Moving Mountains to Reconnect Kaikōura Communities

ENGEO VIEW

May 2019 Issue:

Earthquake Recovery Efforts Enable Social and Economic Progress in Kaikōura

by Richard Justice, CMEngNZ
Christchurch, New Zealand

The Magnitude 7.8 Kaikōura Earthquake in November 2016 resulted in extensive damage to the coastal slopes and caused uplift at several locations. The transport corridor located on a narrow coastal strip of land between steep mountainous slopes and the Pacific Ocean was seriously impacted by landsliding to the north and south of Kaikōura.

More than 80 landslides occurred along the road and rail transport corridor, severely affecting critical road, rail and marine transport links to North Canterbury communities.

The North Canterbury Transport Infrastructure Recovery (NCTIR) was formed comprising key stakeholders, New Zealand Transportation Authority (NZTA) and KiwiRail, along with four of New Zealand's largest contractors. NCTIR committed to reconnecting affected communities by the end of 2017, while improving the safety and long-term resilience of the road and rail infrastructure.

Extraordinary efforts have been made to reconnect communities, including an extensive geotechnical program within the dynamic landscape, requiring flexible and evolving design.

In December 2016, just one month after the earthquake, NCTIR was able to open a limited section of State Highway 1 (SH1) south of Kaikōura. In December 2017 the remainder of the SH1 between Christchurch and Picton was opened.

In early September 2017, less than one year following the earthquake, the Main North Line Railway

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was re-opened for freight. In December 2018 the railway re-opened for passenger services.

Sean Harris, ICE Director of Membership, said, “I am pleased to see the public recognize how the project directly transformed people’s quality of life. More than just a re-opening of road and rail systems, the project reconnected families and friends, and allowed businesses to welcome back tourism. The project stands out globally, not only as one of the finest examples of outstanding technical achievement, but also highlights the importance of civil engineering in enabling social and economic progress.”

Work on SH1 along the Kaikōura coast will continue through 2019 as temporary works are made permanent and a $200 million improvement package is implemented to improve the safety and resilience of the area, including slope protection, tunnels, seawalls and safe stopping areas.

For many of the ENGEO team, the work we have been involved with over the last two years has been the most challenging of our careers. We’ve learned a lot, helped a lot, and are privileged to be an integral part of the diverse and talented group that comprise NCTIR.

AWARDS

2018 Railway Technical Society of Australasia (RTSA), Biennial Project Award

2018 International Tunnelling and Underground Space Association International Tunnelling Awards, Finalist for Project of the Year including renovation (up to $50M)

2018 Institute of Civil Engineers (ICE) UK Awards, People's Choice Award

Geologic Wonder in Death Valley

ENGEO'S February 2019 Photo Contest Winner

by Melissa Glickman
San Ramon, California

Sailing stones have been studied for over a century, and have mesmerized onlookers for years with their mysterious movement and long race-like trails left behind. It wasn't until 2014 that a time lapse video captured what has baffled researchers for decades. Ice sheets a few millimeters thick form overnight and the strong winter winds push the stones at speeds up to 5 meters per minute! These ice sheets would then melt during the sunny days leaving behind a path and a new resting point for the stone before the next sunset.

A small group from ENGEO visited Death Valley to witness the sailing stones first hand. Staff Engineer Chris Stouffer captured this photo during their trip, and while their tents froze overnight, he says January in Death Valley has perfect weather during the day.

"Death Valley is classically a geologic wonder. We wanted to see first hand the environment that causes this phenomena. Death Valley National Park and Racetrack Playa are the most famous locations to find the longest sailing stone tracks on record."

Chris Stouffer
Staff Engineer,
Oakland, California

Massive Asbestos Remediation Clears way for New Children's Hospital

by Simon Charles
Wellington, New Zealand

Riddiford House, a 67-year-old nurses' quarters building behind Wellington Hospital, has been safely demolished as part of the project to build the new Children's Hospital in New Zealand.

It is the largest asbestos remediation project undertaken by ENGEO to date, and could possibly be the largest friable asbestos removal job conducted in New Zealand!

When an old building is demolished, there are toxic materials released and exposed that pose a danger to those working in the debris, those living nearby, and those who have to haul it away.

Asbestos regulations are still very new in New Zealand. They are designed to reduce the risk of health effects from potential exposure on site, as well as the risk to businesses, by helping all contractors comply with the relevant asbestos regulations.

The building is seven stories with a 10,763.9 sf (1,000 m2) footprint. The entire exterior of the building was coated in an asbestos-containing skim coat and asbestos-containing paint.
The roof also contained an asbestos bitumen membrane. After the job commenced, previously unidentified building materials were discovered. This triggered a large-scale investigation into other building elements where asbestos also may have been present. Project delays could have cost tens of thousands of dollars per day, making it critical to develop a strategic and effective survey method that maintained the integrity of the assessment and mitigated all associated risks.

The alternative to additional surveying would have been to presume that asbestos was present throughout the building and strip out each level, back to bare concrete — a very costly and time-consuming process. Taking the time to accurately identify the asbestos-containing materials kept the project on schedule and limited the cost of additional labor and contaminated waste disposal fees.

US Regulatory Update

New Vapor Intrusion Screening Levels Require More Extensive Site Investigations and Conservative Mitigation Measures

by Jeffrey Adams, PhD, PE
San Ramon, California

Vapor intrusion has been an emerging environmental issue affecting land development for a number of years. Recent regulatory changes, however, may significantly affect how sites are developed, especially Brownfield sites.

Vapor intrusion may occur when subsurface contamination, such as petroleum hydrocarbons or solvents, volatilize and migrate through the subsurface soils, eventually entering into indoor air spaces. These compounds may be carcinogenic and/or present other potential chronic health risks.

The migration of subsurface vapors into indoor air is estimated through attenuation factors. Indoor air contaminant concentrations are typically a small fraction of underlying soil gas concentrations due to a variety of factors, including structural features, ventilation, and climate. In the past, regulatory agencies have used soil gas-to-indoor air attenuation factors of approximately 0.001, meaning indoor air concentrations were estimated to be one-thousandth of measured soil gas concentrations under a building.

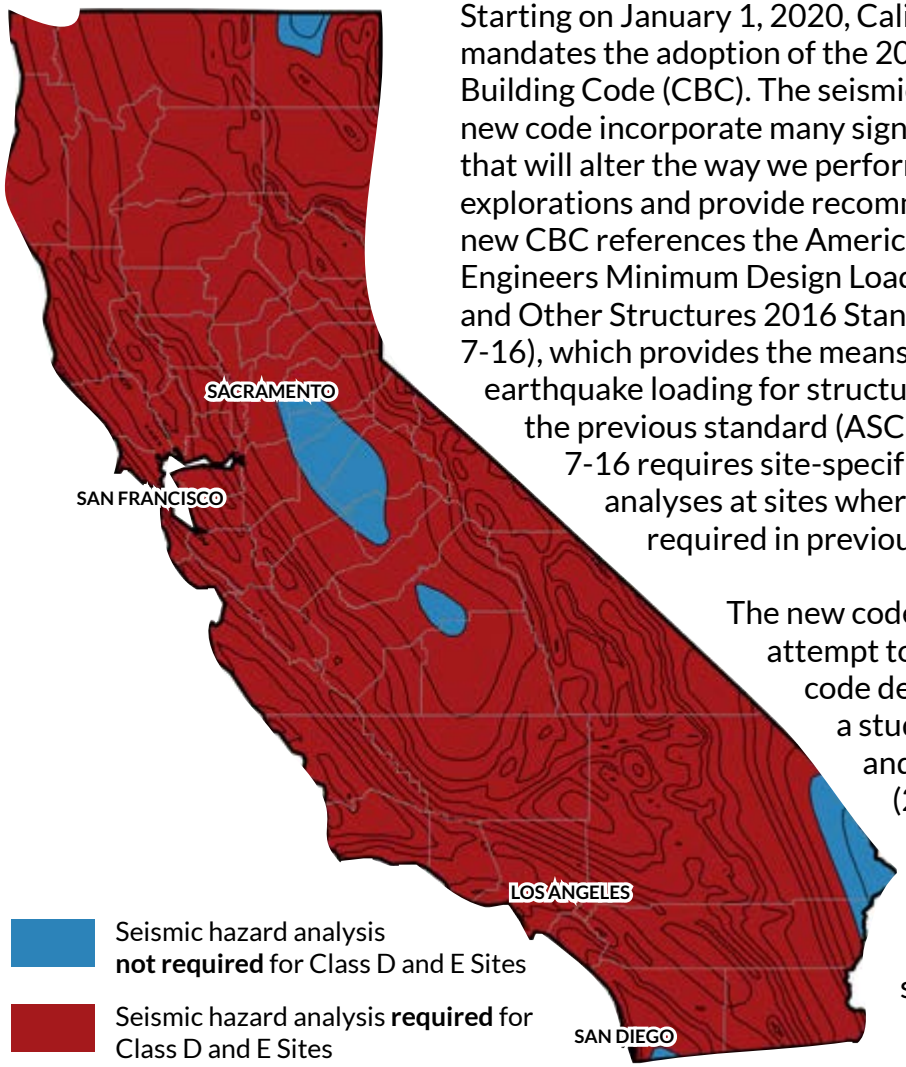
Recently, spurred by the United States Environmental Protection Agency (USEPA), California's regulatory agencies, including the San Francisco Regional Water Quality Control Board (RWQCB) and the Department of Toxic Substances Control (DTSC), revised the soil gas-to-indoor air attenuation factor to 0.03, resulting in significant reductions of allowable soil gas screening levels associated with vapor intrusion. As a consequence, sites with very low concentrations of volatile organic compounds, such as benzene or tetrachloroethene ("PERC", a dry cleaning solvent), that had never been considered a human health risk may now require vapor mitigation.

The regulatory agencies have acknowledged that the attenuation factors may be overly conservative for California and are likely to be revisited in the future. Until then, the development community should expect that far more extensive phase II environmental site assessment studies may be required during due diligence activities to assess vapor intrusion, and vapor intrusion mitigation systems, including vapor barriers and underlying ventilation/depressurization systems, may be more common than in the recent past.

US Regulatory Update

CBC2019 Makes Significant Changes to Seismic Design Parameters.

by David Teague, PhD, PE
San Ramon, California



Starting on January 1, 2020, California state law mandates the adoption of the 2019 California Building Code (CBC). The seismic provisions of the new code incorporate many significant changes that will alter the way we perform our geotechnical explorations and provide recommendations. The new CBC references the American Society of Civil Engineers Minimum Design Loads for Buildings and Other Structures 2016 Standard (ASCE 7-16), which provides the means for determining earthquake loading for structural design. Unlike the previous standard (ASCE 7-10), ASCE 7-16 requires site-specific seismic hazard analyses at sites where they were not required in previous codes.

The new code provisions attempt to correct previous code deficiencies. In fact, a study by Kircher and Associates (2015) found that the seismic provisions of ASCE 7-10 were deficient at stiff to soft soil sites, which the code refers to as "Site Class" D and E sites, respectively. To address these deficiencies, ASCE 7-16 now mandates site-specific seismic hazard analyses (SHA) at Site Class D and E sites in virtually all major metropolitan areas of California. Additionally, the code imposes more stringent minimum design ground motions at longer periods, which will require taller structures to be more seismically robust. Further, the code requires the use of "current seismic interpretations, including uncertainties for models and parameter values for seismic sources and ground motions." This means the incorporation of the Third California Earthquake Rupture Forecast (UCERF3) fault model. The inclusion of UCERF3 results in the use of different analytical tools from the current standard tools and the incorporation of judgment as to which fault scenarios should be included in the deterministic portion of the calculations.

As a consequence of these code changes, we can no longer simply obtain seismic design parameters from published maps for many projects in California. Rather, a site-specific SHA will be required to define these parameters at many sites. In order to optimize the SHA results, a shear wave velocity profile of the upper 100 feet of soil

ENGEO Springs into 2019 Celebrating Awards

2019 7th Best Workplaces in the Bay Area
by Great Place to Work and FORTUNE

2019 18th Best Workplaces in the Bay Area
by Silicon Valley Business Journal and San Francisco Business Times

2018 ASCE Region 9

- *Outstanding Geotechnical Project of the Year*
  Blu Harbor Residential Development, Redwood City, California

- *Outstanding Small Project of the Year*
  Yuba Goldfields 100-Year Interim Flood Protection Project, Yuba County, California

2018 ASCE Orange County Branch Awards

- *Project of the Year*
  Orange County Great Park Sports Complex, Irvine, California

- *Flood Management Project of the Year*
  The Agua Chinon Corridor, Orange County, California

CBC2019 Changes to Seismic Design Parameters
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will be required. However, there are some exceptions to the new SHA requirements. These exceptions typically apply to short structures at Site Class D sites.

Our approach will be to discuss with the structural engineers whether any of these exceptions are applicable early in the process so that this additional level of effort can be avoided where appropriate. Our staff are experts at performing SHA, if required, and will work closely with the structural engineers to meet the code provisions. We can even perform more sophisticated, non-ergodic SHA for structures (particularly tall buildings) where structural design is driven by seismic resistance and the added level of effort could result in a more economical design.