ACKROYD LLP
BARRISTERS & SOLICITORS

RICHARD C. SECORD, LLM
(780) 412-2717
rsecord@ackroydlaw.com

ASSISTANT: SANDRA L.
(780) 423-8905 ext 305
slodoen@ackroydlaw.com

OUR FILE No. 158693 /RCS

YOUR FILE No. 1701

December 1, 2020

EMAIL TO: laura.friend@nrcb.ca

Natural Resources Conservation Board
1900, 250 - 5 Street SW
Calgary Alberta Canada T2P 0R4

Attention: Laura Friend, Manager, Board Reviews

Dear Ms. Friend:

Re: Alberta Transportation Springbank Off-Stream Reservoir Project
NRCB Application No. 1701
Additional Pre-Hearing Submissions of SR1 Concerned Landowners Group (SCLG)

We act for the SR1 Concerned Landowners Group ("SCLG"). As indicated in paragraph 48 of the SCLG's Prehearing Submissions (Exhibit PHC-14), the SCLG intended to retain an expert on dam safety and risk. Th SCLG has retained Austen Engineering Ltd. in that regard and we attach a budget from Austen Engineering to complete a design review, risk assessment and flood inundation analysis and mapping for the SR1 Off-stream Dam. Also attached is Austen Engineering's dam safety services information.

The following is a revised Table to replace the one found at PDF pg. 18 of SCLG's Prehearing Submissions marked as Exhibit PHC-14.

No.	Area	Expert/Lawyer	Budget	GST	Total
A.	Water Management	Dr. Fennell	$21,000.00	$1,050.00	$22,050.00
B.	Biodiversity	Mr. Wallis	$29,430.00	$1,471.50	$30,901.50
C.	Dam Design & Risk Assessment	Austen Engineering	$106,151.00	$5,307.55	$111,458.55
D.	Air quality and dust	Dr. Zelt	$12,000.00	$600.00	$12,600.00
E.	Fish Impacts	Not yet retained	0	0	0
F.	Noxious Weeds	Dr. Osko	$34,800.00	$1,740.00	$36,540.00

H	Legal Counsel	Ackroyd LLP	$204,650.00	$10,232.50	$214,882.50
		Total	**$408,031.00**	**$20,401.55**	**$428,432.55**

Should you have any questions, we would be pleased to address them.

Yours truly,

ACKROYD LLP

Original signed by

RICHARD C. SECORD
RCS/sl
Enclosures

1500 First Edmonton Place, 10665 Jasper Avenue NW, Edmonton AB Canada T5J 3S9
Telephone: (780) 423-8905 Fax: (780) 423-8946

AUSTIN ENGINEERING

SPRINGBANK SR1 DAM REVIEW

Proposal for

SR1 OFF-STREAM DAM

DESIGN REVIEW AND RISK ASSESSMENT

November 30, 2020

Springbank Community Association

AUSTIN ENGINEERING

1151 Cedar Ave. Trail, BC V1R 4B8
250-448-7525
www.austinengineering.ca

Roger Austin, P.Eng.
roger.austin@austinengineering.ca
November 30, 2020

Karin Hunter
President
Springbank Community Association
Calgary, Alberta

RE: Phase 1 Proposal for the Springbank Off-stream Dam (SR1) – Design Review and Risk Assessment

Dear Karin Hunter,

Austin Engineering Ltd. (Austin Engineering) is pleased to provide the Phase 1 proposal to the Springbank Community Association (the Association), for engineering services to perform a design review and risk assessment for Springbank Off-stream Dam located 11 km west of Calgary, AB.

The proposed Springbank Off-stream Reservoir (SR1) Project will divert water from the Elbow River during a flood, temporarily store flood water, and then return water to the Elbow River in a controlled manner.

It is Austin Engineering's understanding that the project owner is the Government of Alberta and that the project design, engineering, and management is being provided through Stantec Inc. This dam is classified as an "Extreme" consequence facility, according to Dam Safety Guidelines (2007) of Canadian Dam Association. Owing to the concerns about the safety and risks to the downstream communities in the event of a flood induced failure, the Springbank Community Association reached out to Austin Engineering for third-party engineering services.

In response to the Springbank Community Association's request, Austin Engineering is proposing the scope of works described below for Phase 1: Design review and risk assessment of SR1 dam. Phase 2 (not included in this proposal) would involve presentations and communications with Stantec, the Government of Alberta and NRCB as required to discuss and address any outcomes of Phase 1.

Upon acceptance of this proposal, Austin Engineering will perform the following Phase 1 scope of works:

- **Project Management**
  - Conduct kick-off meeting (teleconference)
  - Conduct monthly progress meetings and provide updates
  - Manage reporting, invoicing, and communications

1151 Cedar Ave. Trail, BC V1R 4B8
250-448-7525
www.austinengineering.ca

- **Background Information Review**
  - Review all available documentation provided
- **Design Assessment**
  - Conduct an assessment of the existing dam design with respect to the following areas:
    - Hydrological
    - Hydrotechnical (review will include an analysis of reservoir filling rates and impacts on dam stability)
    - Dam break and flood inundation mapping
    - Geotechnical
    - Dam emergency planning
    - Operation, Maintenance and Surveillance (OMS)
- **Inundation Mapping**
  - Obtain and mesh DEM data
  - Review failure modes for SR1 Diversion Structure
  - Cut cross sections for flood model and mapping
  - Develop and run HEC-RAS model to determine flood levels
  - Develop inundation maps associated with failure of SR1 Diversion Structure
- **Risk Assessment**
  - Develop a hazard failure modes analysis and matrix
  - Identify deficiencies
- **Reporting**
  - Submit a draft report for review
  - Revise report to address the Association's review comments
  - Submit final report

The project deliverable would be a report to the Association which will include a design review summary, assessment, and recommendations. This report could be used to support a request to Stantec and/or the Government of Alberta for additional design or analysis to be completed for the project (depending on the design review outcomes).

Following a review of the information provided on the NRCB website, it appears the design and analysis documentation listed is preliminary/conceptual in nature and the detailed design documents are not yet available. Our scope of works would include a request for the following documentation for the SR1 Off-stream Dam:

- Complete geotechnical data set;
- All hydrological and hydrotechnical files;
- Detailed design drawings and technical specifications completed to date;

1151 Cedar Ave. Trail, BC V1R 4B8
250-448-7525
www.austinengineering.ca

- Draft Dam Emergency Plan (DEP);
- Draft Operation, Maintenance and Surveillance (OMS) Manual; and
- Detailed analysis reports updated based on design changes.

Austin Engineering can complete the above scope of work within 18 weeks following the receipt of written confirmation from the Association to proceed. Austin Engineering proposes completing this work, subject to our terms and conditions, for **$106,151** (excluding taxes) based on the attached cost breakdown. We anticipate that, given approval to proceed on or before Dec 8th, 2020, we would be able to complete the scope of work by Mar 26, 2021. However, we have allowed for an interim report issued on Feb 19th should the Oral Hearing occur at the end of February, as is currently scheduled.

Also attached is a proposed schedule to complete the entire scope of works. Bear in mind that the extent of the scope of works that can be completed will be impacted by the scheduled date of the hearing. For example, if the hearing is scheduled for May 2021, we anticipate full completion of the scope; however, if the hearing is scheduled for February or March 2021, a portion of the proposed scope will be reduced as indicated.

If you have any questions or concerns, please do not hesitate to contact us. If you choose to accept this proposal, please sign the attached proposal acceptance form and provide all invoicing details. Send the completed form to accounts@austinengineering.ca.

Thank you for the opportunity to submit a proposal and we look forward to working with you on this project.

Sincerely,

Roger Austin, P. Eng.
Principal Engineer
Austin Engineering Ltd.

RK

Enclosed:

- Proposal Acceptance Form
- Terms and Conditions
- Cost Breakdown

1151 Cedar Ave. Trail, BC V1R 4B8
250-448-7525
www.austinengineering.ca

- Proposed Schedule
- Team Resumes
- Dam Safety Services Brochure

AUSTIN ENGINEERING

1151 Cedar Ave. Trail, BC V1R 4B8
250-448-7525
www.austinengineering.ca

Proposal Acceptance Form

PROPOSAL APPROVAL & BILLING INFORMATION	
Project name:	
Client name:	
Approval signature:	
Billing address:	
Accounts Payable Contact	
Name:	
Email address:	
Phone number:	
Project Manager / Supervisor	
Copy Project Manager / Supervisor? ☐ Yes ☐ No	
Email address:	
Austin Engineering sends invoices monthly. An additional 2% will be charged after 30 days. Payment can also be made by credit card.	

AUSTIN ENGINEERING LTD. STANDARD TERMS AND CONDITIONS OF SALE FOR ENGINEERING SERVICES

All sales of engineering services, design services, detail drawing services, consulting and training services, and inspection and analysis services by Austin Engineering Ltd. (collectively referred to herein "Engineering Services') are subject to the following terms and conditions. All proposals, quotations or acknowledgments issued by Austin Engineering Ltd. (AEL) are an offer to sell Engineering Services pursuant to these terms and conditions. Austin Engineering Ltd. objects to any additional or different terms contained in any documentation submitted by Customer. No waiver or modification of these terms and conditions shall be binding on Austin Engineering Ltd. unless authorized in writing by Austin Engineering Ltd. Austin Engineering's acceptance of any order is contingent upon the receipt of a valid purchase order or written direction from the Customer.

SCOPE. The scope of work for the Engineering Services to be provided to Customer is specifically set forth in the proposal, quote, or acknowledgment submitted to Customer by Austin Engineering Ltd.. If Customer requests a change in the scope of the Engineering Services to be provided, Austin Engineering Ltd. reserves the right to revise delivery schedules and make an equitable adjustment to the price. Customer acknowledges and agrees that Austin Engineering Ltd. is providing the Engineering Services only and is not providing or participating in the provision of any product(s). Austin Engineering Ltd. will not be obligated to provide any services which are (a) outside of the scope defined in the applicable documentation; (b) outside its area of expertise; or (c) in violation of any applicable laws, codes or regulations.

CUSTOMER OBLIGATIONS. Customer shall make available in a timely manner at no charge to Austin Engineering Ltd. all drawings, technical data, measurements, or other information and resources reasonably required by Austin Engineering Ltd. for the performance of the Engineering Services. Customer will be responsible for, and assumes the risk of any problems resulting from, the content, accuracy, completeness and consistency of all such data, materials and information supplied by Customer.

PRICES/TAXES. Prices for the Engineering Services are subject to escalation in the event of an increase in costs associated with the project. Unless otherwise stated or agreed, AEL's prices do not include sales taxes.

PAYMENT TERMS. Standard payment terms are net 30 days for creditworthy customers. For all orders greater than $50,000 or project extending beyond 1 month, progress payments will normally be required as specified in the quotation.

LIMITED WARRANTY. Austin Engineering Ltd. will provide the Engineering Services in accordance with generally accepted professional engineering practices using reasonable care and skill consistent with that ordinarily exercised by members of the profession under similar conditions. However, due to the nature of the Engineering Services being provided, Austin Engineering Ltd. cannot fully guarantee the success of Customer's project. As such**,** except as set forth in this Section, Austin Engineering Ltd. makes no warranties or guarantees, whether express, implied, or statutory, regarding or relating to the Engineering Services furnished under this Agreement. Austin Engineering Ltd. specifically disclaims all implied warranties of merchantability and fitness for a particular purpose with respect to the Engineering Services.

REMEDY FOR BREACH OF THE LIMITED WARRANTY. The parties acknowledge and agree that the Engineering Services are being provided by Austin Engineering Ltd. with the expectation that Austin Engineering Ltd. is not assuming any financial or operational risks of the Customer. In the event Austin Engineering Ltd. commits an error with respect to or incorrectly performs the Engineering Services, Austin Engineering Ltd. shall use commercially reasonable efforts to correct such error, or re-perform such Engineering Services at no cost to Customer. Customer acknowledges that its sole and exclusive remedy, and AEL's sole and exclusive liability, for any defect or error in the Engineering Services shall be correction, re-performance or substitution of such services by Austin Engineering Ltd..

LIMITATION OF LIABILITY. AEL's liability for damage of any kind arising out of the Engineering Services provided pursuant to this Agreement shall in no case exceed the price paid by Customer. In no event shall Austin Engineering Ltd. be liable for any special, indirect, incidental or consequential damages, including loss of profits or business interruption or loss of use of equipment, however caused arising from the Engineering Services provided pursuant to this Agreement.

DELIVERY/FORCE MAJUERE. Austin Engineering Ltd. shall have no liability for delays or any other breach of its obligations resulting from an Act of God, war, riot, explosion, accident, act of government, work stoppage, default of subcontractor or supplier of materials, or any other cause beyond the reasonable control of Austin Engineering Ltd..

CANCELLATION, SUSPENSION OR DELAY. Customer may cancel an order for Engineering Services upon written notice to Austin Engineering Ltd. and payment of an agreed upon cancellation charge, which shall include all costs incurred by Austin Engineering Ltd. prior to the cancellation plus a reasonable profit. A purchase order may be suspended or delayed by Customer with AEL's prior written consent. If Austin Engineering Ltd. agrees to a suspension or delay, Customer shall reimburse Austin Engineering Ltd. for all costs incurred up to the date of such suspension or delay, plus a reasonable profit. All other costs related to and risks incidental to resumption of the Services shall be bore by Customer.

AUSTIN ENGINEERING LTD.'S PROPERTY. Except as otherwise specifically set forth in the scope of work provided as part of the proposal or quotation, all documents, including drawings, specifications, computer files, electronic media, data, engineering calculations, notes, and other documents and instruments prepared or furnished by Austin Engineering Ltd. (collectively the "Documentation") are the property of Austin Engineering Ltd.. Austin Engineering Ltd. shall retain all common law, statutory and other reserved rights, including copyright, applicable to the Documentation. The Documentation is not intended or represented to be suitable for use on any other project. Any reuse of the Documentation without written verification or adaptation by Austin Engineering Ltd. for the specific purpose intended is prohibited and will be at Customer's sole risk and without liability or legal exposure to Austin Engineering Ltd.. Customer agrees to defend, indemnify and hold Austin Engineering Ltd. harmless against all claims, damages, losses, and expenses (including reasonable attorneys' fees) arising from or in any way connected with the unauthorized use or modification of the Documentation by Customer or any person or entity that acquires or obtains the Documentation from or through Customer without the written authorization of Austin Engineering Ltd..

INTELLECTUAL PROPERTY RIGHTS. Each party shall retain ownership of all intellectual property it had prior to commencement of the Engineering Services. However, Austin Engineering Ltd. shall own exclusively all rights in any ideas, inventions, or works of authorship created in or resulting from the Engineering Services, including but not limited to all patent rights, copyrights, moral rights, rights in proprietary information, trademark rights and other intellectual property rights, and Customer will execute assignments as necessary to achieve that result.

UNAUTHORIZED CHANGES. Austin Engineering Ltd. shall have no liability to Customer or others for changes made to the Documentation by Customer without AEL'S prior written approval.

INDEMNITY. Customer will defend, indemnify, and hold Austin Engineering Ltd. harmless from all claims, damages, losses and expenses (including reasonable attorney fees) arising out of the provision of the Engineering Services by Austin Engineering Ltd. under this Agreement, including claims related to AEL's use of Customer supplied drawings, measurements, data, or any other information provided by Customer that is used in performing the Engineering Services. However, in no event shall Customer be liable under this provision for claims arising out of the sole negligence or willful misconduct of Austin Engineering Ltd..

COMPLIANCE WITH LAWS. The parties agree to comply with all applicable federal, provincial, or local laws in connection with the Engineering Services being provided pursuant to this Agreement.

ASSIGNMENT. Customer may not assign the Agreement between Austin Engineering Ltd. and Customer without the prior written consent of Austin Engineering Ltd..

THIRD-PARTY BENEFICIARIES. Nothing contained in this Agreement shall create a contractual relationship with or a cause of action in favor of a third party against AEL. AEL's Engineering Services are being performed solely for Customer's benefit, and no party or entity shall have any claim against Austin Engineering Ltd. because of this Agreement or the performance or nonperformance of the Engineering Services.

INDEPENDENT CONTRACTORS. Each party will be and act as an independent contractor and not as an agent or partner of, or joint venture with, the other party for any purpose related to this Agreement or the transactions contemplated by this Agreement, and neither party by virtue of this Agreement will have any right, power, or authority to act or create any obligation, expressed or implied, on behalf of the other party.

ENTIRE AGREEMENT. This Agreement represents the entire and integrated Agreement between Customer and Austin Engineering Ltd. and supersedes all prior negotiations, representations or agreements either written or oral. This Agreement may be amended only by written instrument signed by both Customer and Austin Engineering Ltd..

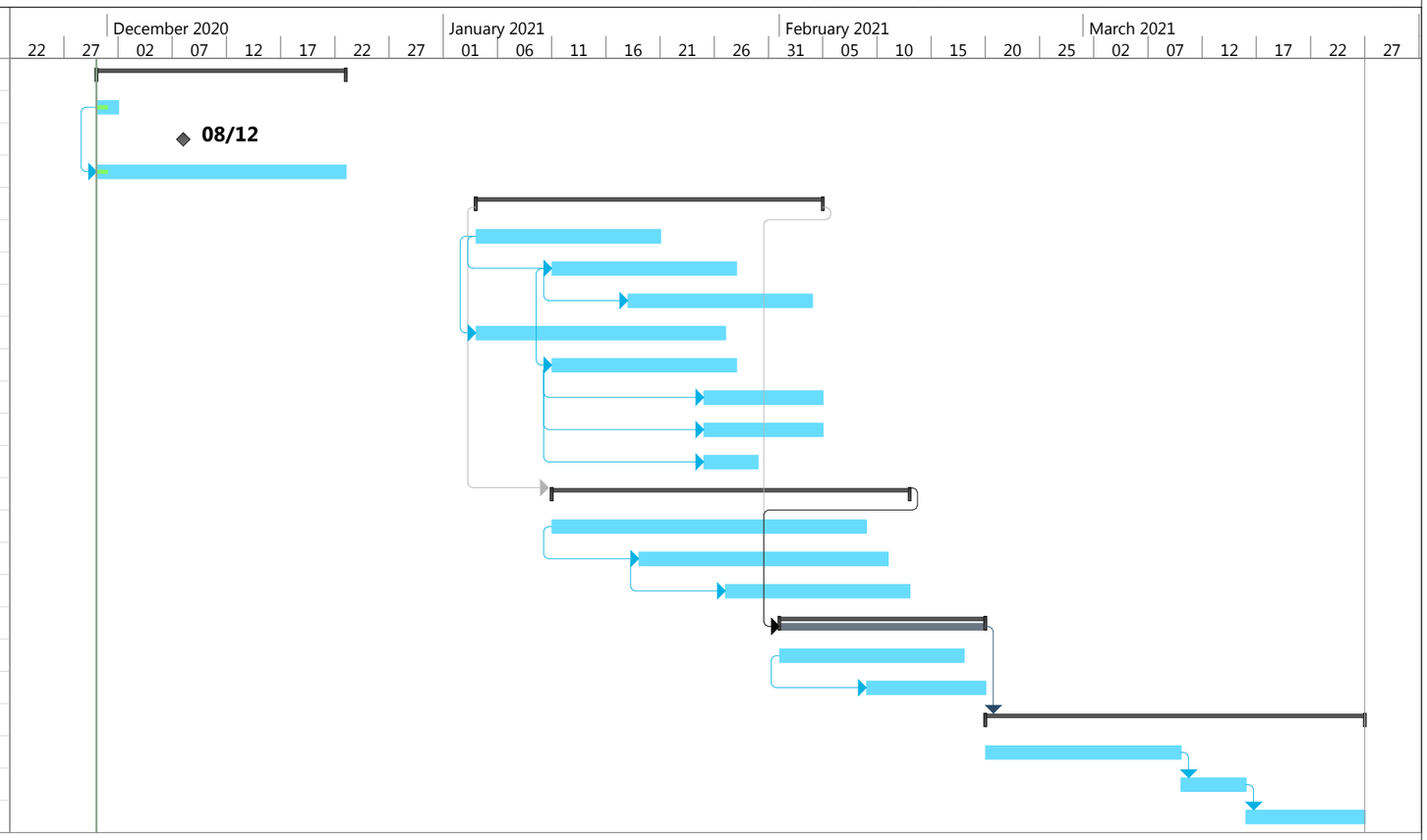
AUSTIN ENGINEERING

PROJECT FEES: Springbank SR1 Offstream Dam - Engineering Review & Inundation Maps

ITEM	TASK ACTIVITY	Project Manager Jenn Wilson, MA	Principal Dam Safety Engineer Roger Austin, P.Eng.	Sr. Geotechnical Engineer Kevin Fattah, P.Eng.	Sr. Hydrotechnical Engineer Ruth Keyes, P.Eng.	Civil/Structural Engineer Mike Peters, P.Eng.	Hydrotechnical EIT Hanna Hamid, M.Eng.	Civil/Structural EIT Tanzim Alam, M.Eng.	Manager of Technical Communication Sara Howald, B.Sc.	AE Office Overhead	Hours	Professional Fees	Disburs.	Total
		$154	$198	$198	$144	$144	$108	$108	$116	$14				
ENGINEERING SERVICES:														
1.00	**REVIEW EXISTING INFORMATION**													
1.01	Project management & reporting	2	2						2	6	**6**	**$ 1,022**		$ 1,022
1.02	Kickoff Meeting (Teleconference)		2	2	2				2	8	**8**	**$ 1,425**		$ 1,425
1.03	Obtain and review available background information		8	8	8		8			32	**32**	**$ 5,636**		$ 5,636
	REVIEW EXISTING INFORMATION SUB-TOTAL	**2**	**12**	**10**	**10**	**0**	**8**	**0**	**4**	**46**	**46**	**$ 8,083**	**$ -**	**$ 8,083**
2.00	**DESIGN ASSESSMENT**													
2.01	Project management & reporting	2	2						2	6	**6**	**$ 1,022**		$ 1,022
2.02	Review Hydroloical Data and Comment on Existing Reports		4		16		16		4	40	**40**	**$ 5,850**		$ 5,850
2.03	Review Hydrotechnical Data and Comment on Existing Reports			4	16		16		4	40	**40**	**$ 5,850**		$ 5,850
2.04	Review Dam Break and Flood Inundation Mapping		4	8	8		8		2	30	**30**	**$ 5,048**		$ 5,048
2.05	Perform Independant Geotechnical Stability & Seepage Analysis		4	32		8			4	48	**48**	**$ 9,424**		$ 9,424
2.06	Perform Structural Analysis on Outlet Works		4			16		32	4	56	**56**	**$ 7,806**		$ 7,806
2.07	Review and Comment on Dam Emergency Planning Documentation		2		8		8		2	20	**20**	**$ 2,925**		$ 2,925
2.08	Review and Comment on Dam Operation, Maintenance and Surveillance Manual		2		8		8		2	20	**20**	**$ 2,925**		$ 2,925
2.09	Stakehold interviews and tabulation of concerns		2	2	2				8	14	**14**	**$ 2,207**		$ 2,207
	DESIGN ASSESSMENT SUB-TOTAL	**2**	**24**	**46**	**58**	**24**	**56**	**32**	**32**	**274**	**274**	**$ 43,056**	**$ -**	**$ 43,056**
3.00	**RISK ASSESSMENT**													
3.01	Project management & reporting	2	2						2	6	**6**	**$ 1,022**		$ 1,022
3.02	Develop Hazard and Failure Modes Matrix		4	8	8		8		8	36	**36**	**$ 5,829**		$ 5,829
3.03	Interium Report Outlining Risks and Deficiencies for Oral Hearing Cross Examination		8	4	8		4		16	40	**40**	**$ 6,382**		$ 6,382
	RISK ASSESSMENT SUB-TOTAL	**2**	**14**	**12**	**16**	**0**	**12**	**0**	**26**	**82**	**82**	**$ 13,233**	**$ -**	**$ 13,233**
4.00	**INUNDATION MAPPING FOR SPRINGBANK**													
4.01	Project management & reporting	2	2						2	6	**6**	**$ 1,022**		$ 1,022
4.02	Obtain Digital Elevation Model & Cut Sections	4			4		16			24	**24**	**$ 3,260**	$ 7,500	$ 10,760
4.03	HEC-RAS Flood Modeling and Determination of Flood Levels		2	2	8		20			32	**32**	**$ 4,556**		$ 4,556
4.04	Produce Inundation Maps		2	2	8		16			28	**28**	**$ 4,067**	$ 7,500	$ 11,567
	INUNDATION MAPPING FOR SPRINGBANK SUB-TOTAL	**6**	**6**	**4**	**20**	**0**	**52**	**0**	**2**	**90**	**90**	**$ 12,905**	**$ 15,000**	**$ 27,905**
5.00	**FINAL REPORT AND SUBMISSIONS**													
5.01	Project management & reporting	2	2						2	6	**6**	**$ 1,022**		$ 1,022
5.02	Complete Draft Report for Springbank		4	2	4		2		16		**28**	**$ 3,834**		$ 3,834
5.03	Review Report with Springbank and Incorporate Feedback		2	2	2				8		**14**	**$ 2,007**		$ 2,007
5.04	Issue Final Report		8	4	8	4	4		16	44	**44**	**$ 7,013**		$ 7,013
	FINAL REPORT AND SUBMISSIONS SUB-TOTAL	**2**	**16**	**8**	**14**	**4**	**6**	**0**	**42**	**50**	**92**	**$ 13,876**	**$ -**	**$ 13,876**
	SUMMARY													
1.00	**REVIEW EXISTING INFORMATION**	2	12	10	10	0	8	0	4	46	46	$ 8,083	$ -	$ 8,083
2.00	**DESIGN ASSESSMENT**	2	24	46	58	24	56	32	32	274	274	$ 43,056	$ -	$ 43,056
3.00	**RISK ASSESSMENT**	2	14	12	16	0	12	0	26	82	82	$ 13,233	$ -	$ 13,233
4.00	**INUNDATION MAPPING FOR SPRINGBANK**	6	6	4	20	0	52	0	2	90	90	$ 12,905	$ 15,000	$ 27,905
5.00	**FINAL REPORT AND SUBMISSIONS**	2	16	8	14	4	6	0	42	50	92	$ 13,876	$ -	$ 13,876
	PROJECT TOTAL													
	PROJECT Total	14	72	80	118	28	134	32	106	542	584	**$ 91,151**	**$ 15,000**	**$ 106,151**

AUSTIN ENGINEERING

ID	Task Mode	Task Name	Duration	Start	Finish
1		**Review Background Info**	**20 days**	**30/11/20**	**22/12/20**
2		Compile Document List	2 days	30/11/20	01/12/20
3		Kickoff Meeting	0 days	08/12/20	08/12/20
4		Review Background Information	20 days	30/11/20	22/12/20
5		**Design Assessment**	**28 days**	**04/01/21**	**04/02/21**
6		Hydrological Review	15 days	04/01/21	20/01/21
7		Hydrotechnical Review	15 days	11/01/21	27/01/21
8		Dam Break and Flood Mapping	15 days	18/01/21	03/02/21
9		Geotechnical Seepage and Stability	20 days	04/01/21	26/01/21
10		Structural Analysis of Outlet Works	15 days	11/01/21	27/01/21
11		Review DEP and Comment	10 days	25/01/21	04/02/21
12		Review OMS and Comment	10 days	25/01/21	04/02/21
13		Stakeholder Interviews	5 days	25/01/21	29/01/21
14		**Innundation Mapping**	**29 days**	**11/01/21**	**12/02/21**
15		Obtain DEM and Cut Sections	25 days	11/01/21	08/02/21
16		HEC-HMS Flood Modeling	20 days	19/01/21	10/02/21
17		Produce Innundation Maps	15 days	27/01/21	12/02/21
18		**Risk Assessment**	**17 days**	**01/02/21**	**19/02/21**
19		Develop Hazard and Failure Risk Matrix	15 days	01/02/21	17/02/21
20		Interim Report for Hearing	10 days	09/02/21	19/02/21
21		**Final Report and Submissions**	**30 days**	**20/02/21**	**26/03/21**
22		Draft Report	15 days	20/02/21	09/03/21
23		Review Report with Springbank	5 days	10/03/21	15/03/21
24		Final Report	10 days	16/03/21	26/03/21



Project: Springbank SR1 Dam Review
Date: 30/11/20

Task	Project Summary	Manual Task	Start-only	Deadline
Split	Inactive Task	Duration-only	Finish-only	Progress
Milestone	Inactive Milestone	Manual Summary Rollup	External Tasks	Manual Progress
Summary	Inactive Summary	Manual Summary	External Milestone	

ROGER AUSTIN, P.ENG.

Dam Safety Engineer

AUSTIN ENGINEERING

Roger is the Owner and Principal Engineer at Austin Engineering Ltd. in Trail, BC. Roger holds a B.ASc. in Civil-Structural Engineering from the University of British Columbia and has more than 20 years of experience in the industry. Roger's collaborative approach to engineering projects is key to the success of Austin Engineering's work on dams of all sizes and complexities. By customizing the project deliverables to meet the client's needs, Roger helps dam owners operate and maintain their dams as safely and efficiently as possible. Prior to founding Austin Engineering, Roger worked with FortisBC Inc. as Manager of Generation Engineering, where he oversaw all engineering for their Columbia River generating stations, including all mechanical, electrical, civil, and dam safety projects.

Experience

Principal Engineer – 2014-Present
Austin Engineering Ltd., Trail, BC

As the Dam Safety Engineer at Austin Engineering, Roger has been involved in all dam safety projects, performing duties including dam inspections, technical reviews, quality assurance, dam design and engineering, and project management. Roger also spearheads the firm's research into seismic impacts on dam performance and design. Below is an outline of some of the key dam safety projects that Roger has been involved in:

- Prince Rupert – Eiffage Canada – Woodworth Diversion Dam Replacement Phase 1
- Regional District of Kootenay Boundary – Kelly Creek Dam 2018 Annual Inspection
- Regional District of Kootenay Boundary – Saddle Lake Dam 2018 Annual Inspection
- Prince Rupert– PRP Technical Review Woodworth Dam Bids

  BC Hydro – Walter Hardman Weir Repairs
- District of Summerland – Summerland Garnet Dam Bridge
- City of Cranbrook – Design Removable Stoplogs Idlewild Dam
- BC Hydro – Revelstoke Penstock Review
- FortisBC – Waterline Pipe Support Waneta Dam
- Nelson Hydro - Forebay Deck Replacement

Education

- **B.ASc. Civil Engineering**
  University of British Columbia, Vancouver, BC, Canada
- **Executive Management Program**
  Massachusetts Institute of Technology, Cambridge, MA, USA

Research

- **2019** – Comparative Seismic Performance of Dams in Canada and China Using Numerical Analysis and Shake Table Testing
- **2018** – Experimental and Numerical Investigation of a Reduced Scale Dam Utilizing 3D Printing & Shake Table Analysis

ROGER AUSTIN, P.ENG.
Dam Safety Engineer

AUSTIN ENGINEERING

- HMI – Menihek Dam Concrete Details
- District of Summerland – Garnett Dam Spillway
- BC Hydro – Walter Hardman 2017 Dam Safety Investigation Scope of Work
- FortisBC – 2017 Annual Inspections for Corra Linn Dam, South Slocan Dam, Rover Creek Dam, Lower Bonnington Dam, Brilliant Dam, Waneta Dam, Upper Bonnington Dam, and Falls Creek Dam
- Regional District of Kootenay Boundary – Saddle Lake Dam Safety Upgrades
- Regional District of Kootenay Boundary – Saddle Dam Annual Inspection Report 2017
- District of Summerland – Summerland Thirsk & Garnet Dam Safety Review 2017
- Nelson Hydro – Forebay Concrete Work Details
- BC Hydro – Mica Floor Analysis
- Town of Ladysmith - Holland Lake Dams Dam Emergency Plan, Operation Maintenance and Surveillance Manual, & Mapping
- Nelson Hydro – Seepage Monitoring
- FortisBC - Falls Creek Operation Maintenance and Surveillance Manual and Dam Emergency Plan
- FortisBC – Rover Creek Operation Maintenance and Surveillance Manual and Dam Emergency Plan
- BC Hydro – Gordon M. Shrum Dam Seismic Review
- FortisBC – Waneta Operation Maintenance and Surveillance Manual Update
- City of Cranbrook – Idlewild Dam Safety Upgrades
- City of Kimberly – Mark Creek Dam Safety Review
- Regional District of Kootenay Boundary – Saddle Dam Spillway Design
- FortisBC – Quarterly Dam Safety Inspections for Walden North, Brilliant Dam, Corra Linn Dam, South Slocan Dam, Upper Bonnington Dam, and Lower Bonnington Dam

Skills Highlights

- Design of dams, spillways, channels, dykes and hydraulic structures
- Dam Safety Reviews (DSR)
- Dam Emergency Plans (DEP)
- Operation, Maintenance and Surveillance (OMS) Manuals
- Stability analysis of concrete gravity dams
- Design of distribution, transmission and substations
- Project management, planning, design, cost estimation and construction
- Seismic design and retrofits
- Spillway and head gate design and analysis
- Fatigue and failure analysis
- Design review of steel, concrete and timber structures

- FortisBC – Brilliant Dam - Public Safety Management Plan
- FortisBC – Arrow Lakes Hydro- Operation Maintenance and Surveillance Manual Review
- FortisBC – 2014 Annual Dam Safety Reports for South Slocan Dam, Upper Bonnington Dam, Corra Linn Dam, Lower Bonnington Dam, Waneta Dam and Brilliant Dam
- Fortis Generation East - Battersea Dam Emergency Spillway Repairs
- FortisBC – Waneta Expansion - Operation Maintenance and Surveillance Manual
- FortisBC – Waneta - Dam Stabilization

Supervisor of Generation Engineering – 2013-2014
FortisBC Inc., Trail, BC

- Oversaw all FortisBC, Fortis Generation East, Fortis Ontario and Fortis US dam safety and civil requirements
- Managed all mechanical, electrical and civil projects
- Responsible for developing strategic objectives and ensuring they became a part of operational and business plans
- Integrated operational resources to extend current business capabilities
- Developed and managed relationships with 3rd party providers, area customers, community and business leaders and key community organizations
- Recommended and implemented effective risk management strategies to ensure safety standards were upheld within the generating plants
- Managed generation operating budgets with a focus on cost efficiencies and improved work methods
- Recommended strategic solutions, new ideas, approaches and performance improvements.
- Responsible for all Generation Capital and Operations Planning throughout FortisBC generating stations
- Distribution Structure Analysis for the design of distribution structures. including guyed targets, overhead guys, and foundation soil conditions

Professional Associations

- Canadian Dam Association
- Engineers and Geoscientists British Columbia
- Association of Professional Engineers and Geoscientists of Alberta
- Northwest Territories and Nunavut Association of Professional Engineers and Geoscientists
- Professional Engineers and Geoscientists Newfoundland & Labrador

Civil Engineer – 2010-2012
FortisBC Inc., Trail, BC

- Responsible for the design of transmission structures, substations, access roads, containment systems and many civil items as the sole Civil Design Engineer for FortisBC
- Responsible for Generation planning and writing of the Generation Integrated System Plan for Generation for BCUC Submission
- Responsible for Dam Safety Management at the FortisBC generating stations and 3rd party plants.
- Provided Generation operation crews with engineering technical support in routine daily jobs at nine FortisBC operating plants
- Generation Capital project planning with FortisBC clients such as Columbia Power Corporation and Teck Metals Ltd.
- Provided engineering support to T&D Benvoulin office engineering team in Osoyoos line expansion project
- Prepared tender documents for various projects such as spillway gate rehabilitation project in Waneta Dam
- Conducted quality control in rehabilitation projects accomplished by contractors at Lower Bonnington and Brilliant Dams
- Conducted engineering designs in structural modifications in Upper Bonnington Dam unit no. 2 major overhaul project
- Conducted feasibility study for proposed Similkameen Dam project
- Analyzed and interpreted data from piezometers installed in power houses and spillway sections in FortisBC dams
- Provided engineering designs for crane lifting devices and hoisting systems in accordance with WorkSafeBC guidelines
- Contributed to spillway gate and head gate rehabilitation projects at Brilliant Dam

Project Engineer and Superintendent – 2008-2011
Peter Kiewit Sons, Revelstoke, BC

- Completed approximately $40 million of civil works and penstock installation for the Revelstoke Unit 5 Hydro Project which added 530MW of installed capacity to the Revelstoke Dam
- Managed more than 150 people including engineers, trades people and contractors onsite; project involved welding and fabrication to CSA standards, proper execution of multiple critical lifts, and management of high-hazard confined spaces
- Managed the installation of a traveling platform capable of rolling 400ft up and down the interior of the penstock

- Responsible for project planning, quality control, scheduling, procurement, contracts, engineering and safety
- Successfully managed unique safety considerations and was the authority to effectively oversee major project components, meeting budgets and timelines
- Completed construction of the above-ground process facilities including conveyor systems, utilities buildings, mine dry buildings, ore transfer stations and process facilities for a diamond mine in the Northwest Territories
- Supervised a group of approximately twelve engineering coordinators covering the disciplines of civil, geotechnical, structural, mechanical, piping, electrical and instrumentation
- Member of the group responsible for construction planning, quality control, scheduling and cost control, management of information requests, engineering design changes, procurement of materials, and creation of drawing packages

Research and Publications

Li, S., Issa, A.S., Alam, T., Austin, R., & Alam, M. S. 2019. “Comparative Seismic Performance of Dams in Canada and China Using Numerical Analysis and Shake Table Testing”, presented at the International Commission on Large Dams (ICOLD) 2019 Annual Meeting/Symposium.

Issa, A., Alam, T., Austin, R., Alam, M. S., Tyler, J. & Seethaler, R. 2018. “Experimental and Numerical Investigation of a Reduced Scale Dam Utilizing 3D Printing & Shake Table Analysis”, presented at the Canadian Dam Association (CDA) 2018 Conference and Exhibition.

RUTH KEYES, P.ENG.

Senior Hydrotechnical Engineer

AUSTIN ENGINEERING

Ruth holds a Bachelor of Engineering in Civil and Environmental Engineering and specializes in hydrology, hydraulic design, earthworks, and surface and ground water management projects. She has more than 10 years of experience as a consulting engineer working on a variety of hydrology, environmental, and dam safety projects. Ruth's focus is always our clients' success, leading the Austin Engineering team in optimizing designs to minimize capital and operating costs, while maximizing operational efficiency and design life.

Employment Experience

Senior Hydrotechnical Engineer – 2015-2016, 2019-Present

Austin Engineering Ltd., Trail, BC

In her leadership position, Ruth provides senior advisory services throughout many dam safety and environmental projects. She utilizes her extensive experience in the inspection, design, analysis and testing of hydraulic and water-retaining structures to provide our clients with customized dam safety deliverables, including dam safety reviews, emergency response plans, maintenance and surveillance manuals, and inflow design flood modeling. Some of the key projects Ruth has worked on include:

- Eiffage Canada – City of Prince Rupert Woodworth Dam Value Engineering Design
- City of Nelson – Nelson Hydro Powerplant Emergency Response Plan and Operation, Maintenance and Surveillance Manual
- Regional District of Kootenay Boundary – Saddle Lake Dam Spillway Design and Construction Support
- Regional District of Kootenay Boundary – Saddle Lake Dam Annual Inspection
- Regional District of Kootenay Boundary – Kelly Creek Dam Annual Dam Inspection
- City of Cranbrook – Idlewild Dam Inflow Design Flood Hydrological Modeling and Spillway Design
- City of Kimberley – Mark Creek Dam: Dam Safety Review; Dam Emergency Plan; and Operation, Maintenance and Surveillance Manual
- City of Kimberley – Mark Creek Dam Inundation Mapping

Education

- **B.E. Civil/Environmental Engineering and B.Sc. (Math/Computer Science)**
  Adelaide University, Adelaide, Australia

Professional Associations

- Engineers and Geoscientists British Columbia

- City of Trail – Cambridge Reservoir Dam Inflow Design Flood Hydrological Modeling
- City of Trail – Cambridge Reservoir Dam: Dam Safety Review; Emergency Planning Guide; and Operation, Maintenance and Surveillance Manual
- City of Trail – Water System Emergency Response Plan and Contingency Plan
- FortisBC – Quarterly Dam Inspections for Corra Linn, Upper Bonnington, Lower Bonnington, South Slocan & Brilliant Dams

Environmental Coordinator – 2016-2019

Mercer Celgar, Castlegar, BC

Some of the key projects Ruth worked on as the Environmental Coordinator at Mercer Celgar include:

- Colby Crane Piling Repair Project – Management, permit services, and environmental monitoring during piling work
- Landfill Expansion Project - Technical review and oversite during the excavation of two additional cells and installation of the liner and leachate collection system
- Landfill Management – Design and implementation of drainage improvements for existing landfills; reviewing and coordination of operation guidelines
- Soil Amendment Program – Undertaking site visits, soil sampling, and analysis and the development of land application plans
- Dolphin Piling Replacement Project – Development of scope of work, environmental management plan, permit application packages, and training leader for environmental team

Project Engineer – 2014

WSA Engineering, Castlegar, BC

- Robson Raspberry Water System Capital Expenditure Charge Study – model of the Robson Raspberry water system with projected demands for 2020 and 2040 to identify water system improvements to meet hydraulic design criteria
- Sunshine Estate Water Utility Society – water well and pump capacity review and recommendations

Skills Highlights

- Reporting hydraulic system analysis and design
- Erosion control
- Dam and channel remediation
- Flood assessment and mitigation
- Drainage system analysis and design
- Wastewater and sewerage system design
- Environmental assessments

RUTH KEYES, P.ENG.
Senior Hydrotechnical Engineer

AUSTIN ENGINEERING

Project Engineer – 2014

Pennco Engineering, Nelson, BC

- Yahk Manufactured Home Park Flood Hazard Assessment – hydraulic modelling of 200-year annual exceedance probability flood in Moyie River adjacent to proposed manufactured home park required for Regional District of Central Kootenay development and building applications

Drainage Design Engineer – 2013

City of Port Adelaide Enfield, Adelaide, South Australia

- Analyzed stormwater drainage systems requiring upgrades due to flooding
- Assisted with preparation work for upcoming drainage construction projects
- Reviewed and provided comments or approval for development applications in regards to drainage, access and traffic management
- Assisted with the management of projects under the Stormwater Ten Year Capital Works Program

Project Engineer – 2008-2012

Water Rescources Specialist – 2006-2008

Golder Associates, Calgary, AB

- Shell Jackpine Mine – Khahago Creek Diversion Channel – Lead Design Engineer during detailed design and construction phases
- Shell Muskeg River Mine – Sharkbite Dewatering – 2012 Diversion Channel, Sharkbite Disposal Area ditch 2, Sedimentation Pond expansion - Lead Design Engineer during detailed design and construction phases
- Shell Muskeg River Mine – Sharkbite Dewatering – Groundwater management system / cut-off wall Project Engineer during conceptual and detailed design phases
- De Beers Snap Lake Mine – submerged outfall pipeline and diffuser redesign and replacement – Project Engineer from conceptual design to completed construction
- Canadian Natural Resources Limited – Horizon Mine – Tar River Diversion – Quality Control Inspector during construction of diversion ditch 4. Project Engineer during detailed design of remediation works required on Horizon Lake Dam and diversion ditches 1, 2 and 3

Project Engineer – 2005-2008

Optimatics (Adelaide, South Australia)

- Designed system upgrades for pressurized water distribution networks in the US, UK and Australia
- Assisted in optimization software development including user interface functionality review and training

Forsyth County Master Plan:

- Project Engineer during conceptual design of capital improvements to the existing Forsyth County potable water distribution system, including sizing capacity of new storages and pump stations. Operations of pump stations and storages were optimized in conjunction with capital improvements

Arkley Mains Renewal Design, UK:

- Project Engineer for the conceptual design phases of pipeline replacement projects in the East and South Arkley District Metered Areas for Three Valleys Water

Irrigation System Design, Shepparton, Victoria:

- Project Engineer for the conceptual design of pressurized irrigation systems in rural Victoria to replace existing open channel networks drawing water from the River Murray. A hydraulic model of the system was created using GIS data. Pipe diameters were chosen to minimize capital costs whilst meeting irrigator's demands and design criteria (pressure and velocity)

KEVIN FATTAH, M.SC., M.ENG., P.ENG.

Engineering Manager

AUSTIN ENGINEERING

With more than 20 years of extensive experience in civil and geotechnical engineering, Kevin provides the Austin Engineering team with expert guidance and effective project management. Kevin's engineering expertise includes geotechnical investigation and analysis, foundation design, soil improvement, and civil engineering for dams, highways, mines, and pipelines. Along with his practical experience, Kevin holds a M.Eng. in Geotechnical Engineering, a M.Sc. in Geotechnical Engineering, a B.Sc. in Civil Engineering, and a Minor degree in Construction Management from the University of British Columbia. As Engineering Manager, Kevin leverages his attention to detail and organized approach to project management to deliver effective engineering solutions on time and on budget and ensure client success.

Experience

Engineering Manager – 2020 - Present
Austin Engineering Ltd., Trail, BC

In his role as Engineering Manger, Kevin provides senior oversight for all engineering projects, working closely with our engineers and clients to manage project scopes, budgets, and schedules. Kevin also applies his vast experience and training to provide geotechnical investigations and analysis on a variety of engineering projects. Kevin's key competencies include:

- Project management
- Construction estimation and scheduling
- Geotechnical site investigation and review
- Geohazard assessment and mitigation design
- Slope stability analysis
- Design of deep and shallow foundations
- Design of earthworks and MSE walls
- Provision of Geotechnical Schedule B and C-B
- Dam safety inspections
- Dam safety documentation development, including Dam Emergency Plans (DEP) and Operations, Maintenance and Safety Manuals (OMS)
- Design of roads and civil works, including site drainage

Education

- **M.Eng. Geotechnical Engineering**
  University of British Columbia, Vancouver, BC, Canada
- **M.Sc. Geotechnical Engineering**
  University of British Columbia, Vancouver, BC, Canada
- **B.Sc. Civil Engineering**
  University of Technology, Building & Construction Engineering Dept., Baghdad, Iraq.
- **Minor Degree, Construction Management**
  University of British Columbia, Vancouver, BC, Canada

KEVIN FATTAH, M.SC., M.ENG., P.ENG.
Engineering Manager

AUSTIN ENGINEERING

Senior Geotechnical Engineer – 2017-2018
Conuma Coal Resources Ltd., Tumbler Ridge, BC

- Responsible for all geotechnical and civil tasks for three mining sites (Wolverine, Brule, and Willow Creek)
- Provided technical advice, analyses, design and plans for operations to ensure stability of pit walls, dumps, and mining excavations
- Participated in blasting operations to limit blasting impact on the stability of slopes of dumps
- Supervised the construction and repairs of dams and haul roads
- Monitored, analyzed, and evaluated instrumentation data (slope inclinometers, settlement monuments, extensometers, and wire line piezometers)
- Performed geotechnical inspections for tailing storage facility dams, sedimentation ponds, pit slopes, diversion ditches, and waste rock dumps; reported on the inspections; and provided recommendations to the Mine Operations group

Geotechnical-Civil Engineer – 2017
Self-Employed Consultant

- Performed consulting work for TLA Consulting Services Canada Inc. and Integrus Engineering
- Delivered geotechnical and civil engineering services, such as stormwater system design and management, culvert design, earthwork services, and project proposal writing

Project Engineer – 2016
Armada Group, Dubai, United Arab Emirates

- Supervised construction of high rise residential towers
- Managed project schedule and budget, and all site issues related to construction and construction materials
- Responsible for scheduling of projects, quantity take offs, site measurements and approved payments, and contractor and sub contractor activities
- Successfully managed site procedures to achieve zero losses on construction sites

Skills Highlights

- Project management
- Project scope and budget review
- Construction estimating and scheduling
- Quality assurance and control
- Team supervision and training
- Geotechnical site investigations
- Slope stability analysis
- Dam safety inspections
- Dam stability analysis
- Foundation design
- Evaluation of instrumentation data
- Road and earthwork design
- Culvert and stormwater system design and management
- Supervision of field and laboratory sampling and testing

KEVIN FATTAH, M.SC., M.ENG., P.ENG.
Engineering Manager

AUSTIN ENGINEERING

Senior Geotechnical Pipeline Engineer – 2013-2015
Worley Parsons, Calgary, AB

- Provided technical guidance and supervision for team, mentored intermediate and junior geotechnical staff, and provided in-house technical expertise to other disciplines
- Maintained the quality and timelines for deliverables (drawings, calculations, reports, etc.) and provided professional stamping
- Selected construction methods for pipeline crossings for highways and water crossings (such as HDD and open trench methods)
- Wrote technical reports, proposals, and scope of works, estimated quantities, and performed squad check for deliverables
- Planned and conducted geophysical and geotechnical site investigations for HDDs and glaciomarine clays, including budget estimation
- Managed clients and business development plans: prepared PowerPoint presentations and discussed technical issues and future tasks

Civil Lead and Geotechnical Engineer – 2011-2012
Klohn Crippen Berger, Calgary, AB

- Reviewed scope and design of projects and developed civil design drawings
- Conducted QA/QC and maintained documentation requirements
- Calculated / checked the material take off (MTO) for projects using Civil 3D software
- Acted as a liaison between consultants, suppliers, and contractors
- Designed roads and intersections, side ditches, berms, culverts, and MSE retaining walls
- Inspected seepage pond dam and conducted slope stability analyses
- Wrote geotechnical reports and Design Base Memorandums

Professional Associations

- Engineers and Geoscientists British Columbia
- Canadian Dam Association
- Former member of the Association of Professional Engineers and Geoscientists of Alberta

Civil Engineering Guest Lecturer – 2009-2010
University of British Columbia, Vancouver, BC

- Delivered lectures for CIVL235 – Plain Surveying

Geotechnical-Civil Engineer – 2009-2010
MEG Consulting Limited, Richmond, BC

- Provided geotechnical and civil engineering for the Port Mann Bridge project
- Provided earthwork services and evaluation for the surcharging program for soil improvement
- Supervised site investigation, logging for drilling activities, and soil verification according to ASTM Standards
- Responsible for supervision of the installation and analyzed data for Burros anchors, settlement gauges, piezometers, and inclinometers with respect to surcharging program
- Analyzed and drew vibration monitoring data and inspected piles, caissons, and subgrades
- Supervised the construction for soil nailing for slope stability and stone columns for soil improvement against earthquake events
- Planned, scheduled, and inspected construction work as per specifications and resolved project's construction and design issues
- Coordinated with project stakeholders (BC Hydro and Metro Vancouver) representatives

Project Engineer / Structural Detailing Engineer – 2008-2009
Condor Rebar Consultants Inc., Vancouver, BC

- Conducted full structural rebar detailing for Athabasca River Bridge and for many other big industrial and residential projects (high rise buildings)
- Developed and implemented changes in design to ensure efficient fabrication and installation of rebar
- Calculated accurate rebar quantities and dimensions according to the specifications and standards of the ACI and the Canadian code

Project Manager and Civil-Geotechnical Engineer – 1998-2007
University Engineering Consulting Center, Omar Al-Mukhtar University, Al Bayda, Libya

- Designed deep and shallow foundations for infrastructures and wrote technical design reports
- Conducted geotechnical site investigation and soil verification (according to ASTM), performed laboratory and field tests with assessments and evaluated monitored data
- Involved in the application and design of soil and rock mechanics to solve engineering problems such as retaining walls, slope stability analysis, and excavations

Professor – 1998-2007
Civil Engineering Department, Omar Al-Mukhtar University, Al Bayda, Libya

- Soil Improvement Techniques
- Mechanics of Soil Theory
- Foundation Design
- Structural Drafting
- Descriptive Geometry
- Programming with Fortran

Head of Civil Design Department – 1996-1998
Baghdad Municipal Office, Soil and Materials Laboratories & Design Office, Baghdad, Iraq

- Supervised a group with more than 20 engineering staff
- Managed and administrated projects: implemented different work procedures and technologies, assisted in building effective teamwork and budget, and provided technical advice
- Maintained heritage buildings, roads, bridges, and other municipal assets, such as pumping stations
- Baghdad Tunnels Services Project
- Bab Al Shake Residential Project

Municipal Engineer – 1984-1993
Baghdad Municipal Office, Soil and Materials Laboratories & Design Office. Baghdad, Iraq

- Prepared study plans for infrastructures of new developments, the scope of work, and estimated time and cost for construction
- Prepared proposals and was responsible for projects implementation, technical accuracy, and timely completion
- Maintained heritage buildings, roads, bridges, and other municipal assets, such as pumping stations
- Performed and reviewed results of field and laboratory tests for construction materials and soils in accordance with the project specifications, and wrote technical reports

Publications

Khalid (Kevin) Fattah, M.Sc., M.Eng., P.Eng. 2007. “Soil Improvement”. Textbook published by the University of Omer Al-Mukhtar.

Khalid (Kevin) Fattah, M.Sc., M.Eng., P.Eng. 2007. “Reinforced Concrete Design II”, Chapter 3. Textbook published in the University of Omer Al-Mukhtar.

MICHAEL PETERS, P.ENG.

Civil-Structural Engineer

AUSTIN ENGINEERING

Michael is a versatile engineer who specializes in structural engineering, with experience in environmental and geotechnical as well. He has extensive experience in structural inspections and design, having worked at several industrial facilities. Mike uses his impressive technical aptitude to deliver comprehensive structural analysis and to develop responsive structural designs and repair details.

Employment Experience

Civil-Structural Engineer – 2019-Present
Austin Engineering Ltd., Trail, BC

Mike performs structural inspections and analysis on a variety of structures, including industrial buildings, retaining structures, and support structures. Mike also conducts reviews of structures and components to ensure they meet applicable building codes and safety requirements. Mike's recent projects include:

- FortisBC – Brilliant Dam Guardrails Review
- FortisBC – Brilliant Dam Spillway Gantry Assessment
- FortisBC – Brilliant Dam Tailrace Gate Support
- FortisBC – Upper Bonnington Dam Floor Penetration Inspection and Analysis
- FortisBC – Lee Terminal Station Upgrades Design
- HMI Construction – BC Hydro GMS Spillway Upgrades Seismic Design
- Houle Electric – BC Hydro Mica Dam Backup Generator

Civil-Structural Engineer – 2014-2019
Redwood Engineering Ltd., Trail, BC

- Performed crane way inspections and structural inspections in several industrial facilities and produced detailed reports, hazard/risk analysis, detailed deficiency analysis, remediation strategies, and cost analysis
- Performed structural engineering and design that included: industrial steel platforms and walkways, crawl beams, concrete retaining walls, suspended concrete slabs, concrete slabs on grade, steel frame structures, and wood frame structures

Education

- **B.Sc. Civil Engineering** with specialization in Structural and Geotechnical studies University of Alberta, Edmonton, AB, Canada
- **Instrumentation Engineering Technology Diploma and Honours** Northern Alberta Institute of Technology, Edmonton, AB, Canada

Professional Associations

- Engineers and Geoscientists British Columbia
- Association of Professional Engineers and Geoscientists of Alberta

MICHAEL PETERS, P.ENG.
Civil-Structural Engineer

AUSTIN ENGINEERING

- Performed construction support and quality control for industrial and residential projects
- Engineered structural repair plans that involved restoring structural capacity to deteriorated or damaged steel, concrete, and wood structures and elements
- Industrial storage rack assessments and structural analysis including seismic effects. Expertise in determining measures to achieve compliance with new WorkSafeBC/Occupational Health and Safety Regulations
- Performed fire code compliance assessment for industrial occupancy and prepared detailed report. Familiar with British Columbia Building Code fire regulations and National Fire Protection Association codes and standards

Project Engineer Co-op – 2013
Teck Coal Ltd. Fording River Operations, Elkford, BC

- Project manager for site-wide pressure vessel inspection program; work included acquisition and review of applicable regulations and codes, preparation of proposal, bid review and cost analysis, contract management, and completion of summary report and recommendations
- Completed preliminary evaluation and design of proposed long-term tailings storage facility and clarified water reclamation system; work included data acquisition and evaluation, site surveys and modeling with AutoCAD and MineSight software, effluent flow measurements and calculations, tailings properties evaluation, cost analysis, risk analysis, completion of comprehensive report and formal presentations
- Assisted in contract management for major construction projects
- Drafting for various projects including pipeline right-of-ways, site survey and contour maps, piping and instrumentation, structural, and electrical portal

Geotechnical Engineer Co-op – 2012
LWL Engineering Ltd., Edmonton, AB

- Completed a structural assessment and detailed report of concrete damage on a high-rise building

Skills Highlights

- Construction quality control
- Engineering drafting
- Reporting
- Structural assessments and inspections
- Structural design
- Seismic assessments
- Seismic design
- Regulatory compliance
- Material testing
- Foundation design
- Structural steel rehabilitation
- Concrete rehabilitation

- Established set back distances for residential projects near slope, designs for retaining walls, slope stability strategies, and groundwater level monitoring
- Assisted professional engineers to prepare proposals, geotechnical design reports, cost estimates, geotechnical analyses, site plans, and stratigraphic drawings.
- Performed site investigations, site surveying, borehole logging and subsurface geotechnical reports, slope stability analyses, and soil classifications.

Structural Engineer Co-op – 2011
Stantec Consulting Ltd., Red Deer, AB

- Drafting for bridge design projects including the North Highway Connector (Red Deer, AB), Fort MacKay River Bridge Replacement (Fort MacKay, AB). Other drafting assignments included projects for structural, transportation, instrumentation and electrical, and urban development
- Assisted professional engineers to complete and/or prepare detailed design reports, tender documents, and maintenance reports and cost estimates
- Performed bridge inspections and construction supervision

HANNA HAMID, PH.D.

Civil-Environmental EIT

AUSTIN ENGINEERING

Hanna holds an M.Sc. and Ph.D. in Civil Engineering, with a focus in Environmental Engineering. She specializes in water quality, water and wastewater treatment, sustainability and life cycle analyses of treatment technologies, and emerging contaminants. In her role as Hydrotechnical Engineer-in-Training at Austin Engineering, Hanna has worked on many dam safety projects and has performed a variety of engineering tasks, including hydrological modelling, flood mapping, and technical reviews. Hanna consistently utilizes her expertise, strong work ethic, and attention to detail to produce outstanding deliverables that help drive the success of every project she works on.

Employment Experience

Hydrotechnical Engineer-in-Training – September 2020-Present
Austin Engineering Ltd., Trail, BC

Hanna leverages her extensive knowledge of hydrology and hydraulics to assist our senior hydrotechnical engineer in completing analyses and assessments for our dam safety projects. Hanna has worked on the following recent projects:

City of Prince Rupert – Woodworth Dam Design and Construction

- Reviewing and providing feedback on testing and quality plan
- Conducting a technical background review

City of Cranbrook – Gold Creek Dam Preliminary Design

- Assisting with development of hydrological model

Regional District of Kootenay Boundary – Kelly Dam Annual Inspection

- Conducting a literature review of the catchment hydrologic assessment
- Assisting with report writing

Krestova Improvement District – McDermid and Langill Reservoir Dam Safety Inspection

- Developing channel sections for hydrological model
- Preparing flood maps

Education

- **Ph.D. Civil Engineering**
  University of British Columbia, Vancouver, BC, Canada
- **M.Sc. Civil Engineering**
  UBC Okanagan, Kelowna, BC, Canada
- **B.Sc. Civil Engineering**
  Bangladesh University of Engineering and Technology, Dhaka, Bangladesh

Professional Associations

- Engineers and Geoscientists British Columbia
- BC Water and Waste Association
- International Water Association

HANNA HAMID, PH.D.

Civil-Environmental EIT

AUSTIN ENGINEERING

Mitacs Accelerate Intern – August 2020-Present
Civil Engineering Department, UBC, Vancouver, BC

Through the Mitacs Accelerate Intern program, Hanna is working with KWL Associates Ltd. to develop a low-cost adsorptive material from sewage sludge for water treatment applications. Her work on this project includes:

- Preparing research proposals for funding agencies, outlining project scope, timeline, task breakdown, and cost estimation
- Conducting Life Cycle Analysis (LCA) and Life Cycle Cost Analysis (LCAA) of sludge-based activated carbon production for water treatment
- Performing lab-scale experiments to test sludge-based activated carbons for contaminant removal from water
- Characterizing water quality in terms of physical, chemical, and biological parameters
- Analyzing experimental data and writing technical reports communicating the results

Civil Engineer Engineer-in-Training – February 2017-July 2020
CMO Consultants Ltd., Vancouver, BC

During her time at CMO, Hanna gained a wealth of experience while working on a wide variety of water resource projects:

Fraser River Hydrodynamic Modelling

- Developed a 2D model of the Fraser River
- Conducted a literature review and historical water flow data analysis

Fortis BC – Right of Way Waterlogging Mitigation

- Developed culvert design for stormwater drainage
- Completed technical report writing

Bow River Hydrodynamic and Water Quality Modelling

- Conducted analysis of historical water quality data for model calibration
- Completed extreme event analysis of historical weather and water level
- Wrote technical reports

Skills Highlights

- Water and wastewater treatment
- Life Cycle Analysis (LCA) and Life Cycle Cost Analysis (LCAA) of treatment technologies
- Water quality assessment
- Hydraulic analysis of channels
- Stormwater drainage design
- Hydrological modelling
- Flood mapping
- Extreme event analysis
- Technical reporting

Fortis BC – Scour Mitigation Design of Bonaparte River Pipeline Crossing

- Conducted terrain analysis of site LIDAR data
- Completed hydrodynamic analysis of the stream to simulate flow velocity and depth
- Completed technical reports

Coastal Vulnerability Assessment for BC Communities in Northern and Central Coast

- Conducted terrain analysis to produce bathymetry data for flood modelling
- Completed extreme event analysis of historical weather and water level data
- Performed literature reviews and report writing

Arctic Bay Harbour Concept Development

- Conducted extreme event analysis for historical weather data

TANZIM ALAM, M.ENG.

Civil-Structural EIT

AUSTIN ENGINEERING

Tanzim has worked extensively on structural assessments and seismic evaluations of municipal and industrial projects throughout British Columbia, as well as internationally. He has his Masters in Structural and Earthquake Engineering from the University of British Columbia and brings his in-depth knowledge of structural and seismic engineering to Austin Engineering. Tanzim has worked on multiple dam safety projects and is experienced with the structural and seismic analysis of dams and related structures. His diligent and responsive approach ensures that clients receive excellent engineering solutions tailored to their needs.

Experience

Civil-Structural Engineer-in-Training – 2016-Present
Austin Engineering Ltd., Trail, BC

On dam safety projects, Tanzim performs structural and seismic analysis of the dam and related structures. In the Austin Engineering lab, Tanzim also conducts research on the impacts of earthquakes on the performance and design of dams. Below is an outline of some of the key dam safety projects Tanzim has worked on at Austin Engineering:

- Nelson Hydro Galvanized Deck Replacement
- Nelson Hydro Platform Design
- Nelson Hydro Bridge Deck Replacement
- Regional District of Kootenay Boundary – Saddle Dam Annual Inspection
- HMI Construction – Hugh L. Keenleyside Dam Cable Tray Seismic Analysis and Retrofit Design
- HMI Construction – Hugh L. Keenleyside Dam PAM, MCC and CS Panels Seismic Review
- HMI Construction – Corra Linn Dam Pier Repair and Designs
- Struthers Tech – Site C Sea Can Support
- FortisBC – Waneta Dam Head Gate Refurbishment
- FortisBC – Waneta Dam Head Gate and Tailrace Gates Single Device Isolation Review
- FortisBC – Corra Linn Dam Semi Gantry Endtruck and Control Cabinet Seismic Analysis and Certification

Education

- **M.Eng. Civil Engineering** University of British Columbia, Vancouver, BC, Canada (2017)
- **B.Sc. Civil Engineering** Islamic University of Technology, Bangladesh (2012)

Research

- **2019** – Comparative Seismic Performance of Dams in Canada and China Using Numerical Analysis and Shake Table Testing
- **2018** – Experimental and Numerical Investigation of a Reduced Scale Dam Utilizing 3D Printing & Shake Table Analysis

TANZIM ALAM, M.ENG.
Civil-Structural EIT

AUSTIN ENGINEERING

- FortisBC – Lower Bonnington Dam Stoplog Single Device Isolation Review
- FortisBC – Upper Bonnington Dam Rail Bridge Study
- BC Hydro – Sugar Lake Dam Repair
- BC Hydro – Seven Mile Dam Scaffold Review

Consultant EIT – September - November 2016
CMO, Vancouver, BC

- Coordinated and onducted streamflow measurements and water quality testing
- Performed hydrologic analysis and numerical analysis

Design Engineer – June - December 2015
McDonald Steel Building Products Limited, Bangladesh

- Analyzed school building models
- Provided structural systems for school buildings with minimum construction costs
- Created 3D models for an Air Force hangar to analyze the behavior of the structure
- Optimized structures by assigning different types of sections
- Calculated gravity loads
- Designed base plates

Civil Engineer (Co-op) – May - November 2014
AMEC Foster Wheeler, Lloydminster, AB

- Analyzed school building models
- Inspected material and construction quality
- Performed site inspections
- Performed analysis and compression testing

Design Engineer - December 2012 – August 2013
Development Design Management, Bangladesh

- Analyzed and designed structural models, including earthquake and wind loading

Skills Highlights

- Seismic analysis
- Seismic design
- Structural assessments
- Structural design
- Foundation design
- Regulatory compliance
- Construction quality control
- Engineering drafting
- Repair detail
- Material testing
- Reporting

TANZIM ALAM, M.ENG.
Civil-Structural EIT

AUSTIN ENGINEERING

- Prepared beam designs, foundation layouts, footing design and floor framing plans
- Coordinated with clients on designs, reports and documents
- Analyzed bearing capacity of existing structures
- Developed ETABS models of large buildings
- Assessed additional load carrying capacity

Research and Publications

Li, S., Issa, A.S., Alam, T., Austin, R., & Alam, M. S. 2019. "Comparative Seismic Performance of Dams in Canada and China Using Numerical Analysis and Shake Table Testing", presented at the International Commission on Large Dams (ICOLD) 2019 Annual Meeting/Symposium.

Issa, A., Alam, T., Austin, R., Alam, M. S., Tyler, J. & Seethaler, R. 2018. "Experimental and Numerical Investigation of a Reduced Scale Dam Utilizing 3D Printing & Shake Table Analysis", presented at the Canadian Dam Association (CDA) 2018 Conference and Exhibition.

Professional Associations

- Engineers and Geoscientists British Columbia

AUSTIN ENGINEERING

DAM SAFETY SERVICES

Specializing in expert dam safety services and providing excellent value to ensure you meet regulatory requirements and continue to operate your dam safely.

YOUR DAM – YOUR COMMUNITY'S FUTURE

As a dam owner, you know you must meet the BC Dam Safety Regulation requirements. But that's not the only reason to keep your dam operating at peak performance.

The dam you manage is vital to your community's future. A well-maintained dam ensures raw water for drinking and irrigation, lowers flood risk, and keeps downstream dwellers safe. It can also provide nearby lands with recreation opportunities, wildlife habitats, and income potential through hydroelectric power generation.

For you and your organization, the dam is a tremendous source of pride. The community respects and depends on you for all the great things the dam brings to their lives. You want that pride and respect to continue – now and in the future.

FINDING A PARTNER YOU CAN TRUST

Managing a dam is a huge responsibility and a growing challenge. The BC Dam Regulation requirements are stricter, and enforcement more rigorous than ever. This puts extra demands on limited municipal budgets. On top of that, upgrading or replacing ageing dams and infrastructure is costly.

Climate change is making dam management even more complicated. Municipalities need reliable water access and storage capacity, and flood mitigation strategies and structures to protect against seasonal flooding.

Choosing an engineering partner to help you address all these challenges is a daunting task. With such high stakes, you can't afford to make a mistake. How do you find a partner you can trust?

DAM SAFETY REQUIRES A TEAM OF EXPERTS

The team at Austin Engineering applies innovative technologies to streamline processes and rigorously test and understand every aspect of dam safety.

A PERSONAL COMMITMENT TO CLIENT SUCCESS

We understand your challenges because we've dealt with them first-hand. The Austin Engineering team has more than 20 years of experience working on dams of all sizes, ages, and complexities across Canada and the US.

Every member of our team is personally committed to our clients' success. We know each dam is unique and every client has distinct goals and challenges. As experts in developing engineering solutions tailored to individual needs and budgets, we help our clients save money and make better decisions. We would love to do the same for you.

Our dam safety team leaders include Roger Austin, our Principal Engineer and Dam Safety Engineer; Ruth Keyes, Senior Hydrotechnical Engineer; and Kevin Fatah, Senior Geotechnical Engineer and Engineering Manager.

Roger is a dam safety expert who enjoys sharing his vast knowledge. Using his typical engaging and collaborative style, Roger gives dam owners the information, tools, and best practices they need to make well-informed decisions, gain self-sufficiency, and become true participants in the dam safety process. Also skilled in value engineering, Roger has saved clients millions of dollars by re-working existing designs to reduce construction, maintenance, and monitoring costs.

Ruth's expertise is providing hydrology studies and hydraulic analysis for all our dam safety projects. Ruth is a phenomenal advocate for our clients when dealing with regional dam safety officers and navigating the provincial dam safety program. She consistently coordinates between the client and the Ministry, making sure everyone wins.

Kevin is responsible for conducting stability and seismic analysis of dams and related structures. Aside from his vast geotechnical expertise, Kevin is an outstanding project manager. His steadfast attention to detail and organized approach to his work ensure our projects stay on schedule and on budget.

Working with our team, you're assured the best possible engineering outcome.

DAM SAFETY ENGINEERING EXPERTS

Tailored solutions for all your dam safety challenges.

DAM SAFETY COMPLIANCE

Our experts will help you to understand your obligations fully and maintain compliance with the BC Dam Safety Regulation through:

- Dam Safety Review (DSR)
- Operation, Maintenance and Service Manual (OMS)
- Dam Emergency Plan (DEP)
- Annual Dam Inspection

We'll also help you strategically plan to ensure you continue to meet dam safety requirements in the future.

DAM DESIGN AND PERFORMANCE EVALUATION

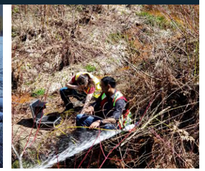
Looking to replace or build a new dam, weir, dyke, or diversion? Our team's innovative approach to evaluating existing and proposed structures' performance results in lower construction costs, shorter building schedules, healthier aquatic habitats, better flood mitigation, and increased raw water security. Completing these evaluations and defining core objectives early in the design process helps reduce project risk and achieve stakeholder buy-in.

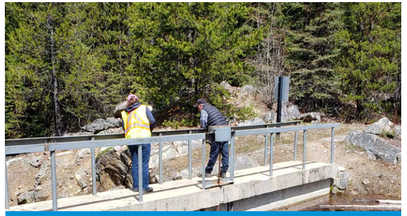
DAM REPAIRS AND UPGRADES

Perhaps you have an old dam that needs some tender loving care. Trust our team to bring your dam and related structures in to safe working order. We specialize in designing upgrades and repairs for older dams, ensuring these critical assets can serve your community well into the future.

AUSTIN ENGINEERING IS SYNONYMOUS WITH DAM SAFETY

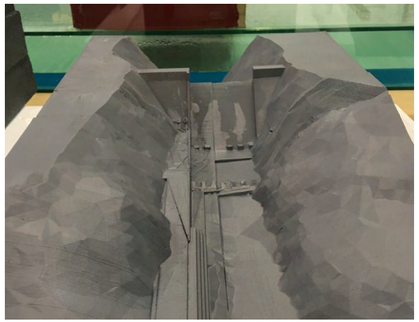
As a leading dam safety expert, Austin Engineering has a successful track record, from dam safety inspections and repairs to comprehensive new dam designs.





MEETING OR EXCEEDING EXPECTATIONS

We are committed to delivering excellent engineering and innovative solutions for our clients. We work diligently to ensure the success of their projects - big and small.



CITY OF PRINCE RUPERT

WOODWORTH DAM REPLACEMENT

The City of Prince Rupert realized its Woodworth Dam – built in 1910 – needed replacing and set out to obtain funding and approval for an ambitious multi-year project. Despite initial success, the challenges and costs of building a new dam in a remote region with limited road access threatened the project's future.

In 2019, the City asked Austin Engineering for guidance. After reviewing the existing project plan, Austin Engineering showed the City how a few design tweaks would reduce project costs. These included reducing concrete, rock anchors, and rock excavation. With these design changes, the City was able to reduce costs and gain approval for a project that will ensure the community's future water supply. In the process, the City scored some environmental benefits – reduced debris entering the water course and about 500 construction trips on the service road.

DISTRICT OF LAKE COUNTRY

LAKE DAM SAFETY REVIEWS

The District of Lake Country needed comprehensive Dam Safety Reviews for their four dams: Oyama Lake Dam, Oyama Lake Saddle Dam, Crooked Lake Dam, and Swalwell Lake Dam. This was the first time these dams were reviewed since BC Dam Safety Regulations were updated in 2016.

In 2020, the District asked Austin Engineering to conduct Dam Safety Reviews for these four dams. Drawing on our vast knowledge from other reports we submitted under the new regulations enabled us to complete our analysis and Dam Safety Review reports for Lake Country swiftly and efficiently.

The District's Dam Safety Reviews to be submitted under the new regulations anticipate what the Dam Safety Officer will be looking for and include information to satisfy both the regulatory requirements and the Dam Safety Officer's expectations.

REGIONAL DISTRICT OF KOOTENAY BOUNDARY

SADDLE LAKE DAM ANNUAL INSPECTIONS AND SPILLWAY UPGRADES

The Saddle Lake Dam is a small earth-filled and concrete dam impounding the Saddle Lake reservoir at Grand Forks, BC. Roughly 100 years old, the dam was built without a spillway. With the original low level outlet no longer operable, there was no way to regulate water levels behind the dam during high water events. This posed a severe risk for flooding and threatened people's safety, property, and habitats downstream.

The Regional District of Kootenay Boundary, which operates the dam, asked Austin Engineering to design the required dam upgrades and develop a multi-year phased approach to the project. Having done five prior annual inspections of the dam, our team leveraged its in-depth knowledge to address the safety concerns associated with the spillway upgrade.

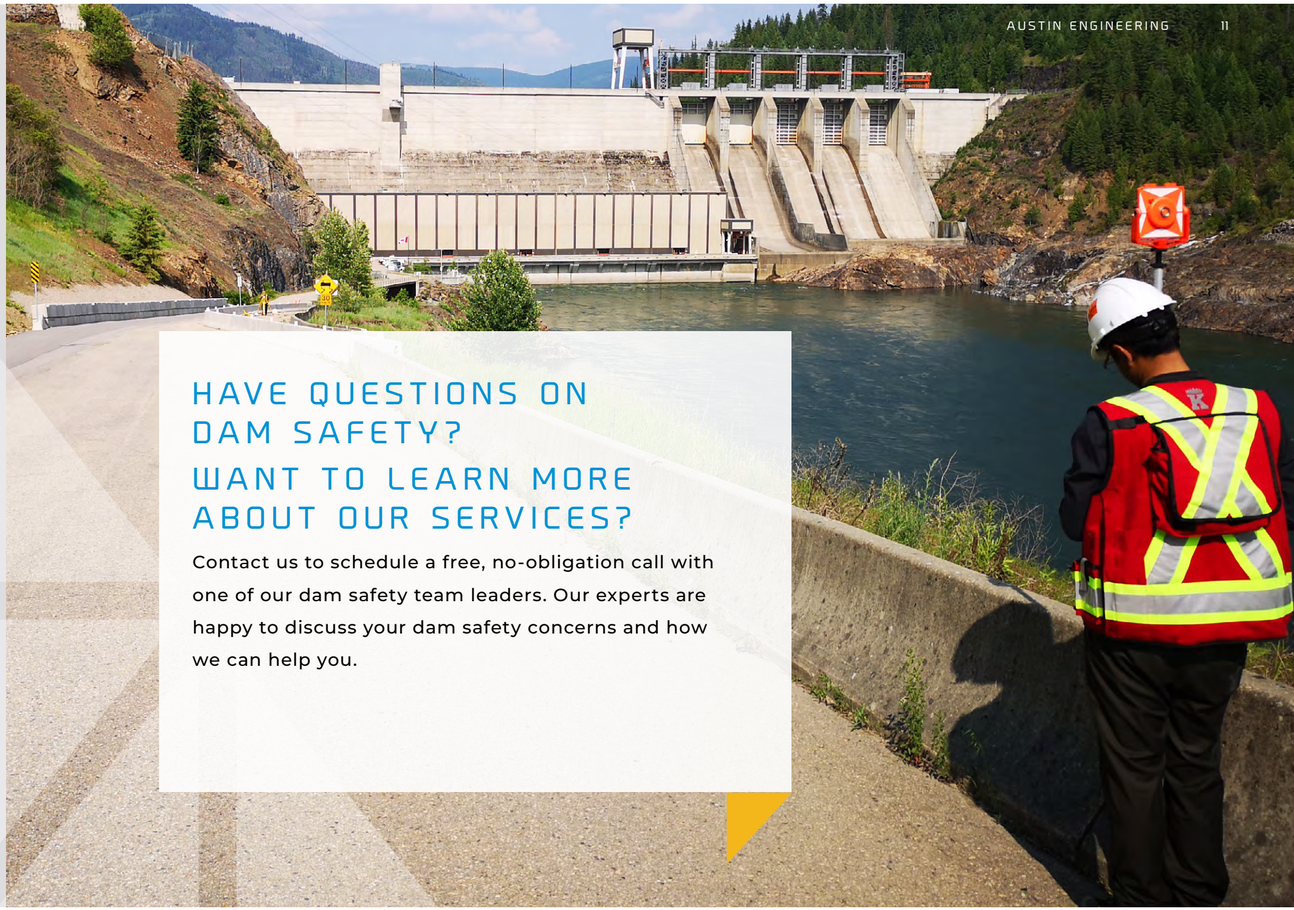
With the concrete spillway, abutments, and pedestrian bridge now complete, the community around Saddle Lake Dam can enjoy peace of mind, knowing their dam is once again able to keep them safe.

AUSTIN ENGINEERING IS TRUSTED BY CLIENTS FROM SMALL MUNICIPALITIES TO LARGE CORPORATIONS, AND BRINGS INTEGRITY TO EVERY PROJECT.

AVOIDING RISK WITH PROACTIVE PLANNING

You know the risks of neglecting dam safety. Some are obvious, like penalties for non-compliance and harm to people, property, and infrastructure. Others are less obvious but just as serious, like threats to the community's drinking water and extra costs to municipal budgets if the dam is damaged or if the new upgrades fail to address the community's future needs.

Proactive planning with a highly qualified and technically astute partner avoids unwelcome consequences. A trusted engineering expert will help you develop a dam safety plan to identify your vulnerabilities, gain a full understanding of your dam safety responsibilities, and chart a practical path forward.



HAVE QUESTIONS ON DAM SAFETY?

WANT TO LEARN MORE ABOUT OUR SERVICES?

Contact us to schedule a free, no-obligation call with one of our dam safety team leaders. Our experts are happy to discuss your dam safety concerns and how we can help you.

COMMITMENT TO EXCELLENCE,
INNOVATION, AND CLIENT SUCCESS

AUSTIN
ENGINEERING

250-448-7525
AUSTINENGINEERING.CA

1151 CEDAR AVE
TRAIL, BC V1R 4B8

PROUD MEMBERS OF:
CDA ACB Canadian Dam Association Association canadienne des barrages
ENGINEERS & GEOSCIENTISTS BRITISH COLUMBIA