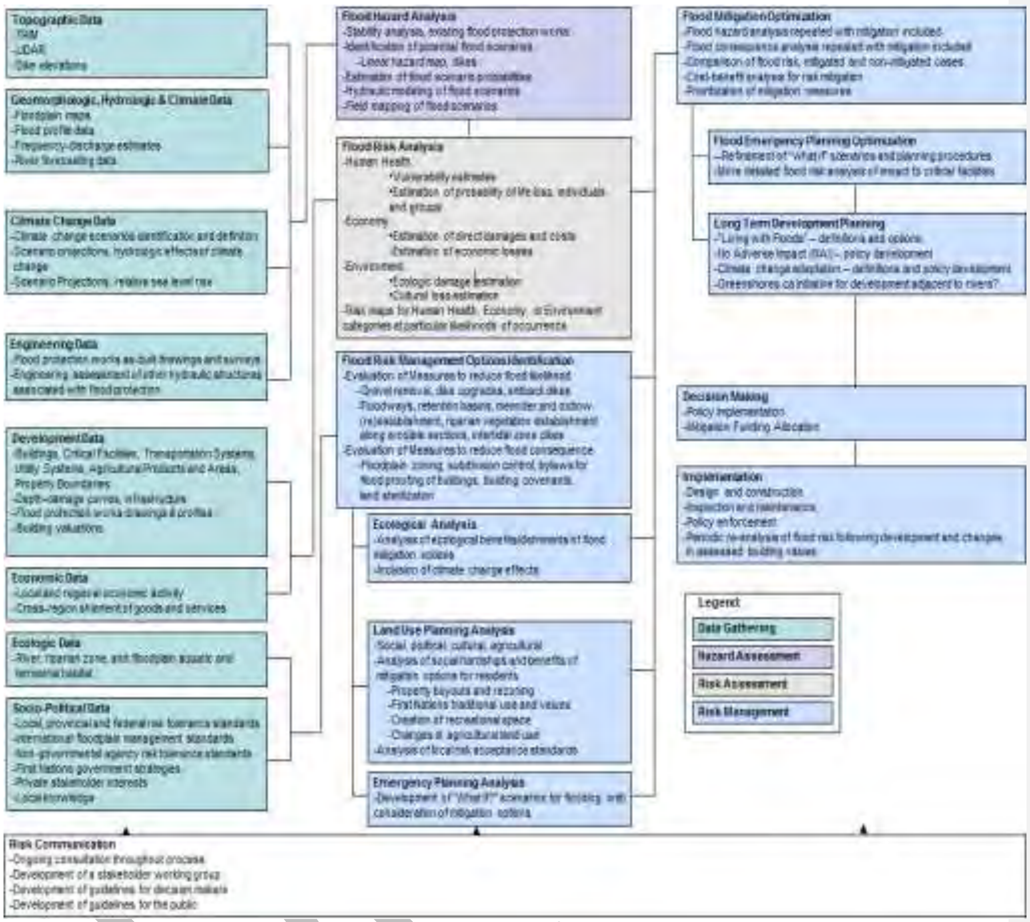


Figure ~~F~~E-2: Flood hazard and risk analysis embedded in the overall flood risk management approach. This chart applies mostly to Class 3 and 4 (High and Very High Risk) assessments (see Table D~~E~~-5).

E~~F~~4 FLOOD VULNERABILITY AND RISK MAPS

Vulnerability and risk maps are useful tools for determining damage potential and risk, and can be applied by emergency managers to plan for evacuations. Flood experts use such maps for the planning of flood defence structures; and land use planners can base land management decisions on these maps.

Standardized vulnerability or *flood risk maps* do not yet exist in BC or Canada. The following section provides guidance for the QP when public safety issues, or the *client's* needs, require additional services which call for flood vulnerability and risk maps. The material presented reaches beyond the approach presently used for flood management in BC. It is, therefore, not referenced in the current provincial or local legislation.

~~F~~E4.1 Flood Vulnerability Maps

Flood vulnerability maps can be defined as "Maps that provide inventories of *elements at risk* for a given flood hazard scenario". Vulnerability maps can display the following variables:

- the number and location of floodplain inhabitants and users potentially affected;
- the number and type of economic activity of the area potentially affected; and
- the location and type of facilities that may cause pollution in case of flooding as well as areas potentially affected by those pollutants.

As for the population these maps can be based on:

- the distribution of population per *municipality*, address, building, average number of people per building or block; and
- the distribution of particularly vulnerable groups (elderly, schools, hospitals, infrastructure with high density of population or tourists).

For assets and economic activity, the following should be mapped and highlighted:

- type of industries and products;
- type of agriculture;
- linear infrastructure (e.g., roads, railways, pipelines);
- residential areas (metropolitan, urban, rural, recreation); and
- essential and sensitive infrastructures (roads, power, telephone, gas, sewer, water supply, hospitals, schools, fire brigade, railway, sports facilities).

For installations potentially causing pollution, environmentally sensitive areas and areas of cultural value within the floodplain, the following contents could be included:

- chemical industry facilities and warehouses;
- petroleum industry and storage facilities for oil products;
- thermo-electric power stations: oil, gas, coal;
- fuel/gas stations;
- agricultural warehouses for fertilizers, herbicides, pesticides, poisonous substances, nutrients, feed lots and high occupancy animal pens;
- special dump sites for chemical or industrial waste; and
- waste water treatment plants.

For environmental assets and sites of known cultural value the following contents could be included in flood vulnerability maps:

- burial grounds;
- celebration sites;
- heritage sites
- national parks and wildlife refuges;
- wetlands;
- fish spawning grounds; and
- rare wildlife habitat areas and ecological reserves.

~~F~~E4.2 Flood Risk Maps

Flood risk maps are defined in the United Kingdom as "maps that show the likely effects of floods on human health, economic activity, the environment and cultural heritage". A more explicit definition emphasizes the combination of flood hazard and consequences. A flood risk map quantitatively or qualitatively combines the intensities of a given flood hazard scenario with the likely flood consequences. For example, an economic flood risk map for a 500-year return period flood could show the likely direct monetary losses per unit area considered. The unit area will depend on the mapping scale, which hinges on the respective objectives of a flood risk study.

The following types of flood risk maps could be considered:

- Maps of economic losses based on depth-damage statistics. Such maps would show homogenized zones in which damage is expressed as monetary value lost per unit area for the specified flood hazard scenario (flood probability, flood hazard scenario).
- Maps of the number of potential fatalities in a non-evacuated scenario based on mortality statistics. Such maps would display homogenized zones or contours that would allow the map viewer to identify areas of highest mortality as a function of inundation depth and flow velocity as well as habitation density. Such maps may have to be generated for different hazard scenarios (different dike breaches, different return periods) because evacuation will drastically reduce likely mortality numbers.

Flood risk maps can be produced at different scales. For large areas, such as the Fraser River floodplain, maps at scales of 1:25,000 and 1:100,000 may be appropriate. For detailed information about individual buildings or facilities, scales between 1:5,000 and 1:10,000 may be more appropriate.

E~~F~~4.3 Flood Loss Estimation and HAZUS-MH

Estimation of potential losses due to flooding requires the management and analysis of geospatial information. This information includes hazard data, the position and attributes of elements at risk, and criteria to estimate losses based on the flood intensity at particular locations.

Geographic Information Systems (GIS) form a common platform for the management and analysis of ~~this~~ these data. A free ArcGIS extension called HAZUS-MH has been developed by FEMA and the National Institute of Building Sciences (NIBS), and adapted for Canadian use by Natural Resources Canada to estimate losses due to flood and earthquake hazards at regional scale.

The HAZUS-MH flood module produces loss estimates applicable to vulnerability assessments and development of flood mitigation plans, as well as emergency preparedness, response and recovery. The user can evaluate losses due to flood scenarios for a wide range of elements at risk including buildings, utilities, and essential facilities. The results are reported at a Canadian Census Tract level of study detail to account for uncertainty at particular building locations. More information, specific software and hardware requirements, and software download links can be found at http://drrplan.net/.

E~~F~~5 FLOOD RISK TOLERANCE CRITERIA

E~~F~~5.1 Loss of Life

The use of risk of loss of life criteria originated in the United Kingdom and the Netherlands during the 1970s and 1980s in response to the need to manage risks from major industrial accidents (Ale, 2005).

In the United Kingdom, the maximum tolerable risk to an individual in a new development has been set by the Health and Safety Executive at 1:100,000 per annum. The maximum tolerable risk for workers, based on the assumption that the risk faced by workers is somewhat voluntary, has been set at 1:1,000 per annum (Whittingham, 2008).

In the Netherlands, maximum *acceptable risk* to an individual in a new development is 1:1,000,000 per annum. In practice, Ale (2005) has shown that the United Kingdom and

Netherlands risk tolerance criteria are very similar as a result of the different legal systems employed by the two countries.

The determination of tolerable life risk can be expressed as:

- the risk to the individual most at risk; and/or
- the societal risk.

Figure ~~F~~E-4: F-N curves to evaluate the risk to life loss of groups (societal risk) (Kendall et al., 1977)

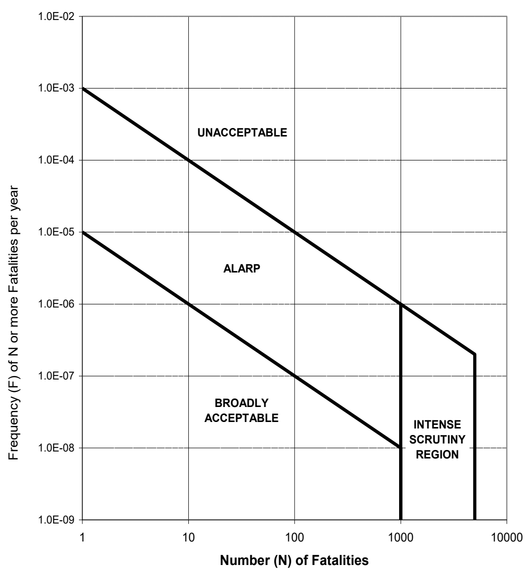


Figure ~~F~~E-4 allows a direct evaluation of life loss from floods. The principal error source in applying this graph to flood risk scenarios is the assumption of timely and orderly evacuations well before the flood inundates the developed areas. Furthermore, in some cases, particularly for sudden unpredicted outbreak floods or debris flows or dike failures, evacuation may not have been prescribed. Such error bands should be reported and ideally shown as two lines (upper estimate and lower estimate).

E~~F~~5.2 Economic Risks

The level of tolerable economic risk from floods is a function of an individual's or organization's financial ability to absorb or survive the potential economic loss. Influencing factors include net worth or market capitalization, access to insurance, awareness of the risks, and availability of suitable emergency response plans to help recover from the potential loss.

For example, large mining corporations and road, railway and pipeline operators can plan for and recover from floods affecting their operations. Most local governments have much less experience and capacity to sustain economic losses. Most individual homeowners, who cannot insure against floods may only be entitled to limited financial compensation from the government.

Because of these issues, it is difficult to establish economic risk tolerance criteria for floods that apply across a range of subdivision sizes, industries and organizational types and sizes, and individuals.

Risk tolerance must be viewed over different spatial scales. For example, significant flood damage to a single home in an extreme flood may be tolerable to society as this constitutes only hardship to the owner and does not affect society at large. However, if many homes are impacted, losses are increasingly deferred to tax payers. For extreme losses (in the billions of dollars), the total risk for all flood consequences may become intolerable to individuals and society alike, particularly when flood consequences directly or indirectly affect a large portion of the population. An example would be a catastrophic flood on the lower Fraser River.

E~~F~~5.3 Other Risks

For other consequence types, a purely quantitative approach is increasingly difficult because thresholds for what environmental and cultural losses are considered tolerable have not been set and are unlikely to be developed as a provincial standard. Furthermore, organizations and individuals have different levels of risk tolerance. Risk associated with such consequences will need to be evaluated on a case-by-case basis and through stakeholder and approving agency input.

Within some organizations there may also be an aversion to discussing flood risk in quantitative terms. In these cases, qualitative methods are useful to communicate and evaluate risks from floods and related phenomena. Risk management protocols can be assigned to a range of qualitative risk ratings.

Figure ~~F~~E-5 provides an example of a semi-quantitative framework, developed by BGC Engineering Ltd., for which risks can be evaluated. The left side of the matrix provides a range of flood likelihoods. Implicit is that the flood will reach the elements at risk considered in the study in question. This section will need to be custom-tailored to each assignment and the ranges of return periods considered should be guided by Tables D~~E~~-1, D~~E~~-2, and D~~E~~-3.

The portion of the table below the risk ratings exemplifies a typical range of consequences for floods but again can be adjusted depending on the project needs. For example, if the study relates to the City of Richmond, a different range in economic losses needs to be chosen with a highest category perhaps being >$10 billion.

The core of the risk matrix is the rating from Very Low to Very High, which would govern the risk response. Indicated on the risk rating matrix are two lines that indicate three different risk zones. First, the unacceptable zone is associated with High and Very High risks. Tolerable risk may be considered for Moderate and Low risks. Acceptable risk is associated with Very Low risks for which no further mitigation may need to be considered.

The approving agency will need to review the risk matrix in each case and determine if the suggested lines between acceptable, tolerable and unacceptable risk are applicable. In case of unacceptable risk, the development will likely be rejected and a set of risk reduction measures implemented before the development becomes approvable. In the case of a tolerable risk, the risk reduction should be considered to lower risk further.

Figure ~~E~~F-5: Example risk matrix to determine the relative level of flood risk for proposed developments

Flood Risk Evaluation

Risk Evaluation and Response

VH	Very High	Risk is unacceptable short-term (before next flood season) risk reduction required, long-term risk reduction plan must be developed and implemented
H	High	Risk is unnacceptable; medium-term risk reduction plan must be developed and implemented in a reasonable (< 5 yrs) time frame. Planning should begin as soon as feasible
M	Moderate	Risk may be tolerable; more detailed review required, reduce risk to Low where reasonably practicable
L	Low	Risk is tolerable, continue to monitor if resources allow
VL	Very Low	Risk is broadly acceptable, no further review or risk reduction required

Likelihood Descriptions

Likelihood of Undesirable Outcome

Likelihood Descriptions		Probability Range	1	2	3	4	5	6
Scenario can be expected on average every other year	Very Likely	0.5 - 0.2	M	H	H	[illegible]	[illegible]	[illegible]
Scenario typically occurs on average every 10 years	Likely	0.2 - 0.07	L	M	H	H	[illegible]	[illegible]
Scenario typically occurs on average every 50 years	Moderate	0.07 - 0.02	L	L	M	H	H	H
Scenario occurs on average every 100 years	Unlikely	0.02 - 0.007	VL	L	[illegible]	M	H	H
Scenario occurs on average every 200 years	Very Unlikely	0.007 - 0.004	VL	VL	L	L	M	H
Scenario occurs on average every 500 years	Extremely Unlikely	0.004 - 0.0013	VL	VL	VL	L	L	M

unacceptable

tolerable

acceptable

Consequence Descriptions

Indices	1	2	3	4	5	6
	Negligible	Minor	Moderate	Major	Severe	Catastrophic
Safety (injury/loss of life)	Minor injuries of few individuals	Major injury of one person	Major injury of several persons	Single fatality	< 10 fatalities	> 10 fatalities
Economic (monetary losses)	Negligible; no business interruption; <$1,000	Some asset loss; <$10,000 damages	Serious asset loss; several days of business interruption; <$100,000	Major asset loss; several weeks business interruption; <$1,000,000	Severe asset loss; several months business interruption; <$10M	Total loss of asset, one year or more business interruption; >$10M
Social & Cultural	Negligible impact	Slight impact; recoverable within days	Moderate impact, recoverable within weeks	Recoverable within months	Long-term (years) loss of social and cultural values	Complete loss of significant social and cultural values
Intangibles (personal suffering)	Negligible impact	Slight impact; recoverable within days	Moderate impact, recoverable within weeks	Personal hardship usually recoverable within months	Leaves significant personal hardship for years	Irreparable personal hardship
Ecological (flora & fauna)	Negligible impact	Slight impact; recoverable within days	Moderate impact, recoverable within weeks	Recoverable within months	Severe species loss	Irreparable species loss

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APPENDIX F~~G~~: FLOOD ASSESSMENT CONSIDERATIONS FOR DEVELOPMENT APPROVALS

F~~G~~1 INTRODUCTION

F~~G~~1.1 Overview of Appendix

A QP may be retained to prepare flood assessment reports pursuant to the statutes outlined in Appendix B~~C~~ (recognizing that these statutes will continue to evolve over time). With reference to the stages of land development, these can be generally categorized as follows:

Building Permit	renovation or expansion
	new single family or duplex house
	new multi-family building
	new industrial/commercial/institutional building
Subdivision	
Rezoning	
Crown Land Disposition	

This appendix summarizes the flood assessment considerations and mitigation measures that may be appropriate for such land development projects, and is intended to be consistent with the ~~provincial~~ 2004 BC ~~publication~~ Flood Hazard Area Land Use Management Guidelines (with 2014 draft amendment). Most of the numerical guidelines in this appendix are extracted from that document. It is important to recognize that legislative, local bylaw, and/or restrictive *covenants* may be applicable and take precedence over the measures outlined in this appendix, and should only be varied in consultation with the appropriate parties. ~~Values other than those referenced in this appendix are appropriate for consideration where it has been determined (by analysing expected flood intensities and the corresponding vulnerability of the relevant structures) that their use will not result in significant damage to the relevant structure(s).~~

A *flood hazard assessment* (FHA) is a common component for flood assessments in each development category. In some cases, an existing FHA will suffice, but a QP needs to be satisfied that it is appropriate in view of climate change, sea level rise, and land use change (see Section 3). The flood assessment should document the full range of flood hazards to which the site may be subject and categorize the landform on which the site is located (floodplain, *alluvial fan*, fluvial terrace, bedrock, etc.). If the QP is aware of any potential hazards beyond flooding and erosion that are outside the area(s) of expertise of the QP, such hazards should be noted. The *approving authority* can then decide if such hazards warrant independent further investigation ~~by a specialist~~.

Flood assessment reports for proposed developments should consider the provision of flood protection in the form of *standard dikes* and other *structural mitigation works*.

In all situations, transfer of flood hazard to other parties as a result of *construction* of the proposed project and/or the protective works for the proposed project needs to be avoided or countered.

This appendix is a key component of implementing the flow chart (Figure 3-1), and should be read in conjunction with that figure.

~~G~~F1.2 Special Considerations Relating to Dike Standards

If development cannot practically be located outside an area subject to flood hazard, it is strongly preferred that it be located in areas protected by a standard dike (or an equivalent standard of protection for other types of structural mitigation works). The standard dike level of protection represents a stringent standard in view of the high standard for design and construction, the need for a maintenance program undertaken by a local diking authority (typically local government), and the provision of legal access in the form of rights-of-way or land ownership.

In BC, the Inspector of Dikes has the function of determining whether a dike can be considered a standard dike. While a standard dike is the ultimate objective for protection of existing development and new development areas, this represents a standard that may not always be practically achievable. For example, the requirement of legal access (rights-of-way or land ownership) may represent a challenge for older dikes that cross private property. In some cases, through consultation with a local authority, flood protection works that are not fully standard as per the definition may nevertheless be considered adequate for the purpose of the proposed project.

If a dike is to be considered adequate in the context of a flood assessment pursuant to these Guidelines, the following minimum standard is to be met:

- a local diking authority (typically local government) accepts responsibility for the dike;
- while the dike may not fully contain the designated flood, it should be reasonably close and within the capability of the local diking authority to address such deficiency;
- while the dike may not fully meet all current design and construction standards, any such deficiencies should be within the capability of the local diking authority to address;
- any deficiency in legal access does not unreasonably preclude the local diking authority from ensuring the overall integrity of the dike; and
- the local diking authority accepts that the dike is adequate for the purpose of the proposed project.

The above criteria can also be extended to other structural mitigation works other than dikes, to the extent that this would be applicable.

All flood assessment reports pertaining to proposed development must clearly describe both the existing and post-development level of protection provided by existing or proposed dikes and other structural mitigation works. If works are considered less than standard, the reasons for this determination are to be clearly noted in the report for the information of the approval authority, the developer and future property owners. If works are less than standard, but are considered adequate, the reasons for this determination are also to be clearly noted, along with any relevant future *consequences*. In general, significant new development should not be located in floodplain and fan areas in the absence of an adequate dike or other structural mitigation works.

Where new dikes or other structural mitigation works are to be constructed, or where existing works are to be upgraded, prior approval from the Inspector of Dikes is required, along with any applicable environmental approvals. In general, such works should be constructed prior to the development being occupied.

~~G~~F1.3 Need for Floodproofing in Areas Protected by Standard/Adequate Dikes

The presence of structural mitigation works in the form of a standard/adequate dike (or other structural mitigation works) alone is generally not sufficient to allow new development. In most cases, secondary floodproofing should be undertaken. ~~-~~This may include some or all of the following:

- elevation to a suitable flood construction level (FCL);
- determination of an appropriate method of achieving the FCL (landfill, structural means, or some combination);
- protection against erosion;
- appropriate restriction of building use below the FCL; and
- site grading measures to direct overland flow.

Specification of an FCL should be based on the flood level that would result in the absence of the dike or other structural mitigation works.

F~~G~~2 BUILDING PERMIT

The conditions identified in this section are applicable for a building permit application that represents new construction on an existing lot.

Regardless of any development approval requirements, it would be prudent for the QP to ask the local authority to make the report (in whole or in part) available to future landowners through registration of an appropriate restrictive covenant.

F~~G~~2.1 Renovation or Expansion

A building inspector may require a flood assessment for a building renovation or expansion in a potential flood hazard area.

Where local government by-law provisions and/or restrictive covenants exist that appropriately govern the project, those provisions should be followed. Any proposed variances to those provisions should be subject to consultation with the local and/or provincial government in consideration of the measures outlined below.

Where a renovation or expansion would result in the total floor space being increased by not more than 25% of the floor space existing at the time of the original building construction, implementation of the measures outlined below is considered appropriate professional practice when making submissions for renovation or expansion building permit applications:

- where the building is subject to a flood hazard, the new floor area should be at or above the existing floor elevation;
- the method of achieving the required floor elevation (fill, structural, or any combination) may be the same as for the existing building;
- where the building site is subject to a possible erosion hazard, any expansion shall not intrude into the setback zone ~~further~~ farther than the existing building;
- any extension of the building foundation should consider hydraulic loading and scour;
- the construction of additional or new erosion protection works may be required (such works shall be suitably robust in view of the purpose of protecting a house), subject to environmental agency approval, and with documentation of future operation and maintenance requirements for the owner; and
- where the building is subject to a dike setback, any expansion shall not be within 7.5 m of the dike toe or dike right-of-way unless accepted by the local diking authority and the *Deputy Inspector of Dikes*).

Where applicable, the above measures shall be incorporated into statements regarding the suitability of the land for the intended use. This will provide a practical approach to facilitate most building renovation and expansion projects.

If the local government requests a statement on the tolerability of *flood risk*, the local government ~~needs to~~ should establish such a threshold. The QP may then determine flood risk in accordance with Appendix E~~F~~ and report appropriately.

For building renovation or expansion where a potentially severe life-threatening hazard exists, the ~~QP~~QP should consult with the local government regarding an appropriate approach, which may include a *risk assessment* and/or structural mitigative works.

Where the renovation or expansion would result in the total floor space being increased by more than 25% of the floor space existing at the time of the original building construction, the work shall be treated as a new building (see below).

F~~G~~2.2 New Single Family or Duplex House

A building inspector may require a flood assessment for a new house (single family or duplex) on an existing lot in a potential flood hazard area.

Where local government by-law provisions and/or restrictive covenants exist that appropriately govern the project, those provisions should be followed. Any proposed variances to those provisions should be subject to consultation with the local and/or provincial government in consideration of the measures outlined below.

This section outlines principles and measures of appropriate professional practice when making submissions for building permit applications. Some common items that apply to each situation are as follows:

- the building shall be set back an appropriate distance from the creek or river in view of the potential for long-term erosion;
- the building shall be elevated to an appropriate FCL;
- in addition to hydraulic considerations, the FCL shall consider the implications of linear fills such as roads and railways;
- the FCL applies to the underside of a wooden floor system, or the top of a concrete floor system used for habitation or the storage of goods susceptible to damage by floodwaters;
- no area below the FCL shall be used for habitation, business, the storage of goods damageable by floodwater, or the installation of fixed equipment;
- the method of achieving the FCL (fill, structural, or any combination) shall be appropriately specified;
- areas used solely for vehicular parking may be located below the FCL;
- the design of the building foundation should consider hydraulic loading and scour~~)~~;
- where the building is subject to a dike setback, any expansion shall not be within 7.5 m of the dike toe or dike right-of-way unless accepted by the local diking authority and the Deputy Inspector of Dikes; and
- the need for a future dike right-of-way should be considered (if appropriate through consultation with the local diking authority), and recommendation for a dike right-of-way may be made.

Where a lot has a suitable building site outside the hazard area, or an area subject to a lesser hazard, a preferable approach is to require the building to be located in such non-hazard or lesser hazard area.

It is strongly preferred that standard creek or river setbacks be maintained. Only where a significant hardship exists should erosion protection measures be proposed as a justification for a reduced setback. Significant hardship may exist where comparative cost analysis indicates that construction o~~f~~n the less hazardous site is impractical, prohibitively expensive, and/or results in environmental degradation. Any erosion protection works shall be suitably robust in view of the purpose of protecting a house, subject to environmental agency approval, and with documentation of future operation and maintenance requirements for the owner.

Alluvial Fan (No Dike)

Where a proposed building site is located on a creek or river fan that is not protected by a dike or other structural mitigation works, the need for both protective works and floodproofing measures must be considered. In general, new buildings should only be considered for unprotected fans if:

- the local government has adopted an appropriate by-law or land use regulation that provides for building construction with knowledge of the flood hazard; or
- the QP concludes that the site may be suitable for the intended use.

A QP may conclude that the site may be suitable for the intended use if at least one of the following conditions applies:

- the fan is inactive;
- a standard/adequate dike or equivalent other structural mitigation works is constructed with the pertinent approvals as part of the development;
- the building site is not in a high hazard area of the fan (i.e., an avulsion or debris flow path, a *design flood* velocity greater than 1 m/s, and where safe access and egress is not possible); and/or
- a risk assessment is undertaken whereby the local government establishes a tolerable level of *risk*, and the QP assessment confirms that the risk would not exceed this level.

If the QP concludes that the land may be suitable for the intended use, the FCL should be a minimum of 1.0 m above the surrounding finished grade around the perimeter of the building. Particular attention needs to be given to specification of appropriate on-site mitigation measures such as foundation design, method of achieving the FCL, site grading and building configuration.

Flood Hazard Area (Not a Fan and No Dike)

Where a proposed building site is located in an area adjacent to a creek, river, lake or ocean that is not protected by a dike, the need for both dike works and floodproofing measures must be considered. In general, new buildings should be considered for unprotected floodplains only if:

- the local government has adopted an appropriate by-law or land use regulation that provides for building construction with knowledge of the flood hazard; or
- the QP concludes that the site may be suitable for the intended use.

A QP may conclude that the site may be suitable for the intended use if at least one of the following conditions applies:

- a standard/adequate dike or equivalent other structural mitigation works is constructed with the pertinent approvals as part of the development;
- the building site is not in a high hazard area of the floodplain (i.e., an avulsion path, a flood velocity greater than 1 m/s, a flood depth greater than 2.5 m, and where safe access and egress is not possible); and/or
- a risk assessment is undertaken whereby the local government establishes a tolerable level of risk, and the QP assessment confirms that the risk would be within this level.

If the QP concludes that the land may be suitable for the intended use, the FCL should be at the 200-year return period flood level plus *freeboard* (0.3 m for instantaneous peak floods and 0.6 m for daily peak floods). Particular attention needs to be given to specification of appropriate on-site mitigation measures such as foundation design, method of achieving the FCL, and site grading.

Fan or Flood Hazard Area with Standard/Adequate Dike
Where a proposed building site is located on a fan or floodplain that is protected by a standard/adequate dike, the need for floodproofing measures must be considered. In general, new buildings may be considered for protected floodplain and fans.

For fans, a minimum FCL may be 0.6 m to 1.0 m above the surrounding finished grade. For floodplains, the FCL should be at the 200-year return period flood level plus freeboard (0.3 m for instantaneous peak floods and 0.6 m for daily peak floods) unless a lower FCL is prescribed by a local bylaw or justified on the basis of a dike breach analysis. Where accepted by the local authority and in keeping with the character of the neighbouring area, the FCL for floodplains may be achieved by a ground level basement with appropriate floodproofing measures and building restrictions. The building shall be set back an appropriate distance from any active internal drainage channels.

General

Where in the judgment of the QP, the proposed building would be subject to an unacceptable flood risk, the QP should not submit a report indicating that the land may be suitable for the intended use. The 2004 Flood Hazard Area Land Use Management Guidelines provide the following examples of such situations:
- the site being in the floodway or an active erosional area;
- the site being in an avulsion or debris flow path;
- a flood depth greater than 2.5 m;
- a flood velocity greater than 1 m/s; and/or
- where safe access and egress is not possible.

F~~G~~2.3 New Multi-Family Building

New multi-family buildings should not be located within fan or floodplain areas that are not protected by standard/adequate structural mitigation works unless:
- the local government has adopted an appropriate by-law or land use regulation that provides for building construction with knowledge of the flood hazard; or
- the QP concludes that the site may be suitable for the intended use.

A QP may conclude that the site may be suitable for the intended use if at least one of the following conditions applies:
- the building site is on an inactive fan;
- a standard/adequate dike or equivalent other structural mitigation works is constructed with the pertinent approvals as part of the development;
- the building site is not in a high hazard area of the fan or floodplain (as noted above and where safe access and egress is not possible); and/or
- a risk assessment is undertaken whereby the local government establishes a tolerable level of flood risk, and the QP assessment confirms that the risk would be within this level.

Standards for new multi-family houses should meet the standards for single houses, with a greater degree of conservatism in view of the greater number of inhabitants. Variance~~s~~ of the standards is discouraged.

F~~G~~2.4 New Industrial/Commercial/Institutional Building

New industrial/commercial/institutional buildings should not be located within fan or floodplain areas that are not protected by standard/adequate structural mitigation works unless:
- the local government has adopted an appropriate by-law or land use regulation that provides for building construction with knowledge of the flood hazard; or

- the QP concludes that the site may be suitable for the intended use.

A QP may conclude that the site may be suitable for the intended use if at least one of the following conditions applies:
- the building site is on an inactive fan;
- a standard/adequate dike or equivalent other structural mitigation works is constructed as part of the development;
- the building site is not in a high hazard area of the fan or floodplain (as noted above and where safe access and egress is not possible); and/or
- a risk assessment is undertaken whereby the local government establishes a tolerable level of risk, and the QP assessment confirms that the risk would be within this level.

Standards for new industrial/commercial/institutional buildings should consider the standards for single houses. Variance~~s~~ of the standards is discouraged.

Some specific considerations pertaining to industrial buildings are as follows:
- water-oriented industrial buildings may be located outside standard dikes;
- relaxation of the FCL may be considered, especially for heavy industrial buildings behind standard dikes;
- in some cases it may be appropriate to allow limited building use below the FCL if appropriate floodproofing measures are incorporated into the building design; and
- for proposed major industrial developments, a risk assessment may be considered as a basis to develop site-specific mitigative measures.

Some specific considerations pertaining to commercial buildings are as follows:
- commercial buildings should generally not be located outside standard dikes;
- in some cases it may be appropriate to allow limited building use below the FCL if appropriate floodproofing measures are incorporated into the building design; and
- the specification of floodproofing measures shall consider the potential for different building use in the future as per the applicable land zoning.

Some specific considerations pertaining to institutional buildings (schools, universities, hospitals, fire halls, police stations, emergency response headquarters, churches, community centres, etc.) are as follows:
- institutional buildings should not be located outside standard dikes;
- institutional buildings should be considered as potential places of local refuge during flood emergencies, so the FCL should not be relaxed; and
- institutional buildings should have appropriate access/egress in view of their potential use during flood emergencies.

In view of the wide variance of the sizes and types of industrial, commercial, and institutional buildings, it is recognized that hazard mitigation may be site-specific.

F~~G~~3 SUBDIVISION

An *Approving Officer* may require a flood assessment for a new subdivision in a potential flood hazard area.

Regardless of any bylaw or development approval requirements, it would be prudent for the QP to ask the local authority to make the report (in whole or in part) available to future landowners through registration of an appropriate restrictive covenant.

Where there are local government by-law provisions and/or restrictive covenants that appropriately govern the project, those provisions should be followed. Any proposed variances to those provisions should be subject to consultation with the local and/or provincial government in consideration of the measures outlined below.

This section outlines some principles and measures that constitute appropriate professional practice when making submissions for subdivision applications.

At an early stage in the subdivision process, the QP should consult with the approving authority regarding the role of dikes and other structural mitigation works, as well as the need for a risk assessment. In general, unless the applicable regulations provide appropriate direction in view of the scale of development and flood hazard type, a risk assessment is likely to be more appropriate for medium or larger proposed subdivisions (over 10 single family units as defined in Appendix D~~E~~) in areas protected by standard/adequate works, and for any proposed subdivisions in areas not protected by standard/adequate works. A risk assessment can help determine the suitability of a site for the intended use, and to refine proposed flood risk reduction measures to be incorporated as part of the proposed development.

Some common items that apply to each subdivision are as follows:

- the building area of the development shall be set back an appropriate distance from the creek or river in view of the potential for long-term erosion (without the need for erosion protection works);
- buildings shall be elevated to an appropriate FCL;
- in addition to hydraulic considerations, the FCL shall ~~include~~ consider the ~~effects~~ implications of linear fills such as roads and railways;
- the FCL applies to the underside of a wooden floor system, or the top of a concrete floor system used for habitation or the storage of goods susceptible to damage by floodwaters;
- no area below the FCL shall be used for habitation, business, the storage of goods damageable by floodwater, or the installation of fixed equipment;
- the method of achieving the FCL (fill, structural, or any combination) shall be appropriately specified;
- areas used solely for vehicular parking may be located below the FCL;
- the design of the building foundation should consider hydraulic loading and scour~~)~~;
- where the development is subject to a dike setback, any expansion shall not be within 7.5 m of the dike toe or dike right-of-way unless accepted by the local diking authority and the Deputy Inspector of Dikes; and
- the need for a future dike right-of-way should be considered (if appropriate through consultation with the local diking authority), and recommendation for a dike right-of-way may be made.

Where a site has a suitable development area~~s~~ outside the hazard area, or an area subject to a lesser hazard, a preferable approach is to require buildings to be located in such non-hazard or lesser hazard area. Alternatively the land development density can be lowered within the hazard area, while compensating with an increase in development density outside the hazard area.

In general, new subdivisions should not be constructed on unprotected fans or unprotected floodplain areas. Unless otherwise regulated by the local authority, a preferable approach for such areas is as follows:

- undertake a comprehensive FHA;
- consider a formal FRA in consultation with the local authority;
- implement effective land use regulations through the local authority;

- protect a subdivision in a floodplain with a standard dike having a design return period of at least 200 years;
- protect a subdivision on a fan with standard structural mitigation works;
- designate a local diking authority (typically local government) to be responsible for the works in perpetuity;
- ensure that all protective works are conservatively situated, located on a right-of-way, and designed in view of long-term fluvial geomorphological processes, land use, and climate change;
- prepare an operation and maintenance manual to facilitate the functions of the local diking authority in a manner that is consistent with provincial and federal environmental regulations; and
- develop appropriate secondary floodproofing measures for the development area.

The standard dike level of protection is strongly preferred for proposed subdivisions, however as noted in section ~~G~~ F1.2, there may be situations where this level of protection cannot practically be provided, but where the works are considered adequate for the purpose of the proposed development.

F~~G~~3.1 Subdivisions on Unprotected Alluvial Fans

A new subdivision should only be considered for a fan that is not protected by standard/adequate structural mitigation works if:

- the local government has adopted an appropriate by-law or land use regulation that provides for subdivision with knowledge of the flood hazard;
- a standard/adequate dike or equivalent other structural mitigation works is constructed as part of the development (in which case section ~~F~~E-3.3 of this appendix applies); or
- the QP concludes that the site may be suitable for the intended use.

A QP may conclude that the site may be suitable for the intended use if the local authority accepts that the proposed subdivision may proceed in the absence of a standard/adequate dike or other structural mitigation works, and at least one of the following conditions applies:

- the fan is inactive;
- the subdivision would only nominally increase the development density on the fan, and is not in a high hazard area of the fan (i.e., an avulsion or debris flow path, a flood velocity greater than 1 m/s, and where safe access and egress is not possible); and/or
- the subdivision site would only nominally increase the current development density on the fan, and a risk assessment is undertaken whereby the local government establishes a tolerable level of risk and the QP assessment confirms that the risk would be within this level.

If the QP concludes that the land may be suitable for the intended use, the FCL should generally be a minimum of 1.0 m above the surrounding finished grade around the perimeter of the building. Particular attention needs to be given to specification of appropriate on-site mitigation measures such as foundation design, method of achieving the FCL, site grading, and building configuration. Provision should be made for safe access and egress during flood events.

F~~G~~3.2 Subdivisions on Floodplains not Protected by Standard Dikes

A new subdivision should only be considered for a floodplain not protected by a standard/adequate dike if:

- the local government has adopted an appropriate by-law or land use regulation that provides for subdivision with knowledge of the flood hazard;
- a standard/adequate dike is constructed as part of the development (in which case section F~~G~~-3.3 of this appendix applies); or

- the QP concludes that the site may be suitable for the intended use.

A QP may conclude that the site may be suitable for the intended use if the local authority accepts that the proposed subdivision may proceed in the absence of a standard/adequate dike, and at least one of the following conditions applies:

- the subdivision site is located on the flood fringe (i.e., its removal from the floodplain would not increase the designated flood level) and the ground is fully raised to the 200-year return period flood level plus freeboard (with consideration of protection of the landfill slope against erosion);
- the subdivision site would only nominally increase the current development density on the floodplain, and is not in a high hazard area of the floodplain (i.e., an avulsion path, a flood velocity greater than 1 m/s, a flood depth greater than 2.5 m, and/or where safe access and egress is not possible); and/or
- the subdivision site would only nominally increase the current development density in the floodplain, and a risk assessment is undertaken whereby the local government establishes a tolerable level of risk and the QP assessment confirms that the risk would be within this level.

If the QP concludes that the land may be suitable for the intended use, the FCL should be at the 200-year return period flood level plus freeboard (0.3 m for instantaneous peak floods and 0.6 m for daily peak floods). Particular attention needs to be given to specification of appropriate on-site mitigation measures such as foundation design, method of achieving the FCL, prescribing building setback distances from water bodies and site grading. Provision should be made for safe access and egress during flood events. The construction of erosion protection works is not favoured as a means to reduce the building setback. Where necessary, erosion protection works may be appropriate, subject to environmental agency approval, and with documentation of future operation and maintenance requirements for the owner. Bank protection works protecting more than three residential units should be subject to operation and maintenance by the local authority (with an appropriate land tenure).

F~~G~~3.3 Subdivisions on Fans and Floodplains Protected by a Standard/Adequate Dike

Where a proposed subdivision site is located on a fan or floodplain that is protected by a standard/adequate dike (and/or other structural mitigation works), the need for floodproofing measures must be considered. In general, new subdivisions may be considered for protected floodplain and fans.

For fans, a minimum FCL may be 0.6 m to 1.0 m above the surrounding finished grade. For floodplains, the FCL should be at the 200-year return period flood level plus freeboard (0.3 m for instantaneous peak floods and 0.6 m for daily peak floods) unless a lower FCL is prescribed by a local bylaw or justified on the basis of a dike breach analysis. Buildings shall be set back an appropriate distance from any active internal drainage channels.

For medium or larger subdivisions (over 10 single family units as defined in Appendix ~~D~~C), the QP should consult with the local authority regarding the need for a formal FRA. If appropriate, such an assessment can be undertaken to help establish the development conditions.

F~~G~~4 REZONING

A flood assessment report may be required at the rezoning stage of a land development project. As rezoning typically results in increasing the development density, it should only occur in flood hazard areas where appropriate flood protection standards can be met. The requirements for a rezoning flood assessment should be clarified with the local authority.

The flood assessment report should document any applicable legislation, bylaw requirements and restrictive covenants. Any proposed variances to these provisions should be subject to consultation with the local and/or provincial government in consideration of the measures outlined below. Appropriate bylaw measures or other land use controls would best be implemented in order to guide subsequent development activities (subdivision and building permit).

Consultation with the approving authorities should occur regarding the benefit and need for a formal FRA. If appropriate, a formal FRA should be undertaken.

A proposed conceptual mitigation approach should be presented that is based on the concept of protecting the future development with standard/adequate dikes (and other structural mitigation works). Rezoning should not occur ~~i~~on an unprotected fan or unprotected flood hazard area~~s~~ unless an appropriate concept plan is developed to protect the development. Appropriate floodproofing measures should also be proposed to fully achieve the applicable standards for building setbacks, flood construction levels, and other measures.

F~~G~~5 CROWN LAND DISPOSITION

Sale or lease of individual existing lots should~~all~~ be treated as a new building.

Sale or lease of raw land parcels should~~all~~ be treated as a subdivision.

APPENDIX G~~H~~: PROFESSIONAL PRACTICE IN LIGHT OF CLIMATE CHANGE AND LAND SURFACE CONDITION IMPACTS ON FLOODING

G~~H~~1 INTRODUCTION

As noted in Section 3.6, it is now widely accepted that global and regional climates are changing on the time scale of a human generation. However, it remains difficult to quantify those changes, and it is even more difficult to predict the changes in factors, such as land surface condition, that can affect flooding at the watershed scale. As a result appropriate professional practice requires that the effects of climate change and reasonably foreseeable changes in land surface condition be considered when carrying out *flood hazard* and/or *risk assessments.* Section 3.5 identifies various factors for consideration and steps to be taken in addressing the effects of climate and land surface change when completing flood assessments.

It is expected that the projected changes will result in an increase in the frequency of flooding in many drainage basins in the province, particularly small and medium drainage basins that are dominated by short-period runoff events, and that the flood events will typically be more intense and of a larger magnitude.

Climate change means that hydrometeorological and hydrological data will continue to change and that traditional methods of predicting the frequency of floods and levels of flood flows based on historical records (which entails the assumption of stationarity) will statistically not be valid (Milley et al., 2008) and will become increasingly unreliable. Model-based hydro-climatological forecasting of flood flows will likely become more important, but its appropriate use will require a better understanding of the underlying climate change model.

APEGBC has undertaken several initiatives to explore the impact of climate change on professional engineering and geoscience practice. This has involved APEGBC *members*, through the Climate Change Advisory Group, advising Council on these matters on an ongoing basis. -In 2014, APEGBC published a position paper entitled A Changing Climate ~~I~~in British Columbia Means Evolving Responsibilities ~~F~~for APEGBC ~~A~~and APEGBC Registrants.- In 2016, APEGBC published a ~~P~~position paper on Human-Induced Climate Change.

QPs should be on the watch for future publications in this rapidly evolving area of practice.

G~~H~~2 CLIMATE CHANGE SCIENCE – AN UPDATE

G~~H~~.2.1 Overview

Successive reports of the Intergovernmental Panel on Climate Change have incrementally increased the level of scientific confidence in the fact of climate change. The physical processes driving climate change are complex. Climate models are simplifications of particular climate change scenarios that are subject to some level of uncertainty. Even more difficult are analyses of changes in flood frequencies as these could be regarded as a third order effect of climate change. Greenhouse gas emissions and changes in the condition of Earth's surface influence global temperatures and evaporation that, in turn, change tropospheric moisture fluxes. Changes in available moisture lead to trends in precipitation amounts, intensities and timing on regional scales. These effects are influenced by topography, especially by mountain ranges that lie across the principal wind direction. Accordingly, broad regional generalizations need to be viewed with some skepticism. This is particularly the case for the relatively local spatial-temporal scales of most FRAs, where climate variations may occur at topographic scales not considered within a regional or global model.

Nonetheless, climate model predictions, in combination with analyses of historic data for a particular site, are a useful tool when one is tasked with the assessment of *flood risk* in a changing climate. Historic data series in this context should be used to identify trends and deviances in mean and variance.

Over the past 25 years, global air temperatures have increased by approximately 0.2°C/decade. Globally, carbon dioxide emissions from fossil fuels in 2008 were 40% higher than in 1990. Assuming stable future emissions it remains very likely that global temperatures will eventually increase by more than 2°C from the early 1990s - an outcome that many experts predict will cross a threshold to severe social and economic effects. It is further increasingly unlikely that the targeted upper limit CO_2 concentration of 450 ppm can be achieved given the globe's increasing appetite for fossil fuels. Global sea level rise over the past 20 years has averaged 3.4 mm/year, which is approximately 80% above prior IPCC predictions. Sea level rise is now forecast to reach and possibly exceed one metre by the end of the century if emissions are not curtailed, with an upper empirically predicted limit of 1.4 m (Rahmstorf, 2007). However, the Delta Committee (2008) in the Netherlands estimates an upper range of sea level rise of approximately 2.5 m by 2150 and 4 m by 2200 above 1990s levels. The currently recommended planning figures for BC are 1.0 m rise by 2100 and 2.0 m by 2200 (Ausenco Sandwell, 2011).

Technical sources for tracking the continually developing analysis and projections of climate change, with particular reference to BC, are given in section 3.6.2.

G~~H~~.2.2 BC Climate Change

Climate change impacts the entire hydrologic system, including variables such as temperature, evaporation, the type and amount of precipitation, the balance between water storage as ice, snow or liquid forms, and soil moisture levels. This section summarizes the pertinent findings (as of 2011) on climate change science for BC as they relate to hydrogeomorphic hazards.

- Sea Level Rise: although post-glacial rebound and tectonic uplift partially mitigate global sea level rise in some locations, relative sea level rise on the BC coast is expected to be as much as 1 m by the end of the century (BC Government, 2007; Ausenco Sandwelll, 2011). Periodic increased sea level rise may also be associated with increased El Niño activity. Impacts of such sea level rise include reduced effectiveness of coastal defences, damage to coastal structures (e.g., marinas, docks, and sewage outfalls), increased coastal erosion such as that observed on Haida Gwaii, and increased salinization of low elevation aquifers such as those in the Gulf Islands.
- Temperature: by the end of the 21st century, BC's temperature is expected to be about 2.8°C warmer on average (Rodenhuis et al., 2009) with an important increase in winter temperatures. This means that projected temperatures for an average year will be warmer than almost all of the warmest years reported in historic data.
- Precipitation: Average annual precipitation is expected to increase by about 10% (6 to 17%) in BC by 2100, with the increase primarily occurring during winter months and in the mountains. Further description of potential impacts of rainfall changes is provided in section ~~H~~G-3.
- Runoff: For snowmelt-dominated large river systems, an increase in surface runoff can be expected during the winter months due to a greater proportion of precipitation falling as rain. There will be an earlier rise and peak in the spring freshet due to warmer spring temperatures, whilst drier conditions will occur in the summer (Schnorbus et al., 2010a). These conditions will produce characteristically lower spring freshets and summer flows,

but the possibility for years with severe floods, such as have been experienced in the past, will remain.

For smaller coastal watersheds with a hybrid snowmelt and rainfall-dominated runoff regime a trend towards purely rain-dominated floods can be expected. For example, in Campbell River, highest flows will likely switch from May/June to November, December and January with decreasing summer flows (Schnorbus et al., 2010b).

The currently observed pine beetle kill may also increase the magnitude of peak flow events between 50 and 180% for combinations of pine kill plus a proportion of subsequent clear cutting to remove dead standing timber from 25 to 100% (Schnorbus et al., 2010b). Such numbers relate only to relatively small watersheds (<10 000 km^2) and cannot be extrapolated because of the likely negative proportionality between increasing watershed area and area affected by pine beetle infestations. These changes will be modulated in subsequent decades by regrowth of the forests.

G~~H~~3 *CONSEQUENCES* OF CLIMATE AND LAND USE CHANGES

G~~H~~.3.1 Changes in Rainfall Amounts and Intensities

The effects of precipitation on flood hazard vary over a wide range of temporal and spatial scales, from the cumulative effects of seasonal rainfall to the intensities encountered during a single storm. The projected approximately 10% increase in winter precipitation, combined with predicted higher temperatures during this same period, will influence the extent of winter snowpack and the timing and rate of melt. Increased temperatures may also influence the intensity of summer convectional showers and the frequency of strong southwesterly flows bringing particularly heavy rainfall to the coast in winter (the so-called pineapple express). For the practitioner, these changes have potential bearing on long-term estimates of the timing and magnitude of winter storms, including rain-on-snow events, the spring freshet, soil water balance, and effects of antecedent moisture on debris flow and debris flood triggering.

At shorter (e.g., sub 72-hour) time scales, IDF curves are a standard method to estimate the probability that a given average rainfall intensity will occur at various event return periods. They are routinely used in water management and form the basis for urban stormwater drainage calculations and sizing of culverts, drain pipes and other waste-water infrastructure. Much of this infrastructure is designed to function for a half a century or more, a time scale comparable with that over which measurable changes in precipitation characteristics are expected.

IDF curves are based on historic precipitation at a particular climate station and depend on the statistical principle of data stationarity: that the mean and variance of data will not change significantly over time so that past precipitation patterns can be used to predict future events. However, given that such data stationarity is not expected to hold, IDF curves based on past conditions should be interpreted with caution when used as design inputs for long-term (>30-year design life) infrastructure. For flood assessments, a precautionary sensitivity allowance for climate change is recommended. The basis of such sensitivity analysis would likely be ensemble projections from regional climate models.

Currently, the short-term precipitation data required to construct IDF curves cannot be discerned by regional climate models, which typically report results at monthly or longer time scales. This poses a challenge for workers tasked with estimating rainfall intensities in a changing climate. Prodanovic and Simonovic (2007) generated simulated IDF curves for London, Ontario, based on existing, drier, and wetter climate scenarios. These authors used non-parametric weather generators to produce short duration rainfall predictions. The weather generator combines historic information with Global Circulation Model output and produces climate information based on perturbation algorithms. A basis for adjusting IDF curves is presented by Burn et al. (2011) in an analysis of rainfall totals for 1-12 hours for long-term recording stations in BC.

G~~H~~.3.2 Changes in Snowcover and Glacial Ice Cover

Warmer winters will raise winter snowline (Cohen et al., 2012). However, high level snowpack may increase, given the expectation for wetter winters. Glaciers, which sustain mid and late-summer runoff in a significant number of BC mid-size drainage basins, are generally in retreat because of recent warm summers (Bolch et al., 2010). Changes are regionally variable: in northwestern BC, glaciers have dominantly been thinning, leading to increased summer runoff and sediment influx into streams, whereas in central and southern BC, glaciers have been in frontal retreat so that reduced area has led to lower late-summer flows (Moore et al., 2009).

High elevation snowpacks may be expected eventually to sustain many of these glaciers in a new equilibrium with reduced area. So long as climate continues to change, however, glaciers will continue to change; the larger ones more slowly than small ones because of their longer adjustment times to reach equilibrium with the prevailing climate.

G~~H~~.3.3 Changes in Land Use, Insect Infestations, and Wildfires

Population in BC, in comparison with land area, is light. Whilst population will continue to increase substantially, it is not expected to produce land use changes as severe as those experienced between 1850 and about 1980, except around the main foci of settlement. Urban land conversion will continue to be relatively rapid in the Lower Mainland, lower Vancouver Island and the Okanagan Valley, with the first being largely urban by late in the century. This implies strongly changed patterns of runoff and streamflow in relatively small drainage basins in and immediately around these focal points of settlement. Stormwater management in small urban watersheds will be sufficiently important to merit concerted study at provincial scale.

Forest condition and forest hydrology are impacted over significant areas by fungal and insect infestations and by fire. The recent mountain pine beetle infestation demonstrates this. A future changed climate will induce ecological disequilibrium in many respects, including shifting the ranges of both forest species and their pests. The latter being more mobile, an increased incidence of infestation might reasonably be expected with a transient time scale of order a century (or more). This will influence runoff and the incidence of flooding in small to medium-sized drainage basins. The pine beetle history provides valuable experience for anticipating such events. Pike et al. (2010) present an authoritative review of forest hydrology for BC (see, in particular, chs. 6: Hydrologic Processes and Watershed Response, and 19: Climate Change Effects on Watershed Processes in British Columbia).

Increases in temperature and summer droughts will augment the potential for forest fires. An increased incidence of severe summer convectional storms will raise the incidence and severity of lightning strikes, hence the incidence of forest and grassland fire. Particularly hot (stand-replacing) forest fires can lead to formation of hydrophobic (water repellent) soils that can increase runoff and increase the probability of debris flows even at relatively minor (1-5 year) rainfall return periods for various intensities (e.g., Cannon and Gartner, 2005).

G~~H~~.3.4 Changes in Runoff

The net result of the above factors is that runoff and flood flows will change in BC through the 21st century. Salient features include the following:

- An increased incidence of winter flooding in coastal BC, with the possibility for more extreme flows than in the past, due both to the increased proportion of winter precipitation that will fall as rain and a possible increased persistence of warm southwesterly flows that deliver particularly heavy and often long-duration rainfall.

- Spring floods associated with seasonal snowmelt may become more severe because of more rapid snowmelt, or when a major warm storm occurs over a rapidly melting snowpack. Possible increases of order 10% in extreme spring flood flows are envisaged.
- Increased likelihood of severe summer convectional showers inducing extreme floods in small to medium drainage basins. This applies everywhere in the province but is of greatest concern in the Interior.
- Increased precipitation intensity leading to the need for enhanced stormwater management measures in urban areas and along major communication routes.
- Increased probability of forest fires due to more intense droughts and more pest-afflicted forests will lead to higher runoff and increase probability of debris floods and debris flows in affected watersheds.

The foregoing circumstances need to be factored into analyses of flood hazard that forecast likely conditions for more than a decade ahead.

G~~H~~4 ANALYTICAL ISSUES

G~~H~~.4.1 Non-Stationarity of Hydro-Climatic Time Series

Contemporary climate change is a continuing phenomenon, while humans continue to modify Earth's surface environment in ways that will induce further climate change. Even if climate change and land surface changes were controlled, climate, as perturbed by greenhouse gas emissions, will continue to change for decades to centuries. It will require Earth's environment a long period to re-equilibrate to the changes that already have occurred. This implies a stormier and more variable climate in future. In addition, land cover change is ongoing. Consequently, hydrometeorological and hydrological time series are and will continue to be non-stationary: mean values will certainly continue to shift, and variance will probably increase as well.

Practically, this means that traditional methods of predicting extreme flows and water levels based on past experience will statistically be invalid and increasingly unreliable. If one expects only a shift in the mean, forecasts based on past experience might be rescued if consideration is given to changing frequencies of events (practically, this would mean that the flood frequency curve is shifted in magnitude), but if variance also changes, then future distributions of events will be quite unlike those of the past. Hydro-climatological model-based forecasting of flood flows will become important from a precautionary point of view, but proper use of such analyses will require a much deeper understanding of model stability and verisimilitude than currently available.

G~~H~~.4.2 Change in Statistical Methods and Applications

Statistics in flood analysis and forecasting in the past has mainly been applied to summarize historical experience and to make simple forecasts based on the magnitude-frequency relation revealed by the historical data. As noted above, non-stationary conditions obviate this approach (unless we know the trajectory of change rather precisely). An alternative is to use regional hydro-climatological models to forecast future scenarios. In this instance, statistics remains important in a different way. Given uncertainty about future conditions, models must be run iteratively to produce ensemble forecasts of the range of probable outcomes (in our case, flood flows), using a range of input conditions. Probabilities associated with the input conditions will weigh the outputs so that, amongst the ensemble of results, most likely conditions can be identified and probabilities of occurrence can be assigned to all outcomes. It will be important to ~~realise~~realize that these probabilities will reflect the state of our knowledge, not firm information about what the future will deliver.

The historical record should still be examined. Time trend analysis of flood magnitude is an important first step in any flood analysis for it will reveal whether there is a significant historical trend (see, for example, Bauch and Hickin, 2011). Block maxima analysis (using only annual maxima) may not suffice, and partial duration series may yield more reliable results. Hydro-climate trend analysis should be combined with flood frequency and magnitude analysis to gain a more complete picture of the hydrodynamic changes.

Analysts should consider also the effect of hydrological extremes that are produced by short-term climate excursions such as ENSO (for example, the stormy winters associated with La Niña phases) and the decade-length climate phases associated with the Pacific Decadal Oscillation that may induce periods of several years to decades length when increased storminess or winter snowfall may create clusters of high flow events that do not, however, signal a ~~secular~~ trend. It remains important, then, to refer to historical experience to identify such excursions and ensure that the results of model simulations represent plausible projections. For relatively short-term extrapolation, recent flooding histories (approximately the most recent 30 years, corresponding with a climate normal period) may be used to guide analysis.

G~~H~~5 CHANGES IN SEA LEVEL, STORM SURGE, AND COASTAL CONDITIONS

Because climate change affects both the mean temperature (hence volume) of seawater, and the volume of water locked in perennial snow and ice on land, sea level is changing. The rate of sea level rise in the latter half of the 20th century was, on average, near 2 mm/year, but it appears to have accelerated to approximately 3.4 mm/year globally within approximately the past 20 years. It is important to understand, however, that the observed rate is not the same everywhere in the world ocean because of both circulation effects and gravitational effects of adjacent land masses. In addition, what is important for public safety is not absolute sea level change but change relative to the land surface, which factors in movements of Earth's crust. Much of the BC coast, for example, is experiencing a relative rise of sea level, but the west coast of Vancouver Island is actually experiencing relative fall of sea level because the land is rising faster due to tectonic effects than current sea level rise.

Recent studies (Mazzotti et al., 2008) project relative sea level rise on the BC coast to 2100. For Fraser delta, the rise is expected to be between 32 and 68 cm, with a contribution of 1 to 2 mm/a (10 to 20 cm for a century) from sediment consolidation (Mazzotti et al., 2009). (On loaded sites, short-term subsidence may be an order of magnitude higher.) At Victoria the range of expected sea level rise is 17-34 cm and at Prince Rupert 18-75 cm (from projection of GPS trends). These results are different than global averages. On the outer coast of Vancouver Island, however, sea level is expected to fall because of tectonic effects, but that effect might be offset by the occurrence of a major earthquake. There is evidence for past sudden coastal subsidence of up to 2 m (Hyndman and Rogers, 2010). In view of changing rates of sea level rise, however, a recent conservative estimate for planning purposes is that sea level rise on the BC coast may be as much as 1 m by the end of the century (Ausenco Sandwell, 2011). Ausenco Sandwell (2011) further discusses issues and guidelines to be incorporated into a program of upgrading sea defences to meet the circumstances of rising sea level.

Given the present awareness, sea level rise is sufficiently slow that it can be dealt with within normal engineering programs for the maintenance and improvement of coastal facilities, although eventually, major decisions concerning the repositioning of installations such as water intakes and outfalls, dock and bridge decks may have to be addressed.

Of more immediate concern is the future prospect for storm surges and tsunami waves, and coastal erosion. Storm surge elevations are influenced by mean sea level, by pressure differences in storms, and by wind-driven effects. The latter two factors will be affected by the changing incidence of severe storms on the coast. The prospect is for an increased incidence of severe winter storms particularly along the central and north coast of BC, but it is, at present, not quantified. It is notable that ENSO effects can produce an interannual variability of up to 20 cm sea level change on the BC coast, which appears not by itself to produce any outstanding effects.

Wave-induced erosion will depend upon mean water level and on the severity of storm driven waves, as well as on the susceptibility of the coast. Most of the BC coast consists of bedrock, with low sensitivity to erosion. The map of sensitivity of the BC coastline (BC, 2007) shows only Fraser delta and the Naikoon area (Haida Gwaii) being highly susceptible. Some parts of the Gulf Islands of the Georgia Strait are also susceptible. A study of offshore wave height records recovered from ocean buoys (Gemmrich et al., 2011) showed, after appropriate adjustments for instrument changes, no significant trends in storm wave heights off the BC coast (35 years of record).

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APPENDIX ~~I~~H: ~~—~~ FLOOD MANAGEMENT IN OTHER JURISDICTIONS

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A number of European countries sustained severe flood damage during the past two decades. For example, between 1998 and 2002 there were 100 major floods in Europe resulting in damages amounting to CAN $25 billion and 700 lives lost. As a result, Europe's flood management approach and practices have advanced significantly. The key element has been the transition from a hazard-based to a *risk*-based approach, including quantification of both hazards and *consequences*. This experience provides some useful lessons for developing risk-based flood management procedures in BC.

In 2002, the European Exchange Circle on Flood Mapping (EXCIMAP) was created to improve and standardize flood mapping. In 2007 it published guidelines on the use of flood maps, differences between hazard and risk maps, flood mapping process and dissemination.

A guideline for good practices for flood mapping was also published, and includes sections on the use of flood maps, the differences between hazard and risk maps, the flood mapping process, and flood map dissemination. In the same year a flood map atlas was compiled that contained examples of national practices from 19 European countries, the USA and Japan, as well as sections on transborder flood mapping, flood maps for insurance, and emergency flood maps.

The European Flood Directive (EFD) was issued in 2007, requiring all European Union countries to produce the following for all potential *flood risk* watersheds:

- preliminary FRAs by the year 2011;
- *flood hazard* and *flood risk maps* by 2013; and
- flood risk management plans by 2015.

The following provides a brief summary of recent European Union flood risk management initiatives agreed to after the damaging floods in 2002.

To standardize flood mapping, the EXCIMAP was created. This organization included both flood specialists and stakeholders. The principal objectives were to:

- review the current practices in flood mapping in Europe;
- identify the knowledge and good practices; and
- compile guidelines for good practices for flood mapping.

In contrast to previous efforts, return periods for flood hazard mapping were increased, depending on the length and continuity of hydrologic data, to 1000 years. *Flood hazard maps* are being produced to show flood extents of a high, medium and extreme probability event scenarios (<100-year, 100-year and 1,000-year return periods, respectively). For each scenario, the flood extent, water depths and flow velocities are estimated and shown on a series of maps. (It must be realised that, in Europe, records of high water levels are much longer than in BC.)

Flood intensity maps are being produced to show the flood depth for individual return period events using very high resolution (10 cm) topography, typically generated by LiDAR, with depth shown as 0.25 m or 0.5 m contours. Flood propagation maps are being produced to show flood depth and propagation time, information that is very useful for evacuation planning and emergency measures. Flood hazard maps are being reproduced with and without proposed or implemented flood risk reduction measures.

In Switzerland, for example, flood hazard maps were translated into hazard zoning maps. A matrix was used to combine flood hazard in four classes (30-year, 100-year, 300-year and 1000-year return periods) and flood intensity (weak <0.5 m, medium 0.5 to 2 m, and strong >2 m water depths). This matrix provides guidance for new *construction*, restricted construction, and where landowners should be informed.

Flood risk maps are being produced to show the potential consequences associated with the flood scenarios expressed in terms of the number of inhabitants potentially affected, the type of economic activity of the area, the installations that might cause accidental pollution, as well as other information that the country considers useful. They show the potential economic damage per unit area. The unit of choice varies from millions of €/ha, for rural areas, to €/m^2 for cities with particularly high damage potential. These maps also show qualitatively the expected damage by overlaying flood hazard maps with land use maps.

Flood emergency maps, created from flood hazard maps, show emergency routes, lane directions, *dikes*, evacuation zones, emergency residences, evacuation bus stops, closed entrances and exits, and provide detailed advice for the public.

All of the above maps are disseminated through a variety of methods. Most commonly, the internet is being used to show flood hazards and risks, flood profiles and photographs of rivers and creeks together with legends and explanations. This method of communication provides essential information to planners but also educates the public on the nature of the flood hazards and associated risks. Google Earth is employed to allow users to focus on an area of interest and quickly determine flood hazard and risk.

Key achievements from the recent European flood risk reduction initiatives include:

- a uniformly high standard now exists for distribution and availability of comprehensive flood-related data;
- a focus is placed on accurate and up-to-date flood hazard and risk maps for all of Europe;
- flood hazard and risk maps must be used in all land use planning;
- intolerable flood risk is to be avoided through sterilization of land as opposed to strict building requirements;
- detailed and up-to-date flood information is provided to the general public;
- a broad holistic approach to floodplain management accounts for, or emphasizes, environmental and recreational values; and
- Europe-wide and international cooperation and collaboration is promoted.

Additional information on the European flood risk management initiatives can be found at: http://ec.europa.eu/environment/water/flood_risk/flood_atlas/index.htm. The following table summarizes flood risk tolerance criteria in different countries.

Table ~~I~~H-1. Flood risk tolerance in various developed nations

Country	Jurisdiction	Flood Risk Tolerance Criteria/Protection Standards	Comment
Germany	Bundesländer (provinces) Ministries of Environment, Nature Conservation and Traffic	• Q_{100} are designated as flood zones and either require permits for construction (e.g., Baden-Württemberg) or are exempt from construction (e.g., Bavaria).	There are no specific risk tolerance criteria for the entire country or the individual Bundesländer
Netherlands	entire country	• Southern Holland: 1:10,000 from Ocean flooding, 1:2500 to 1:1250 from river flooding, 1:250 for small polders (ring dikes) • Rest of country: 1:4000 from ocean flooding, same for river flooding as above.	

Country	Jurisdiction	Flood Risk Tolerance Criteria/Protection Standards	Comment
US	National Flood Risk Management Program (NFRMP), operated by the Federal Emergency Management Agency (FEMA), U.S. Army Corps (USACE), Association of State Floodplain Managers (ASFPM) and the National Association of Storm and Floodwater Management Agencies (NAFSMA)	• Mandatory flood insurance of “high risk” areas, defined as those areas having a 1% or greater chance of flooding in any given year (0.01 annual flood probability). Flood insurance is provided by the National Flood Insurance Program (NFIP), administered by the Federal Emergency Management Agency in partnership with private insurance companies. The insurance covers replacement cost of building structure and contents, with some restrictions. • No adverse impact (NAI) floodplain management program. This program aims to ensure the action of any community or property owner, public or private, does not “adversely impact” the property and rights of others with respect to flood risk.	There are no specific risk tolerance criteria for risk to life, or quantitative thresholds set for flood risk tolerance beyond the flood probability tolerance threshold for mandatory flood insurance. The NAI program provides guidelines but does not enforce a specific set of standards, requirements or practices.
Hong Kong	Drainage Services Department	• Hazard-based flood protection standards, based on flood return periods • Flood warning system in areas subject to high frequency flooding • Requirement for a “Drainage Impact Assessment” for proposed developments to ensure development does not increase flood risk to adjacent developments.	Areas subject to significant flood hazard (e.g., Sheung Wan low-lying area) are receiving significant structural flood mitigation works (>$200M).
Australia	National Flood Risk Advisory Group (NFRAG), a working group of the Australian Emergency Management Committee (AEMC)	• Hazard-based design criteria: traditionally 1% Annual Exceed~~e~~ance Probability (AEP); more recently 0.2% AEP or probable maximum flood (PMF). Guidelines for completing FRAs have been compiled, but without reference to quantitative risk tolerance thresholds.	
United Kingdom	Environment Agency	Environmental Protection Flood Risk Legislation (2009): • Required assessment of flood risk in three areas: Human health, economic activity, and the environment (including cultural heritage) • Required assessment components, in order of completion: Preliminary FRA, Flood Hazard and Risk Maps, and Flood Risk Management Plans for areas judged as subject to “significant” flood risk.	Further ~~C~~consultation planned ~~for Summer 2010~~ with regard to defining “significant flood risk”.

APPENDIX ~~J~~I: FLOOD ~~HAZARD AND RISK~~ ASSURANCE STATEMENT

Note: This Statement is to be read and completed in conjunction with the "APEGBC Professional Practice Guidelines - Legislated Flood Assessments in a Changing Climate, March 2012 ("APEGBC Guidelines") and is to be provided for flood assessments for the purposes of the *Land Title Act*, Community Charter or *the Local Government Act*. Italicized words are defined in the APEGBC Guidelines.

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To: The *Approving Authority* Date: ____________________________________

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Jurisdiction and address

With reference to (check one):

- ☐ *Land Title Act* (Section 86) – Subdivision Approval
- ☐ *Local Government Act* (~~Sections 919.1 and 920)~~Division 7) – Development Permit
- ☐ Community Charter (Section 56) – Building Permit
- ☐ *Local Government Act* (Section 524~~910~~) – Flood Plain Bylaw Variance
- ☐ *Local Government Act* (Section 524~~910~~) – Flood Plain Bylaw Exemption

For the Property:

____

Legal description and civic address of the Property

The undersigned hereby gives assurance that he/she is a *Qualified Professional* and is a *Professional Engineer* or *Professional Geoscientist* who fulfils the education, training and experience requirements as outlined in the APEGBC Guidelines.

I have signed, sealed and dated, and thereby certified, the attached flood assessment report on the Property in accordance with the APEGBC Guidelines. That report must be read in conjunction with this Statement. In preparing that report I have:

Check to the left of applicable items

___1. Consulted with representatives of the following government organizations:
____

___2. Collected and reviewed appropriate background information

___~~2~~3. Reviewed the proposed ~~residential~~ development on the Property

___~~3~~4. Investigated the presence of restrictive *covenants* on the Property, and reported any relevant information

___5. Conducted field work on and, if required, beyond the Property

___~~4~~6. Reported on the results of the field work on and, if required, beyond the Property

___~~5~~7. Considered any changed conditions on and, if required, beyond the Property

~~6~~8. For a *flood hazard* analysis ~~or flood risk analysis~~ I have:

___~~6~~8.1 reviewed and characterized, if appropriate, floods that may affect the Property

___~~6~~8.2 estimated the flood hazard or *flood risk* on the ~~p~~Property

___~~6~~8.3 ~~includ~~considered (if appropriate) the effects of climate change and land use change

___8.4 relied on a previous hazard assessment by others

___8.5 identified any potential hazards that are not addressed by the report

9. For a flood *risk analysis* I have:

___~~6.4~~9.1 identified existing and anticipated future *elements at risk* on and, if required, beyond the Property

___~~6.5~~9.2 estimated the potential *consequences* to those elements at risk

~~7~~10. In order to mitigate the estimated flood hazard for the property, the following approach is taken:

___10.1 a design return period[1] approach

10.2 a *risk assessment* approach

10.3 incorporated the approach outlined in Flood Guidelines Appendix F~~G~~

10.4 determined that the site is not subject to a flood hazard (no mitigation is needed)

11. Where the Approving Authority has adopted a specific level of flood hazard or flood risk tolerance ~~or return period that is different from the standard 200-year return period design criteria[1]~~, I have

___~~7~~11.1 made a finding on the level of flood hazard or flood risk tolerance on the Property

11.2 compared the level of flood hazard or flood risk tolerance adopted by the Approving Authority with ~~the~~ my findings ~~of my investigation~~

~~___7.2 made a finding on the level of flood hazard or flood risk tolerance on the Property based on the comparison~~

___~~7~~11.3 made recommendations to reduce the flood hazard or flood risk on the Property

~~8~~12. Where the Approving Authority has **not** adopted a level of flood risk or flood hazard tolerance I have:

___~~8~~12.1 described the method of flood hazard analysis or flood risk analysis used

___~~8~~12.2 referred to an appropriate and identified provincial or national guideline for level of flood hazard or flood risk

___12.3 made a finding on the level of flood hazard of flood risk tolerance on the Property

___~~8~~12.~~3~~4 compared ~~thisise~~these presented guideline with the findings of my investigation

~~___812.4 made a finding on the level of flood hazard of flood risk tolerance on the Property based on the comparison~~

___~~8~~12.5 made recommendations to reduce the flood hazard or flood risk~~s~~

___~~9~~13. Considered the potential for transfer of flood risk and the potential impacts to adjacent properties

___14. Reported on the requirements for implementation of the mitigation recommendations, including the need for subsequent professional certifications and future inspections ~~of the Property and recommended who should conduct those inspections~~.

~~15.~~

~~16.~~

Based on my comparison between

Check one

☐ the findings from the investigation and the adopted level of flood hazard or flood risk tolerance (item 7.2 above)

☐ the appropriate and identified provincial or national guideline for level of flood hazard or flood risk tolerance (item 8.4 above)

I hereby give my assurance that, based on the conditions contained in the attached flood assessment report,

Check one

☐ for subdivision approval, as required by the *Land Title Act* (Section 86), "that the land may be used safely for the use intended".

Check one

☐ with one or more recommended registered covenants.

---

[1] Flood Hazard Area Land Use Management Guidelines, published by the BC Ministry of Forests, Lands , and Natural Resource Operations, and the 2009 publication Subdivision Preliminary Layout Review – Natural Hazard Risk, published by the Ministry of Transportation and Public Infrastructure. It should be noted that the 200-year return period is a standard used typically for rivers and purely fluvial processes. For small creeks subject to debris floods and debris flows return periods are commonly applied that exceed 200 years. For life-threatening events including debris flows, the Ministry of Transportation and Public Infrastructure stipulates in their 2009 publication Subdivision Preliminary Layout Review – Natural Hazard Risk that a 10,000-year return period needs to be considered.

☐ without any registered covenant.

☐ for a development permit, as required by the *Local Government Act* (Sections 919.1 and 920), my report will "assist the local government in determining what conditions or requirements under [Section 920] subsection (7.1) it will impose in the permit".

☐ for a building permit, as required by the Community Charter (Section 56), "the land may be used safely for the use intended".

Check one

☐ with one or more recommended registered covenants.

☐ without any registered covenant.

☐ for flood plain bylaw variance, as required by the Flood Hazard Area Land Use Management Guidelines associated with the *Local Government Act* (Section 524~~910~~), "the development may occur safely".

☐ for flood plain bylaw exemption, as required by the *Local Government Act* (Section 524~~910~~), "the land may be used safely for the use intended".

Date:

Prepared by:

Reviewed by:

Name (print)

Name (print)

Signature

Signature

Address

Telephone

(Affix Professional seal here)

If the Qualified Professional is a member of a firm, complete the following:

I am a member of the firm ______________________________
and I sign this letter on behalf of the firm. (Print name of firm)

APPENDIX ~~K~~J: CASE STUDIES

The following hypothetical examples further illustrate~~s~~ the application of the Guidelines.

The examples listed below emphasize an important differentiation between existing lots on which landowners have a basic right to build a house and the creation of new lots where there is no right and is subject to approval by the *Approving Officer*. The examples below are meant to span the entire spectrum of single building permit on an existing lot to a large-scale subdivision.

Example 1: Floodplain Bylaw Relaxation Request

Background:
The *Regional District* building inspector receives a request for a relaxation of the building setback distance requirements in the Regional District's Floodplain Bylaw. The owner of a 5-hectare parcel adjacent to a river proposes to build a new house 15 m from the natural boundary of the river instead of the 30 m distance required in the bylaw. The property is in a sparsely populated rural area. The applicant is informed that a report from a ~~QP~~QP must accompany the application before the Board will consider the application. The applicant has a site specified which is on the inside of a mild bend in the river which meets all the other requirements for septic field location, setback from property lines, etc. The river channel is 50-m wide. Floodplain mapping indicates that the ground level at the proposed building site is higher than the 200-year return period FCL. The riverbank through this property is natural and there are no armoured banks in the area. There is a 30-m high, unstable slope with evidence of recent landslide activity on the opposite side of the river on the outside of a bend approximately 300 m upstream from the proposed building site.

Guideline Application:
The ~~QP~~QP consults Figure 3-1 and conducts the following steps:

- The QP meets with the *client* informs him/her about the Guidelines and their application to the requested bylaw relaxation.
- The QP obtains from the *approving authority* the applicable regulations which appear to have been met. Standard *structural mitigation works* do not exist and are not considered for mitigation purposes. The need for a formal *risk assessment* is discussed but the regional district decides that it is not required because of the perceived low *risk*.
- There is no current flood assessment for this reach of the river, which prompts the QP to generate one.
- The QP compares the floodplain maps and notes that the proposed site is above the specified FCL for the 200-year return period flood. The QP, however, also notes that the site is on the inside of a river bend consisting of sandy gravels with little apparent cohesion. The QP examines the river's overall geomorphic stability and concludes that the river is not prone to sudden channel changes or avulsions and is well incised. A chronosequence of air photographs is compared to determine channel bank erosion rates. The QP finds that the bank in question could erode to the building within a 100-year time frame in absence of bank erosion measures. Furthermore, the QP investigates the instability noted under Background above on the opposite river bank upstream. Given that landslide assessments are outside his/her expertise the QP recommends investigation by a landslide specialist.
- The landslide specialist visits the site and reports that landslide may be possible at this site at a return period of perhaps decades. Such landslides could be large enough to divert the river into the bank in question thereby accelerating erosion processes on the river bank in question. This is noted in the QP report.
- The QP prepares a flood assessment report as per regulatory considerations and his/her findings from the hazard assessment. The conclusion states that he/she cannot support a bylaw relaxation and that a different site ought to be identified on the 5-acre parcel that does not share the same degree of hazard. Alternatively, bank protection of the river reach in question could be

contemplated though, in this particular case, this would likely be cost prohibitive. However, the QP points out that an alternate site has been identified upstream that does not share the same problems and that would be suitable for *construction*.

Example 2: Subdivision Approval

Background:
The Ministry of Transportation and Infrastructure (MTI) subdivision approval officer receives an application for approval to subdivide a 25-hectare parcel of land into 5 five-hectare lots. The property is located in the Regional District of Columbia in an area without building bylaws or building inspectors. The property is located on a moderately sized active *alluvial fan* as identified by MFLNRO *Flood Hazard Maps*. The subdivision Approving Officer advises the applicant that a flood assessment report is required to determine if the land is safe for the intended use. There is no prior flood assessment report.

The property is located on the lower half of a 2.5 km^2 alluvial fan at the mouth of a creek. The braided creek channel is 60 m wide on the fan and has an average gradient of 5%. There is a history of flooding on the fan; most recently during the high runoff years 1972 and 1974. During these floods the creek flooded most of the fan surface and caused significant property damage by erosion. Up until the mid 1980s the *flood hazard* was managed somewhat by regular bulldozing of the channel through the fan area. Since regular dredging was curtailed gravel has accumulated in the channel increasing the chance of a channel avulsion. In 1975 a berm was pushed up on the right bank following an avulsion which again resulted in significant damage to property and the highway. The avulsion resulted in high velocity flow through the property now proposed for subdivision. The berm is classified by MFLNRO as an orphan flood control structure meaning that the berm is not considered standard and is not under the jurisdiction of the local diking authority. The berm has deteriorated over the years and is located on private lands. It is vegetated and there are no access roads or trails to the structure. Prior to 2003, when MFLNRO was involved in the land use regulation in flood prone areas, the Ministry refused subdivisions in this area. MFLNRO staff has identified the hazard associated with this berm to the regional district and the subdivision Approving Officer. There is no mechanism to establish a maintenance authority to enable the upgrade, inspection, and maintenance of this deteriorating structure.

Guideline Application:
The QP consults Figure 3-1 and conducts the following steps:
- The QP informs the client about the Guidelines and their application to the requested subdivision as per Figure 3-1.
- The QP consultation with the Approving Officer exposes the findings listed in the background section above. The Approving Officer agrees that a formal risk assessment may be appropriate in light of apparent hazard if the outcome is still a statement that the site is or is not safe for the use intended.
- The QP consults Table D~~E~~-1 and determines that the site can be classified as a small subdivision which prompts a Level 1 study.
- Following these guidelines in Section 3 and Appendices D~~E~~ and G~~H~~, the QP notes that large sections of the watershed are affected by beetles with high tree mortality. Moreover significant areas of the lower watershed have been clearcut. The QP concludes that such land surface changes may affect watershed hydrology. The QP also notes that the lower channel of the creek is characterized by an unstable braiding channel that also shows signs of channel bed aggradation.
- A review of future climate change and hydrological effects in the specified area suggests higher rainfall intensities, higher total annual precipitation, more precipitation will be falling as rain and a thinning snowpack at lower elevations. The QP concludes that the frequency and magnitude of summer rainstorm floods and spring freshets are likely to increase.

- According to Table D~~E~~-1, the QP determines the peak flow for a 500-year flood to which 10% is added to account for climate change and land surface changes in the watershed. 1-D modelling shows that the proposed development area would be inundated up to a 1.5 m water depth for this flood *hazard scenario* ignoring any fan aggradation during the event. The QP also concludes that a channel change into the area of the proposed development is likely for the lifetime of the proposed development.
- The QP applies the statutes of Appendix F~~G~~ 3-1 and, in consultation with the approving agency and the client prepares a formal risk assessment following procedures outlined in Appendix E~~F~~.
- Table E~~F~~-1 suggests a moderate risk for the unmitigated scenario which indicates a Class 2 risk assessment including calculations of risks of loss of life. The formal risk assessment concludes that the life loss potential is tolerable when measured against international risk tolerance standards. However, an unmitigated flood could lead to total losses for each proposed home.
- To reduce *flood risk* to levels that may be considered tolerable to the regional district, the QP concludes that the buildings would need to be elevated at least 2 m above grade and the building platforms be protected by riprap. Access and egress to the properties would equally have to be elevated or lack of access and egress would need to be tolerated in a flood situation and may need to be completely reconstructed after a flood including possible creek re-channelization.
- The QP submits the flood assessment report in which he specifies that the development may be safe for the use intended **if** comprehensive mitigation be implemented to upgrade the existing non-standard *dike* to a standard dike that could withhold a 500-year return period flood and buildings be elevated 2 m above grade.
- Since, as stated in the background section above, there is no mechanism in place to establish a maintenance authority for the standard dike, the MTI decides to reject the subdivision approval. The QP report also stipulates that if a maintenance authority is identified, the subdivision could be developable.

Example 3: New Subdivision on a River Floodplain

Background:
A large new subdivision of 300 new homes is proposed on a river floodplain which is protected by a dike. Scientific studies conducted at a BC university show that long-term sediment aggradation has reduced the *freeboard* so that a 200-year flood may lead to dike overtopping. The MTI Approving Officers request a flood assessment report from a QP.

Application of Guidelines
The QP consults Figure 3-1 and conducts the following steps:

- Previous flood assessments exist but do not include the channel bed aggradation and have not included changes in land surface or climate change.
- Applicable regulations are appropriate but allow for no contingencies with respect to changing flood hazard by channel bed aggradation, land surface change and climate change. The QP concludes that a comprehensive flood hazard assessment is needed to revisit the existing flood hazard.
- The Flood Hazard Assessment includes a flood frequency analysis of up to a 1,000-year flood and accounts for climate change. Consultation with experts in the field of the effects of climate change on runoff for the watershed in question suggest that peak flows may increase by up to 15% by the end of the century. This estimate includes effects of widespread tree mortality due to beetle infestations in the watershed in question.
- In consultation with the Approving Officer and the client, a formal FRA is agreed upon.
- The QP applies Table E~~F~~-1 and finds that potential life loss in case of a dike breach or dike overtopping could result in up to five statistical deaths and an annualized building loss for the 200-year return period flood of $1,000 to $10,000. This results in a High level of assessment corresponding to a Class 3 study as per Table E~~F~~-2.

- A more in-depth study on the potential mortality of subdivision residents concludes that for a flood scenario with no evacuations, the mortality could be as high as 25, while for an evacuated case, the statistical number of fatalities may vary between one and five, depending on the chosen flood hazard scenario. The data are plotted on an F-N curve~~s~~ and the risk plots in the unacceptable zone.
- Using depth-damage curves for the modelled assumed flood depths in case of dike overtopping and dike breach yields a total direct economic loss of $120 million.
- These results from the study are also entered into a risk matrix similar to the one shown in Figure E~~F-~~5 and a high flood risk is determined.
- The QP prepares a flood report that concludes that the present risk to the proposed development is such that, in consultation with the Approving Officer, the site cannot be classified as safe for the use intended.
- The QP specifies a comprehensive flood risk reduction strategy that proposes~~d~~ several alternatives. One is moving of the subdivision ~~further~~ farther away from the river and setting back the dikes to allow a higher river flow conveyance. The other alternative is to upgrade the existing dikes to an elevation at which flood risk is reduced to at least Moderate, which in this case, would require a dike height increase of 0.8 m at a very high cost. The last alternative is to upgrade the dike to the provincial standard for the river in question which is the flood of record and add the corresponding allowance for peak flow increases due to climate and land surface changes.
- In parallel a cost-benefit analysis is being conducted, and a multicriteria analysis addresses ecological, social, and intangible effects.
- In the end, an agreement is reached between the local diking authority, under consideration of existing development, and perceived benefits of new development that costs for dike setback and ecological enhancement be shared between the district and the land developer. In addition, a 1 m FCL is prescribed.

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Professional Engineers and Geoscientists of BC

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Quality Management Guideline—Use of Seal

V1.2 July 2017

Table of Contents

1.0 DEFINITIONS

1.1 The following definitions are specific to this Quality Management Guideline (QM Guideline). All references in the text to these terms are italicized.

Act
Engineers and Geoscientists Act, R.S.B.C. 1996, c. 116, as amended.

APEGBC
Association of Professional Engineers and Geoscientists of the Province of British Columbia.

APEGBC professional(s)
Professional engineers, professional geoscientists, licensees, including limited licensees, licensed to practice by *APEGBC*.

APEGBC professional of record
The professional engineer, professional geoscientist or licensee, including limited licensee with the lowest level of direct professional responsibility for the engineering or geoscience work and any related engineering or geoscience *documents* produced, and whose *seal* appears on the *documents*; a test of "direct professional responsibility" is the ability of that *APEGBC professional* to alter or revise the engineering or geoscience content in the master *documents*.

Bylaws
The *Bylaws* of *APEGBC* made under the *Act*.

digital certificate
Letters, characters, numbers or other symbols in digital form that an *APEGBC professional* creates or adopts to represent the electronic equivalent of his or her handwritten signature. *APEGBC* must authorize and endorse the *digital certificate* technology used in conjunction with the electronically applied *seal* in order to provide confirmation with *APEGBC's* best practices regarding security, protection of *document* integrity and proof of authenticity.

direct supervision
The *Act* defines *direct supervision* as - means the responsibility for the control and conduct of the engineering or geoscience work of a subordinate.

document(s)
Includes, but is not limited to, reports, letter reports, certificates, design briefs, memos, field memos, specifications, drawings, maps, plans and some *shop drawings* that provide recommendations, designs, directions, estimates, calculations, opinions, interpretations or observations that involve technical engineering or geoscience matters in hard copy, e-mail or digital format. The term *document* has an extended meaning and includes a photograph, film, recording of sound, any record of a permanent or semi-permanent character and any information recorded or stored by means of any device.[1]

With regards to *sealing*, electronic *documents* and hard copy *documents* are considered the same.

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[1] B.C. Reg. 168/2009, *Court Rules Act*, Supreme Court Civil Rules, Part 1 — Interpretation, Rule 1-1 — Interpretation, Definitions

electronic seal
Digital version of a *seal* that represents a true replica of the ink impression or embossing of the *seal* issued by *APEGBC*, with no material variation in size, format or wording.

non-ink signature
Applying a signature utilizing a touch screen or electronic pen that produces a unique gesture for each instance.

organization
Any firm, corporation, partnership, government agency, sole proprietor or other type of legal entity that employs *APEGBC professionals* and provides products and/or services requiring the application of professional engineering and/or professional geoscience.

seal (synonymous with stamp)
noun: *APEGBC professional's seal*; either a rubber *seal* or *electronic seal*, collectively called *seal* in this QM Guideline.
verb: Affix an *APEGBC professional seal*, along with signature and date, to a *document*. The handwritten date or the digitally embedded date associated with the digital signature must be the date of *sealing* and signing; this date may differ from the date on the *document*.

shop drawing
Includes, but is not limited to, a pre-existing standard or generic drawing, diagram, illustration, schedule, performance chart, brochure, or other printed information, provided by a contractor to an *APEGBC professional of record* or used by an *APEGBC professional of record*, to illustrate details of a portion of work. Refer to the *APEGBC Professional Practice Guidelines - Shop Drawings*.

2.0 PURPOSE AND SCOPE

2.1 The *Act*, states that:

> "A member or licensee receiving a seal or stamp under this section must use it, with signature and date, to seal or stamp estimates, specifications, reports, documents, plans or things that have been prepared and delivered by the member or licensee in the member's or licensee's professional capacity, or that have been prepared and delivered under the member's or licensee's direct supervision."

2.2 *APEGBC professionals* are required to *seal* all *documents* that they prepare and deliver in their professional capacity or were prepared under their *direct supervision*. When an individual becomes an *APEGBC professional* he or she is issued a *seal* by *APEGBC. APEGBC* retains ownership of the *seal* and is the sole authority to establish rules for its use.

2.3 This QM Guideline is intended to assist *APEGBC professionals* in the appropriate use of their *seal* to meet the requirements of the *Act* by addressing the following:

- the purpose of the *seal*
- which *documents* require *sealing*
- who is permitted to *seal* a *document*
- *sealing* in one's professional capacity or after one's *direct supervision*
- *sealing* with limited prior involvement
- how to *seal*

2.4 The *Act* requires that *APEGBC professionals* must *seal* all *documents* that they prepare and deliver, in their professional capacity or were prepared under their *direct supervision*. Conversely, they must only *seal* and deliver *documents* for which they are willing to accept professional responsibility. Failure to *seal* a *document* that is required to be *sealed* and that an *APEGBC professional* has prepared and delivered is a breach of the *Act*.

2.5 These obligations apply to *APEGBC professionals* working in their professional capacity in all sectors when their work applies to or is used in any of the following:

- ongoing engineering and geoscience work
- projects with a defined start and finish
- products and services requiring the application of professional engineering or professional geoscience
- engineering or geoscience deliverables such as reports, drawings, specifications or other deliverables
- implementation or use of engineering and geoscience work as may be found in a manufacturing facility, technology company, operations or utilities work
- construction or installation of engineering or geoscience work
- implementation or construction carried out by others
- implementation or construction being carried out by the *APEGBC professional's organization's* own forces
- engineering or geoscience work carried out for use internally within the *APEGBC professional's organization*
- engineering or geoscience work carried out for others

2.6 These obligations apply to *APEGBC professionals* employed in their professional capacity in all sectors including but not limited to:

- aerospace
- construction
- consulting
- education
- government
- healthcare
- high technology
- light and heavy industry
- marine engineering and naval architecture
- manufacturing
- natural resources
- operations
- research and development
- utilities

2.7 This QM Guideline is the minimum standard for use of *seal* by *APEGBC professionals*. Failure to meet the intent of this QM Guideline may be evidence of unprofessional conduct and may give rise to disciplinary proceedings by *APEGBC*.

3.0 GUIDELINES FOR PRACTICE

3.1 WHAT IS THE PURPOSE OF A *SEAL*?

3.1.1 The purpose of the proper and appropriate use of the *seal* is to authenticate *documents* prepared and delivered by *APEGBC professionals* in their professional capacity or under their *direct supervision*. The *seal* is not a mark of warranty. It is not a guarantee of accuracy. Instead, it should be considered a “mark of reliance”, an indication that others can rely on the fact that the opinions, judgments, or designs in the *sealed documents* were provided by an *APEGBC professional* held to high standards of knowledge, skill and ethical conduct.

3.1.2 The application of the *APEGBC professional’s seal* with the signature and date is the authentication process used to verify that a *document* has not been modified or tampered with, and that it represents the original content for which the *APEGBC professional* by *sealing*, signing and dating the *document* has accepted professional responsibility.

3.1.3 Aside from the issue of authentication, the *seal* is important because it is a visible commitment to the standards of the professions, and signifies to the user of the *document* that an *APEGBC professional* has accepted professional responsibility for the *document*. When an *APEGBC professional seals,* signs and dates a *document*, he or she is confirming the following:

- the engineering or geoscience work was prepared by the *APEGBC professional* in his or her professional capacity, or under his or her *direct supervision*
- he or she is professionally responsible and accountable for the *document*
- the authenticity of the *document*
- the identity of the *APEGBC professional*
- their designation and that he or she is in good standing with *APEGBC* and has practice rights
- the relevant legislation has been met
- the applicable requirements under the *Act* and *Bylaws* have been met including the quality management bylaw and the code of ethics
- he or she is qualified by training or experience in the engineering or geoscience discipline(s) related to the *document*
- the intent of the relevant *APEGBC* practice guidelines have been met

3.2 WHICH *DOCUMENTS* REQUIRE *SEALING*

3.2.1 General

3.2.1.1 *Documents* requiring the *APEGBC professional’s seal* are those *documents* (in hard copy, e-mail or digital format) prepared in his or her professional capacity or under his or her *direct supervision,* involving the delivery of products or services requiring the application of professional engineering or professional geoscience.

3.2.1.2 The requirement for *sealing* electronic *documents* and hard copy *documents* is the same.

3.2.1.3 Engineering and geoscience projects are delivered in various stages throughout a projects’ lifecycle. The *Act* requires that all professional documents prepared, delivered and relied upon must be sealed with signature and date, this includes those documents prepared for the various stages of an engineering or geoscience project. Below is an example of typical stages in consulting engineering projects for buildings:

- Tendering
- Design
- Permitting
- Construction
- Commissioning

Other areas of engineering and geoscience are too varied to give relevant examples of typical stages.

3.2.2 Internal *documents*

3.2.2.1 *Documents* issued informally within an *organization* that are preliminary, conceptual or not intended to be relied on by others, do not need to be *sealed*. However, when *documents* are sent from one department of an *organization*, and issued formally to another department, branch, office, division or other entity within the same *organization*, and those *documents* will be used, relied on, acted upon or externally issued by the other entity, those *documents* must be *sealed*. For example, preliminary *documents* issued to another department to determine permitting requirements would not need to be *sealed*. However, *documents* issued to another department that will be used to apply for a permit would need to be *sealed*, even if those *documents* were not ready for or issued for construction.

3.2.3 Preliminary *documents*

3.2.3.1 *Documents* that are incomplete, are not in their final form, i.e., will not be relied upon, that are being issued to indicate general works or degree of complexity, or are marked and being issued “for discussion”, “information only” or collaboration purposes are considered preliminary *documents* that do not need to be *sealed*. The intent that these *documents* are preliminary must be clear to those who are receiving them. For example, *documents* issued for “information only” to bidders to allow them to provide budget prices to a consultant do not require *sealing*. However, *documents* issued to bidders, who will rely on the adequacy of those *documents* to provide fixed prices, must be *sealed*. A work-in-progress, non-finalized *document*, or draft *document* should be clearly marked with ‘Preliminary’, ‘Draft’, ‘For Review Only’, ‘For Discussion Only’, ‘Not For Construction’, ‘Not for Implementation’ or similar notations which confirm the status of the *document*.

3.2.4 CADD drawing files

3.2.4.1 Clients, such as municipal governments may request computer assisted drafting and design (CADD) drawing files in an editable format such as DWG for ongoing maintenance of their facilities or infrastructure and to publish online for use by others. Drawings in this file format can be altered by the client. An *APEGBC professional* has a number of options for *sealing* and authenticating their original work, to distinguish it from future changes to the drawings made by the client. The *APEGBC professional* may:

- Embed the CADD file(s) in a PDF and seal the PDF using an *electronic seal* and digital certification technology that meets the *APEGBC* best practices for digital certification of electronically applied *seals* (refer to Section 3.6.7 of this guideline). *Seal* a hard copy version of the drawings and provide it together with a set of editable CADD files that are not *sealed*.
- Scan a *sealed* set of drawings and provide it together with a set of editable CADD files that are not *sealed*.

3.2.5 Bound *documents*

3.2.5.1 Bound documents may include reports, assessments, investigations and evaluations.

3.2.5.2 Drawings, maps or plans bound into another *document* such as those listed in 3.2.5.1 do not require *sealing*, provided the *document* they are bound into is *sealed*.

Drawing sets are not considered bound documents, each drawing must be sealed.

3.2.6 Copies of originally *sealed documents*

3.2.6.1 The users of a *document* signed, *sealed*, dated and previously delivered by the *APEGBC professional* may request a copy or copies of the original *document* in hard copy or electronic format. Where a copy of an authenticated *document* will suffice, the copy does not need to have an original *seal* applied.

3.2.6.2 If *sealing* of the copy is required, a hard copy *document* to which the *APEGBC professional* has affixed his or her *seal* with signature and date may be scanned and transmitted electronically.

3.2.6.3 *APEGBC professionals* are cautioned against issuing copies of *documents* after they have been *sealed*, signed and dated, whether in hard copy, pdf or fax format, unless proper controls are in place to prevent their *seal*s from being used by others.

3.2.7 *Shop drawings*

3.2.7.1 Please refer to the *APEGBC Professional Practice Guidelines - Shop Drawings* to determine which types of *shop drawings* should be *sealed* by an *APEGBC professional*. This guideline can be found on the *APEGBC* website.

3.2.8 Standard drawings

3.2.8.1 A professional member might be asked to prepare a design drawing that is intended to be used in more than a single instance. The decision whether or not to authenticate such a standard/generic drawing can only be made by the professional member who prepared the drawing. If it is not possible to sufficiently limit or specify the conditions under which the drawing can be used, the drawing should be left unauthenticated.

3.2.8.2 A professional member who subsequently uses an unauthenticated standard drawing is responsible for determining that the drawing is suitable for the current purpose and for its authentication.

3.2.9 E-mail

3.2.9.1 It is common that during work on a project a large number of emails are exchanged. When emails contain engineering and/or geoscience opinions or decisions that will be relied on by others, then this information must be captured in a sealed document within a reasonable time frame. For example, the emailed information could be captured in the next issuance of a sealed drawing, in a sealed report or even in a weekly memo that is sealed.

Alternatively, if using *electronic seals* in combination with the *digital certificate* you can apply your *electronic seal* and *digital certificate* to your email. This is can be achieved by converting your email to a pdf *document*, applying the *electronic seal* and *digital certificate* and attaching the pdf *document* to a covering email. The above can be completed in a few steps without leaving your workstation.

Professional judgement must be used to determine if the communication requires a seal and what type of sealed document is most appropriate.

3.2.10 *Documents* issued in the field

3.2.10.1 *Documents* issued in the field and not *sealed* at the time that include engineering or geoscience decisions or opinions that change the *documents* issued for construction or implementation must be followed up with an appropriately *sealed document*. Unless contractual obligations require it, the *sealed document* need not be issued to the recipient of the field-issued *document*, but must be filed and retained as a record to meet the intent of this QM Guideline.

3.2.11 Design build drawings/documents

3.2.11.1 Pre-bid package design-build documents may include partially complete reports, letter reports, design briefs, memos, field memos, specifications, drawings, maps, plans that provide recommendations, designs, directions, estimates, calculations, opinions, and interpretations or observations that involve technical engineering or geoscience matters, prepared as part of the design-build team under contract with a construction contractor or contractor joint venture for the purpose of developing a commercial bid for a project procured via Design-Build, Engineering Procurement Construction (EPC), or Private Public Partnerships (P3). These documents do not need to be sealed as they are preliminary in nature and are prepared as part of the process in developing the final bid package for delivery.

3.2.11.2 The final bid package that will be submitted to the client(s) and any subsequent engineering or geoscience documents must be sealed prior to delivery. The design build project model, as commonly employed in P3 projects, involves the preparation of design build drawings/documents intended for use by those receiving and reviewing bid packages. Bid packages prepared for these purposes can vary from 25% – 95% complete. There is a degree of uncertainty with respect to cost and impact on the final design. To address these issues, *APEGBC* recommends that the *APEGBC professional* responsible for the engineering or geoscience work incorporates the following declaration in the professional documents prepared and delivered for this stage of the project:

> "The *seal* and signature of the undersigned on this document certifies that the accuracy and completeness of the design/information in the document is only appropriate for the design build tender stage of the project and the state of completion of the document reflects the use for which the design/information are intended.
>
> The undersigned does not warrant or guarantee, nor accept any responsibility for the use of these documents for any other purposes than the design build tender stage."

3.2.12 Final design drawings

3.2.12.1 *APEGBC* recommends that the *APEGBC professional of record* responsible for the design and field review services must *seal* the final design drawings upon completion of the construction project. These drawings reflect design changes made during construction and incorporate such contractually related items as addenda and change orders, but do not include as-constructed information provided by others.

3.2.13 As-built or as-constructed drawings

3.2.13.1 *APEGBC* discourages the use of the terms "as-built drawings" or "as-constructed drawings" as they imply that the drawings show exactly what was built or constructed. The terms may also suggest a level of certification or impose inappropriate liability. For this reason, *APEGBC* recommends and uses the term “record drawings”. Refer to the following section for the appropriate requirements for these drawings.

3.2.14 Record drawings

(i) General

3.2.14.1 There are substantial legal and liability issues associated with *APEGBC professionals sealing* record drawings that include as-constructed conditions supplied by others not under the *direct supervision* of the *APEGBC professional*.

3.2.14.2 The *Act* provides that *APEGBC professionals* must use their *seal* with signature and date only on *documents* prepared in their professional capacity or prepared under their *direct supervision*.

3.2.14.3 *APEGBC professionals* are not permitted to *seal* and take professional responsibility for information on record drawings provided by others whom they did not directly supervise. This would preclude *APEGBC professionals* from taking professional responsibility for record drawings either prepared by the contractor, developer, operations manager or others responsible for the implementation or construction, or based on information or measurements provided by them.

3.2.14.4 To *seal* record drawings that include as-constructed conditions, and remain in compliance with the *Act*, the *APEGBC professional* or his or her subordinate must observe and record all as-constructed information, including measurements, used in the record drawings. Even if the *APEGBC professional* or his or her subordinate had been present on the project site full-time, the *APEGBC professional* would not likely be in a position to observe and record all necessary measurements to be able to take professional responsibility for as-constructed information on the record drawings.

(ii) Professional liability insurance

3.2.14.5 *Sealing* record drawings also has serious implications from a professional liability insurance perspective.

3.2.14.6 Standard professional liability insurance policies for *APEGBC professionals* typically exclude coverage for claims against the *APEGBC professional* resulting from warranties or guarantees provided by the *APEGBC professional*, unless the *APEGBC professional’s* liability would already exist at law.

3.2.14.7 If an *APEGBC professional seal*s and takes professional responsibility for record drawings, which include as-constructed information prepared by others, this may be considered a warranty or guarantee of the accuracy of the as-constructed information. As a result, the *APEGBC professional’s* liability insurance coverage for any claim concerning the accuracy of the as-constructed information may be compromised or negated.

3.2.14.8 If, however, the *APEGBC professional* prepares the record drawing only with as-constructed information observed and recorded by the *APEGBC professional* or his or her subordinate, the *APEGBC professional’s* liability would already exist at law and the exclusion in the standard professional liability insurance policy would not apply.

(iii) Declaration

3.2.14.9 To address these legal and liability issues, *APEGBC* recommends that the *APEGBC professional* responsible for the engineering or geoscience work and field review not *seal* record drawings, where the as-constructed information has been provided by others, unless the following declaration is provided on the drawing (or a similar one provided by his or her insurance or legal advisor):

> "The *seal* and signature of the undersigned on this drawing certifies that the design information contained in these drawings accurately reflects the original design and the material design changes made during construction, that were brought to the undersigned's attention. These drawings are intended to incorporate addenda, change orders and other material design changes, but not necessarily all site instructions.
>
> The undersigned does not warrant or guarantee, nor accept any responsibility for the accuracy or completeness of the as-constructed information supplied by others contained in these drawings, but does, by *sealing* and signing, certify that the as-constructed information, if accurate and complete, provides an as-constructed system which substantially complies in all material respects with the original design intent."

(iv) Exposure to disciplinary proceedings

3.2.14.10 If an *APEGBC professional seal*s record drawings, containing as-constructed information provided by others that he or she did not *directly supervise*, he or she may be exposed to discipline proceedings under the *Act* unless a declaration is provided on the drawings, that is consistent with the one provided above.

3.2.15 Other applicable legislation

3.2.15.1 *APEGBC professionals* must be aware of and follow *sealing* requirements and protocols provided in other federal or provincial legislation, such as Occupational Health and Safety Regulations, the BC Building Code and *Safety Authority Act*.

3.2.16 How should out of province-engineered and supplied equipment be handled?

3.2.16.1 Where *APEGBC professionals* specify equipment, products or components which require engineering design and are manufactured or fabricated out of province for use on projects in BC, they should begin by preparing and *sealing* a performance specification for the equipment, products or components. The specifications should indicate that the manufacturer or fabricator must certify that the equipment meets the performance specification. In such circumstances *APEGBC* does not require the *APEGBC professional* to *seal* the fabrication or vendor drawings.

3.2.16.2 However, when *APEGBC professionals* receive such equipment, products or components, they do have some obligations that require the application of their *seal*. If Occupational Health and Safety legislation imposes any requirements such as guards and safety switches, *APEGBC professionals* are responsible for checking and *sealing* that the equipment meets these requirements. *APEGBC professionals* must also confirm that the equipment meets any BC Safety Authority requirements. Where the equipment requires services such as electrical, gas or water feeds, *APEGBC professionals* are responsible for designing and *sealing documents* showing these services.

3.2.16.3 Pre-engineered buildings designed and fabricated outside of BC must be *sealed*, signed and dated by an *APEGBC professional*.

3.2.17 Non-engineering or non-geoscience *documents*

3.2.17.1 *APEGBC professionals* must not *seal documents* that do not contain engineering or geoscience content unless stipulated by other regulatory requirements.

3.2.18 Resources to assist in determining which *documents* should be *sealed*

3.2.18.1 Various types of *documents* are identified in Figure 1 and recommendations are provided on which types should be *sealed* in order to reflect good professional practice.

3.3 WHO IS PERMITTED TO *SEAL* A *DOCUMENT*

3.3.1 General

3.3.1.1 *Documents* associated with engineering and geoscience work or projects that have been prepared and delivered by, or under the *direct supervision* of, an *APEGBC professional*, must be *sealed* by the *APEGBC professional of record*.

3.3.2 Limited licensees

3.3.2.1 Engineering or geoscience licensees granted a limited scope as specified in their licences, are authorized to affix their *seal* only to *documents* which are within the defined scope of practice identified on their limited licences.

3.3.3 Who decides whether and when a *document* can be *sealed*?

3.3.3.1 An *APEGBC professional* cannot avoid using his or her *seal* on the grounds of his or her job description or at the request of his or her employer or client. The *APEGBC professional*, alone, should decide whether a *document* requires *sealing* in accordance with the *Act*.

3.3.3.2 The use of a *seal* should not be automatic, but should be affixed only after the *APEGBC professional* has evaluated and is ready to accept professional responsibility for the *document*. The legal liability of an *APEGBC professional* is not dependent on whether or not the *APEGBC professional* affixes his or her *seal* to a *document* that he or she prepared or was prepared under his or her *direct supervision* and delivered to others who will rely on it. *APEGBC professionals* are professionally responsible and accountable for any aspect of a project, work or *document* that they have prepared and delivered, whether or not they apply their *seal*.

3.3.3.3 Before deciding to *seal* a *document* an *APEGBC professional* typically prepares the *document* or has it prepared, reviews it, and takes professional responsibility for its content. Only after doing so, does he or she *seal* it, and deliver it to those who will use or rely on it.

3.3.4 Fees associated the use of the *seal*

3.3.4.1 The *seal* may be used only in conjunction with engineering and geoscience work that the *APEGBC professional* carries out or reviews in his or her professional capacity, or *directly supervises* others who carry out the work. An *APEGBC professional* may not charge a fee for simply applying his or her *seal* to a *document*.

3.3.5 *Sealing documents* in other jurisdictions

3.3.5.1 *APEGBC professionals* involved in the preparation of *documents* related to products or services requiring the application of professional engineering or geoscience, for works on projects located outside of BC, must confirm the *sealing* requirements in the jurisdiction in which the works or projects are located. If there are no *sealing* requirements in the relevant jurisdiction, for the purpose of authentication it is recommended that the *APEGBC professional seal* the *documents*. Where *sealing* requirements exist, *documents* may only be *sealed* by those licensed to practice in the other jurisdiction.

3.4 *SEALING* IN PROFESSIONAL CAPACITY OR UNDER *DIRECT SUPERVISION*

3.4.1 General

3.4.1.1 An *APEGBC professional* should only *seal* a *document* he or she has prepared or that was prepared under his or her *direct supervision*.

3.4.1.2 Refer to Section 3.5 for information on *APEGBC professionals sealing documents* in their professional capacity despite minimal or no prior involvement.

3.4.2 Single discipline *documents*

3.4.2.1 *Documents* involving a single discipline of engineering or geoscience must, at a minimum, be *sealed* by the *APEGBC professional of record*. Where there is input from one or more *APEGBC professional* specialists, each specialist must also *seal* the *document* and qualify the extent of his or her responsibility. For example, in such a case, a structural engineer could qualify the *seal* with a statement such as, “For Wood Trusses Only”.

3.4.3 Multiple discipline *documents*

3.4.3.1 If more than one engineering and/or geoscience discipline is included in one *document*, as a minimum, the *APEGBC professional* for each discipline must *seal* the portion of *document* for that specific discipline, and qualify the extent of his or her responsibility. Where there is input from one or more *APEGBC professional* specialists, each specialist must also *seal* the *document* and qualify the extent of his or her responsibility. For example, in such a case, a structural engineer could qualify the *seal* with a statement such as, “For Structural Aspects Only”.

3.4.4 Revised *documents*

3.4.4.1 When a *sealed document* is revised by, or under the *direct supervision* of, the same *APEGBC professional(s)* responsible for the originally issued *document*:

- the act of revising should be clearly indicated in the title block
- any revisions should be clearly identified
- once ready to accept professional responsibility for the revisions, the *APEGBC professional(s)* apply and date the *seal(s)* to indicate the date of the revisions

3.4.4.2 When a *sealed document* is revised by, or under the *direct supervision* of, an *APEGBC professional(s)* other than the *APEGBC professional(s)* responsible for the originally issued *document*,

- the act of revising should be clearly identified in the title block
- the revisions only, including all elements of the *document* that are affected by the revisions, must be *sealed* and dated by the *APEGBC professional(s)*, who is now taking professional responsibility for the revisions

3.4.4.3 In *sealing* the revised *document* the *APEGBC professional sealing* the revisions is only responsible for the revisions and their appropriateness in the revised *document*. Care should be taken to clearly identify the revisions, as this identifies the boundary of professional responsibility between the *APEGBC professional of record* for the original *documents* and the one taking responsibility for the revised *documents*.

3.4.5 Reissued *documents*

3.4.5.1 When a *sealed document* is reissued by, or under the *direct supervision* of, the same *APEGBC professional(s)* responsible for the originally issued *document*:

- the act of reissuing should be clearly indicated in the title block

- if a reissued *document* is reproduced from an *unsealed* master, the *APEGBC professional* should apply, sign and date the *seal(s)* on the reproduced *document*
- if reissuing a copy that has been previously *sealed*, the original *seal(s)* must be initialled and dated by the same *APEGBC professional(s)*

3.4.5.2 An example of a *document* reissued without revisions may be drawings previously prepared for a delayed phase of a project.

3.4.5.3 When a *sealed document* is reissued by, or under the *direct supervision* of, an *APEGBC professional(s)* other than the *APEGBC professional(s)* responsible for the originally issued *document*:

- the act of reissuing should be clearly indicated in the title block
- the reissuing *APEGBC professional(s)* must *seal*, sign and date the reissued *document* and is thereby accepting professional responsibility for the *document*

3.4.5.4 When an *APEGBC professional(s)* other than the *APEGBC professional(s)* responsible for the originally issued *document* reissues or revises a *document*, there is no requirement for the original *APEGBC professional(s)* to be made aware of these actions.

3.4.6 Translated *documents*

3.4.6.1 An *APEGBC professional* may be requested to *seal* a *document* in a language, or in more than one language, other than his or her working language(s).

3.4.6.2 The translation of an engineering or geoscience *document* is itself the practice of professional engineering or professional geoscience and as such it is unlawful for a non-*APEGBC professional* to translate engineering or geoscience *documents.* It would be unprofessional for a unilingual *APEGBC professional* to *seal* and sign engineering or geoscience *documents* translated by a non-*APEGBC professional* or to *seal* and sign a *document* that is in whole or in part in a language other than his or her working language(s).

3.5 *SEALING DOCUMENTS* WITH LIMITED PRIOR INVOLVEMENT

3.5.1 General

3.5.1.1 Some *APEGBC professionals* acting in their professional capacity *seal* engineering or geoscience *documents* prepared by others where there has been no *direct supervision*, by the *APEGBC professional* for example where the *APEGBC professional* has not been actively involved, or prior or early involvement has been minimal or non-existent. The following three examples identify how *sealing* such *documents* may be carried out to meet the requirements in the *Act* and this QM Guideline.

Example 1

3.5.1.2 An *APEGBC professional* may be asked to *seal* engineering or geoscience *documents* prepared by engineering or geoscience professionals registered in another jurisdiction. The *seal* is required to permit the use or application of the engineering or geoscience *document* for a project or works located within British Columbia. In such cases, the *APEGBC professional* must carry out a thorough and documented review or check of the engineering or geoscience product sufficient to merit the application of the *APEGBC professional's seal* to the pertinent *documents*. Such a review or check may include, but is not limited to, consideration of all engineering or geoscience assumptions and parameters, and checking of the engineering or geoscience work included in the *document*. After application of his or her *seal*, the *APEGBC professional* assumes full professional responsibility for the *sealed documents*.

Example 2

3.5.1.3 An *APEGBC professional* may be asked to *seal* an engineering or geoscience *document* prepared by individuals who were *directly supervised* by another *APEGBC professional*. In such a situation, the *APEGBC professional sealing* the *document* is acting in his or her professional capacity, and hence must perform a review at a level comparable to that required to prepare the original *document*.

Example 3

3.5.1.4 The third example involves an *APEGBC professional sealing* engineering or geoscience *documents* prepared by others, without *direct supervision,* that is the *APEGBC professional* is not actively involved and prior or early involvement was minimal. When *sealing* such *documents*, the *APEGBC professional* is acting within his or her professional capacity.

3.5.1.5 Where the *APEGBC professional* has minimal prior involvement before a *document* is presented to him or her for *sealing*, professional practice requires that one of the following two conditions are met and documented:

1. The *APEGBC professional* has confirmed that:
   (a) A documented formal quality management system, appropriate to the nature of the work being carried out, is in place
   (b) The *APEGBC professional* has documentation related to the formal training and experience of the individual involved carrying out the professional engineering or professional geoscience work
   (c) The individual developing the *document* is working within a practice area for which he or she has appropriate training and experience,

   or

2. The *APEGBC professional* has a long-standing relationship with the individual involved, on the active staff of the same *organization*, and involved in the delivery of similar products or services requiring the application of engineering or geoscience, on a repeated basis.

3.5.1.6 Provided that one of the two prerequisites is met, the *APEGBC professional* must also carry out an appropriate review of the engineering or geoscience work before affixing his or her *seal*. An appropriate review would include a review of all key engineering or geoscience issues before *sealing* the *document*.

3.5.1.7 The *APEGBC professional* must be familiar enough with the engineering or geoscience *document* to be able to directly deal with and respond to questions related to the *document* or its implementation.

3.5.1.8 The *APEGBC professional sealing* the *document* is taking professional responsibility for the *document*.

3.5.1.9 Reviewers of engineering or geoscience documents where the document was prepared by an *APEGBC professional* should not be sealing the document. The document should only be sealed by the *APEGBC professional of record*. If the reviewer is directly supervising the preparation of the document by a non-*APEGBC professional* the reviewer should seal the document.

3.6 HOW TO *SEAL*

3.6.1 General

3.6.1.1 A *seal* is not complete without a signature and date. The date must be the date of *sealing* and signing, even though this date may differ from the date on the *document*.

3.6.1.2 *Sealed documents* may **not** be signed by another person signing on behalf of ("per") the *APEGBC professional* identified on the *seal*.

3.6.2 Types of *seal*s and their use

3.6.2.1 The traditional rubber *seal* issued by *APEGBC* to all *APEGBC professionals* is used to *seal* hard copy *documents* and is applied with the *APEGBC professional's* signature and date. The *sealing* of engineering and geoscience *documents* prepared in an electronic form require the application of an electronic seal in combination with a digital certificate. Please note that all members receive a rubber seal as part of their membership, however members can choose to additionally purchase a long reach embosser seal, which is acceptable to use on professional documents.

3.6.2.2 Refer to Figure 2 for guidance on the location of the *seal* for different types of *documents*.

3.6.2.3 Refer to Figure 3 for examples of how to apply professional *seals*.

FIGURE 2: WHERE TO APPLY PROFESSIONAL *SEALS*

Type of *Document*	Location
Drawings	In allotted space in title block or in lower right corner of each drawing
Specifications	On first page or cover sheet of section to which the *seal* applies or, if responsible for overall specification, on cover sheet for overall specification
Reports	Next to the title of the author or signature in the report whether at the beginning or end of the report
Other written *documents*	Next to the title of the author or signature whether at the beginning or end of the *document*
Digital files	Use an *electronic seal* and signature only in combination with digital certification technology confirmed to meet *APEGBC* best practices (see best practices for use of electronically applied *seals* later in this QM Guideline) in locations appropriate to the type of *document*

3.6.3 Rubber *seal*

3.6.3.1 The ink impression of the rubber *seal* should be clear and legible, and must be signed and dated adjacent to or across the *seal*. It is preferred if the ink used for the *seal,* and the ink used for the signature and date, are contrasting colours.

3.6.4 *Electronic seal*s and *digital certificate*s

3.6.4.1 *APEGBC professionals* may *seal* electronic *documents* using an electronic version of their *seal* in conjunction with the *digital certificate* technology.

3.6.4.2 Where an electronic document has been digitally authenticated, the file is the *original*, any printed reproductions are copies. It is acceptable to provide these printed copies, however clients and authorities having jurisdiction have the right to request originals whether digital or hardcopy.

3.6.5 Minimum legal requirements

3.6.5.1 The minimum legal requirements established under the *Act* regarding the use of electronically applied *seals* and *digital certificates* are as follows:

- *APEGBC* members must use an *electronic seal* issued by *APEGBC* (this requirement can also be met by using a *digital certificate* technology service provider that has been independently confirmed to meet *APEGBC* best practices, as listed below).

- The *seal* must bear the engineer's, geoscientist's, or licensee's name, as well as the words "Professional Engineer, Province of British Columbia", "Professional Geoscientist, Province of British Columbia" or "Limited Licensee" respectively.
- The *electronic seal* must be capable of being "returned" to *APEGBC*, i.e., a member must be able to show *APEGBC* that he or she is no longer able to use the *electronic seal.*
- The *digital certificate* must include the date the *document* was *sealed.*

3.6.6 Options for using *electronic seals* and *digital certificate* technology

3.6.6.1 *APEGBC professionals* may use *electronic seal*s with *digital certificate* technology in one of the following ways:

1. Create or purchase an electronic version of their *seal* from *APEGBC* and use an *APEGBC*-endorsed *digital certificate* service provider such as Notarius, Inc.
2. Create or purchase an electronic version of their *seal* and use their choice of a *digital certificate* service provider that has been confirmed to *APEGBC* by an independent consultant (paid for by the *APEGBC professional* or their *organization*) to meet the *APEGBC* best practices as listed below.
3. Purchase an electronic version of their *seal* from *APEGBC* and use their choice of a *digital certificate* service provider that has **NOT** been independently confirmed to meet the *APEGBC* best practices (see Section 3.6.6.2).

3.6.6.2 With option 3, *APEGBC* will not be able to confirm to those receiving such *documents* electronically that they have an appropriate level of security, protection of *document* integrity, and proof of authenticity, that are equivalent to a hard copy *document sealed* with the *APEGBC professional's* ink *stamp* with handwritten signature and date.

3.6.7 Best Practices for use of electronically applied *seals*

3.6.7.1 For *APEGBC* to be able to confirm the integrity, security and authenticity of *documents* which have been *sealed* using an electronic image of the *seal*, the following must occur:

1. *APEGBC professionals* must apply a *digital certificate* which has been independently verified as meeting the *APEGBC* best practices under item 2.

2. To meet *APEGBC* best practices the service provider used must:
   - be experienced in providing this technology to members and licensees of other professional associations
   - have the resources, technical support and systems in place to provide continuity of service for the foreseeable future
   - have protocols consistent with *APEGBC's* authority to regulate the use of the *APEGBC professional's seal,* by allowing *APEGBC* to revoke or suspend the *APEGBC professional's* ability to use their *seal*
   - have protocols consistent with *APEGBC's* need to ensure that only an *APEGBC professional* is granted the authority to own and use an electronically applied *seal* with his or her personalized *digital certificate*
   - have a platform that offers flexibility and ease of use for a wide range of purposes and applications (e.g. compatible with different file formats, ability to *seal*, sign and date multiple sets of engineering or geoscience *documents* in a single operation)
   - have *digital certificate* technology that is compatible with that used by members of the Architectural Institute of BC
   - use a Public Key Infrastructure, which is a combination of hardware, software, people, policies and procedures needed to create, manage, distribute, use, store, and revoke digital signatures

- have a *digital certificate* that is compliant with the International Telecommunications Union X509v3 standard
- maintain the *digital certificate* under the sole control and possession of the *APEGBC professional*
- allow *digital certificate* to be stored on the media of the *APEGBC professional's* choice (i.e. hard drive, memory stick)
- provide interfaces between the technology and the software used by *APEGBC professionals* so the image of the *APEGBC professional seal* with signature and date appears when printing the *document*

3.6.8 Non-Ink Signatures

3.6.8.1 Applying a signature utilizing a touch screen or electronic pen that produces a unique gesture for each instance, meets the minimum legal requirement. The *APEGBC professional of record* must sign and date adjacent to or across the seal, the signature must be applied by hand for each instance. Copying an image of the signature and using it on other documents or on other instances of the seal is strictly forbidden.

Note: A non-ink signature is NOT a secure digital signature that attaches a *digital certificate* and does not protect the document from alteration.

3.6.9 Unacceptable *seal*s

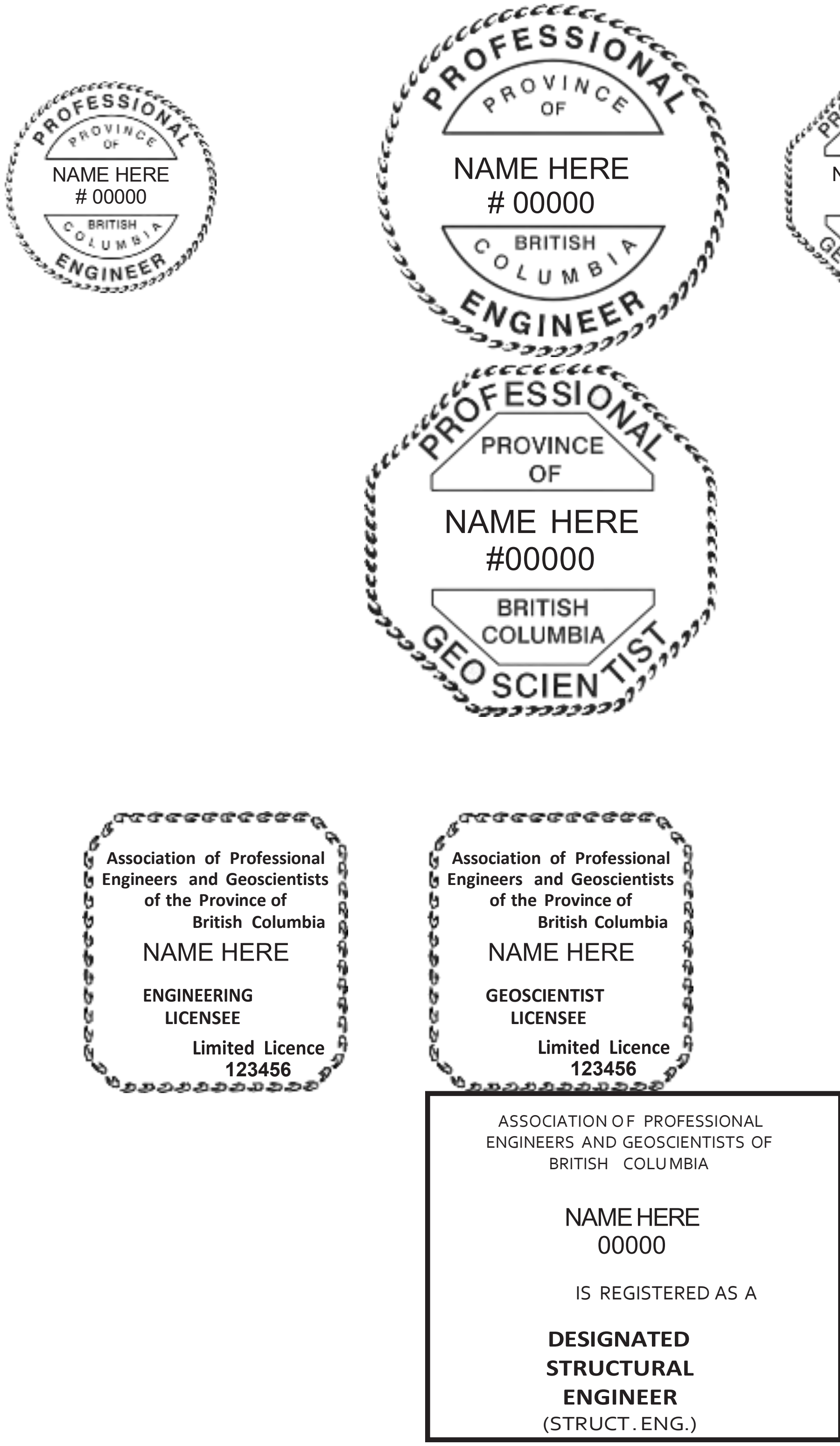
3.6.9.1 *APEGBC* does not approve the use of other types of *seals*, including but not limited to, stick-on *seal*s, photocopied *seal*s, *electronic seals* in electronic files without digital certification, and electronically scanned images of ink *stamp seals* applied to originally *sealed documents*.

3.6.9.2 Placing an image of a handwritten signature and date with a *seal* on an electronically prepared *document* is not equivalent to *sealing* the *document* and not approved by *APEGBC*. To be acceptable the minimum legal requirement is a live signature applied by the *APEGBC professional* named on the seal.

3.6.9.3 Placing text, a graphic, or anything else on a professional *document* that is not *sealed*, indicating that an appropriately *sealed* copy exists at another location is not acceptable. The minimum requirement is that a *sealed* copy of the *document* be provided to the recipient. If unsealed convenience copies are provided, an appropriate disclaimer should be placed on the *document* to mitigate unintended usage.

Figure 3: Examples showing how to apply *seals*

Acceptable examples of seals (sign and date adjacent to or across the seal).
(this is a place holder and will be amended during the design process)



3.7 Suggested Methods for Issuing *Sealed Documents*

3.7.1 General

3.7.1.1 The *Act* requires that *APEGBC professionals seal* any *document* that they prepare and intend to deliver or that has been prepared and will be delivered under their *direct supervision*. Before deciding whether an issued *document* must be *sealed* according to the *Act*, the *APEGBC professional* should ask the following question:

- Will those receiving the *document(s)* be relying on the engineering or geoscience content or is it being issued for information only?
    - o If it will be relied on whether for bidding, permitting, construction, implementation, use or other reliance, *seal* the *document(s)*.
    - o If it is for information only, discussion purposes, collaboration or not in its final form and it will be obvious to the receiver that they cannot rely on it to price, construct, install, implement or use, don't *seal* the *document(s)*.

3.7.1.2 Here are some practical ways to comply with the *Act* and issue *documents* that require *sealing*:

3.7.2 Hard copy *documents*

- Print the *document(s)*, apply the *seal* to the hard copy *document(s)*, sign and date the *seal*, and issue the hard copy *document(s)*. A record *sealed* set must be retained by the *APEGBC professional*. This method may be impractical for issuing a large number of sets.
- Print the *document(s)*, apply the *seal* to the original, sign and date the *seal*, reproduce multiple hard copies, as needed, and issue the copies of the *document(s)*. The *APEGBC professional* does not need to originally *seal* the copies. A record *sealed* set must be retained by the *APEGBC professional*.
- Apply an electronic version of the *seal* to the *document* files, print the *document(s)*, sign and date the *seal* on each original, reproduce multiple hard copies, as needed, and issue the copies of the *document(s)*. Remove the *electronic seal* from working *document* files. The *APEGBC professional* does not need to originally *seal* the copies. A record *sealed* set must be retained by the *APEGBC professional*.
- Apply an electronic image of the seal to the file with digital certification that meets APEGBC best practices and add fine print to the digital signature zone stating, "This document is a printed copy from a digitally signed & sealed original", and then print. A record sealed set must be retained by the APEGBC professional.

Note: The retained record set can be a copy, either hardcopy or digital, i.e. photocopy or scanned PDF.

3.7.3 Electronically issued *documents*

- Apply an electronic image of the *seal* to the file with digital certification that meets *APEGBC* best practices and transmit the file to others. A record *sealed* set must be retained by the *APEGBC professional*.
- Print the *document(s)*, apply the *seal* to the original, sign and date the *seal*, scan the hard copy originally *sealed document(s)* and issue the file created electronically. A record *sealed* set must be retained by the *APEGBC professional.*

  Note: The application of an image of the *APEGBC professional's* signature is NOT allowed unless it is done in conjunction with an appropriate digital certificate. Any *APEGBC professional* who is aware of or authorises the application of an image of their signature in conjunction with their professional seal may be disciplined under the *Act*.

FIGURE 1: WHEN TO APPLY *SEALS*					
		EXTERNALLY ISSUED OR FORMALLY PREPARED AND DELIVERED INTERNAL *DOCUMENTS* Delivered to external users such as clients, contractors, government ministries, authorities having jurisdiction Delivered to internal users within the *organization* such as other departments, branches, offices or divisions for external or formal internal use[3]			
		Single discipline – single *APEGBC professional of record*	**Single discipline – multiple *APEGBC professional of record***	**Multiple disciplines**	
PRELIMINARY OR DRAFT *DOCUMENT* a work in progress; non-finalized *document*[4]	No	No, unless required by other laws or regulation. If required, *seal* as per Originally issued ***document*** and mark accordingly (e.g. **PRELIMINARY, NOT FOR IMPLEMENTATION, NOT FOR CONSTRUCTION**)	No, unless required by other laws or regulation. If required, *seal* as per Originally issued ***document*** and mark accordingly (e.g. **PRELIMINARY, NOT FOR IMPLEMENTATION, NOT FOR CONSTRUCTION**)	No, unless required by other laws or regulation. If required, *seal* as per Originally issued ***document*** and mark accordingly (e.g. **PRELIMINARY NOT FOR IMPLEMENTATION, NOT FOR CONSTRUCTION**	Yes, if submitted for legal or regulatory purposes
ESTIMATES	No	No, unless the document contains engineering or geoscience content as part of the estimate	No, unless the document contains engineering or geoscience content as part of the estimate	No, unless the document contains engineering or geoscience content as part of the estimate	Yes if work awarded based on the document
BID, TENDER, PURCHASE OR PROCUREMENT *DOCUMENTS* *documents* prepared for any procurement process related to engineering and/or geoscience works including any addenda incorporated in *documents* during bidding process	No, if the Tender, Purchase or Procurement *documents* are being issued to bidders as information only and the bidders understand that they cannot rely on their completeness or accuracy (e.g., for budget pricing based on general works and degree of complexity).	Yes, *seal* as per Originally issued ***document*** and mark accordingly (e.g. **FOR TENDER ONLY, NOT FOR CONSTRUCTION, NOT FOR IMPLEMENTATION)**	Yes, *seal* as per Originally issued ***document*** and mark accordingly (e.g. **FOR TENDER ONLY, NOT FOR CONSTRUCTION, NOT FOR IMPLEMENTATION)**	Yes, *seal* as per Originally issued ***document*** and mark accordingly (**FOR TENDER ONLY, NOT FOR CONSTRUCTION, NOT FOR IMPLEMENTATION)**	Yes

[2] For discussion or review purposes only as the validity of the contents are not intended or ready to be relied on by others. Refer to Internal *Documents* and Preliminary *Documents* in Sections 3.2.2 and 3.2.3 of this QM Guideline.
[3] Refer to Internal *Documents* and Preliminary *Documents* in Sections 3.2.2 and 3.2.3 of this QM Guideline.
[4] Refer to Preliminary *Documents* in Section 3.2.3 of this QM Guideline.

FIGURE 1: WHEN TO APPLY *SEALS*					
		EXTERNALLY ISSUED OR FORMALLY PREPARED AND DELIVERED INTERNAL *DOCUMENTS* Delivered to external users such as clients, contractors, government ministries, authorities having jurisdiction Delivered to internal users within the *organization* such as other departments, branches, offices or divisions for external or formal internal use[3]			
		Single discipline – single *APEGBC professional of record*	**Single discipline – multiple *APEGBC professional of record***	**Multiple disciplines**	
STANDARD DRAWING[5]	No	Yes	Yes[5], each professional to seal and qualify area of responsibility	Yes[5], each professional to seal and qualify area/discipline of responsibility	Yes
SPECIFICATIONS	No	Yes	Yes, each professional to seal and qualify area of responsibility	Yes, each professional to seal and qualify area of responsibility	Yes
ISSUED FOR PERMITTING *documents* prepared and deemed ready for permit purposes	No	Yes, *seal* as per Originally issued ***document*** and mark accordingly **ISSUED FOR PERMIT PURPOSES ONLY**	Yes, *seal* as per Originally issued ***document*** and mark accordingly **ISSUED FOR PERMIT PURPOSES ONLY**	Yes, *seal* as per Originally issued ***document*** and mark accordingly **ISSUED FOR PERMIT PURPOSES ONLY**	Yes
DESIGN BUILD	No, if the *documents* are being used for internal purposes in preparation of the bid package	Yes, *seal* as per guidance in Section **3.2.11**	Yes, *seal* as per guidance in Section **3.2.11**	Yes, *seal* as per guidance in Section **3.2.11**	Yes
ISSUED FOR CONSTRUCTION, IMPLEMENTATION OF USE *DOCUMENTS* *documents* prepared and deemed ready for construction, implementation of use including reissued Bid *Documents* where no changes were made during bidding	NA	Yes, *seal* as per Originally issued ***document*** and mark accordingly **ISSUED FOR CONSTRUCTION, IMPLEMENTATION OR USE** If reissuing bid *documents*, see Reissued *documents*	Yes, *seal* as per Originally issued ***document*** and mark accordingly **ISSUED FOR CONSTRUCTION, IMPLEMENTATION OR USE** If reissuing bid *documents*, see Reissued *documents*	Yes, *seal* as per Originally issued ***document*** and mark accordingly **ISSUED FOR CONSTRUCTION, IMPLEMENTATION OR USE** If reissuing bid *documents*, see Reissued *documents*	Yes

[5] Refer to Standard Drawing in Section 3.2.8 of this QM Guideline.

A professional who subsequently uses an unauthenticated standard document must determining that it is suitable for the current purpose and authenticate.

FIGURE 1: WHEN TO APPLY *SEALS*					
		EXTERNALLY ISSUED OR FORMALLY PREPARED AND DELIVERED INTERNAL *DOCUMENTS* Delivered to external users such as clients, contractors, government ministries, authorities having jurisdiction Delivered to internal users within the *organization* such as other departments, branches, offices or divisions for external or formal internal use[3]			
		Single discipline – single *APEGBC professional of record*	**Single discipline – multiple *APEGBC professional of record***	**Multiple disciplines**	
REVISED *DOCUMENT*[6] *document* changed from a master *document*, or an earlier revised *document*—by different *APEGBC professional*	No	Yes, clearly identify revisions; *APEGBC professional* revising *document* must *seal*, sign and date revisions with date revised	Yes, clearly identify revisions; *APEGBC professionals* revising *document* must *seal*, sign and date revisions with date revised	Yes, clearly identify revisions; original *APEGBC professional* must re-date and initial original *seal* with date revised	Yes
FINAL DESIGN DRAWINGS *document* that includes all design changes made by change order during construction, or by addenda during bidding and not previously incorporated in *documents*	N/A	Yes, *seal* as per Originally issued ***document***	Yes, *seal* as per Originally issued ***document***	Yes, *seal* as per Originally issued ***document***	Yes
RECORD DRAWINGS[7] *document* that includes as-constructed or as-implemented information	N/A	No, unless required to do so. If required, *seal* as per **Originally Issued *Document*** and, if *document* includes as-constructed information supplied by others, add declaration not accepting responsibility for that information (see clause 3.2.14.9).	No, unless required to do so. If required, *seal* as per **Originally Issued *Document*** and, if *document* includes as-constructed information supplied by others, add declaration not accepting responsibility for that information (see clause 3.2.14.9).	No, unless required to do so. If required, *seal* as per **Originally Issued *Document*** and, if *document* includes as-constructed information supplied by others, add declaration not accepting responsibility for that information (see clause 3.2.14.9).	Yes

[6] Refer to Section 3.4 of this QM Guideline for further information regarding a different *APEGBC professional of record sealing* revised *documents*.
[7] Refer to Section 3.2.14 in this QM Guideline for further information regarding *sealing* record drawings.

Figure 1: When to apply *seals*					
		Externally issued or formally prepared and delivered internal *documents* Delivered to external users such as clients, contractors, government ministries, authorities having jurisdiction Delivered to internal users within the *organization* such as other departments, branches, offices or divisions for external or formal internal use[3]			
		Single discipline – single *APEGBC professional of record*	**Single discipline – multiple *APEGBC professional of record***	**Multiple disciplines**	
Field *Documents*[8] professional *documents* prepared and issued in the field that contain opinions or decisions that change the Issued for Construction *documents*	NA	*Seal* in the field or follow up by preparing in office, *sealing* as per Originally issued ***document*** and retaining in files. This QM Guideline does not require that *Sealed* copy be sent to field recipient.	*Seal* in the field or follow up by preparing in office, *sealing* as per Originally issued ***document*** and retaining in files. This QM Guideline does not require that *Sealed* copy be sent to field recipient.	*Seal* in the field or follow up by preparing in office, *sealing* as per Originally issued ***document*** and retaining in files. This QM Guideline does not require that *Sealed* copy be sent to field recipient.	Yes
Shop Drawings *documents* prepared and designed by an *APEGBC professional* for a fabricator, supplier, equipment manufacturer, installer or erector	No	Yes, *seal* as per Originally issued ***document*** (see *APEGBC Professional Practice Guidelines - Shop Drawings*)	Yes, *seal* as per Originally issued ***document*** (see *APEGBC Professional Practice Guidelines - Shop Drawings*)	Yes, *seal* as per Originally issued ***document*** (see *APEGBC Professional Practice Guidelines - Shop Drawings*)	Yes
Reports prepared by an APEGBC Professional	No	Yes, next to the title of the author or signature in the report whether at the beginning or end of the report	Yes, next to the title of the author or signature in the report whether at the beginning or end of the report	Yes, next to the title of the author or signature in the report whether at the beginning or end of the report	Yes
Drawings, Maps or Plans Bound into Another Bound *Document* bound booklets containing reports, drawings, plans, maps	No	No, provided the bound *document* is *sealed*	No, provided the bound *document* is *sealed*	No, provided the bound *document* is *sealed*	Yes
***Documents* Submitted in Response to Demand-Side Legislation**	NA	Yes, *seal* as per Originally issued ***document***	Yes, *seal* as per Originally issued ***document***	Yes, *seal* as per Originally issued ***document***	Yes

[8] Refer to Section 3.2.10 of this QM Guideline for further information regarding *sealing* field *documents*.

FIGURE 1: WHEN TO APPLY *SEALS*					
		EXTERNALLY ISSUED OR FORMALLY PREPARED AND DELIVERED INTERNAL *DOCUMENTS* Delivered to external users such as clients, contractors, government ministries, authorities having jurisdiction Delivered to internal users within the *organization* such as other departments, branches, offices or divisions for external or formal internal use[3]			
		Single discipline – single *APEGBC professional of record*	**Single discipline – multiple *APEGBC professional of record***	**Multiple disciplines**	
(e.g. the Occupational Health and Safety Regulations, BC Building Code or *BC Safety Authority Act*)					
ELECTRONIC *DOCUMENT* *documents* in digital format containing engineering or geoscience information	No	Yes, *seal* as per Originally issued ***document*** using *electronic seal* with *digital certificate* technology that meets *APEGBC* best practices, or print to hard copy, *seal*, sign, date and retain in files	Yes, *seal* as per Originally issued ***document*** using *electronic seal* with *digital certificate* technology that meets *APEGBC* best practices, or print to hard copy, *seal*, sign, date and retain in files	Yes, *seal* as per Originally issued ***document*** using *electronic seal* with *digital certificate* technology that meets *APEGBC* best practices, or print to hard copy, *seal*, sign, date and retain in files	Yes
***DOCUMENTS* FOR NON-BC WORK** engineering or geoscience projects geographically located outside of BC	No	*Seal* only if a member or licensee in the respective jurisdiction where the works or projects are located. Where there is no licensure requirement *seal* as an *APEGBC Professional*	*Seal* only if a member or licensee in the respective jurisdiction where the works or projects are located. Where there is no licensure requirement *seal* as an *APEGBC Professional*	*Seal* only if a member or licensee in the respective jurisdiction where the works or projects are located. Where there is no licensure requirement *seal* as an *APEGBC professional*	Yes
***DOCUMENT* PREPARED BY A NON-BC PROFESSIONAL** *document* prepared by an engineering/geoscience professional in another jurisdiction who is not licensed to practice in BC	No	*Seal* as per Originally issued ***document*** only after sufficient review of the project/works and *document* to assume full responsibility for both	*Seal* as per Originally issued ***document*** only after sufficient review of the project/works and *document* to assume full responsibility for both	*Seal* as per Originally issued ***document*** only after sufficient review of the project/works and *document* to assume full responsibility for the both	Yes, if *seal*ed

Figure 1: When to apply *seals*					
		Externally issued or formally prepared and delivered internal *documents* Delivered to external users such as clients, contractors, government ministries, authorities having jurisdiction Delivered to internal users within the *organization* such as other departments, branches, offices or divisions for external or formal internal use[3]			
		Single discipline – single *APEGBC professional of record*	**Single discipline – multiple *APEGBC professional of record***	**Multiple disciplines**	
Document* Not Prepared Under *Direct Supervision *document* prepared by someone not under the *direct supervision* of the *APEGBC professional*	No	*Seal* as per Originally issued ***document*** only after sufficient review of project/works and *document* to assume full responsibility for the *document* including altering or revising the *document*	*Seal* as per Originally issued ***document*** only after sufficient review of project/works and *document* to assume full responsibility for the *document* including altering or revising the *document*	*Seal* as per Originally issued ***document*** only after sufficient review of project/works and *document* to assume full responsibility for the *document* which includes the ability to alter and revise the *document*	Yes, if *seal*ed
Translated *Documents*[9] *document* containing same information in more than one language	No	*Seal* as per Originally issued ***document*** *Seal* translated *documents* only if fluent in language to which *document* translated	*Seal* as per Originally issued ***document*** *Seal* translated *documents* only if fluent in language to which *document* translated	*Seal* as per Originally issued ***document*** *Seal* translated *documents* only if fluent in language to which *document* translated	Yes, if *seal*ed
***Documents* in Multiple Languages[10]**	No	*Seal* in multiple languages only if fluent in those languages	*Seal* in multiple languages only if fluent in those languages	*Seal* in multiple languages only if fluent in those languages	Yes, if *seal*ed

[9] Refer to Section 3.4.6 of this QM Guideline for further information about *sealing* translated *documents*.
[10] Refer to Section 3.4.6 of this QM Guideline for further information about *sealing documents* in multiple languages.

4.0 REFERENCES AND RELATED *DOCUMENTS*

APEGBC Professional Practice Guidelines - Shop Drawings

APEGBC Quality Management Guidelines - Direct Supervision

APEGA Practice Standard for Authenticating Professional Documents

Professional Engineers and Geoscientists of BC

Date: May 29, 2017

Report to: **Council for Decision**

From: Governance Committee
Jennifer Cho, CPA, CGA
Director of Finance & Administration

Subject: Volunteer Guidelines Policy

Linkage to Strategic Plan: Effective governance and resources that enable and guide APEGBC's operations.

Purpose:	For Council to review and approve the Volunteer Guidelines Policy.
Motion:	That Council approve the Volunteer Guidelines Policy as presented.

Background

As part of the volunteer orientation program that is in development, guidelines for volunteers have been created. This document provides volunteers with information on policies and procedures that influence their involvement with APEGBC. At the June 17, 2016 meeting, Council approved the Volunteer Guidelines (Appendix A), subject to legal and editorial review. Both legal and editorial reviews have since been completed.

Discussion

The creation of the Volunteer Guidelines and requiring volunteers to agree to abide by them helps to better support APEGBC operations and is good governance, as well as aides to limit our legal liability with respect to some of the sections in the document. It also provides volunteers with resources to support them in their involvement with APEGBC.

The Volunteer Guidelines will be made available online and be accessible to all volunteers. All current volunteers would be requested electronically confirm that they have read, understand and agree to abide by the Volunteer Guidelines. Going forward, this process will be part of the orientation for new volunteers.

As part of the legal review of the Volunteer Guidelines, it was confirmed that every organization by law must have a respectful workplace policy that addresses bullying, harassment and violence. These policies apply to everyone, including volunteers, and as such, evidence confirming that all volunteers have been made aware of these required policies is required.

Several other key policies within the document (confidentiality, ownership of copyright, conflict of interest, etc.) have no legal requirement to exist but may be of particular value to the organization not only for improved functional clarity but also to generally limit our liability. Similarly, if the organization wants to terminate a volunteer relationship based on a breach of policy, having the Volunteer Guidelines agreed to by the volunteer in question will assist in confirming the related breach.

Recommendation(s)

The Governance Committee at their February 2017 meeting reviewed the Volunteer Guidelines Policy. In consideration of both the legal requirements and the general benefits to the organization of having volunteers agree to abide by the Volunteer Guidelines, the Governance Committee recommends that the attached policy (Appendix B) be approved. The policy **requires** all volunteers to electronically confirm that they have read, understand and agree to abide by the Volunteer Guidelines. Without this confirmation, individuals would not be permitted to function in the capacity of Volunteer with APEGBC.

Attachment A – Volunteer Guidelines

Attachment B – Volunteer Guidelines Policy

Volunteer Guidelines

Welcome to Our Team

On behalf of APEGBC's Council and staff, it is my privilege to express our deep appreciation for the volunteers that commit their time and expertise to our association and the professions of engineering and geoscience. APEGBC's accomplishments are due in large part to the engaged participation of volunteers like you.

We want to ensure that you receive the resources and support necessary for you to achieve success and enjoy your volunteer experience with us. These guidelines outline your role as a volunteer and are intended to support you during your volunteer time with APEGBC. Please take a few minutes to familiarize yourself with the information below. If you have any questions about these guidelines or any of our policies or procedures, please contact APEGBC's Human Resources Manager, Kevin O'Connell, at koconnell@apeg.bc.ca.

After you have read through and reviewed the guidelines, you will be asked to acknowledge that you have read, understand and agree to abide by them by checking a box at the bottom of the page and clicking "Submit".

The knowledge and experience you contribute as a volunteer is essential to enabling APEGBC to support and promote the professions as a trusted partner and progressive regulator. Thank you.

Ann English

Chief Executive Officer & Registrar

Welcome to APEGBC

Dedicated volunteers are at the heart of APEGBC's work as the engineering and geoscience licensing and regulatory authority for BC, and play a part in almost every aspect of the association—from reviewing applications for professional registration to participating on committees that set and uphold practice standards.

OUR MISSION, VISION, & VALUES

Vision

Professional engineers and geoscientists creating a better future for all.

Mission
To support and promote the engineering and geoscience professions as a trusted partner and progressive regulator that serves the public good.

Values
Integrity
Accountability
Innovation

Much of the work our volunteers do links directly to our 3-year Strategic Plan. Learn more about our Strategic Plan here.

GOVERNANCE STRUCTURE

APEGBC's purpose and duties as the provincial licensing and regulatory body for engineering and geoscience in BC are defined by legislation, the *Engineers and Geoscientists Act.* APEGBC is governed by a council of 13 elected members and four government appointees. Council is accountable to the public through the Ministry of Advanced Education and to the members for both the governance and management of the association.

VOLUNTEER COMMITMENT

Volunteering with APEGBC provides ongoing opportunities for:

- Giving back to your profession and industry;
- Meeting new people and building your network;
- Earning professional development credits;
- Learning and developing skills;
- Contributing your ideas; and
- Receiving recognition of your contributions.

In return we ask that you approach your role with enthusiasm, a team mentality, and a genuine interest in giving back. We also ask that you:

- Respect confidentiality;
- Arrive on time for meetings and events;
- Be prepared for meetings and events;
- Encourage a respectful working environment;

- Provide constructive feedback; and
- Be accountable.

We understand our volunteers lead busy lives and we are grateful for the time they dedicate to volunteering with us. As such, we ask that you recognize when you are unable to meet the commitments of the volunteer position and work with the group leader to identify a solution.

APEGBC is committed to ensuring that its operations and business are conducted in an ethical and legal manner. We ask that you support this by familiarizing yourself with, and to adhering to, all policies and procedures during your time as a volunteer with APEGBC.

CONFIDENTIALITY

Some of the information accessed by volunteers during their activities with APEGBC is confidential. A volunteer must maintain the confidentiality of all confidential information to which they are privy, unless otherwise permitted or required by APEGBC.

If you are unsure whether the information shared is of a confidential nature, please check with your volunteer group's APEGBC staff support person.

Anyone, either during the course of, or subsequent to, becoming a volunteer of APEGBC, must not:

1. Divulge any confidential information communicated to, produced, or acquired as a result of his or her participation in activities with APEGBC;
2. Divulge any confidential information acquired in the performance of APEGBC related duties and responsibilities to any person or third party not authorized by APEGBC or by law to have such information;
3. Benefit directly or indirectly in consideration for revealing any confidential information; and
4. Use confidential information in any personal undertaking in which he or she may be, or may become, involved.

These terms of confidentiality are of a general nature and apply to all volunteers. Some volunteers working with specific groups may be required to uphold additional confidentiality requirements. Should an additional confidentiality agreement be required, your volunteer group's APEGBC staff support person will discuss this with you.

OWNERSHIP OF COPYRIGHT

Volunteers sometimes assist APEGBC by authoring documents, such as reports or guidelines, or by making contributions to the authorship of such documents. Whenever a written work product or any other type of intellectual property is created for APEGBC in the course of volunteering, the copyright will belong to APEGBC.

CONFLICT OF INTEREST

Volunteers should perform their duties for APEGBC in such a manner that confidence and trust in the integrity, objectivity and the impartiality of the process are observed.

A conflict of interest arises, or may appear to arise, when a volunteer's private or public interest takes precedence over, or competes with the voluntary duties or responsibilities to APEGBC. Conflicts of interests may be real, perceived or potential, and may evolve at any time before, during, or after appointment to, voluntary participation with APEGBC.

The recognition of a real, perceived or potential conflict of interest is a matter of judgment and the primary responsibility for recognizing a conflict of interest rests with each volunteer in the course of his or her participation in activities with APEGBC. If you feel you may be in a real, perceived or potential conflict of interest, discuss this with your volunteer group's APEGBC staff support person. If a conflict arises at any point, the volunteer will be expected to declare and excuse him or herself from the conflicting portion of volunteering activities.

GIFTING, HOSPITALITY AND OTHER BENEFITS

As an APEGBC volunteer you choose to volunteer your time and service to APEGBC and understand that in doing so you are not considered to be employed by APEGBC at any time. You understand that you will not be compensated in any way for the service you provide as an APEGBC volunteer. As a volunteer, you are free to stop volunteering your time and service to APEGBC at any time.

From time to time, a volunteer might receive gifts from APEGBC in recognition for their contributions. These gifts are ethically acceptable for volunteers to receive because they are given as tokens of appreciation, are non-compensatory in nature, and do not hold significant value.

However, there may be other times when a volunteer is presented with gifts from other sources, and these may be inappropriate. Gifts, hospitality, or other benefits should not be given by, or received by, any volunteer in the course of his or her participation in activities with APEGBC, if that gift, hospitality, or other benefit could – or be perceived to – influence the volunteer’s judgement or performance of their duties and responsibilities with APEGBC, or be viewed as compensation. Giving or receiving an inappropriate gift can easily create a conflict of interest or the appearance of one – for instance, a volunteer might be swayed to act more favorably than he or she otherwise would towards a person who has given them a gift. If there is any doubt as to the perceived effect of the gift, hospitality, or other benefit, please bring it to the attention of your volunteer group's APEGBC staff support person.

ALCOHOL AND DRUGS

As a volunteer of APEGBC, you may be invited to attend social events or other functions where alcohol may be served. If you (including guests) choose to enjoy an alcoholic beverage, it is expected that you will drink responsibly and will not put yourself or others at risk of injury, or drink and drive.

We expect that you will represent the association in a professional manner. When at an APEGBC function, please ensure the following:

- If you consume alcohol, do so responsibly.
- You will not operate or have care and control of a motor vehicle while under the influence of alcohol.
- You ensure your safety and the safety of others by having a designated driver or alternate method of transportation home.
- You will be free from the effect of any illegal drugs.

EXPENSE REIMBURSEMENT

APEGBC will reimburse preauthorized travel expenses. Please contact your APEGBC staff support person to confirm what expenses you are eligible for and to receive a reimbursement form.

Receipts must be submitted together with the expense reimbursement form before the end of the fiscal year in which the expenses occurred. APEGBC's fiscal year runs from July 1–June 30.

POLITICAL ACTIVITIES

<u>Non-Partisan Stance</u> In circumstances where APEGBC or any volunteers participate in the public policy arena **on behalf of APEGBC**, this participation shall be of a non-partisan nature. These occurrences can include: direct relations with the government, engagement in lobbying activities or attendance at political campaigns, conferences or events. APEGBC volunteers will be expected to participate with all political parties, with no preference or undue advantage being extended to any one political party, political figure or political ideology over another.

<u>Activities in Personal Capacity</u> Members and volunteers must receive authority from APEGBC before identifying they are representing the interests of APEGBC. Under any circumstances where a volunteer is acting in a personal capacity, he or she must exercise scrupulous judgment to avoid the appearance of representing the interests of APEGBC.

BULLYING, HARASSMENT AND VIOLENCE

APEGBC is committed to providing a positive environment in which all individuals are treated, and treat each other, with respect and dignity. We expect all employees and volunteers to support and contribute to a positive and respectful environment. As an APEGBC volunteer, supporting a respectful environment includes ensuring respectful behaviour during volunteer activities related to your role, as well as while traveling, at conferences, training sessions and seminars you attend. It also includes volunteer-related phone calls, emails, text messages and other communications, during volunteer-related social events sponsored or supported by APEGBC and elsewhere if you are there as a result of your responsibilities to APEGBC.

Bullying or harassing behaviour includes any conduct or comment (whether verbal or written) by a person towards another that is inappropriate, vexatious, or offensive and that was known or reasonably ought to have been known by the alleged bully or harasser to be humiliating, insulting, threatening, or intimidating. This behaviour includes inappropriate or offensive conduct, or comments that are based on a protected ground of discrimination as defined in the *Human Rights Code* and will not be tolerated by APEGBC.

The offender could be another volunteer or someone other than a volunteer, but with whom the volunteer is required to be in contact as part of their volunteer work for APEGBC.

Although bullying and harassment is generally considered in terms of a pattern of ongoing behaviour, it may include behaviour that occurs on a one-time basis.

Examples of behaviour that may constitute bullying or harassment include but are not limited to:

- Jokes or gestures that are abusive or degrading;
- Personal ridicule and malicious gossip;
- Abuse of authority to intimidate or coerce, improperly control, or influence someone;
- Racial epithets or slurs;
- Taunting or ostracism;
- Displaying derogatory, humiliating, or offensive objects, cartoons, drawings, or photos; and
- Sexual harassment, which is defined as one or more incidents involving unwelcome conduct of a sexual nature.

Accusations of bullying and harassment are serious and are reserved for serious behaviours. Not all interpersonal conflict, differences of opinion, or disputes that are rude or thoughtless will constitute bullying or harassing behaviour unless the behaviour was also inappropriate.

Should a volunteer ever encounter a violent situation, he or she should never attempt to intervene directly in a physically dangerous or violent situation; however such situations should be reported immediately to APEGBC and the proper authorities. Volunteers must advise of any and all incidents of bullying, harassment and/or violence at APEGBC or at APEGBC-sponsored meetings or events of which they have knowledge, are witness to, or in which they are involved. Incidents should be reported to APEGBC's Human Resources Manager.

BREACHES OF CONFIDENTIALITY, CONFLICTS OF INTEREST OR INCIDENTS OF BULLYING, HARASSMENT OR VIOLENCE

APEGBC is committed to ensuring that its operations and business are conducted in a fair, ethical and legal manner and that volunteers support and contribute to a positive and respectful work environment. In the event that APEGBC becomes aware of an alleged breach of confidentiality, conflict of interest or an incident of bullying, harassment or violence, the Registrar will conduct an independent investigation in a suitable manner as is required in the circumstance, respecting principles of procedural fairness. For APEGBC members, this process may initiate a formal investigation under the *Engineers and Geoscientists Act*.

Complaints may be referred directly to the Registrar at registrar@apeg.bc.ca or your volunteer group's APEGBC staff support person.

CRIMINAL RECORD CHECK

For specific circumstances, volunteers may be required to undergo a criminal record check. Your volunteer group's APEGBC staff support person will advise if this applies to you.

SOCIAL MEDIA

APEGBC uses social media to enhance member engagement and communication with members, stakeholders and the public, and to promote the professions of engineering and geoscience. We encourage volunteers to actively engage in online discussions and dialogue through social media channels. APEGBC has corporate accounts on the following social media platforms:

Twitter - Follow us @APEGBC

LinkedIn - Join the APEGBC Discussion Group

YouTube - View and share APEGBC videos promoting engineering and geoscience

Facebook - [Like the APEGBC Student Program page]

In posting material relating to APEGBC on personal social media accounts (such as Twitter, LinkedIn, Facebook, Instagram or YouTube) either directly through a mention of APEGBC, using relevant hashtags, or indirectly, we ask that you adhere to the following principles:

- Respect APEGBC, its members and staff**:** Social media sites are public spaces and we expect you to be respectful of the association, staff, volunteers and members.
- Use common sense**:** Think before you post. Social media accounts are accessible to the public and what you post could have significant consequences. If you would not be comfortable with your supervisor, co-workers, or APEGBC staff reading your words, do not write them.

In posting material relating to APEGBC on personal social media accounts either directly through a mention of APEGBC, using relevant hashtags, or indirectly, you agree not to:

- Post material that is profane, obscene, offensive, libelous, defamatory, threatening, harassing, abusive, inappropriate, inflammatory or otherwise objectionable towards any individual or entity.
- Post material that infringes on the rights of APEGBC or any individual or entity, including privacy, intellectual property or publication rights.
- Disclose any information that is confidential or proprietary to APEGBC or any third party that has disclosed information to APEGBC.

To maintain consistency in our brand and communications, APEGBC's corporate social media accounts are managed by the association's Communications Department. Our online dialogue thrives when volunteers participate in the conversation. Although you may have your own personal social media accounts, volunteers must not create an APEGBC branded account.

APEGBC reserves the right to ask volunteers to remove or edit posts on social media sites at any time should they violate the principles noted in this policy.

If you have questions or would like more information on appropriate use of social media, email APEGBC's Acting Manager, Communications, Laurel Buss, at lbuss@apeg.bc.ca.

INTERACTION WITH THE MEDIA

The objectives of APEGBC's media relations efforts are to create positive public awareness about the professions of engineering and geoscience, and to increase awareness of APEGBC and its duty of ensuring public safety through the work of the association and its members.

In general, when responding to inquiries from the media, only designated spokespeople are permitted to speak on behalf of APEGBC. If you are contacted by a journalist to offer comments on behalf of APEGBC, please refer them directly to the Acting Director, Communications & Stakeholder Engagement, Melinda Lau, at mlau@apeg.bc.ca.

In certain circumstances, the CEO or President will appoint subject-matter experts for technical issues, and volunteers who participate on committees may be called on to speak to media by APEGBC media relations staff. If contact is initiated directly by journalists however, volunteers should first contact APEGBC.

Volunteers involved in organizing local events on behalf of APEGBC branches may sometimes be approached by journalists regarding these activities. Before speaking to journalists, volunteers are asked to seek advice from APEGBC media relations staff who can help with effectively engaging media, or if this is not feasible, to inform staff after the interaction has taken place.

PHOTOS AND VIDEOS

At times, APEGBC may be photographing or videotaping events, sessions, workshops, or even meetings where you might be volunteering and your likeness may be used to promote APEGBC. If you do not wish to participate, please advise your volunteer group's APEGBC staff support person.

POLICY REVISIONS

APEGBC reserves the right to amend these policies and guidelines from time-to-time in our judgment to address issues that may arise and changes in our operations or the law.

ADDITIONAL INFORMATION

If you have any questions regarding your role as a volunteer or APEGBC, please feel free to connect with your volunteer group's APEGBC staff support person.

Volunteer Guidelines Policy

1. Volunteer Guidelines Purpose

The Volunteer Guidelines help to support APEGBC operations and in good governance, provide volunteers with resources to support them in their involvement with APEGBC and educate and inform volunteers of important policies and procedures that are applicable to them.

2. Volunteer Guidelines Access & Distribution

2.1 The Volunteer Guidelines are available online through the APEGBC website and are accessible to all members who have logged in via their UserID and Password. Non-members interested in becoming volunteers will be given special access to the website so that they can access the Volunteer Guidelines, as required.

2.2 Communications directing volunteers and prospective volunteers to the Volunteer Guidelines will occur proactively by Human Resources with any required follow up being communicated by the Support Staff that liaises with them in relation to their function as a volunteer. This ensures that all existing and prospective volunteers are given the opportunity to review the Volunteer Guidelines, ask questions regarding the document's content and confirm their understanding of and their agreement to abide by it.

3. Volunteer Guidelines Acknowledgement

3.1 The Volunteer Guidelines contain sections that APEGBC is legally required to have all volunteers agree to abide by. These sections include Bullying, Harassment and Violence. Other sections also assist in limiting APEGBC's general liability. For these reasons, this policy requires all volunteers to confirm their understanding of and their agreement to abide by the Volunteer Guidelines.

3.2 Upon completing their review of the Volunteer Guidelines online, all existing volunteers and prospective volunteers are required to confirm electronically, where indicated on the document, that they have read, understand and agree to abide by the Volunteer Guidelines. All confirmations are tracked by Human Resources through Qlickview and are based on the login used.

3.3 Existing volunteers that have not confirmed electronically that they have read, understand and agree to abide by the Volunteer Guidelines within 30 days of the initial release of the document will no longer be permitted to function in the capacity of Volunteer with APEGBC.

3.4 New volunteers will only be able to function in the capacity of Volunteer with APEGBC once they have provided the electronic confirmation that they have read, understand and agree to abide by the Volunteer Guidelines.

Policy CG-6 Code of Conduct for Council Members

N.B. The APEGBC Procedure "Implementation of Council's Code of Conduct" does not form part of Policy CG-6, but is appended for information. It describes the procedure arising from an alleged breach of the Code of Conduct.

Preamble

The following Code of Conduct shall bind Council members, including elected, appointed and ex-officio members. All Council members will be expected to sign a copy of the Oath or Affirmation of Office, also set out in this policy, at the beginning of their term.

Code of Conduct

1. **Professional Behaviour**. Council members are expected to behave in an ethical, businesslike and lawful manner. They should conduct themselves honestly and ethically, and in a manner that maintains and enhances the public's trust in the engineering and geoscience professions. Council members shall act impartially and with integrity, and shall exercise the degree of care, diligence, and skill that a reasonably prudent person would exercise in comparable circumstances. Council members should always observe proper decorum and should treat one another and staff with respect and courtesy.

2. **Council Decisions**. Council members should discuss all issues freely and openly at Council meetings, presenting both supporting and contrary points of view, regardless of their memberships in any committees reporting on the issues. They should vote in the public interest in the practice of the professions, and – unless there is a conflict with the public interest – in the best interests of the membership as a whole. They are expected to accept and respect Council decisions. Unless specifically delegated to do so, they are not authorized to speak on behalf of Council regarding its decisions.

3. **Conflict of Interest**

3.1 Council members must avoid conflicts of interest, and must disclose any real, perceived or potential conflict of interest. If in doubt, they should disclose to the President or the CEO potential or perceived conflicts, so as to discuss and agree upon the appropriate action. Should a Council member be under consideration for employment with APEGBC, or should a Council member seek to, or participate in a proposal to, engage in any private business or personal services with APEGBC, she/he must withdraw from Council deliberations, voting, and access to information, so as to assure procedurally-controlled access to information and competitive opportunity. For clarity, members of Council are not in a conflict of interest once the provision of their services to APEGBC has been procured following APEGBC's procurement policy and practices that offer a fair competitive opportunity for all qualified service providers.

3.2 A Council member who has been served with a *Notice of Inquiry* by APEGBC on matters that are relevant to the work of Council or a committee, should immediately cease participating in the related work of the Council or committee until the complaint is resolved.

3.3 When Council must decide upon an issue about which a Council member has an unavoidable conflict, that member shall declare the conflict, and absent himself/herself without further comment from the deliberation and vote.

4. **Discipline Hearing**. A Council member who is found guilty in a *Discipline Hearing* is expected to resign from Council.

5. **Confidentiality**. Councillors should not divulge any confidential information unless authorized to do so or required to do so by law. The proceedings of any parts of meetings of Council or a committee that are deemed to be confidential, including in-camera and closed (i.e. in-camera, but attended by the appropriate staff) portions, including the minutes and records, shall be kept in confidence by all attendees.

6. **Individual Authority**. Council members may not attempt to exercise individual authority over APEGBC except as explicitly set forth in Council policies. Unless specifically delegated to do so, Council members do not have authority to direct the CEO & Registrar or staff or other members of Council; and they have no authority to speak on behalf of Council to the public, media or other entities.

7. **Reporting of Non-Compliance**. A Council member shall report any serious non-compliance of this Code committed by another Council member, when such an offence becomes known to or is reasonably suspected by that Council member. A report must be made to the President unless the non-compliance involves the President, in which case the report must be made to the Vice-President.

   [APEGBC assures every Council member that it will not carry out or, to the fullest extent reasonably within its power, permit any retribution or retaliation of any kind for reports made in good faith regarding known or reasonably suspected instances of non-compliance with this Code.]

Oath or Affirmation of Office

As a member of the Council of the Association of Professional Engineers and Geoscientists of the Province of British Columbia, I declare and affirm that I will carry out my roles and responsibilities to the best of my ability and in the best interest of the public and the engineering and geoscience professions, and that I will adhere to and be bound by the Code of Conduct for Council members.

So help me God [Those persons affirming may omit this phrase].

APEGBC Procedure
Implementation of Council's Code of Conduct

IMPLEMENTATION OF COUNCIL'S CODE OF CONDUCT
(Referred to in Council Governance Policy CG-6)

This Procedure details how allegations of breaches of the Code of Conduct will be addressed and is based on progressive discipline concepts.

1.0 The President and one other person will promptly discuss the offence with the offending Council member. No permanent record will be kept of this discussion.

2.0 Upon receipt of a second allegation of the same offence, the President will assess the allegation. The President may confer with the CEO who may arrange for independent advice, if necessary or requested, on how to address the issue(s) identified in the allegation. At the direction of the President, the report may be investigated internally by staff, by Council or an appropriate Committee, or be referred to another appropriate authority.

3.0 Following the procedure identified in 2.0 above, if warranted, the President will issue a letter to the Council member outlining the circumstances and expected corrective actions.

4.0 Continued offence will result in a motion of censure being brought to an in-camera meeting of the Council. The offending Council member should not be present or vote, since this would represent a conflict of interest. The President conveys the results of the motion to the Councillor. If the motion of censure is carried by a two-thirds majority, the President shall request the Council member to resign from Council. If the member declines to do so, the member shall be removed from all Committee and Task Force memberships, except in cases of ex officio memberships that cannot be removed.

5.0 In the event that the President is alleged to be the offending Council member, the Vice-President will perform the roles of the President as identified above.

Approved by Council:	**September 13, 2013 (CO-13-113)**
Revised and Approved by Council:	**September 12, 2014 (CO-14-76)**

Volunteer Guidelines Policy

1. **Volunteer Guidelines Purpose**
   The Volunteer Guidelines help to support APEGBC operations and in good governance, provide volunteers with resources to support them in their involvement with APEGBC and educate and inform volunteers of important policies and procedures that are applicable to them.

2. **Volunteer Guidelines Access & Distribution**
   2.1 The Volunteer Guidelines are available online through the APEGBC website and are accessible to all members who have logged in via their UserID and Password. Non-members interested in becoming volunteers will be given special access to the website so that they can access the Volunteer Guidelines, as required.
   2.2 Communications directing volunteers and prospective volunteers to the Volunteer Guidelines will occur proactively by Human Resources with any required follow up being communicated by the Support Staff that liaises with them in relation to their function as a volunteer. This ensures that all existing and prospective volunteers are given the opportunity to review the Volunteer Guidelines, ask questions regarding the document's content and confirm their understanding of and their agreement to abide by it.

3. **Volunteer Guidelines Acknowledgement**
   3.1 The Volunteer Guidelines contain sections that APEGBC is legally required to have all volunteers agree to abide by. These sections include Bullying, Harassment and Violence. Other sections also assist in limiting APEGBC's general liability. For these reasons, this policy requires all volunteers to confirm their understanding of and their agreement to abide by the Volunteer Guidelines.
   3.2 Upon completing their review of the Volunteer Guidelines online, all existing volunteers and prospective volunteers are required to confirm electronically, where indicated on the document, that they have read, understand and agree to abide by the Volunteer Guidelines. All confirmations are tracked by Human Resources through Qlickview and are based on the login used.

3.3 Existing volunteers that have not confirmed electronically that they have read, understand and agree to abide by the Volunteer Guidelines within 30 days of the initial release of the document will no longer be permitted to function in the capacity of Volunteer with APEGBC.

3.4 New volunteers will only be able to function in the capacity of Volunteer with APEGBC once they have provided the electronic confirmation that they have read, understand and agree to abide by the Volunteer Guidelines.

3.5 Sections 3.3 and 3.4 do not apply to elected and currently sitting members of Council.

3.6 In the event that a Council member is alleged to have breached the provisions of the Voluntary Guidelines, the matter will be referred to the President for investigation and appropriate action unless the non-compliance involves the President, in which case the report must be made to the Vice-President. The actions to be taken by the President or Vice-President, as appropriate, will be in accordance with the procedures set out in the “Implementation of Council’s Code of Conduct” as appended to Council Governance Policy CG-6 Code of Conduct for Council Members.

Interim Treatment of Prospective Life Members or Licensees

BACKGROUND

Following the decision of Council to discontinue exercising its discretion to grant Life Membership and to directly contact members potentially affected by this change to explain Council's actions in this regard, staff identified 1,319 members who would otherwise have been sent an invitation to apply for Life Membership in 2018. The selection of members was based on the eligibility criteria:

- age 70 or older in 2018; and
- At least 20 years of membership with Engineers and Geoscientists BC. (The bylaw requires35 years practising professional engineering or professional geoscience, including at least 20 years of membership with APEGBC).

Communication with Potentially Affected Members – Letter to 1.319 members

A letter from the President was sent to this group of members explaining that:

i. Council has noted that certain elements of the bylaw may contravene the Human Rights Code ('the Code') with respect to potential discrimination based on age and place of origin;

ii. To address this matter immediately, Council has made the decision to stop awarding Life Membership until this issue has been examined in more detail.

iii. We are working diligently to identify an interim solution for those who may be affected in 2017/18

iv. The recipients would be invited to participate in a brief survey on the interim solution;

v. Council will also be reviewing the bylaw that governs this process, as well as related bylaws and may be proposing bylaw revisions in 2018; and

vi. All APEGBC members will be invited to participate in consultation on any proposed new or revised bylaw(s) once that review has been initiated.

To preserve confidentiality, members were not advised that a challenge had been made to the Human Rights Tribunal that the Life Membership bylaw contravenes the Code o by discriminating on the basis of age; and that Council had received legal advice in support of this position.

Communication with Potentially Affected Members – Survey of 1,137 members

On August 12, 2017, a survey was sent to 1,137 members from this cohort, seeking their views on a variety of topics related to Life and Non-Practising membership. Surveys were not sent to members without email addresses, nor to those who had opted out of receiving email communications from the association.

Key issues explored in the survey were:

- Which members in this cohort are practising
- The current employment status of non-practising members
- Reasons for retaining Life Membership
- Aspects of future non-practising membership, such as restricted title and reduced fees.

Members' responses were provided anonymously, with an option to volunteer on a separate sits to for further consultation on this subject.

Survey response rates were strong:

- 455 members or 40% of those surveyed responded
- 213 members provided open comments
- 89 members volunteered to participate in further consultations on this and related topics.

Detailed survey results can be found at is https://www.surveymonkey.net/results/SM-588MG7JZ/. The password is apegbc1.

Survey highlights are:

- 75% of the respondents are still practising engineering; 25% (115) are not; and of these 100 are retired from all gainful employment.
    - with a 40% response rate, these numbers are in line with the typical annual uptake of Life Membership – between 200 and 250 members.
- Potential features of an interim solution that ranked the highest are:
    - No fee or substantially reduced fee (78%)
    - Use of the full professional designation without a non-practising qualifier (79%)
    - Access to member benefits (68%)
    - Voting rights (58%)
- Member opinion on Non-Practising Membership
    - 56% of respondents also said that they would definitely (34%) or probably (22%) not support a restricted designation such as P.Eng. (Non-Practising)
    - 39% thought that a $50 annual fee is appropriate
    - 22% thought that a $100 annual fee would be appropriate
    - Others offered suggestions such as a fee to cover the association is out of pocket costs, or a reduced fee moving to no fee after 35 years of membership.
- In providing overall commentary, members expressed opinions that: :
    - the association should continue with a free age-or service-based Life membership and not yield to political correctness (instances of other age-based free memberships were cited). *As noted above, members were not aware that Human Rights challenge had been made or that the association had received a legal opinion that Life membership based on age or number of years of membership contravenes the Code.*
    - long-serving members should be entitled to free Life Membership
    - Life Membership be an award for long-serving volunteers
    - an interim solution is desirable (some were confused about 'interim membership' while others thought that the association should have figured out the new bylaw before ceasing to award Life Membership.
    - They need membership to keep Life Insurance.

DISCUSSION

Staff have considered several options for the interim solution, based on the principles cited in report 6.7, plus current legislation, legal opinions received regarding the current Life membership and licensure bylaw, survey results, financial analysis of various fee options and the recommended future bylaw solutions. Two options are presented below.

It is recommended that regardless of the option chosen, Council advise the members that there was a challenge to the Life Member bylaw under the Human Rights Code and has determined the bylaw does discriminate on the basis of age. This may form part of the background in the Communications Plan (Appendix E).

Option 1 – Change One Year Fee Deferral to One Year Fee Waiver

- Allow members who can prove financial need to have a one year waiver of fees by changing the fee deferral procedure to a fee waiver procedure; and
- Advise members of human rights challenge to the bylaw.

Potential Effects:

- Strong reaction from members who may have been counting on qualifying for Life Membership in 2018, including demands to reinstate it or provide a close substitute
- Council seen to be taking away a category of membership before consulting the membership
- Council seen to be not listening after consulting with potentially affected members
- Positive reaction from members in need with respect to one year fee waiver vs one year fee renewal
- Fiscally responsible as current uptake for fee deferral is one third to one half the uptake for Life Membership in a given year
- Clarity to members who were unaware of the human rights challenge.

Option 2 –Non-Practising Membership at a Reduced Fee

Offer non-practising membership or licence under Bylaw (c):

- At a reduced fee for all non-practising members; and/or
- At a one-time or permanent fee waiver for those who would have qualified for Life Membership based on years of membership (35 years with the association; or 20 years with the association and 15 elsewhere),subject to receipt of a legal opinion that this does not constitute indirect age discrimination.
- Change the return to practice policy to discourage year to year changes between practising and non-practising membership to 'average down' fees or frequently move in and out of practice without proving competency.
- Advise members of human rights challenge to the bylaw.

Potential Effects:

- Council seen to be listening to the members
- May provide information on potential uptake should Council approve a reduced fee for non-practising members who comply with the proposed non-practising member bylaw
- Fee reduction or waiver based on years of membership may contravene the BC Human Rights Code or other legislation (a legal opinion is pending).
- Will likely result in moderate to significant net downside of revenues, depending on the fee and uptake
- May set expectations for continued reduced fees for non-practising members before sufficient consultation is done

- May encourage significant additional uptake by members who are non-practising and wish to take advantage of a fee reduction
- Increased numbers of acknowledged non-practising members using full title without recognized public differentiation may compromise the public interest
- Clarity to members who were unaware of the human rights challenge.

RECOMMENDATIONS

Option 1

- Allow members who can prove financial need to have a one year waiver of fees by changing the fee deferral procedure to a fee waiver procedure
- Advise members of human rights challenge to the bylaw.

Proposed changes to the Non-Practising Member Bylaw 10(c)

BACKGROUND

The main report shows how the proposed changes to the four bylaws are interlinked.

Discontinuation of Council's discretion dto grant Life Membership has resulted in a renewed review of the effectiveness of Life Membership and Non-Practising Membership Bylaws with respect to their providing tools to assist the association in protecting the public interest.. Together these grades of membership represent 2,658 non-practising members or ten percent of the professionally registered or licensed membership.

There are also 343 Life Members who were granted Life Membership with practice rights prior to 1998. This category includes past presidents from 1997 and prior, plus members who are 89 years of age at a minimum.

DISCUSSION

Despite their declared non-practising status, the majority of the members without practice rights in the Non-Practising Member and Life Member grades of membership are encouraged by the profession to use to use the unrestricted designations of P.Eng., P.Geo., Eng.L. and Geo.L. Several other professions have a reduced-fee grade of membership with a restricted title such as Designation(Retired), for those who are no longer practising the profession.

The loss of practice rights, use of the restricted title and a commitment to the Council not to practise the profession until released by the Council from that commitment, allow these professions to provide clear public recognition of members who are no longer practising. Members in these categories normally pay a fee that reflects their reduced rights as members.

Non-Practising Member Bylaw

The solution proposed is to expand the Non-Practising Member bylaw to:

i. include limited licensees
ii. require a restricted title: e.g. P.Eng.(Non-Practising); deemed revocation of the certificate of registration which grants right to full title
iii. require an annual declaration by the member or limited licensee that they are not practising professional engineering or professional geoscience
iv. maintain the reference to the voting privileges of these members to indicate that their input into association decisions is valued; and
v. clearly set out the requirement to apply for and fulfill the requirements to resume practice rights.

Two complementary actions are recommended to assist in implementing the bylaw and will be addressed during the consultation phase.

i. a restructured annual fee for this grade of membership that recognizes the loss of member rights; and

vi. a revised Return to Practice policy that recognizes that members may leave practice for a short period of time (e.g. for health or family reasons) while remaining competent to practice, but requires proof of competency for members who are out of practice for a cumulative number of years in any one period. The policy should also address those who are in non-practising status past a certain threshold (e.g. 5 years) so that they have to make a full application for assessment of their competence to practice.

Current Bylaw 10(c)	**Proposed bylaw 10(c)**
Non-Practising member 10 (c) Council may grant non-practising membership to a member who is in good standing and who commits in writing to Council not to engage in the practice of professional engineering or professional geoscience until released from the commitment by Council in writing. Members granted non-practising status shall retain voting privileges. Non-practising members who apply for practising status shall be required to pay the applicable fees set by Council and to demonstrate compliance with the current requirements in the Act and bylaws for registration as a member.	**Non-Practising member** 10 (c) Council, in its discretion, may upon application, grant non-practising membership to a member or limited licensee who is in good standing. (c.3) Non-practising members and non-practising limited licensees retain voting privileges. (c.4) A certificate of registration of a non-practicing member or non-practicing limited licensee is deemed to be revoked for the purposes of sections 20(6) and 20(7) of the Act. A non-practicing member or non-practicing limited licensee must use as applicable only the following professional designation(s) a. Professional Engineer (Non-Practising) or P.Eng. (Non-Practising) b. Professional Geoscientist (Non-Practising) or P.Geo. (Non-Practising) c. Limited Licensee (Non-Practising) or Eng.L. (Non-Practising), or d. Limited Licensee (Non-Practising) or Geo.L. (Non-Practising). (c.5) Non-practising members and non-practising limited licensees must annually commit to Council not to engage in the practice of professional engineering or professional geoscience until released from the commitment by Council in writing. (c.6) Non-practising members and non-practising limited licensees who apply for practising status must pay the applicable fees set by Council and demonstrate compliance with the current requirements in the Act and bylaws for registration as a member or limited licensee.

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Proposed changes to the (Prior) Life Membership or Licensure Bylaw 10(c.1)

BACKGROUND

Much of background and discussion in Appendix B for the proposed Non-Practising bylaw wording apply to the proposed wording of the Prior life membership or licensure bylaw.

The qualification language in the current Life Member Bylaw must be repealed as it contravenes the BC Human Rights Code and makes statements about the requirement that the member not have gainful employment of any kind. The employment clause goes beyond the association's mandate as set out in the Engineers and Geoscientists Act.

Similar additions with respect to restricted title, deemed revocation of membership or licence certificate, annual commitment not to practice and return to practice requirements are suggested for the Life Membership and licensure bylaw. Clauses have also been proposed to vest the status and rights of the current Life Members.

Proposed Life Membership or Licensure Bylaw

Prior life membership or licensure

10 (c.1) [Repealed]

~~Council, in its discretion, may upon application, confer life membership or licensure in the association upon any member or limited licensee~~

~~(i) [Repealed.]~~

~~who is at least 70 years of age and has been practising professional engineering or professional geoscience for 35 or more years, with an unblemished record, and~~

~~(ii) [Repealed.]~~

~~who has been a member or limited licensee in good standing of the association for 20 or more years, or in the case of a professional geoscientist, has practised in British Columbia for 20 or more years, and~~

~~(iii) [Repealed.]~~

~~who has retired from all gainful employment, who shall, without further payment of fees, have use of title and voting privileges but no practice rights. Life members whose status had vested in accordance with the bylaws before December 31, 1997 shall retain all their rights and privileges of membership in the association.~~

(c.7) Life members whose status had vested in accordance with the bylaws before December 31, 1997 shall retain all their rights and privileges of membership in the association.

(c.8) Life members or life limited licensees whose status had vested in accordance with the bylaws between January 1, 1998 and June 16, 2017 shall without further payment of annual fees retain voting privileges but continue not to have practise rights.

(c.9) Except for those life members whose status had vested in accordance with the bylaws before December 31, 1997, all life members or life limited licensees must annually commit to Council not to engage in the practice of professional engineering or professional geoscience until released from the commitment by Council in writing.

(c.10) Except for those life members whose status had vested in accordance with the bylaws before December 31, 1997, a certificate of registration of a life member or life limited licensee is deemed to be revoked for the purposes of sections 20(6) and 20(7) of the Act. A life member or life limited licensee must use as applicable only the following professional designation(s)

(i) Professional Engineer (Non-Practising) or P.Eng. (Non-Practising)

(ii) Professional Geoscientist (Non-Practising) or P.Geo. (Non-Practising)

(iii) Limited Licensee (Non-Practising) or Eng.L. (Non-Practising), or

(iv) Limited Licensee (Non-Practising) or Geo.L. (Non-Practising).

(c.11) Life members or life limited licensees who apply for practising status must pay the applicable fees set by Council and to demonstrate compliance with the current requirements in the Act and bylaws for registration as a member or limited licensee.

Proposed changes to the (Prior) Honorary Life Membership or licensure and Honorary Member Bylaws

BACKGROUND

Membership is granted in perpetuity under two other Bylaws:

A. The Honorary Life Membership Bylaw grants practice rights and all other member privileges without payment of annual fees to
   a. The outgoing President; and
   b. Those whom Council has deemed to have made outstanding contributions to professional engineering and professional geoscience.

Since it came into effect in 1998, it has been awarded solely to outgoing Presidents and CEOs.

Not only has this bylaw not been used as extensively as it was intended to recognize members in addition to Presidents and CEOs of the association, but its current wording also precludes Council from awarding this grade of membership to non-practising members.

It also grants practice rights for life, which is not in the best interest of the public.

B. Honorary Membership is currently for non-members who have made outstanding contributions to professional engineering and professional geoscience without payment of annual fees.

DISCUSSION

It is recommended that these two grades of membership be combined to allow Council to confer Honorary Membership on deserving non-members, members and licensees.

Honorary Membership would not by itself confer any other rights of practice, membership or licence. It would be 'layered on top of' the current status of the recipient.

The proposed wording also recognizes that there are circumstances in which Council may wish to revoke Honorary Membership.

The Honorary Life Membership Bylaw would be repealed and the rights of current Honorary Life Members would be vested..

Proposed Bylaw Wording

The proposed wording of the two bylaws is:

<table>
<tr><th>Current Bylaw 10(c.2)</th><th>Proposed bylaw s10(c.2 and c.12)</th></tr>
<tr><td>Honorary life membership or licensure

10 (c.2) Council, in its discretion, may confer honorary life membership or licensure in the association upon any member or limited licensee

(i) who has served as president of the association, or

(ii) who council deems worthy by virtue of outstanding contributions to the professions of engineering or geoscience who shall be entitled to enjoy the rights and privileges of membership or licensure in the association without further payment of fees.</td><td>Prior honorary life membership or licensure

10 (c.2) [Repealed.]

<s>Council, in its discretion, may confer honorary life membership or licensure in the association upon any member or limited licensee</s>

<s>(i) who has served as president of the association, or</s>

<s>(ii) who council deems worthy by virtue of outstanding contributions to the professions of engineering or geoscience who shall be entitled to enjoy the rights and privileges of membership or licensure in the association without further payment of fees.</s>

(c.12) Honorary life members whose status had vested in accordance with the bylaws between January 1, 1998 and December 31, 2018 shall retain all their rights and privileges of membership in the association.</td></tr>
<tr><th>Current Bylaw 10(d)</th><th>Proposed bylaw 10(d)</th></tr>
<tr><td>Honorary membership

10 (d) Council, in its discretion, by unanimous vote, may confer honorary membership in the association, without payment of fees, on non-members who have made outstanding contributions to the professions of engineering or geoscience.</td><td>Honorary membership

10 (d) Council, in its discretion, by unanimous vote, may confer honorary membership in the association, without payment of annual fees, on members, licensees or non-members who have made outstanding contributions to the professions of engineering or geoscience.

(d.1 Honorary membership does not of its own accord confer:

<u>i.</u> membership or licence, or

<u>ii.</u> the right to practise professional engineering or professional geoscience, to vote or to be nominated as a candidate for president, vice president or councilor.

(d.2) The honorary membership status of a member, licensee or non-member continues at the pleasure of Council and may be revoked at Council’s discretion without notice to the honorary member.</td></tr>
</table>

CONSULTATION PLAN: LIFE MEMBERSHIP BYLAWS

ISSUE

This plan addresses consultation with members and stakeholders on a series of amendments to existing bylaws that govern membership categories for non-practising members, life members, and honorary life members.

The amendments address the cessation of granting of Life memberships under bylaw 10(c.1); including proposed modifications to associated bylaws to harmonize grades of membership and enhance public protection. The impacted bylaws are:

- **10(c) Non-Practising member.**
- **10(c.1) Life membership or licensure.**
- **10(c.2) Honorary life membership or licensure.**
- **10(d) Honorary membership.**

OBJECTIVES

1. That members be aware of the proposed changes, and understand the reasoning behind the proposed changes.
2. That members know where and how to participate in consultation, and feel that their input is being heard.

AUDIENCES

1. Members
2. Key membership groups:
    - Current Life Members
    - Those who would soon qualify for Life Membership
    - Current Honorary Members
    - Past Presidents
3. Engineers and Geoscientists BC committees:
    - The Registration Committee
    - The Standing Awards Committee (currently makes recommendations to Council for Honorary Life Membership)
4. Provincial and territorial regulators

STRATEGY

Introducing changes to multiple bylaws (including amendments and repeals) could be confusing to members, and they will be looking to us to explain the complexities in a simple and straightforward manner. Discussing the bylaws and related amendments as a package will likely reduce confusion.

These bylaws are most relevant to more senior members of the association, and members early in their career are likely to be less interested in engaging on these topics. Consultation results are likely to reflect this, and varied methods of providing input should be made available, including focus groups or in-person consultation sessions.

Communication should clarify the reasons for the changes and focus on the ways that the changes align with our responsibilities and our regulatory mandate. Language should be simple and straightforward to provide clarity to this complex subject matter.

TIMELINE/DELIVERY

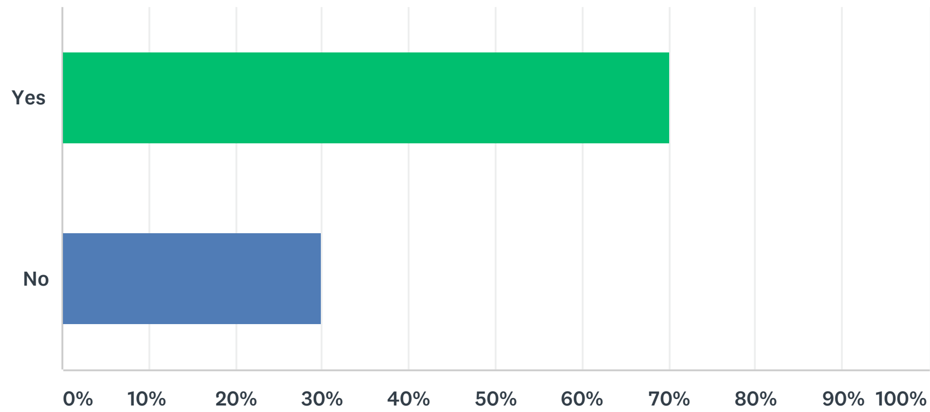
Timeframe	Communication and Consultation	Audience(s)
September/October 2017	• Background information and consultation opportunities communicated to members through ENews and *Innovation* • Dedicated webpage with information on consultation opportunities and a method for providing direct feedback (e.g. feedback form)	Members Key Membership Groups
November 2017	• Membership survey to identify broad issues and input • Follow-up in-person consultation meeting or focus group to provide more detailed input	Members Key Membership Groups
January/February 2018	• Committee consultation to evaluate issues identified by members, and to provide feedback on the draft bylaw amendments • Input invited from other provincial and territorial regulators	Committees Regulators
March – June 2018	• Presentation of consultation results • Recommendation on next steps • Legal review of bylaw	Council
June – September 2018	• Final bylaw and background information presented to members • Member ratification	Members

Q1 Please enter your name.

Answered: 10 Skipped: 0

Q2 Do you believe that the views of Past Presidents are important information for Council to know?

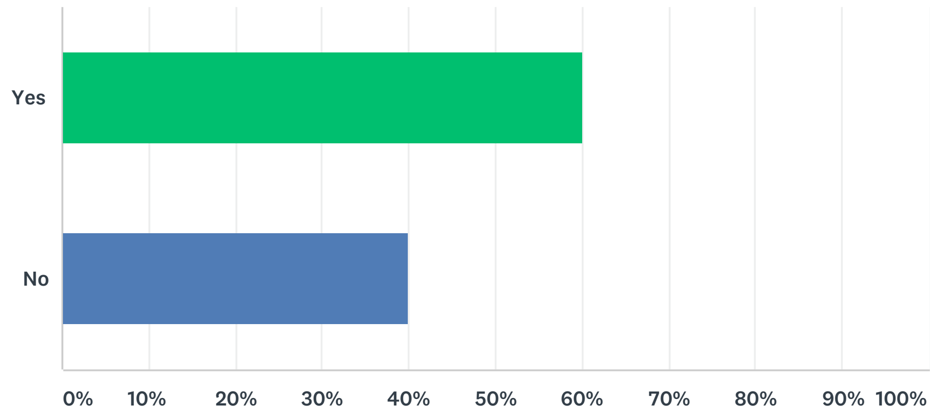
Answered: 10 Skipped: 0



ANSWER CHOICES	RESPONSES	
Yes	70.00%	7
No	30.00%	3
TOTAL		10

Q3 Do you believe that Past Presidents forums are a useful way to engage Past Presidents and gain their insights?

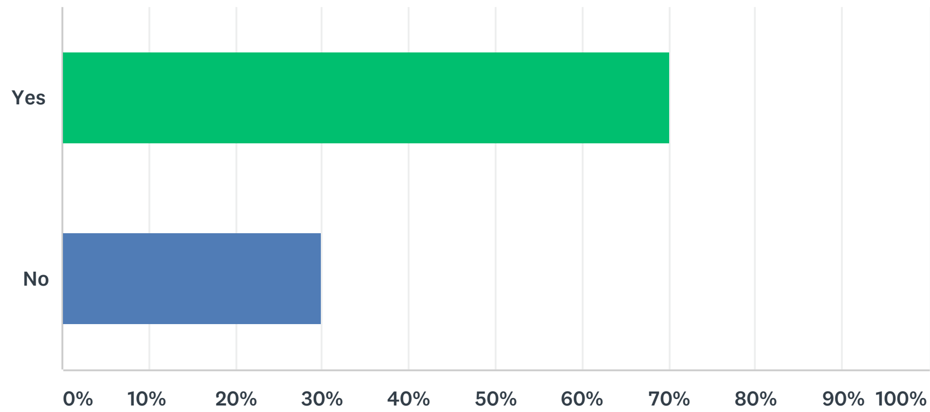
Answered: 10 Skipped: 0



ANSWER CHOICES	RESPONSES	
Yes	60.00%	6
No	40.00%	4
TOTAL		10

Q4 Do you believe that direct engagement with the Past Presidents should be continued?

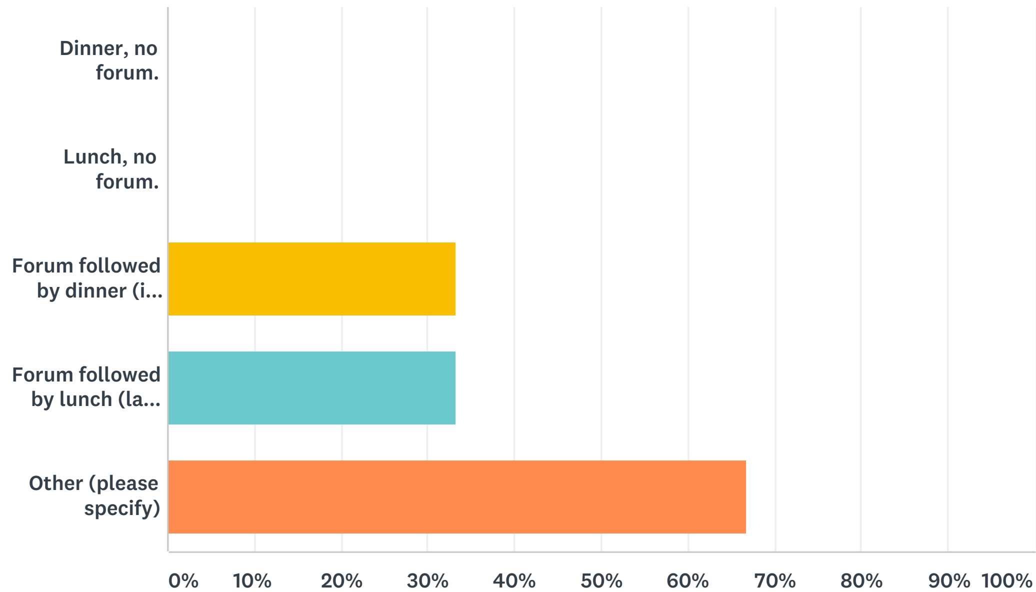
Answered: 10 Skipped: 0



ANSWER CHOICES	RESPONSES	
Yes	70.00%	7
No	30.00%	3
TOTAL		10

Q5 If you believe that direct engagement with the Past Presidents should continue, which of the following formats would be preferable?

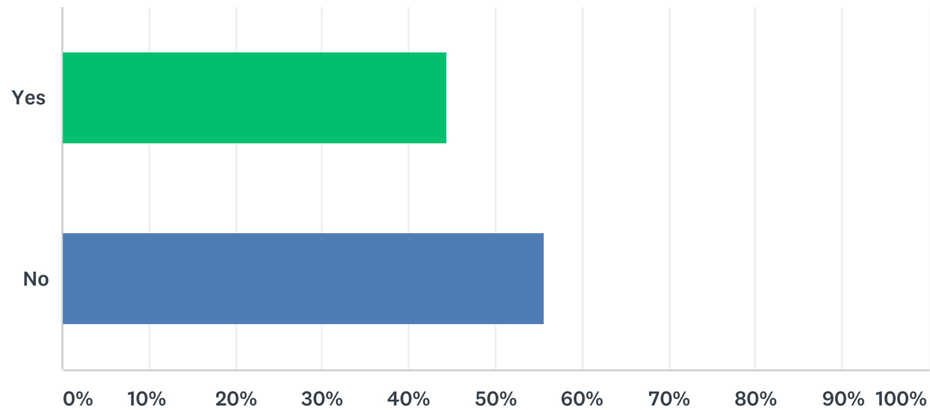
Answered: 6 Skipped: 4



ANSWER CHOICES	RESPONSES	
Dinner, no forum.	0.00%	0
Lunch, no forum.	0.00%	0
Forum followed by dinner (i.e. current format)	33.33%	2
Forum followed by lunch (last year)	33.33%	2
Other (please specify)	66.67%	4
Total Respondents: 6		

Q6 Do you believe we should discontinue scheduled forums and engage on specific issues in workshops as the need arises?

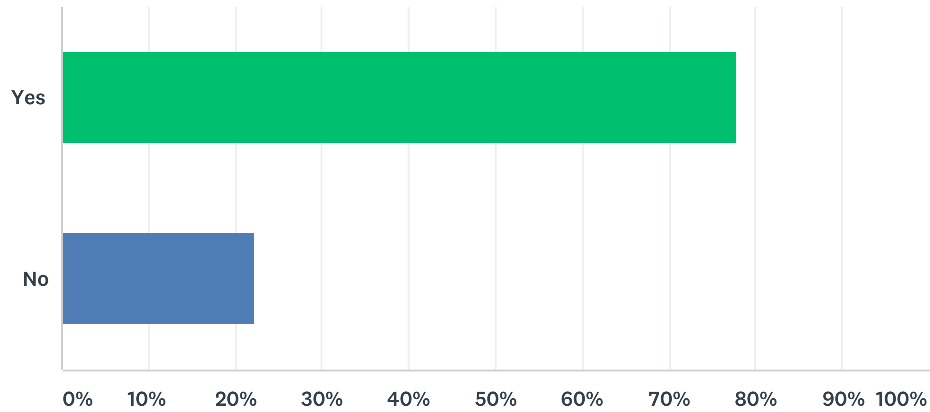
Answered: 9 Skipped: 1



ANSWER CHOICES	RESPONSES	
Yes	44.44%	4
No	55.56%	5
TOTAL		9

Q7 Would you like to discuss this matter at an upcoming Council meeting?

Answered: 9 Skipped: 1



ANSWER CHOICES	RESPONSES	
Yes	77.78%	7
No	22.22%	2
TOTAL		9