

Mitchell Titus is an engineer in training (EIT) and Junior Dam Safety Engineer with unique experience in dam safety, hydraulics, and hydrology. Mitchell is the recipient of the NSERC – USRA 2021 award, held with the University of British Columbia and supervised by Dr. Dwayne Tannant, Ph.D.. Mitchell is a hard-working, bright, and is an energetic supporting member of the Interior Dams team. He provides general engineering support, including computer assisted drafting (CAD), field investigation assistance, and other activities.

RELATED EXPERIENCE

Brigade Lake Dam Hydrotechnical Analysis. Mitchell completed the hydrotechnical analysis for the Brigade Lake dam system, located in Kamloops, for its 2024 dam safety review. Mitchell created a hydrological model in HEC HMS by using available elevation data and the provincial guidelines from the BC Extreme Flood Project. The model estimated the reservoirs response to both a 1 in 1000-year event and the probable maximum flood. The results were then used to assess the spillway and freeboard performance of the dam during these events. [Kamloops, in progress]

Brigade Lake Inundation Study. Mitchell completed preliminary hydrological modelling, inundation mapping, and report writing for the Brigade Dam failure consequence classification. The results were used to determine the failure consequence classification of the dam. [Kamloops, in progress]

Hadden Dam Hydrotechnical Analysis. Mitchell completed the hydrotechnical analysis for the Hadden dam system, located in Kelowna, for its 2024 dam safety review. Mitchell created a hydrological model in HEC HMS by using available elevation data and the provincial guidelines from the BC Extreme Flood Project. The model estimated the reservoirs response to both a 1 in 1000-year event and the probable maximum flood. The results were then used to assess the spillway and freeboard performance of the dam during these events. [Kelowna, in progress]

Stevens Dam Hydrotechnical Analysis. Mitchell completed the hydrotechnical analysis for the Stevens dam system, located in Kelowna, for its 2024 dam safety review. Mitchell created a hydrological model in HEC HMS by using available elevation data and the provincial guidelines from the BC Extreme Flood Project. The model estimated the reservoirs response to both a 1 in 1000-year event and the probable maximum flood. The results were then used to assess the spillway and freeboard performance of the dam during these events. [Kelowna, in progress]

Piper Pond Dam Hydrotechnical Analysis. Mitchell completed the hydrotechnical analysis for the Piper Pond dam system, located in Dawson Creek, for its 2024 dam safety review. Mitchell created a hydrological model in HEC HMS by using available elevation data and the provincial guidelines from the BC Extreme Flood Project. The model estimated the reservoirs response to both a 1 in 1000-year event and the probable maximum flood. The results were then used to assess the spillway and freeboard performance of the dam during these events. [Dawson Creek, in progress]

Piper Pond Inundation Study. Mitchell completed preliminary hydrological modelling, inundation mapping, and report writing for the Piper Pond Dam. The results were used to determine the failure consequence classification of the dam. [Dawson Creek, 2024]

Ed James Lake Dam Hydrotechnical Analysis. Mitchell completed the hydrotechnical analysis for the Ed James Lake dam system, located in Rock Creek, for its 2024 dam safety review. Mitchell created a hydrological model in HEC HMS by using available elevation data and the provincial guidelines from the BC Extreme Flood Project. The model estimated the reservoirs response to both a 1 in 1000-year event and the probable maximum flood. The results were then used to assess the spillway and freeboard performance of the dam during these events. [Rock Creek, 2024]

Fulton Lake Dam Hydrotechnical Analysis. Mitchell completed the hydrotechnical analysis for the Fulton Lake dam system, located in Topley Landing BC. Mitchell created a hydrological model in HEC HMS by using available elevation data and the provincial guidelines from the BC Extreme Flood Project. The model estimated the reservoirs response to both a 1 in 1000-year event and the probable maximum flood. The results were then used to assess the spillway and freeboard performance of the dam during these events. [Topley Landing, 2024]

Browne Lake Inundation Study. Mitchell completed preliminary hydrological modelling, inundation mapping, and report writing for the Browne Lake Outlet Dam and Spillway Dam. The results were used to determine the failure consequence classification of the dam. [Kelowna, 2023]

Jim Smith Lake Inundation Study. Mitchell completed preliminary hydrological modelling, inundation mapping, and report writing for the Jim Smith Lake Dam. The results were used to determine the failure consequence classification of the dam. [Cranbrook, 2023]

City of Kelowna Dam Safety Management System Document. Mitchell was a contributor to the City of Kelowna's Dam Safety Management System (DSMS) document. He created and designed the rough draft of the document, and filled the document with all available dam safety information. This document contains the dam safety information, such as Operation, Maintenance and Safety (OMS) manual and Dam Emergency Plan (DEP) for all dams owned by the City. [Kelowna, 2023-2024]

Scotty Creek Inundation Study. Mitchell completed preliminary hydrological modelling, inundation mapping, and report writing for the Scotty Creek Dam. The results were used to determine the failure consequence classification of the dam. [Kelowna, 2023]

Williams Lake First Nations Dam Decommission. Mitchell helped in the Valley Upper Pond dam decommission project for the Williams Lake First Nations (WLFN), located on the 150 Mile House Ranch. Mitchell was responsible for the hydrotechnical analysis and design work. He designed the new Valley Creek channel, which flows through the location of the old dam site, to handle a 1 in 100-year flood event, using current engineering best practices. Fish riffles were included in the design to promote fish habitat within the creek. Mitchell added a diversion channel and a variety of stream crossing to the design which allowed for the new design to meet the irrigation requirements of the 150 Mile Ranch. [150 Mile House, 2023]

McCuddy Dam Diversion Channel Emergency Work. Mitchell created the hydrologic model used in the emergency design work for the McCuddy Dam diversion channel. The results from the model were used by the geotechnical engineer to design a diversion berm. These results included the expected water elevations and velocities based on the current conditions and the IDF of the McCuddy Creek watershed. [Oliver, 2023]

Duhamel Creek Design. Mitchell created the hydrologic model used to rehabilitate Duhamel Creek. At the time, an unauthorized bridge was used to cross the creek and posed a risk to the public as it was susceptible to debris blockage. The hydrologic model was used to simulate the expected conditions of the creek once the bridge was removed, including water elevations during large flood events and sediment transportation. [Nelson, 2023]

Dragon Lake Hydrotechnical Report and Inundation Study. Mitchell completed the hydrotechnical analysis for the Dragon Lake Dam in Quesnel B.C. for its 2023 dam safety review. Mitchell created a hydrological model in HEC HMS by using provincial LiDAR data and the provincial guidelines from the BC Extreme Flood Project. The model estimated the reservoirs response to both a 1 in 1000-year event and the probable maximum flood. The results were then used to assess the spillway and freeboard performance of the dam during these events. Mitchell also completed an inundation study for the Dragon Lake Dam to determine its failure consequence classification [Quesnel, 2023]

James Lake Hydrotechnical Analysis. Mitchell completed the hydrotechnical analysis for the James Lake dam system for its 2023 dam safety review. Mitchell created a hydrological model in HEC HMS by using provincial LiDAR data and the provincial guidelines from the BC Extreme Flood Project. The model estimated the reservoirs response to both a 1 in 1000-year event and the probable maximum flood. The results were then used to assess the spillway and freeboard performance of the dam during these events. [Kelowna, 2023]

Belgo Lake Hydrotechnical Analysis. Mitchell completed the hydrotechnical analysis for the Belgo Lake dam system for its 2022 dam safety review. Mitchell created a hydrological model in HEC HMS by using provincial LiDAR data and the provincial guidelines from the BC Extreme Flood Project. The model estimated the reservoirs response to both a 1 in 1000-year event and the probable maximum flood. The results were then used to assess the spillway and freeboard performance of the dam during these events. [Kelowna, 2023]

Shaunessy Ranch Hydrotechnical Analysis. Mitchell completed the hydrotechnical analysis for the MacCarthy Lake dam system, located on the Shaunessy Ranch, for its 2022 dam safety review. Mitchell created a hydrological model in HEC HMS by using provincial LiDAR data and the provincial guidelines from the BC Extreme Flood Project. The model estimated the reservoirs response to both a 1 in 1000-year event and the probable maximum flood. The results were then used to assess the spillway and freeboard performance of the dam during these events. [Invermere, 2023]

Graystoke Lake Hydrotechnical Analysis. Mitchell completed the hydrotechnical analysis for the Graystoke Lake dam system for its 2022 dam safety review. Mitchell created a hydrological model in HEC HMS by using provincial LiDAR data and the provincial guidelines from the BC Extreme Flood Project. The model estimated the reservoirs response to both a 1 in 1000-year event and the probable maximum flood. The results were then used to assess the spillway and freeboard performance of the dam during these events. [Kelowna, 2023]

Fish Hawk Lake Hydrotechnical Analysis. Mitchell completed the hydrotechnical analysis for the Fish Hawk Lake dam system for its 2022 dam safety review. Mitchell created a hydrological model in HEC HMS by using provincial LiDAR data and the provincial guidelines from the BC Extreme Flood Project. The model estimated the reservoirs response to both a 1 in 1000-year event and the probable maximum flood. The results were then used to assess the spillway and freeboard performance of the dam during these events. [Kelowna, 2023]

City of Kelowna OMS and DEP Document. Mitchell created the Operation, Maintenance and Surveillance (OMS) and Dam Emergency Plan (DEP) document for all dams owned and operated by the City of Kelowna. The document contains background information and emergency contacts for all the dams. The OMS and DEP templates from the BC government were initially used as a start design and Mitchell made the necessary modifications to create a document where information regarding all the dams could be stored in one location, while still allowing for the user to easily navigate through the document to the desired information. [Kelowna, 2022]

Rose Valley Hydrotechnical Analysis. Mitchell helped complete the hydrotechnical assessment of the Rose Valley Dam for its 2022 dam safety review. Mitchell created a hydrological model in HEC HMS by using provincial LiDAR data and the provincial guidelines from the BC Extreme Flood Project. The model estimated the reservoirs response to both a 1 in 1000-year event and the probable maximum flood. The results were then used to assess the spillway and freeboard performance of the dam during these events. Mitchell also helped with writing the report and generating figures. [West Kelowna, 2022].

Esk'etemc First Nations Stream Crossings. Mitchell estimated the 1 in 200-year flood events for 6 stream crossings belonging to the Esk'etemc First Nations group in Alkali Lake B.C. This area is fairly remote with little hydrologic data. Mitchell used the current British Columbia

Extreme Flood Project to find the 1 in 200-year design flood events for all stream crossings and verified the results with multiple checks, including a regional multiple regression analysis equation and a regional regression analysis with unit flow. All methods produced similar results and appropriate factors were included to account for climate change and other important engineering considerations. [Alkali Lake, 2022]

Fish Hawk Lake Riprap Gradation. Mitchell verified the riprap gradation specifications for the upstream slope of Fish Hawk Lake Dam. Various properties of the dam and its watershed were found and used in calculations to find the riprap specifications, following current engineering best practices. The calculations were reviewed by Aaron Hahn P.Eng. AScT., and implemented by the dam owners. [Kelowna, 2022]

Hunters Hill Development Inundation Study. Mitchell inspected the inundation area of a potential dam site in the Hunters Hill Development project with Christian Desjarlias, M.A.Sc, P.Eng.. During the visit, he collected measurements and assessed the downstream storm water system. After completion, Mitchell built a 2D model in HEC-RAS to simulate different dam breach scenarios and commented on his findings through the inundation report. [Summerland, 2022]

Williams Lake First Nation Band Reservoir Data Collection. Mitchell completed a site visit of two reservoirs on the 150 Mile Ranch belonging to the Williams Lake First Nation Band. Each reservoir had bathometric and land surveys, all completed individually by Mitchell. Downstream culverts and road crossing of the reservoirs were also surveyed to find their cross sections and lengths. The data was used to determine if the reservoirs are dams, and to aid in future inundation studies for the Williams Lake First Nation Band's reservoirs. [Williams Lake, 2022].

Hydraulic Creek Reservoir Inundation Study. Mitchell supported the project engineer by for the Hydraulic Creek Intake Dam inundation study. He created the HEC-RAS models which was used to simulate the downstream consequences of the dam's failure. He also created a variety of maps and recommendations displaying the characteristics of the dam breach in QGIS. His findings and calculations from the study were reported and reviewed by supervising engineers. Field inspections at the reservoir and Mission Creek were also completed. [Kelowna, 2022]

District of Summerland's Thirsk Lake Dam Movement Study. Mitchell assisted Christian Desjarlias, M.A.Sc, P.Eng., undergo a study to determine the total movement of the Thirsk Lake dam and how temperature affects it. Land surveying data of the concrete dam and spillway were recorded and compared to previously taken data. The data was taken twice each year, at the coldest and warmest temperatures to model the highest variations of monument placements. [Summerland, 2021]

Kirschner Mountain Slope Failure Analysis. Mitchell assisted Dr. Dwayne Tannant, Ph. D. P.Eng., with the analysis of a major slope failure on Kirschner Mountain from 2019. He created numerous slope profiles in Civil 3D using multiple sets of GIS data provided by the City of Kelowna and compared the change of the slope face over the past 20 years. [Kelowna, 2021].

Derenzy Lake Bathymetric Survey. Mitchell competed a bathymetric survey of Derenzy Lake. Derenzy Lake is a hike-to-only Lake with access via a three-kilometer trail through dense forest and significant elevation gain. The survey required mobilization of a small boat, bathymetric equipment, and use of an RTK GR5 survey system. [Penticton, 2021]

Shannon View Drive, Rock Face Assessment. Mitchell helped edit the spatial data provided by Dr. Tannant Ph.D. P.Eng., focusing on an unsafe rockface located within close proximity to the Shannon View Dr. and Shannon Lake Rd. intersection. The edited data was tested in Rockfall software by Dr. Tannant and a full report was provided to the City of West Kelowna for further recommendations. [West Kelowna, 2021]

McCulloch Lake CCTV and Inspection. Mitchell contributed to the annual McCulloch Lake Dam CCTV inspection working for Interior Dams. He was responsible for directing, handling and

installing the CCTV camera's mobile mechanism under the supervision of Aaron Hahn P.Eng. ASCT., He also assisted in the assessment of the Dam's current level of service. [Kelowna, 2021]

Silhouette Winery Tunnel Design. Mitchell assisted Dr. Dwayne Tannant, Ph. D. P.Eng., with the assessment and design of an underground wine holding cellar for Silhouette Winery located in Naramata B.C. A total of two tunnels were analyzed for any errors made by the blasting contractor, safety requirements were addressed, and a 3D model of the two tunnels was developed to accurately measure the tunnels floors and ceilings height differentials. [Naramata 2021]

City of Peachland Water Front Erosion Study. Mitchell is currently contributing to a four-year study done by Dr. Dwayne Tannant Ph. D. P.Eng., to determine the erosion characteristics for the City of Peachland's waterfront property. A drone was used to create a 3D model of the waterfront which is to be compared with other 3D models yet to be developed. [Peachland, 2021]

Seclusion Bay Resort Bank Erosion Assessment. A full slope assessment was conducted for the owners of Seclusion Bay Resort located in West Kelowna following a devastating mudslide occurring 2 years prior. A large portion of the bank was deemed stable with only a small portion of the bank was recommended further design additions. A previous rockface design by Dr. Dwayne Tannant, Ph.D. P.Eng., was also analyzed for the first time since completion on the same property. [West Kelowna, 2021]

RESEARCH

Rockfall Mitigation Fence Design. Currently in the design process for residential property rockfall protection fencing systems. The fence design is aimed to stop rockfalls with rocks carrying a total of 15 kJ energy. The research project supervisor is Dr. Dwayne Tannant, Ph.D. P.Eng, FCIM. And assisted by Ali Pooresmaeili Ph.D. Candidate. [University of British Columbia, 2021]

EDUCATION

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