Considering hazards both inside and outside the property lines

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SLIDE 1 With your indulgence, I would like to give you a brief summary of three case studies before I discuss some of the ethical issues involved.

SLIDE 2 The first case study involves a site about 110 km northwest of Los Angeles.

SLIDE 3 Interstate Highway 5 was built at the bottom of the valley of Grapevine Creek where it flows through the Tehachapi Mountains toward Bakersfield, California. It is one of the most important highways in California.

SLIDE 4 During a major rainstorm just before dawn on February 5, 1978, water and debris from multiple drainages crossing the hillslope west of the highway flowed into and blocked the drainage culverts under the roadway.

SLIDE 5 Between 35,000 and 55,000 cubic meters of debris flowed onto the only available surface: the southbound or uphill lanes of I-5.

SLIDE 6 On that dark, stormy night, the debris flows had enough volume and power to pick-up and move fully loaded semi-tractor trailers. The flow also slammed into the red Ford Maverick driven by a young mother trying to get home to her husband and children.

SLIDE 7 It picked-up her car, dropped it into an open drainage flume between the north- and south-bound lanes, and carried it two kilometers onto the alluvial fan below the canyon.

SLIDE 8 It took days for her body to be recovered.

SLIDE 9 During the subsequent litigation, it was proven that the public agency that had been responsible for designing, building, and maintaining this stretch of Interstate 5 had ***not*** built the drainage system to handle any sediment or debris. The drainage system had been built to accommodate ***only*** clear-water runoff. They had not utilized adequate geological input in the design of this highway.

SLIDE 10 Even though the State had sovereign immunity, the family received a substantial settlement that did not mitigate the fact that an important life was lost because the project designer failed to use competent geological input that considered important conditions beyond the project boundaries.

This remains a dangerous road during storm events because no relevant changes have been made to the drainage system in the forty years since this tragedy, to the best of my knowledge. This stretch of interstate needs to be re-built as an elevated roadway or causeway.

SLIDE 11 The second and third cases both took place in the small town of Pacifica, California, which is a bedroom community for the San Francisco-San Jose corridor.

SLIDE 12 On Christmas day, 1981, the Velez family consisted of father Bill, mother Barbara, and three children: Michelle, age 14; Billy, age 7; and Melissa, age 4.

SLIDE 13 They lived in a house built just 8 years earlier on Oddstad Boulevard in Pacifica. In the initial soils and geology report before the new subdivision was built, the developer's consultants wrote --
"We have completed an investigation of the soil geologic conditions of the subject site. The investigation consisted of a soil and foundation study and a geologic reconnaissance of the local area...
Our findings indicate that the site is suitable for the proposed residential use..."

SLIDE 14 During a major rainstorm on January 4, 1982, soils in a hillside swale behind the houses on Oddstad Blvd became mobilized in a debris flow that slammed into the house next to the Velez home.

SLIDE 15 The flow moved that house off its foundations and sent it crashing into the Velez house, crushing it and killing all three of the children in the family.

SLIDE 16 It took 36 hours to find them in the mud and debris.

SLIDE 17 During the subsequent litigation, the developers and their consultants offered several explanations for this failure.

SLIDE 18 • The source of the debris was on the other side of the property line, and so they had no authority to investigate off-site conditions.

SLIDE 19 • Colluvium-filled swales were not commonly recognized as potential hazards — it was beyond standard practice.

SLIDE 20 • This project was driven by the developer and engineers. Geology was a minor consideration. Unfortunately, the safety of the humans who would inhabit the houses at the base of that ridge also appears to have been a minor consideration.

SLIDE 21 Years later, the mother said that she thought their home had been built in a safe place. She had no idea it had been built right below the geological equivalent of a loaded shotgun. The Velez parents eventually divorced, completing the destruction of that family.
In a photograph taken from the same vantage point as this one from January 1982, ...

SLIDE 22 ...here is the site as it appears today. The land where the destroyed houses once stood was purchased by other people, who built new houses on the vacant lots. The house you see on the left here is the new house built at the base of the swale, on a lot established on the Holocene debris-flow fan that should have been identified when the area was mapped in 1969 before the subdivision was developed.

SLIDE 23 The new house has a small corridor next to it for future debris flows to pass through. It is unclear whether the current residents understand the history of these lots, or the hazard they share.

SLIDE 24 A quarter century ago, I presented this case at an AEG symposium on geoethics. In attendance was a man who seemed to have been involved in the original site development. After my presentation, he pulled me aside — quite emotional — and asked me if it was unethical to make a mistake. I had no answer for him, and subsequently decided that perhaps I needed to stop pontificating about ethics until I had gained more experience and perspective about applied ethics. Whether I have gained that perspective yet is a matter of opinion. More recent instances of unethical behavior by geoscientists have woken me from my hibernation.

SLIDE 25 My final case study. The San Francisco-San Jose corridor has some of the most expensive real estate in the world, and so the pressure to develop housing that is convenient to workplaces is intense. In 1906, the San Andreas Fault generated a magnitude 7.8 earthquake resulting in around 4 meters of right-lateral slip in the area enclosed in the white rectangle, which is detailed in the next image.

SLIDE 26 After the Alquist-Priolo Earthquake Zoning Law was enacted in 1971, one area along the San Andreas that had not previously been developed was generally considered to be undevelopable, because several strands of the active fault passed through it. A few years ago, a developer acquired this vacant land.

SLIDE 27 They hired State-licensed geological consultants to trench the property to locate the fault strands The double lines show where trenches were dug, and the fault traces are shown in blue.

SLIDE 28 The developer mapped-in the legally required setbacks from active fault traces, shown in yellow...

SLIDE 29 ...and created a design maximizing the number of houses that could be built in the remaining space, using the average footprint of existing houses in the neighborhood. They planned to use the setback space for roadways and utilities. The plan complied with all existing statutes, and was subsequently approved for construction.

SLIDE 30 And so now you can own a house located literally within the active traces of one of the most dangerous faults in the world. It is reasonable to assert that virtually all geoscientists know what will happen here at some point in the future.

SLIDE 31 But do the people living in those houses know the hazard that surrounds them?

SLIDE 32 Governmental law and regulations require licensed professional geoscientists to practice at no less than a specified level.

SLIDE 33 Professional societies publish guidelines for professional practice that meet or exceed statutory requirements and reflect capabilities that all of their individual members should be able to achieve.

SLIDE 34 Many individuals are capable of providing a higher level of service that these guidelines, ...

SLIDE 35 ...and teams of qualified geoscientist have collective capabilities that exceed those of any individual.

SLIDE 36 The ***state of the art*** is often defined in research environments like universities, where the effectiveness of new ideas and practices is undergoing testing and evaluation. Hence, they are not ready for primetime.

SLIDE 37 The same could be said for ***research frontiers***.

SLIDE 38 So I assert that ***ethical practice*** covers the span from statutory requirements through the capabilities of teams or companies of qualified geoscientists.

SLIDE 39 Professional services that are below your capabilities but still meet governmental regulations might be considered ***effective negligence***, ...

SLIDE 40 ...whereas failure to meet governmental regulations is ***statutory negligence***.

I have heard licensed geoscientists say that their work and recommendations are consistent with all relevant governmental laws and regulations, and that their client would not pay for any work beyond that. They say they would like to practice at a higher level, but it's just a business decision not to.

This places current standard practice at the lowest level allowed by the government.

SLIDE 41 ***Slosson's Law***, named after former State Geologist of California Jim Slosson, states that "practice will drop to the lowest level permitted by the administration and enforcement of applicable law."

An essential characteristic of the geoscience profession is its service to the public — to society as a whole. We are the scientific liaisons between society and the geological environment.

SLIDE 42 Geologist Bob Tepel refers to the "primacy clause" in codes of professional ethics, which establishes that a professional has an ethical duty to the public. In our professional work, the health, safety, and wellbeing of the public are paramount.

SLIDE 43 In this view, business decisions do not outweigh our duty to protect the public.

SLIDE 44 Our goal as professional geoscientists is to participate in the responsible development of assets that are of sustainable benefit to society, while avoiding or effectively mitigating any hazardous consequences of that development.

Our professional commitment to society requires us to consider the effect of our work on both sides of the property line.