Tania Gonzalez, PG, CEG

Project Geologist, Vice President

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Ms. Gonzalez has over 18 years of experience in site evaluation and geological feasibility studies. She has extensive experience using soil-stratigraphic and geomorphic techniques to estimate the age of paleo-surfaces and to characterize the recency and magnitude of activity of faulting. She has successfully coordinated and managed complex field studies that involved mobilizing several subcontractors and field personnel at once. Her experience includes field mapping, logging and documenting trenches and excavations, drilling (auger, rotary and rock coring), and down-hole logging of bucket borings for landslide and fault studies. She has experience in absolute and relative dating techniques, including radiometric, thermoluminescence, and paleomagnetic sampling and interpretation. Ms. Gonzalez has also managed and prepared dozens of planning studies with emphasis on geological hazard mitigation. She is fluent in Spanish and conversant in French.

EDUCATION

M.S. Geology (Engineering Geology Option), Texas A&M University	1989
B.S. Geology (Engineering Geology Option with Minor in Anthropology), Texas A&M University	1986

PROFESSIONAL CERTIFICATIONS

Professional Geologist:	California, PG 5868
Certified Engineering Geologist:	California, CEG 1859
First Aid and CPR Training	
40-Hour Hazardous Materials Training	

PROFESSIONAL AFFILIATIONS

Association of Engineering Geologists (AEG)

50TH Anniversary Annual Meeting Field Trip Guidebook Co-Editor	2007
Southern California Section Chair and Member Board of Directors:	2002-2004
Vision, Mission and Values Statement Committee Chair:	2003-2004
Strategic Planning Committee Co-Chair:	2003-2004
Southern California Section Treasurer:	2000-2002
Southern California Section Secretary and Newsletter Editor:	1990-1993
Southern California Section Membership Committee Chair:	1993-1994
Lone Star Student Chapter President:	1986-1987

South Coast Geological Society (SCGS)

SELECTED PROJECT EXPERIENCE

Field Manager for a Paleoseismic Investigation of the Limón and Gatún faults in Panama. Earth Consultants International was retained under contract to the Autoridad del Canal de Panama (ACP) to conduct detailed studies of the Gatún and Limón faults in the Canal Area of central Panama. As part of the study, we used DEM and stereo aerial photos to map lineaments and tectonic geomorphic features indicative of active faulting. Following the imagery review, we conducted field reconnaissance of the two faults, and identified locations

for detailed, three-dimensional paleoseismic trenching. Using both two- and three-dimensional trenching techniques, ECI geologists were able to determine an average geologic slip rate of 8 mm/yr for the Gatún fault and 5 mm/yr for the Limón fault, with recurrence intervals of about 150 years for the Gatún fault and 500 years for the Limón fault. Results were presented to ACP management, and ACP geologists were given hands on training in active fault investigation techniques.

Co-Manager and Field Geologist for a Tectonic Geomorphic Reconnaissance of the Pedro Miguel, Miraflores, Azota-Caballo, western extension of the Gatún, and other faults within the Panama Canal Watershed Area in Central Panama. ECI was retained to review a large area centered on Gatún Lake to locate and evaluate the activity of several faults and lineaments and determine their potential seismic hazard to the Canal. The study included the review of stereo aerial photographs, 10-m digital elevation model, helicopter reconnaissance, and extensive field verification and geomorphic mapping. ECI concluded that the Pedro Miguel, Azota and Miraflores faults are active faults that need to be considered in the seismic hazard model for the Canal and central Panama.

Co-Project Manager and Field Geologist, fault trenching and mapping study of the Ford-Otosan Plant near Golçuk, Turkey, after the August 17, 1999 M 7.4 earthquake. The earthquake caused considerable damage at the Ford-Otosan automobile assembly plant, which was under construction at the time. Management halted construction and retained ECI to conduct a seismic risk analysis of the site to evaluate the probability of another similar earthquake occurring during the lifetime of the plant. As part of the study we mapped surface fault ruptures, with vertical offsets of between 1 and 2.35 meters, and lateral offsets of as much as 1.2 meters, along the southern perimeter of the property. We also mapped the faults and fractures in the area where the main plant buildings were located to determine that the 1.5 meters of subsidence and synclinal warping were associated with secondary faulting associated with a step in the main fault. In the seaward side of the property, we mapped an extensive zone where lateral spreading and slumping occurred. Our field mapping was supplemented with review of aerial photographs taken shortly after the earthquake, before wave action and vehicular traffic destroyed some of the evidence. Our paleoseismic studies and review of historical records indicated that at least two other similar earthquakes occurred in the area of the Ford Otosan plant in the last 500 years, in AD 1509, and AD 1719, suggesting a predictable and regular pattern of surface rupture. Based on these findings, we concluded that the Ford-Otosan plant has a low probability of experiencing another similar earthquake in the next 50 to 100 years. However, it is likely to experience smaller earthquakes (aftershocks) generated by the same fault system, and lower, attenuated ground motions as a result of earthquakes on other faults some distance from the site.

Co-Project Manager, Seismic Hazard Assessments for Several Proposed New School Facilities, City of Los Angeles, California. We assessed the potential hazard of surface fault rupture, tectonic deformation and strong ground motion at eleven potential school sites near the downtown area of Los Angeles. As part of this study we reviewed the geologic literature, including unpublished geologic reports for the metro system, to assess the potential for surface fault rupture and tectonic folding at or near each of the sites. We also conducted a detailed geomorphic assessment to identify potential secondary folds at or near each site that could result in warping or tilting during a future earthquake. We also conducted a deterministic and probabilistic seismic hazard analysis for each site to determine the estimated peak ground

motions resulting from any of several active faults in the region. To conduct these analyses, we considered and modified the existing tectonic models to include the most recently available data on buried thrust faults in the region.

Project Manager and Field Geologist, Fault Location Study for a Proposed Industrial Facility in the Northern Coast of Honduras, Central America (location, client and project are confidential). Conducted a review of published geologic data and aerial images (Landsat and photographs) to look for features indicative of faulting, aeolian accretion, and flooding at the site and vicinity. Based on these data, we designed and conducted a detailed three-week field survey at the site to characterize the subsurface stratigraphy, to 50-meter depths, using cone penetrometer soundings. The subsurface data were correlated across the site to identify potential active traces of a major fault system in the area that would make the project unfeasible. The project required the coordination of several different teams and equipment originating from various places in the United States, Canada and Central America. The data were imported into and modeled using a three-dimensional, GIS-based computer software package that helped us to model the deltaic deposits and determine where they are continuous, and where they have been truncated by faulting.

Project Manager, Study on the Potential for Surface Fault Rupture and Liquefaction-Induced Lateral Spreading to Impact the Section of a Proposed Natural Gas Pipeline between Twentynine Palms and Long Beach, California. An existing petroleum pipeline is to be converted to a high-pressure natural gas pipeline. The pipeline crosses 23 active fault zones, and several potential liquefaction zones and active landslides. We were asked to better define the location of the fault crossings, estimate the fault displacements in the event of fault rupture at each of the fault crossings, and evaluate which segments of the pipeline would be under compression or under tension as a result of fault rupture. We also identified those sections of pipeline that extend across potentially liquefiable terrain, and for five areas, estimated the amount of displacement that could be expected if lateral spreading occurred during an earthquake. The structural engineers used our estimates to evaluate which sections of pipeline need to be retrofitted or replaced to reduce the potential for failure during a seismic event. We worked closely with the engineers to identify the areas where automatic shutoff valves are most appropriate based on the likelihood of that section of pipeline breaking during its expected lifetime, and the population density near that section of pipe. Finally, we provided technical assistance during presentations to the California Division of Mines and Geology and the State Lands Commission.

Project Manager, fault trenching study in the Newport Mesa, across strands of the Newport-Inglewood fault. The three-month long field project involved the excavation and logging of over 2,400 lineal feet of trenches and field mapping of 2,000 lineal feet of natural exposures along the bluffs to locate faults of the Newport-Inglewood fault system. The faults exposed were evaluated as to their recency of activity using soil stratigraphic techniques and their association with cultural deposits of pre-historic age. One of the faults exposed was determined to have ruptured at least once in the Holocene. Structural setbacks were recommended for this fault. The other faults exposed were determined to have been inactive for at least 80,000 years. The main active Newport-Inglewood fault projects immediately south of the site.

Project Manager for two fault hazard investigations in downtown San Diego, along the projection of the Rose Canyon fault. The first study consisted of trenching in the street in front of the property in question to evaluate whether faults associated with the Rose Canyon fault extend beneath the site. Sediments of the Bay Point formation, locally with strongly developed soils, were exposed in the trench. Minor folding of the deeper layers was observed near the eastern end of the trench, but no faults were exposed. The second study approximately four streets to the south consisted of excavating two trenches, one in an east-west direction, and the other in a north-south direction, again in the street. Very loose historical and late Holocene sediments were exposed to depth in sections of the trenches, making the excavations unstable. Therefore, to investigate these areas for faults, we drilled several closely spaced, large-diameter bucket borings. The borings were downhole logged. A fault juxtaposing sediments of the San Diego Formation against possible Ardath Shale was exposed in one of the borings. Trenching in the area exposed recent alluvial sediments down-dropped into the fault zone. Radiocarbon dating of the sediments indicates that the last surface rupturing event occurred less than 3,200 years ago.

Field Project Manager for a seismic hazard investigation of the San Bernardino Valley College to locate the active traces of the San Jacinto fault for campus redevelopment planning. The San Bernardino Valley College campus in San Bernardino was constructed upon an elevated pressure ridge (the Bunker Hill Dike) formed along the San Jacinto fault. As part of an overall campus redevelopment planning, this study was undertaken to quantify the fault rupture hazard through the SBVC. In addition to the threat posed by surface rupture, other secondary seismic impacts were addressed, including liquefaction, shaking amplification, and ground deformation due to folding. The project involved the excavation of eight trenches within the campus area to expose the traces of the San Jacinto fault, completion of ten boreholes to depths of 50-100 feet coupled with nearly 100 cone penetrometer tests, and shear wave velocity profiling of the borings. Manager for additional field studies conducted between 2002 and 2007 to determine whether or not proposed new building locations are underlain by active faults or within the zone of folding.

Field Manager for a fault hazard investigation of the northern San Jacinto fault within the Lytle Creek drainage in Rialto to locate the active traces of the fault, and quantify probable displacement magnitudes for bridge structure design. The purpose of the study was to quantify the fault rupture hazard of the northern segment of the San Jacinto fault where several new freeway bridge structures are proposed for the I-210 extension in San Bernardino County (Foothill Freeway). The project included a subsurface trenching investigation across the major bridge locations to screen the area for secondary faults.

Field Geologist, detailed fault investigation, Las Posas Hills, Camarillo, Ventura County. As part of the study we located the Springville fault, and characterized the frequency and magnitude of activity. Worked closely with Dr. Thomas Rockwell to prepare a soil chronosequence for the Las Posas Anticline, and determined based on soil age relationships, that the hills started to uplift about 80-120 thousand years ago. In addition to the main Springville fault, the west-facing flank of the Las Posas Hills is comprised of steeply dipping sandstone. Bedding-plane faults are common. We conducted extensive trenching in this area to characterize the recency of activity of these bedding plane faults.

Project Manager and Principal Investigator, Hazards Assessment Study for the City of Pasadena, California, to guide future City Planning and Redevelopment [Safety Element]. The City of Pasadena is one of the most vibrant and economically important cities in the Los Angeles metropolitan area, home to many large national and international corporations. Pasadena is also located between two active faults, the Sierra Madre fault to the north, and the Raymond fault to the south. Loss estimation analyses for earthquake scenarios on these two faults indicate that the City of Pasadena is likely to be impacted significantly should either one of these faults break in a large, maximum credible earthquake. The northern and western portions of the City are also susceptible to wildfires, which, given the right Santa Ana wind conditions, could cause significant damage at and near the interface with the built environment. The Technical Background Report to the Safety Element discusses these and other hazards specific to Pasadena, and provides a vulnerability assessment of the city's critical facilities. The Policy document identifies goals, policies and programs that can be implemented to reduce the City's risk, making Pasadena more resistant to natural hazards.

Project Manager and Principal Investigator, Hazards Assessment Study for the City of Moorpark, California, to guide future City Planning [Technical Background Report for the Safety Element]. The City of Moorpark is a fast-growing community that is undergoing significant new residential and commercial development. The older section of town is located on the floodplain of Arroyo Simi, an area susceptible to liquefaction and flooding. The newer residential communities are being located on the hills at the base of the southern Oakridge Mountains. Some of these areas are susceptible to landsliding. The Oakridge fault is located about 2 miles north of the City, while the Simi-Santa Rosa fault system extends across the southern portion of the City. Both of these faults have the potential to generate very strong ground motions in the area should they rupture in an earthquake. Many portions of Moorpark or its sphere of influence are also in a high wildland fire hazard area. Finally, there are four oil fields in the study area; some of these are now abandoned and likely to be developed for residential purposes in the not too distant future. The Technical Background Report included a discussion of the city's susceptibility to these and other hazards, the potential impact to lifelines and critical structures, and discussed various mitigation strategies that can be used to formulate hazard reduction plans and policies that promote safe, environmentally sensitive development.

Project Manager, Technical Background Report for the Safety Elements for the Cities of Palm Springs, Banning, Palm Desert, Desert Hot Springs, La Quinta, Cathedral City, Rancho Mirage and Big Bear Lake. Each one of these individual reports addresses the seismic, geologic and flooding hazards specific to the project city, with emphasis on the potential for the San Andreas fault to break within the next about 20 to 30 years. Other hazards addressed include liquefaction, groundwater extraction induced subsidence, earthquake-induced rockfalls, and wind erosion potential.

Project Manager, Study on the Potential for Surface Fault Rupture, Liquefaction-Induced Lateral Spreading and Landsliding along the California Section of the El Paso Pipeline between the California-Arizona border and Wheeler Ridge. The existing petroleum pipeline will be converted to a high-pressure natural gas pipeline. We were retained to identify those sections of the pipeline that cross faults, liquefaction-susceptible areas, and unstable slope areas. A total of 18 known faults were identified; 11 of these were deemed active. The most significant fault crossing is the Garlock fault, which may move laterally as much as 10 feet

during the next event. Of the liquefaction-susceptible areas identified, the section of pipe near Barstow, along the Mojave River was deemed the most vulnerable to this hazard. Given the population of the area, this is also the area at most risk of being impacted should the pipeline break. Engineering strengthening of the pipe and increased number of automatic shut-off valves were recommended at specific mileposts to reduce the hazards identified.

SELECTED PUBLICATIONS AND PRESENTATIONS

Gonzalez, T., 2007, Pre-instrumental Earthquakes in Panama and the Seismic Hazard of the Panama Canal: Using the Past to Prepare For the Future (abstract): Association of Engineering Geologists 50th Anniversary Annual Meeting, Los Angeles, California, September 24-28, 2007, Program with Abstracts, pp. 85-86.

Gonzalez, T., Rockwell, T., Gath, E., Dawson, T., and Cadena, A., 2007, Tectonic Geomorphology and Paleoseismology of the Limón Fault, Panama (abstract): Association of Engineering Geologists Annual Meeting, Los Angeles, California, September 24-28, 2007, Program with Abstracts, p. 86.

Gath, E., **Gonzalez, T**., Madden, C., Dawson, T., Rockwell, T., and Franceschi, P., 2007, Seismic Hazard Studies for the Panama Canal Expansion Project Using Tectonic Geomorphology (abstract): Association of Engineering Geologists 50th Anniversary Annual Meeting, Los Angeles, California, September 24-28, 2007, Program with Abstracts, pp. 84-85.

Madden, C., **Gonzalez, T**., Rockwell, T., Dawson, T., and Gath, E., 2007, Tectonic Geomorphology and Paleoseismology of the Pedro Miguel fault, Panama (abstract): Association of Engineering Geologists 50th Anniversary Annual Meeting, Los Angeles, California, September 24-28, 2007, Program with Abstracts, p. 102.

Rockwell, T., Gath, E., **Gonzalez, T**., Dawson, T., and Cadena, A., 2007, Tectonic Geomorphology and Paleoseismology of the Gatún fault, Panama (abstract): Association of Engineering Geologists 50th Anniversary Annual Meeting, Los Angeles, California, September 24-28, 2007, Program with Abstracts, p. 114.

Klinger, Y., Sieh, K., Altunel, E., Akoglu, A., Barka, A., Dawson, T., **Gonzalez, T.,** Meltzner, A., and Rockwell, T., 2003, Paleoseismic evidence of characteristic slip on the western segment of the North Anatolian fault, Turkey: Bulletin of the Seismological Society of America, Vol. 93, No. 6, pp. 2317-2332.

Rockwell, T., Barka, A., Akyuz, S., Dawson, T., Sieh, K., and **Gonzalez, T.,** 2000, The North Anatolia fault around the Marmara Sea, and pre- and post-earthquake research after the August 17, 1999 Koaceli earthquake; in Okumura, K., Takada, K., and H. Goto, H. (editors), Active Fault Research for the New Millenium: Proceedings of the Hokudan International Symposium and School on Active Faulting, Letter Press Ltd., Hiroshima, Japan, p. 587-592.

Gonzalez, T., Sieh, K., Dawson, T., Altunel, E., and Barka, A., 2000, Faulting and Ground Subsidence at the Ford-Otosan Plant Near Golçuk, Turkey as a result of the August 17, 1999 Koaçeli, Earthquake (abstract): Pacific Section Convention and Western Regional Meeting, American Association of Petroleum Geologists and Society of Petroleum Engineers, held in Long Beach, California, June 19-22, 2000.

Gath, E.M., **Gonzalez, T**., and Sieh, K., 1998, Earthquake risk assessment at San Bernardino Valley College: hazard mitigation astride the San Jacinto fault in Southern California (abstract): Seismic Safety of Big Cities, Earthquake Prognostics World Forum, International Commission on Earthquake Prognostics and the Turkish Earthquake Foundation, Istanbul, Turkey, p. TMS-3.

Gath, E.M.; and Gonzalez, T., 1995, Earthquake risk assessment at San Bernardino Valley College: hazard mitigation astride the San Jacinto fault in southern California (abstract): Engineering Geology in the Metropolitan Environment; Association of Engineering Geologists, 39th Annual Meeting, Program and Abstracts, p. 44.

Gath, E.M., **Gonzalez, T**., Drumm, P.L., and Buchiarelli, P., 1994, A paleoseismic investigation at the northern terminus of the Whittier Fault Zone, in the Whittier Narrows area, Rosemead, California: Technical Report to the Southern California Earthquake Center.

Bausch, D.B., and **Gonzalez, T**., 1994, Pattern of Damage in the City of Santa Monica from the Mw 6.7 Northridge Earthquake, Seismological Society of America Program for Northridge Abstracts, 89th Annual Meeting, Pasadena, April 5-7, No. 28.

Gath, E.M., **Gonzalez, T**., and Rockwell, T.K., 1992, Evaluation of the Late Quaternary Rate of Slip, Whittier Fault, Southern California: U.S. Geological Survey Final Technical Report, NEHRP Contract No. 14-08-0001-G1696, 24p.

Gonzalez, T., Rockwell, T.K., and Gath, E., 1992, Exploratory Excavations for Fault Investigations: Logging Techniques: Abstracts with Programs, 1992 Annual Meeting of the Association of Engineering Geologists, held in Long Beach, California, October 2-9, 1992.

Gath, E.M., **Gonzalez, T**., and Rockwell, T.K., 1992, Slip Rate of the Whittier Fault Based on 3-D Trenching at Brea, Southern California: Abstracts with Programs, The Geological Society of America 88th Annual Cordilleran Section, Vol. 24, No. 5., 26 p.

Mathewson, C.C., **Gonzalez, T**., and Eblen, J.S., 1992, Burial as a Method of Archaeological Site Protection, Contract Report EL-92-1, US Army Engineer Waterways Experiment Station, Vicksburg, Mississippi.

Gonzalez, T., and Rockwell, T.K., 1991, Holocene Activity of the Springville Fault in Camarillo, Transverse Ranges, Southern California; Preliminary Observations; in Blake, T.F. and Larson, R.A. (editors), *Engineering Geology along the Simi-Santa Rose Fault System and Adjacent Areas, Simi Valley to Camarillo, Ventura County, California*; *Field Trip Guidebook of the 1991 Annual Field Trip, Southern California Section*: Association of Engineering Geologists, pp. 369-383.

Gonzalez, T., 1989, Appendix A: Interdisciplinary Bibliography on the Cultural, Physical, Chemical, and Biological Factors Affecting Archaeological Sites; in Mathewson, C. (editor), Interdisciplinary Workshop on the Physical-Chemical-Biological Processes Affecting Archaeological Sites, Contract Report EL-89, U.S. Army Engineer Water Waterways Experiment Station, Vicksburg, Mississippi.

Mathewson, C.C., and **Gonzalez, T**., 1988, Protection and Preservation of Archaeological Sites through Burial; in Marinos, P.G. and Koukis, G.C. (eds.), Proceedings of An International Symposium on The Engineering Geology of Ancient Works, Monuments and Historical Sites: Preservation and Protection: A.A. Balkema, Rotterdam, Vol. 1, pp. 519-526.