IN THIS ISSUE:

The Editor:

Sharon Scott, P.Geo., Eng. L.
Hayes Forest Services Limited
sharon.scott@hayes.bc.ca

The "Editorial"

Sharon Scott, P.Geo., Eng. L.

By the time this edition makes it to our members it will be "SUMMER". Here's hoping we have some sunnier weather! With the flooding that has occurred, along with more expected due to the heavy snow pack, we certainly don't want rain to increase the potential flood levels. The high profile landslide events near Terrace have had a costly impact on the public, infrastructure and the environment. This is an apt reminder that it is critical that we pay attention to the factors contributing to landslide events.

This issue is an important one as we bring you the 2007/2008 call for nominations for the DEGIFS executive. In addition, we have an update on the OH&S regulation changes. Members should all have a look on the APEGBC website for the new Guidelines for Management of Terrain Stability in the Forest Sector dated April 30, 2007. Your feedback is requested on this draft document by July 20, 2007. While at the APEGBC website, check out the DEGIFS field trip on October 24 and the technical sessions for the upcoming APEGBC AGM from October 25-27, 2007.

Thanks to the members who keep on volunteering their time and input to DEGIFS. You keep us running smoothly.

And now something light to start the summer off right!

A man goes into a restaurant, sits down and reads the lunch specials. It says:
Broiled Accountant $7.99 per plate
Toasted Teacher $7.99 per plate
Fried Engineer $9.99 per plate
Grilled Geoscientist $25.99 per plate

The man calls the waiter over and asks "Hey, why does the Grilled Geoscientist cost so much more?"

The waiter says "Are you kidding? Do you know how hard it is to clean one of them!?!"

Please note: DEGIFS Executive does not necessarily support or agree with the opinions and conclusions or for that matter the drollness of the jokes indicated in the editorial.

DIVISION OF ENGINEERS AND GEOSCIENTISTS IN THE FOREST SECTOR

Volume 12, No. 2 **June 2007**

2007/2008 DEGIFS EXECUTIVE
CALL FOR NOMINATIONS

The DEGIFS terms-of-reference (TOR) specify that the DEGIFS executive shall consist of the Past Chair and 7 members elected by the DEGIFS membership. The term of an executive member is two years. Three executive members are replaced each year with a fourth position replaced every second year. The Chair position continues serving a third year as Past Chair on the executive.

Executive members whom were elected last year and are continuing include:

- *Ron Arksey, P.Geo., Eng. L.*
- *Tracey Raume, P.Eng.*
- *Irena Weiland, P.Geo., Eng. L.*

Executive members completing their terms this year are:

- *Norman Deverney, P.Eng.*
- *Julien Henley, P.Eng.*
- *Doug Underhill, P.Eng., R.P.F.*
- *Dave Wilford, P.Geo., R.P.F.*

As out-going chair, Doug Underhill, P.Eng., *R.P.F.,* will continue with the executive for an additional year as Past Chair.

In accordance with the DEGIFS TOR, a Nominating Committee was struck to make nominations for 4 positions on the 2007/2008 DEGIFS Executive. The goal of the nominating committee was to seek nominations for the executive that, when combined with the continuing executive members, is representative of:

- The diverse fields of professional practice within the DEGIFS membership;
- The geographic areas in which the DEGIFS membership practice; and
- Provides government, industry and consultant representation.

The following is the list of the nominees, who have agreed to be nominated for the 2007/2008 DEGIFS Executive:

- ***Jeremy Araki, P. Eng.***
- ***Julien Henley, P.Eng****.(for another term)*
- ***Mike Noseworthy, P.Geo. Eng L.***
- ***Jack Whittles, P. Geo. Eng L.***

Under the TOR, additional nominees can be made, in writing, by a minimum of two DEGIFS members. Such nominations, signed by the members making the nomination and accompanied by written consent of the nominees, must be sent to the DEGIFS Secretary c/o Peter Mitchell, P.Eng., at APEGBC. To be eligible, the nominations must be received no later than 30 days after this publication of the list of candidates nominated by the Nominating Committee. Please note that affiliate members are not eligible to hold executive positions or vote in an election. In accordance with the TOR, if no nominations are received from the membership in accordance with the above criteria, those nominated by the nominating committee will be declared elected by acclamation and no letter ballot will be conducted. In the event that nominations are received from the membership such that the total number of nominees is greater than executive positions available, a letter ballot will be conducted. Critical dates for the election of Executive members include:

- *Deadline for receipt in writing of nominations: 30 days after the publication of Volume 12, No. 2 of Aspect (Deadline =* ***July 29, 2007****)*
- *Letter ballots to be sent to the membership eligible to vote:* ***September 13, 2007***
- *Deadline for receipt of completed ballots:* ***October 10, 2007***
- *Ballots to be counted by:* ***October 15, 2007***
- *Membership to be notified of election results at the DEGIFS Annual General Meeting scheduled* ***for Whistler, October 25, 2007.***

Additional details on the election of executive Members can be found in the DEGIFS Terms of Reference which can be found on the DEGIFS web site at: www.degifs.com.

DEGIFS Executive Nominations

Following, are brief biographies of nominees put forward by the DEGIFS Executive Nominating Committee. As indicated in the previous article, if no additional nominations are received by July 29, 2007 then these individuals are declared elected by acclamation.

Jeremy Araki, P. Eng.
Though I have worked with many professionals in our field on an operational level, I am excited about the possibility of working with these same people on other issues within the profession. I have worked on resource roads and bridges for most of my working life and strive to learn more about the practice of engineering from both technical and ethical standpoints. I have experience on both the coast and in the interior and have worked for consultants and licensees.

I believe that mentoring, direct supervision, and communication among professionals and trainees are crucial to the continued success of our group in the industries where we work. Just as important are communicating with and educating our clients on our value and scope of practice.

Being a newer professional and working as a consultant, I believe I can bring a perspective and energy that will be helpful to the fulfillment of the above mentioned goals. As I am held accountable to my professional co-workers and clients, I would like to see these same relationships propagate throughout our specialized field to help us stay sharp in our practice and in the practice of the up and coming professionals.

Julien Henley, M.A.Sc., P.Eng
I am currently a member of the DEGIFS executive and am honored to be nominated for another term. I am a bridge engineer with 12 years of experience, focusing on the design, assessment and construction of bridge structures. My work has predominantly focused on the resource and municipal sectors in British Columbia and Alberta. I have also been involved with the development of Ministry of Forest Standard Bridge Design Drawings and completed an evaluation of the Canadian Highway Bridge Design Code for the Ministry of Forests who are considering adopting the new code with modifications to suit typical forestry bridge design. This work has recently been expanded to consider the effects of changes included the new 2006 Canadian Highway Bridge Design Code might have on the design of forestry bridges. In addition to my work at Associated Engineering, I also serve on the CSA W47.1 Technical Committee for the Certification of Companies for the Fusion Welding of Steel.

My engineering experience includes the completion of numerous projects ranging from small culverts and single span crossings to large multi-span steel bridges. These experiences have provided me with the background required to successfully practice engineering in the Forestry Sector where simplicity and practicality are valued. Recently with the increased interest in other resource sectors, this work has expanded to include developing access to Independent Power Projects and mines throughout British Columbia. This work is providing an excellent opportunity to share the knowledge gained working in the Forestry Industry with other resource sectors.

By serving on the DEGIFS Executive I am provided with the opportunity to share my experiences and knowledge, and learn from others, regarding the practice of engineering in the Forestry Sector. This is especially important with the introduction of new guidelines for the practice of engineering in the Forestry Sector and the advent of performance based codes that rely on our professionalism and self-regulation. These new challenges present us with an ideal opportunity to shape the way we practice engineering and I would like to continue to participate in the implementation of these changes as a member of the DEGIFS executive.

Michael Noseworthy, P.Geo., Eng.L.
I am pleased to accept the nomination to the DEGIFS Executive. Following six years working in the field of mining and mineral exploration, I have since worked in the BC forest sector as a professional geologist. During this period I have provided consulting services to resource companies and government across the entire southern portion of our beautiful province and limited locations in the Peace region. My field of practice has focused on terrain stability, road design, landslide avoidance and mitigation, and watershed hydrology.

The forest sector is continuously faced with challenges such as fundamental legislative changes (i.e. Forest Practices Code) softwood lumber tariffs and forest health. It is critical to the success on the industry that these challenges are met quickly with the support of the academic, governmental, industry and professional sectors. I believe the most pressing issues facing the forest sector today are the Mountain Pine Beetle epidemic and global warming. There is a need to

increase both professional and public awareness on these issues and develop strategies to manage for their impacts.

As part of the DEGIFS executive, I would like to work towards expanding the scope of the division to include other resource industries that could benefit from the skills and experience of our membership.

I believe that my previous experience on various committees will aid in my serving on the DEGIFS council. I look forward to working for the membership throughout the coming year.

Jack Whittles, P.Geo., Eng.L.
I am pleased to accept the nomination as a candidate for DEGIFS Executive. I have been carrying out Terrain Stability Field Assessments for 11 years on Coastal BC. I am thankful to have such a wonderful job and value the support that I have received from DEGIFS and its members.

I received a B.Sc. in Geology at UBC and an M.Sc. in Geology at SMU in Texas in 1997. Prior to my years in Forestry I worked for the BC Geological Survey and for several mining companies. The training I received from this work prepared me well for the challenges carrying out terrain assessments.

As a sole practitioner, it is easy to become out of touch with regulation changes and new research, therefore it is important to have support of DEGIFS and its members. I fully enjoy my fieldwork and report writing, but feel it is time to start becoming more involved in DEGIFS.

UPDATE ON OCCUPATIONAL HEALTH AND SAFETY REGULATIONS RELATING TO TERRAIN STABILITY WORK IN THE FOREST SECTOR

By Peter Mitchell, P. Eng.

The following is an update on the activities currently underway in addressing Occupational Health and Safety regulations relating to terrain stability work in the forest sector. For additional background on this issue please refer to the article (http://www.apeg.bc.ca/connections/news/may06/PGeosTSAs.html) in the May 2007 issue of Connections.

In December 2006, WorkSafeBC contacted APEGBC and the Association of British Columbia Forestry Professionals (ABCFP) to consult with them on proposed draft changes to the Occupational Health and Safety (OHS) regulations. These changes relate to terrain and forest road issues with respect to forestry operations, and include addressing the issue of Professional Geoscientists being able to carry out Terrain Stability Assessments (TSA) on forest roads.

These extensive consultations have now been completed. The executive of the Division of Engineers and Geoscientists in the Forest Sector (DEGIFS), members of the APEGBC/ABCFP Joint Practice Board and several other APEGBC members practicing in this field worked from December through February to develop a joint APEGBC/ABCFP submission in response to the draft proposed OHS regulation changes.

A joint submission was required as the amendments to the OHS Regulations that would recognize that Professional Geoscientists can carry out terrain stability work on forest roads, as reflected in the APEGBC *Guidelines for Terrain Stability Assessments in the Forest Sector*, also touches on the role that members of ABCFP play in this area. This is related to the definition of the practice of Professional Forestry as provided in the Foresters Act, which includes "planning, layout and approving forest transportation systems including forest roads."

APEGBC and ABCFP presented their joint submission to WorkSafeBC at a meeting held in late February, 2007. In May 2007, WorkSafeBC responded to the feedback by issuing another revised set of proposed regulatory amendments to the OHS regulations which deal with worker safety related issues relevant to fills, stockpiles, terrain stability, avalanche assessments and forestry operations.

The new proposed revised amendments to the OHS regulations issued in May 2007 can be found on the WorkSafeBC website at www.worksafebc.com/regulation_and_policy/public_hearings/assets/pdf/2007_public_hearing/Part%2026_Strikethrough.pdf . Written comments on these draft regulations will be accepted by WorkSafeBC until **4:30 p.m. Friday, June 29, 2007**. While the most recent

proposed changes address APEGBC's concern that both P.Eng.'s and P.Geo.'s be recognized under the OHS regulations as being able to carry out TSAs for forest road and other excavations related to forestry development, there still remain some matters which require clarification.

APEGBC and ABCFP have met to review their joint submission dated February 27, 2007 and to confirm if the revised draft OHS regulations issued in May sufficiently address the issues raised in our submission.

DEGIFS and the APEGBC/ABCFP Joint Practice Board will be working towards preparing a new submission to address any outstanding issues. This will be completed in time for the June 29, 2007 deadline provided by WorkSafeBC.

All feedback received by WorkSafeBC's June 29, 2007 deadline will be considered and changes will be made to the proposed OHS amendments where deemed appropriate by WorkSafeBC. It is APEGBC's understanding that the amended OHS regulations will then be brought into effect in the summer or early fall of 2007. Once the new OHS regulations have become law and it is confirmed that P.Geo.'s are recognized in the regulations as being able to carry out TSAs for forest roads and other excavations related to forestry development, then P.Geo.'s who received the limited licence in engineering for TSA related work last summer will be consulted by APEGBC regarding the ongoing status of their limited licence.

GULLIES AND FRPR

By Tom Millard, P. Geo.

DEGIFS executive asked that I provide some information regarding how gullies are addressed in the Forest Planning and Practices Regulations (FPPR). In contrast to the Forest Practices Code, the FPPR does not define what a gully is. Instead, Section 38 of the FPPR states that "*An authorized person who carries out a primary forest activity on the Coast must ensure that the primary forest activity does not cause a gully process that has a material adverse effect in relation to one or more of the subjects listed in section 149 (1) of the Act*"

The definition of a "gully process" is: "*a) a rapid erosion of sediment that creates a channel or increases the depth of an existing channel, or b) a debris flood*."

Gully processes are limited to *a and b* above since it is expected that Section 37 of the FPPR (Landslides) will address debris slides, debris flows, or any other landslide type event that could occur in a gully. Although somewhat awkward in its wording, the FPPR approach has some advantages since it avoids the arbitrary criteria for a gully that existed under the FPC. The Gully Assessment Procedure Guidebook (a legally cited guidebook under the FPC) applied only to the coast and therefore Section 38 of FPPR applies only to the Coast.

On a related note, FPPR Section 54, Fan Destabilization, has the equivalent origin to FPPR Section 38 due to the presence of the Fan Destabilization Potential section in the Gully Assessment Procedure Guidebook. Again, it applies only on the Coast.

Regarding debris floods as a gully process, I don't think this was intended to define debris floods as occurring only in gullies (they certainly occur elsewhere), but rather that gullies can have debris floods. One example might be a debris jam on a relatively low gradient gully failing and leading to a debris flood.

Members do you have any comments or suggestions regarding the preceding article? If so we would love to hear your feedback. Please send comments to the DEGIFS executive (see contact information at the end of this newsletter).

THE CHALLENGE OF EXPECTATIONS

An overview and commentary on the discussion paper, The Expectations That Affect The Management Of Public Forest and Range Lands In British Columbia: Looking Outside the Legislation. By Roberta Reader. This paper was jointly released by the Ministry of Forests and Range and the Ministry of Environment in February 2006.

By Ian Miller, RPF

"Reprinted with permission of Ian Miller and the BC Forest Professional magazine (March-April 2007 issue)

Are resource professionals, government officials, tenure holders or other parties aware of all the legal and non-legal expectations that affect forest management? More importantly, are they aware of what's at stake if these expectations are not met?

In my view, one of the key intents behind the *Forest and Range Practices Act* (FRPA) is to acknowledge the likely outcomes and behaviors resulting from existing legal and non-legal expectations and to then fill in the gaps through legislated expectations where required. I have often wished for a simple guide that outlines the roles, risks and rationales behind FRPA —a 'wiring diagram' to give shape and structure to the bigger picture.

With the release of Roberta Readers' discussion paper, *The Expectations that Affect The Management of Public Forest and Range Lands In British Columbia: Looking Outside the Legislation*, we now have that 'wiring diagram.' This paper provides a detailed framework categorizing the legal and non-legal expectations in FRPA and a basis for weighing the significance of these expectations.

Below I have summarized some of the legal and non-legal expectations outlined in Reader's paper affecting forest management that may be of interest to resource professionals:

Legal expectations

Forest managers are expected to make their own interpretations of the statutes that affect their practice. The legal framework for forest management includes resource statutes (e.g. FRPA), professional statutes (e.g. *Foresters Act*) and the common law. The legislature can be expected to make and refine laws over time but cannot be expected to explain them.

The courts will only provide definitive interpretations of statutes on a case-by-case basis. This may seem like a risky management model in the FRPA context. However, FRPA also allows the government to establish objectives and requires government officials to approve plans that are consistent with those objectives. FRPA also provides penalties for non-compliance and a defense of due diligence. In total, government balances the risk and helps to encourage proper stewardship.

Government officials cannot 'tell' you what a statute means, but they can be expected to help develop or document reasonable interpretations of a statute. Statutory decision makers are expected to provide personal 'guiding principles' for their decisions that include plan approvals to help ensure there is transparency for those affected by their decisions.

Professional statutes include provisions for standards of admission, codes of ethics, continuing competency programs, professional practice guidance and complaint resolution, including member discipline. Collectively, these statutes are a way for associations to demonstrate they are ensuring resource professionals are upholding the public interest. Our conduct as professionals is expected to be judged by our peers. This discussion paper contends that these peers should be the experts in their specific areas of practice – a high standard indeed.

Another aspect of the legal expectations comes from Case Law and matters of civil and professional negligence, or malpractice, which can result in much stricter penalties than those imposed under FRPA or other resource statutes.

Society expects resource professionals to do the right thing and avoid situations of negligence or malpractice. There is an evolving area of Case Law that deals with negligence resulting from environmental damage. Governments and tenure holders alike are well advised to heed the Supreme Court's expectations in this regard (*B.C. v. Canadian Forest Products Ltd., [2004] 2 S.C.R. 74*).

Non-legal expectations

Non-legal expectations can also be quite powerful. Witness the expansion in BC of voluntary certification schemes like ISO (International Organization for Standardization), CSA (Canadian Standards Association) or FSC (Forest Stewardship Council). In some cases, these independent standards of forest practice go well beyond any legal requirements.

Similarly, various licensee-led initiatives like the results-based pilot projects in Fort St. John and Powell River as well as in various community forest agreements have demonstrated that new models are workable. Meeting and improving upon the 'social licence' to operate in public forests helps to create new relationships, trust and opportunities.

The wealth of available scientific and technical information is another non-legal element affecting forest management in BC. The challenge here is to find and synthesize information and to apply it to the situation at hand. It will no longer be sufficient to refer solely to a Code guidebook for direction on specific forest practices. Rather, we will be expected to gather current, relevant information from a variety of sources and be prepared to rationalize how this information was used to prepare plans or prescribe practices.

How will we know whether FRPA is working?

Most of the mechanisms for monitoring and reporting on forest practices have been in place for some time, including the various enforcement arms of government ministries, the complaint investigation processes of the professional associations and the Forest Practices Board and the Forest Appeals Commission. In addition, the Ministry of Forests and Range has implemented an effectiveness evaluation program. This program is designed to monitor and report on how well forest practices across the landscape are meeting government's objectives and how effective these various practices are at managing and conserving resource values. Collectively, the reports these groups have generated are expected to be the 'report cards' by which FRPA, forest management generally and, most importantly, our behaviors will be adjudicated.

Why this discussion paper is so important?

This discussion paper explains the drivers and the checks and balances, often outside legal requirements, that are expected when making forest management decisions. These factors help explain why FRPA contains fewer and less-detailed legal requirements compared to the *Forest Practices Code Of BC Act*. In short, I don't think you can understand FRPA unless you understand the full extent of the forces outside FRPA that are influencing forest management.

There isn't enough space here to explain why some of these key expectations for forest management may be important to you as forest managers. However, I hope I've piqued your interest and curiosity. Here is my challenge to you: read the executive summary and chapter one, only 11 pages, and I'm certain you'll want to read on! Please share your responses and comments with your colleagues.

The full text of the discussion paper can be found at:
http://www.for.gov.bc.ca/code/training/frpa/looking.html

Ian Miller was a member of FRPA policy and legislation drafting teams from 2002 to 2006. Ian is currently Manager of Integrated Resources in Forest Practices Branch of the MoFR; in his words "the best job in the best branch of government". His prior work in the Forest Service has spanned operational and

strategic planning, timber supply, as well as field work in Campbell River and Mackenzie forest districts. He trained as a forest technician at BCIT and is a UBC forestry grad.

Member Submission Article:
The following article reflects the current views of the writer, and are not intended to indicate any mandatory requirements or recommendations. Any comments of questions can be directed to the author.

LOG STRINGER BRIDGES. AN INDEPENDENT REVIEW OF FACTORS CONSIDERED IN THE DESIGN AND EVALUATION OF LOG STRINGER BRIDGES, USED ON LOGGING ROADS, IN COASTAL BRITISH COLUMBIA

By Herbert W. Argent, P.Eng
argenteng@shaw.ca

While the current trend is to install steel and concrete bridges on logging roads, log stringer bridges continue to be in service and are still being considered and installed where temporary crossings are required and suitable local logs are readily available. This article reviews factors considered in the design of new log stringer bridges; the evaluation of existing log bridges; and the upgrading of existing log stringer bridges.

Log stringer bridges are classified as **"**temporary", with an anticipated service life up to fifteen years. Logging road bridges in British Columbia are usually designed to Ministry of Forests designated load rating L75 (GVW 68090 kg) when providing access to a public highway; and up to load rating L165 (GVW 149700 kg), where heavier "off highway" logging truck traffic is anticipated, Ministry of Forests logging truck load classifications include specified wheel and axial loading and spacings with allowance for eccentric and unbalanced truck loads. They are described in Appendix B of the Forest Service "Bridge Design and Construction Manual". These load rating classifications apply to the "temporary" log stringer bridges considered in this review; as well as being applied to the steel and concrete bridges described in the Forest Service "Bridge Design and Construction Manual".

The B. C. Forest Practices Code requires log bridges be designed by a qualified Registered Professional. Log stringer bridges may be designed by a Professional Engineer or a Professional Forester. However, bridges designed by Professional Foresters are limited to the use of standard design tables and drawings that have been prepared by a Professional Engineer. Log stringers spanning six meters or less are usually considered to be culverts and are described in the Ministry of Forests "Forest Road Engineering Guidebook "which includes log culvert stringer sizes (Table 12). The B.C. Forest Practices Code provides a flow chart, outlining the Professional and Non-Professional design responsibility, based upon specified limitations. The scope of professional services applicable to log stringer bridges is described in the "Guidelines for Professional Services in the Forest Sector-Crossings" published by the Association of B.C. Forest Professionals. Log stringer bridges are generally used to provide "temporary "crossings in the six to twenty meter span range. Their use is limited by the length, diameter, species and availability of logs that can provide the load classification at the required span. Typical live load bending moments are found in Table 1 below: Bending moments are based on the axle loads on the span. Load rating classifications may include some of the truck axle loads that are not on the bridge when load rating is being designated.

Table 1. Maximum Live Load Bending Moment (KnM) during Classified Vehicle Loading.

SPAN (M)	L75 GVW 68040 kg	L100 GVW 90680 kg	L150 GVW 136090 kg
6.0	372	454	682
8.0	524	656	984
10	694	865	1300
12	874	1106	1660
16	1027	1607	2415
20	1952	2474	3716

To date, the Specified Strength assigned to log stringers has not been assigned by Code; and is based upon individual Professional Engineering judgment. CAN/CSA S6-00 "'Canadian Highway Bridge Design Code which is "used as a reference in logging road bridge design, does provide a specified strength value for Douglas Fir Round Wood Piles (Table 9.14.3) as 20.1 Mpa. The Canadian Woods "Their Properties and Uses" lists a clear wood mean Modulus of Rupture at 52 Mpa. This suggests that at a 99% confidence level, the 20.1 Mpa specified strength

level can be considered to be a reasonable, conservative value until more test results and Code values become generally available to the designer.

For gravel deck bridges where the stringers are closely spaced this 20.1 Mpa value could be adjusted by a load sharing factor (*1.2) to 24.1 Mpa. For all log stringers a Code resistance factor (*0.9) should apply. When using Hemlock it is suggested that 20.1 Mpa specified strength value be reduced by a factor of 0.9; and for Cedar, by a factor of 0.7, relative to Douglas

Fir, based on tabulated mean clear wood Modulus of Rupture, in green condition as listed in the 'Canadian Woods" Edition. Douglas Fir is the most widely used species for log bridges in coastal British Columbia, being relatively stronger, durable and readily available. When spruce or hemlock is available, it is recommended for use only when the anticipated service life is short (less than five years). Cedar is sometimes used with gravel decked stringers but, having a lower specified strength it is more frequently used for log cribbing where it will have a service life in the order of twenty years.

Short span log bridges (10 meters or less) usually have a gravel deck that is 400 mm minimum thickness with a layer of filter fabric spread over the stringers, prior to placing the gravel. This prevents gravel, fines, and deleterious material dropping on to the stream bed below. This is particularly important over fish bearing streams and in a community watershed drainage. Galvanized steel wire rope figure eight cable lashings at mid span provide resistance to lateral spread of the stringers and assist in spreading the loading of the stringers, when tightly installed. Longer span log bridges [ten to twenty meters span] frequently have a wooden deck, using timber cross ties and plank decking. This lessens the dead load applied to the log stringers. Width between outer curb logs is usually 4.9 meters, but on sharp approach curves, width may need to be greater due to side tracking of the log trailer rear wheels. On minor, temporary roads 4.3 meters deck width between curbs, is frequently used. The number of stringers to be used is dependent upon the required road width and suitable available log sizes.

When designing or evaluating gravel decked log stringer bridges; the depth of gravel determines the number of stringers that support each line of wheel loads. Common practice is to assume a 45 degree load spread through the depth of the gravel, plus 600 mm tire contact surface width (2 x gravel depth + 600), up to a loaded stringer spread equal to the axle spacing. Factors for loading at Limit States can be derived from the Canadian Highway Design Code, including an impact factor for wood. Currently, a load factor of 0.60 for unbalanced (60 / 40) logging truck wheel loading is used for log stringer design. Vertical stress loading at the stringer - gravel boundary is a subject of continuing research but at present, the 45 degree load distribution is commonly used.
(a) The Ultimate Live Load Bending Moment distributed to the selected wheel loaded stringers = Bridge design live load bending moment ×1.7 (load factor) × 1.2 (impact factor) × 0.6 (load factor allowing for unbalanced wheel loading.) = 1.22 × Bridge Design Live Load Bending Moment
(b) Ultimate Dead Load Bending Moment = 1.2 (selected dead load factor) × (total dead load of the selected log stringers group and their associated gravel deck, that supports one line of wheels) × span / 8 (assuming uniform distributed loading with adjacent logs reversed). Thus Total Design Bending Moment at Limit State = (a) + (b) .This can then be compared with, or equated to the Ultimate Resistance Moment of the selected wheel loaded group of stringers using: Ultimate design bending stress × 0.1 × (stringer diameter ^{3}) × selected number of wheel line loaded stringers. From this basic formula, the required Stringer Design Diameter can be obtained. This is then applied to all stringers over the full bridge width. Since the initial stringer design sizing is based on a preliminary estimate, the calculation should be refined by trail and error to determine a final diameter. The basic formula can be transposed to evaluate the resistance of measured diameters of existing logs. Subtracting the total dead load bending moment determines the residual calculated allowable live load bending moment and hence the load rating. Normally the capacity of log stringers will be governed by the bending stress.

When evaluating existing log stringer bridges, the procedure described in Section 14. CSA -S6-00 will modify the Load Factors. Using normal traffic / inspection level INSP.2. / System S2 / Element -E2-E3, the live load factor can be reduced to 1.5 and the dead load factor to 1.15. When evaluating the load capacity of existing log stringer bridges, the effective diameter of the individual logs should be used by deleting the field measured estimated depth of decay or other defects. Even with new bridges the diameters of individual stringers vary somewhat from those

specified. Load capacity should be based upon selection of the minimum mid span diameters by field measurements. Field Inspection should include determining the average depth of gravel deck since this will include a significant part of the total dead load.

The design method considered for timber deck log stringer bridges is different to that used for gravel decks. One approach is to assume that all stringers are equally loaded. The live loading should then be increased by 30 % to account for eccentric and off balanced truck live loading. A live load factor of 1.7, impact factor of 1.2 and a dead load factor of 1.2 can be used to determine the ultimate bending capacity. When evaluating existing bridges load factors can be modified to 1.5 (live load) and 1.15 (dead load) as previously noted.

Timber cross ties and Plank decking will generally be Douglas Fir, rough sawn grade # 1 and # 2. Cross tie sizing is related to combinations of the number of log stringers, log stringer spacing, cross tie spacing, species and truck load classification. Table 2 provides a summary of suggested Douglas Fir cross tie sizes taken from a review of earlier publications and past general practice.

Table 2. Minimum Douglas Fir Cross Tie Sizes and Tie spacing for various Load Ratings

No. of Log Stringers & Spacing mm	Max Load Rating	Tie Spacing mm	Tie Size mm
5 1219	L100 L 150	400 400	200 x 200 250 x 250
6 914	L100 L 150	400 400	200 x 200 200 x 250
7 762	L100 L 150	400 400	200 x 200 200 x 200
8 686	L100 L 150	400 400	200 x 200 200 x 200

Due to the exposed wet / dry service conditions to which log stringers and ties are exposed, the log stringer bridge load capacity tends to decline with age. Progressive decay in the sap wood outer shell and possible insect attack within the heartwood may occur. Hence the "temporary" classification with an anticipated 15 year service life. It would seem prudent to slightly over size log stringers for new installations, to allow for future down grading. There is need for close inspection by qualified personnel on a regular basis, usually every two years.

Close inspection of all log stringer bridges should include confirming the species, individual diameters and span of the stringers. The condition and effective diameter of stringers can usually be determined by drilling or chopping with an axe, into the side of the stringers, to gauge the depth of current decay. Hammer soundings may indicate suspect hollow core decay. Severe splits, crusting at bearings, growth of mold, recorded at each inspection will assist in the Professional evaluation of the bridge stringers. Cross ties should be checked for sponginess and decay. Plank deck planking often requires early replacement due to excessive wear and subsequent nail popping.

Foundation abutments should meet the criteria defined in the "Guidelines for Professional Services in the Forest Sector-crossings". The abutments for log stringer bridges will normally be Cedar Cribs or Cedar Log Sills. Cribs should be set back beyond the observed high water mark so that the cribs do not constrict the stream channel. Where ground bearing sill logs are used the base of the sill log should be set back at least 1.5 meters on a 2 : 1 slope line measured back from the observed high water inlet channel width. Log crib and sill construction is described in the FERIC "LOG BRIDGE CONSTRUCTION HANDBOOK". Base crib logs and sill logs should bear on solid, dry, undisturbed bearing strata with a leveling bed of compacted gravel and crushed rock. The total service load design bearing pressure under two thirds of the sill diameter should not exceed 200 Mpa unless bearing is on sound rock. Rip Rap, scour protection, should be provided for the full length of the base of crib or sill log face to avoid undermining of the bearing.

Upgrading of existing log stringer bridges can be done by the addition of Needle Beams, underslung and wedged tight to the underside of the existing stringers. The needle beams are hung from and lashed to two large diameter, clear span Douglas fir curb logs. These curb logs then provide additional live load bending moment capacity. To be effective the needle beams must be tightly wedged to the existing stringers. It is noted that the under slung needle beams will reduce the high water clearance below the structure and must be regularly checked and lashings retightened.

Hydrological conditions are equally important in Forest Road Bridge Design. The Forest Practices Code of British Columbia states that Temporary Bridges (which includes Log Stringer Bridges) shall have the capacity to meet the Q50 return period peak flood level. With the span, of log bridges most likely be less than 20 meters, the watershed drainage area is normally less than twenty five kilometers square**.** Hence the Rational Method used to determine the Q50 design peak flow can be considered valid. Drainage areas beyond this size will likely require more detailed analysis and Hydrological data.

To develop the Q50 Flood level, using the Rational Method, reference can be made to the **"**Manual of Operational Hydrology in British Columbia " published by the Ministry of Environment, Water Management Division (edited by C.H Coulson). This manual includes formula to determining the "time of concentration" based upon maximum upstream drainage channel length, gradient and surface roughness. The time of concentration can then be used to determine the Q50 rainfall intensity which is considered to act uniformly over the total drainage area .Rainfall intensity values can be estimated from rain gauge charts available from the Atmospheric Environment Service and with reference to the "Rainfall Frequency Atlas for Canada" prepared by Hogg and Carr (published by the Canadian Government Publishing Centre, Ottawa). These charts indicate the values and ratio of Q10 rainfall intensity to Q50 rainfall intensity used to determine design flow. The potential for combine rain and melting snow should also be considered which may increase run off intensity by a further 10 percent.

Surface storage characteristics of the drainage basin, reduce the runoff intensity relative to the rainfall intensity and so design flow is reduced by the selection of a "Runoff Coefficient." Where topography varies, this may require the subdivsion of the drainage area in to sub-areas. Some typical values of Runoff Coefficients are listed in Table 3.

Table 3. Summary of Runoff Coefficients.

SURFACE CANOPY	IMPERMABLE	FOREST	AGRICULTURAL
MOUNTAIN	1.00	0.90	-
STEEP SLOPE	0.95	0.80	-
MODERATE SLOPE	0.90	0.65	0.50
ROLLING TERRAIN	0.85	0.50	0.40
FLAT	0.80	0.40	0.30
SNOW MELT	+0.10	+0.10	+0.10
RECURRENCE 10 TO 25 YRS	+0.05	+0.02	+0.07

Q50 design flow = (drainage Area) × (Runoff coefficient) × (Rainfall intensity R / '360 where Area A = hectares, R= mm / hr. Q50 = m^3 / second.
The High Water Elevation at the bridge site can be established by trail and error, equating the Q50 peak flow to a proposed bridge channel profile using the Manning Formula.
The estimated Q50 flow in cubic meters per second can be determined by the Manning Formula.
$Q = A \times R^{0.66} \times S^{0.50} / n$
A=flow area of cross section... R= A / wetted perimeter. S=channel gradient. n= channel roughness coefficient.
Typical published values of "n" are listed in Table 4.

Table 4. Base Values of Roughness Coefficient "n".

Channel Type	Median Size of Bed Material	Base value roughness value " n "
Rock cut	---	0.025 mm-
Firm soil	---	0.025 to 0.032
Coarse sand	1 - 2 mm	0.026 to 0.035
Fine sand	----	0.024
Fine gravel	2 - 64 mm	0.028 to 0.035
Coarse gravel	----	0.026
Cobble	64 - 256 mm	0.030 to 0.050
Boulders	> 256 mm	0.040 to 0.070

Due to the generalized factors involved when using the Rational Method, it is recommended that other procedures also be considered to cross check the estimated Q50 peak flow. This includes on site observations of the present and the observed high water flow level, typically indicated by exposed tree roots or lack of vegetation below the top of bank. The channel cross sectional area, creek gradient and type

of bed material is measured at various locations both upstream and downstream within the area of interest. Using the Manning Formula this information can provide a second estimate of flow that is assumed to have occurred during the Q2 to Q10 return period The ratio that relates this Q2 estimate of flow to that at the Q50 return period can be selected by reference to the applicable short duration rainfall intensity charts and the Rainfall Frequency Atlas for Canada. In steep tumbling channels the Manning Formula may not be valid, due to the extreme roughness of the bed. One suggested check is to assume a Froude number no greater than 0.8 which sets the upper limit of flow Q as:

$Q = 2.5 \times \{A^3 / w\}^{0.50}$,

where A = flow channel Area and w =surface width of channel.

The Q50 peak flow elevation at the bridge can be determined by equating the estimated peak flow from the drainage, to the selected bridge channel profile flow capacity, using the Manning Formula. This can be done by trail and error using experimental high water elevations. The selection of suitable dimensions and elevations for the log stringer bridge opening includes the selection of a "freeboard" clearance that will allow for passage of potential debris flowing under the bridge; and for the finish deck elevation to blend in with road approach gradient requirements. Clearance in the order of 1.5 meters above Q50 flood level is frequently used, subject to site conditions. Single span log bridge opening width should endeavor to avoid constriction of the normal high water flow channel ensuring that bridge abutments and banks are protected from erosion. Fish habitat should be undisturbed during and upon completion of the log stringer bridge and this may require the abutments to be set well back from the observed high water flow channel.

Herbert Argent, P. Eng. is a self employed Civil Engineering Consultant specializing in Forest Road Bridges. He was formerly Regional Bridge Engineer with the Ministry of Forests, Vancouver Region, working with the Ministry, between 1990 and 1998, on the design and inspection of a variety of timber, concrete and steel bridge structures. Prior to working with the Forest Service, he worked as a consultant and with industry, particularly concerning Timber Structures.

The DEGIFS Executive does not necessarily support or agree with the opinions and conclusions indicated in the preceding article.

DEGIFS MEMBER PROFILE:

Victoria Stevens, G.I.T.
Madrone Environmental Services

Interview by: Sharon Scott

Who are you and how did you get to where you are now?

I am originally from Vancouver but grew up in Metchosin, on Vancouver Island. Our property backed onto Witty's Lagoon Park, and I spent a lot of time as a kid running around the trails and taking naturalist classes in the summer. Back then the park had a beautiful log-cabin style nature house with several full time naturalists who were great at encouraging kids to explore and learn about nature. My father is an RPF so I grew up being exposed to the forestry industry and knowing that there were jobs out there that allowed you to travel and to work outside.

In Grade 11, I was lucky enough to be accepted to the United World College of the Adriatic (sister college to Pearson College in Metchosin), located just outside of Trieste in northern Italy. I finished high school in Italy and then returned to BC to attend SFU. While at SFU, I joined the Coop program and worked for the Ministry of Forests in Prince Rupert and Prince George, and Parks Canada in Revelstoke.

After graduation I moved to Ontario for six months to work with on the contaminated site clean-up of a former DEW Line Radar Station at Hall Beach, Nunavut. My next job was as a lab tech and assistant mineralogist with Diamondex Resources where I got to spend 3 summers working in diamond exploration camps in the NWT.

I went back to start a Master's degree at SFU in 2005 and starting working for Madrone Environmental Services in 2006.

What do you do?
I am a graduate student at Simon Fraser University in the Engineering Geology and Resource Geotechnics Research Group, working with Doug Stead on root reinforcement and groundwater interactions. I am also geoscientist with Madrone Environmental Services Ltd out of Abbotsford.

What has been your favorite project experience?
I got to work on some great projects during my two Coop terms with the Ministry of Forests – the Hyp^3 Project and forest road engineering research out of Prince Rupert in 2000 and fire history and landslide research with the Prince George Research Branch in 2001. I got to go out on the MoF boat for week-long trips and travelled to Oona River to work on Hyp^3 project. All of those projects were multi-disciplinary and provided me the opportunity to work with several researchers at once and to travel to many different parts of the province.

If you could impart some advice to young DEGIFS members what would it be?
Don't get tied down to an image of what you think your career will be like – industry and markets change and you have to be flexible enough to take opportunities as they come. You may not always get your dream job right away but I have had some amazing experiences working in industries I never imagined I would end up working in. Take the time early in your career to test out a few different fields to see what you actually love doing and what is important to you.

In your opinion, how can APEGBC or DEGIFS better meet the needs of its members?
I get the impression that many professionals are having to transition their skill sets to new industries and projects, such as terrain analysis for small-scale hydro power projects, or post-fire landslide hazards in the forest-urban interface. Continuing to provide professional development courses and research articles on new projects and industries will help members learn from each other and help develop best-practices for future projects.

And the fun question.... If you could be any kind of geomorphic event, what would you be?

Not sure about me but I have definitely met a few people who could be classified as 'creep'….

CONTINUING PROFESSIONAL DEVELOPMENT OPPORTUNITIES

JULY 10, 2007. MOUNTAIN PINE BEETLE AND WATERSHED HYDROLOGY WORKSHOP: PRELIMINARY RESULTS OF RESEARCH FROM BC AND ALBERTA. Kelowna. FORREX, the BC Ministry of Forests and Range and the Canadian Water Resources Association - BC Branch are collaborating to organize a 1-day workshop on the hydrologic effects of the Mountain Pine Beetle. The objective of the workshop is to present preliminary research results from ongoing projects in BC and Alberta. Rapid communication of relevant, interim research results is needed in order to incorporate the most current and best available knowledge into BC's forests land management response to the MPB infestation.

http://www.selkirk-management.com/events.html

JULY 11, 2007. THE UPPER PENTICTON CREEK WATERSHED EXPERIMENT: RESULTS OF A PAIRED WATERSHED STUDY INTO THE EFFECTS OF FOREST MANAGEMENT ON WATER RESOURCES.

Kelowna. FORREX and the BC Ministry of Forests and Range are collaborating to organize a 1-day workshop reviewing the results of the Upper Penticton Creek Watershed Experiment, a paired-basin study examining the hydrologic effects of forest management. The objective of the workshop is to

present both long-term and recent research results that highlight the state of the knowledge on hydrological effects of forest management in the southern interior of BC.

http://www.selkirk-management.com/events.html

AUGUST 22 - 24/07. 18TH CANADIAN HYDROTECHNICAL CONFERENCE, WINNIPEG, MB. The 3-day conference will continue the tradition of biennial CSCE hydrotechnical specialty conferences. Practitioners, academics, and students are invited to attend. The abstract deadline is January 31, 2007. For more information, see the conference web site, http://www.csce.ca/2007hydrotechnical or contact the Technical Program Chair, Shawn Clark.

OCTOBER 25 - 27/07. APEGBC ANNUAL CONFERENCE AND AGM, WHISTLER, BC.
For more information, see the conference web site, www.apegbc.ca/ac2007/main.html

GEOHAZARDS IV - Quebec City – May 20th to May 24th 2008: *from causes to management*
The 4th Canadian Conference on GeoHazards follows the conference held in 2003 in Edmonton. This series of conferences is an initiative of the Engineering Geology Division of the Canadian Geotechnical Society. The goal of the Conference is to establish the state of knowledge regarding natural hazards in Canada, particularly those of geological origin. All relevant themes will be considered, from snow avalanches to mud flows, from submarine mass movements and tsunamis to rock avalanches, and others. We plan to address all relevant issues from processes, consequences and also scientific and social aspects of risk management.

Deadline for abstracts submission: **July 1st 2007**
Deadline for papers submission: **January 15th 2008**

www.geohazardsquebec.com

Record your completed training online at:
http://www.apeg.bc.ca/prodev/online.html

For more information on continuing professional development guidelines see:

http://www.apeg.bc.ca/prodev/cpdguidelines/cpdguideline.pdf

Do you know of any potential training opportunities or seminars on topics of potential interest to our members? If so please drop a line to the editor so that we can publish them in ASPECT.

Web sites of interest:

APEGBC at
http://www.apeg.bc.ca/prodev/prodevevents.html
FORREX at:
http://www.forrex.org/

Check out these websites with cool videos of sediment transport and pictures of landslides:

http://faculty.gg.uwyo.edu/heller/sed_video_downloads.htm

www.cenat.ch/index.php?nav=8,23,23,23&1=edview=/stall&found=325&start=40

www.knowledgenetwork.ca/slide/splash.html

Members should all have a look on the APEGBC website for the new Guidelines for Management of Terrain Stability in the Forest Sector dated April 30, 2007. Your feedback is requested on this draft document by July 20, 2007.

Who We Are

DEGIFS EXECUTIVE 2005/06
Douglas Underhill, P.Eng., R.P.F., Chair
Ph. (604) 269-2005 / Fx. (604) 269-2008
Email: doug.underhill@helifor.com

Ron Arksey, P.Geo., Eng. L., Vice-Chair
Ph. (250) 339-7160
Email: contourgeoscience@shaw.ca

Norman Deverney, P.Eng. Secretary
Ph. (250) 825-4347 / Fx. (250) 825-0032
Email: deverney.engineering@shawcable.com

Tracey Raume, P.Eng., Treasurer/
Website Coordinator
Ph. (250) 565-6100 ext 6186/ FAX: (250) 565-6671
Email: tracey.raume@gov.bc.ca

Julien Henley, P.Eng. Guidelines Subcommittee Chair / Bursary Coordinator
Ph. (604) 293-1411 / Fx. (604) 291-6163
Email: henleyj@ae.ca

Irena Weiland, P.Geo., Eng. L., Workshops/AGM Coordinator
Ph. (250) 847-5129
Email: iweiland@telus.net

Dave Wilford, P.Geo., R.P.F. Workshops/AGM Coordinator
Ph. (250) 847-6392 / Fx. (250) 847-6353
Email: David.Wilford@gov.bc.ca

Mark Goldbach, P.Eng., Past Chair/Affiliate Representative/Award of Excellence
Ph. (604) 850-8786 / Fx. (604) 850-8756
Email: mgoldbach@golder.com

WEB PAGE CONTACT
Tracey Raume, P.Eng.,
Ph. (250) 565-6100 ext 6186/ FAX: (250) 565-6671
Email: tracey.raume@gov.bc.ca

APEGBC LIAISON
Peter Mitchell, P.Eng., APEGBC Liaison, Alternate JPB Liaison
Ph. (604) 430-8035 / Fx. (604) 430-8085
Email: mitchell@apeg.bc.ca

JOINT PRACTICES BOARD LIAISON
Glynnis Horel, P. Eng.
Ph. (250) 722-7166 / Fx. (250) 653-4926
Email: oesl@shaw.ca

Tom Millard, P. Geo.
Ph. (250) 751-7155
Email: Tom.Millard@gov.bc.ca

EDITORIAL BOARD
Iain Blown, P.Eng./P.Geo
Ph: (250) 837-3743 / Fx: (250) 837-3783
Email: iblown@rctvonline.net

Shelley Higman, P.Eng./P.Geo.
Ph: (250) 468-6842 / Fx: (250) 468-6829
Email: shigman@islandtimberlands.com

Eric McQuarrie, P.Eng.
Ph: (250) 721-1665 / Fx. (250) 721-1665
Email: eric.mcquarrie@shaw.ca

Bob Patrick, P.Eng.
Ph: (250) 756-2256 / Fx: (250) 756-2686
Email: bpatrick@eba.ca

Kevin Turner, P.Eng.
Ph. (250) 828-4562 / Fx. (250) 828-4154
Email: Kevin.Turner@gov.bc.ca

Do Not Forget!!!

ASPECT SUBMISSIONS

LAST DATE FOR SUBMISSIONS TO ASPECT	NEWSLETTER RELEASE DATE
SEPTEMBER 14, 2007	SEPTEMBER 28, 2007
NOVEMBER 30, 2007	DECEMBER 14, 2007

Electronic submissions in **Word format (only)** should be made to Sharon Scott (sharon.scott@hayes.bc.ca) by the date listed above.
Refer to Guidelines for Submission on the website http://www.degifs.com/guidelines.doc for submission requirements.