

Date of Submission	27 March 2017
--------------------	---------------

IPL Project (IPL - 202) Annual Report Form 2017

1 January 2016 to 31 December 2016

1. Project Number and Title:

IPL-202 RIPLEY LANDSLIDE MONITORING PROJECT (ASHCROFT, BC, CANADA)

2. Main Project Fields

Technology Development – Monitoring and Early Warning, Hazard Mapping, Vulnerability and Risk Assessment

Capacity Building – Technology transfer and capacity building to government and private sector
Mitigation, Preparedness and Recovery – Preparedness, Mitigation and Recovery related to infrastructure primarily

3. Name of Project leader: Peter Bobrowsky

Affiliation: Geological Survey of Canada, Senior Scientist

Contact: 9860 West Saanich Road, POB 6000, Sidney, British Columbia, Canada V8L4B2

Peter.Bobrowsky@canada.ca

Core members of the Project: Dr. David Huntley (Geological Survey of Canada); Prof. Michael Hendry (University of Alberta); Prof. Renato Macciotta (University of Alberta); Mr. Tom Edwards (CN Rail)

4. Objectives: The Geological Survey of Canada, University of Alberta, Canadian Pacific Railway and Canadian National Railway are coordinating a multi-partner effort to apply and test a suite of technologies and methods used in the characterization, assessment and monitoring of landslides in Canada funded by Transport Canada. Results will be compared and shared with the professional community to improve global landslide monitoring.

5. Study Area: Primary focus on 1 landslide but including several others situated along the Thompson River, south of Ashcroft, British Columbia, Canada

6. Project Duration: Project may continue indefinitely depending on funding (at least 2020)

7. Report

1) Progress in the project: An exceptional amount of progress occurred during the 2016 year. This included a number of field site visits by all parties: notably in January, February, June, and August 2016. Preparatory activities took place in Vancouver, Edmonton and Sidney. Equipment

deployed during 2016 included a weather station and GeoCubes network. Transient data collection included UAV photogrammetry, InSAR, SAA, piezometric information, LiDAR and others. Notably a large partner workshop took place in December 2016 in Vancouver and was attended by some 60 individuals. Progress and results were shared with the professional community at several venues including: Cape Town for the International Geological Congress (August 2016), Vancouver for the Canadian Geotechnical Conference (September 2016) and Denver for the Geological Society of America meeting (September 2016). A variety of publications have been released for this time period (see below). Project participants engaged the services of numerous consulting individuals and groups to deliver the project objectives including: Adivisian (Worley Parsons) for bathymetric survey of the Thompson River, Frontier Geosciences for waterborne ERT mapping. Approximately \$250,000 CDN in direct cash was spent on this activity in 2016 by all of the agencies involved. Indirect funding (salaries, etc) was likely an equivalent amount.

- 2) Planned future activities or Statement of completion of the Project: 2017 is already beginning as an active effort. One field visit took place in March to collect bathymetric data. 12 new Geocubes were received and are being tested before deployment. A hovercraft will be purchased to facilitate river work. Soil moisture probes will be deployed. Additional UAV data will be collected. Ongoing InSAR, piezometric and weather information will be compiled. We expect participation from colleagues in the Czech Republic this summer at the site. Funding requested will increase direct expenditures by an additional \$100k if approved.
- 3) Beneficiaries of Project for Science, Education and/or Society: initial beneficiaries of the project include the two primary rail companies in Canada (CN and CPR), but this includes sharing with the professional community in Canada as well. In the long term we expect the global landslide community will benefit from our work. Major results will be published in the journal Landslides. A special session on the topic of landslide monitoring will be held in Seattle as part of the annual meeting of the GSA in October 2017. Several field visits will take place between April and December 2017.
- 4) Results: the following publications were released in 2016
 - Huntley, D., Bobrowsky, P., Parry, N., Bauman, P., Candy, C. and Best, M. (2016a) Ripley Landslide: the geophysical structure of a slow-moving landslide near Ashcroft, British Columbia, Canada. GSC Open File 8062, 59 pages
 - Huntley, D., Bobrowsky, P., Zhang, Q., Zhang, X., Lv, Z., Hendry, M., Macciotta, R., Schafer, M., Le Meil, G., Journault, J. and Tappenden, K. (2016b) Application of Optical Fibre Sensing Real-Time Monitoring Technology at the Ripley Landslide, near Ashcroft, British Columbia, Canada. Proceedings Volume, Canadian Geotechnical Society, GeoVancouver2016 Annual Meeting, 13 pages

- Journault, J., Macciotta, R., Hendry, M., Charbonneau, F., Bobrowsky, P., Huntley, D., Bunce, C., and Edwards, T. (2016) Identification and quantification of concentrated movement zones within the Thompson River valley using satellite-borne InSAR. Proceedings Volume, Canadian Geotechnical Society, GeoVancouver2016 Annual Meeting, 13 pages.
- Lato, M., Bobrowsky, P., Roberts, N., Bean, S., Powell, S., McDougall, S., Brideau, M-A., Stead, D. and D. VanDine (2016) Site Investigation, Analysis, Monitoring and Treatment. *Geological Survey of Canada*, Open File 8114.
- Bobrowsky, P., Huntley, D., Hendry, M., Macciotta, R., Schafer, M., Journault, J., Zhang, Q., Zhang, X., Lv, Z., Edwards, T., Bunce, C., and E. Choi. (2016) Assessing multi-sensor technologies and methods in monitoring landslide movement in Canada. *35th International Geological Congress*, Cape Town, South Africa.

Note:

- 1) If you will change items 1)-6) from the proposal, please write the revised content **in Red**.
- 2) Please fill and submit this form by **30 March 2017** to **ICL Network** <icl-network@iclhq.org>