

Engineering value from the monitoring of slopes -current practice and the future

Globally, landslides and cut slope failures cause hundreds of billions of dollars in damages and thousands of deaths and injuries each year. Understanding and managing slope hazards and risks is a major part of the life of engineering geologists and geotechnical engineers.

None of us wants to inadvertently monitor a slope to an unplanned failure! This workshop is designed to address the following slope-related questions:

- What do we know about recognising and interpreting unstable slopes?
- What is appropriate monitoring practice?
- What does monitoring provide and how do we manage achieve safe performance?
- What does the future of monitoring look like?

Item	Times	Led by	
Arrival tea	1230 to 1300		
Welcome	1300 to 1305	Eleni Gkeli	Chair NZGS Symposium Committee
Introduction	1305 to 1310	Sally Dellow	Workshop Chair
Landslide identification and Geological models	1310 to 1400 (50 mins)	Chris Massey *	How to identify landslides or landslide potential in natural slopes and cut slopes; investigation tools (observations, imagery, mapping, geomorphology, subsurface methods incl downhole viewing) Model development (conceptual to detailed) – interactive selection and planned use of monitoring to help build the ground and groundwater models
Monitoring methods	1400 to 1430 (30 mins)	Mark Vessely *	The what, why and how - in ground instruments (pressure and displacement) and other methods of successful slope monitoring or inspection. How to address needs and use most appropriate methods
Validation	1430 to 1500 (30 mins)	Peter Amos	Assessing actual behaviours v expectation (geology, monitoring, design requirement). Using this information to manage hazard and risk resulting in safe slope performance.
Afternoon tea	(30 mins)		
Practice overview	1530 to 1555 (25 mins)	Mark Vessely *	Description of NCHRP case study – monitoring and investigation methods used by US roading authorities – survey of what works well and could be better used
Response capability	1555 to 1620 (25 mins)	Joe Wartman *	Description of the NHERI RAPID group facility based in Washington for worldwide response to major natural hazard events, in particular where slope related with possible example from Palu earthquake (Sulawesi).
Monitoring future	1620 to 1650 (30 mins)	Mike Olsen *	Foreseeable trends in surface survey techniques including InSAR, LiDAR differencing, laser scanning
	1650 to 1715 (25 mins)	Mark Vessely *	Foreseeable trends in subsurface and other technologies including 3D visualisations
Field trip briefing	1715 to 1735 (20 mins)	Don Macfarlane David Stewart	Field trip information (Clyde / Macraes)
Closing	1735 to 17:40	Sally Dellow	

* Remote presenter.

Workshop Presenters



Chris Massey

Dr Chris Massey is an engineering geologist with more than 23 years of consultancy and research experience in the investigation and analysis of complex geological and geotechnical data for landslide and slope stability including landslide monitoring, foundation design, underground/surface rock support and groundwater problems. Chris has a degree in geology from Leeds University, UK; a masters in Engineering Geology from Imperial College, London, UK; and a PhD in engineering geology from the University of Durham, UK. He has published many peer-reviewed journal papers and has given lectures and workshops around the world.



Mark Vessely

Mark Vessely is a principal engineer with BGC Engineering in Golden, Colorado. Mark has 25 years of experience in geologic hazard and risk assessment, emergency response to slope and other ground movements, and design for bridge foundations, retaining walls, pavements, and slope stabilization projects. Throughout his career, Mark has worked with U.S. state and federal transportation departments, railroads, pipeline owners, and local agencies across the United States and into Canada. Recently, Mark was a principal investigator for a U.S. Transportation Research Board study on the current state of practice for geotechnical instrumentation and monitoring of unstable slopes among state transportation departments.



Peter Amos

Peter Amos is a geotechnical engineer with more than 34 years of experience in several countries, specialising in the engineering and operational safety of dams and heavy civil engineering, with extensive experience of engineering in a range of geological environments, seismic engineering, and landslide behaviour. His experience includes the use of instrumentation and a range of investigation techniques to undertake forensic investigations of dam foundation and landslide problems, and applying observational approaches to analysis of the safety of dams and other water retaining structures.



Joe Wartman

Professor Joseph Wartman directs the Natural Hazards Reconnaissance (RAPID) Facility at the University of Washington, where he is the H.R. Berg Professor of Civil and Environmental Engineering. His research and teaching focus on geologic hazards and disaster risk reduction. Prof. Wartman has received awards for his research, teaching and mentoring, service, and non-technical writing, including most recently, the 2020 EXCEL Silver award for feature writing by Association Media and Publishing.



Michael J Olsen

Professor Michael Olsen has BS and MS degrees in Civil Engineering from the University of Utah and a Ph.D. from the University of California, San Diego. His current areas of research include terrestrial laser scanning, remote sensing, GIS, earthquake engineering, hazard mapping, and 3D visualization. He teaches geomatics engineering courses at Oregon State University where he has developed new, ground-breaking, courses in 3D laser scanning, Digital Terrain Modelling and Building Information Modelling. Recent projects include: development of mobile laser scanning guidelines for DOTs, and advanced point cloud segmentation algorithms, earthquake and tsunami reconnaissance landslide and slope stability analysis.