

Resumé of: **George C. Klimkiewicz**

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Education:

M.S. Boston College, 1980, Geophysics, Seismological Studies
B.S. Northeastern Univ., Boston, MA, 1975, Geology

Experience:

2007-present: President and Sr. Seismologist of Weston Geophysical Engineers, Inc., 20 Main St., Acton, MA
 1994-2007: General Manager, Sr. Program Manager, Geophex Ltd. dba Weston Geophysical Engineers
 1977-1994: Senior Seismologist, Project Manager, Weston Geophysical Engineers, Inc.
 1974-1976: Engineering Aide, Stone and Webster Engineering, Inc., Boston, MA

Professional Registrations:

E.I.T. #17991, Commonwealth of Massachusetts Board of Registration of Professional Engineers and Land Surveyors

Professional Affiliations:

Seismological Society of America
 Eastern Section, Seismological Society of America
 Earthquake Engineering Research Institute

Recent Project Management:

Mr. Klimkiewicz has 34 years of professional work experience in the fields of geophysical test program management, seismology and seismic hazard assessment, seismic network installation and structure vibration measurement and analyses. During his 34-year tenure at Weston Geophysical Engineers, Mr. Klimkiewicz has served as general manager and program manager for varied geophysical and seismological site studies. He has served as member of Technical Advisory Groups for geophysical and seismological site characterization for NP projects at Nine Mile Point and at Calvert Cliffs. A partial list of his recent projects is listed.

- Development of Seismicity Parameters for NMP-3 PSHA Sensitivity Analyses for AREVA NP, Inc. (2009).
- Development of Synthetic Ground Motion Time Histories for the Eagle Rock Enrichment Facility for AREVA NP (2010 – 2011).
- Geophysical Site Characterization for the AREVA US LLC Eagle Rock Enrichment Facility for Nuclear Technology Solutions (2009 – 2010).
- Recommendation of Seismic Design Criteria for the Calais ME LNG Project for GZA GeoEnvironmental (2008 -).
- Geophysical Testing including land and offshore surveys to support the NMP-3 Site Characterization for GEI Consultants and AREVA NP (2007 - 2008).
- Site Specific Probabilistic Seismic Hazard Assessment for the Eagle Rock Enrichment Facility for AREVA NP (2008).
- Probabilistic Seismic Hazard Assessment for the Tarbert/Ballylongford LNG Project, Shannon Ireland for Hess LNG (2007 - 2008).
- Geophysical Testing to Support Development of Seismic Design Criteria for the Louisiana Energy Services National Enrichment Facility, Lea County NM, for Nuclear Technology Solutions, LLC (2005).
- Seismic Hazard Assessment for the Louisiana Energy Services National Enrichment Facility Site, Lea County NM, for Framatome ANP (2003).
- Geophysical Testing and Earthquake Hazard Assessment for Rehabilitation of the MHD Longfellow Bridge, Boston MA, for Jacobs Engineering, Inc., ongoing (2005 - 2008).
- Earthquake Hazard Assessment and Recommendation of Seismic Design Criteria for the RIDOT Sakonnet River Bridge, Rhode Island, for Commonwealth Engineers and Consultants, Inc., ongoing (2005 - expected completion 2008).
- Geology, Seismology and Geotechnical Engineering Site Evaluation, Weaver's Cove Energy LNG Receiving Terminal, Fall River MA, for Potem and Partners, Weaver's Cove Energy LLC, ongoing (2003 - 2009).



- Geophysical Seismic Velocity Measurements at the Second Avenue Subway Project 97th Street and Chatham Square, New York NY, for DMJM+Harris ARUP (2005).
- Earthquake Hazard Assessment for the Konaktepe Hydroelectric Project, Eastern Turkey, prepared for The Shaw Group, Inc., (2004).
- Vibration Assessment for the Pennsylvania Maglev Project, prepared for MSM Group (2002).
- Vibration Testing on the Buzzards Bay vertical Lift Railroad Bridge, for Modjeski and Masters, Inc. (2002, 2004)
- Seismic Design Recommendation for the RIDOT Washington Bridge No. 200, Providence RI, prepared for Vanasse Hangen Brustlin, Inc. (2000).
- Probabilistic Seismic Hazard Analysis of the Dams of the Catskill and Delaware Watersheds-New York Water Supply System, prepared for GZA Geo-environmental of NY, Inc. (2000-2002).
- Seismic Hazard Analysis for the Cobble Mountain Reservoir Dam, Western MA, prepared for the Springfield Water and Sewer Commission (2000).
- Technology Development of Site-Specific Design Ground Response Spectra for the Korean Peninsula, Contract KC01-98-05, prepared for the Korea Power Engineering Co., Inc. (2000).
- Seismic Design Recommendation for the MWRA Norumbega Covered Storage DB Project, subcontract No. 250539, prepared for Metcalf & Eddy, Inc. (2000).

Selected Publications:

Klimkiewicz, G. C., May 1999, Preliminary Interpretation of Seismicity of the Korean Peninsula, International Seminar on Seismic Network & Interpretation of Seismicity for Nuclear Power Plants, for Korea Electric Power Research Institute and Korea Electric Power Engineering Corporation, Taejon, Korea, May 27, 1999.

Klimkiewicz, G. C., May 1999, Preliminary Interpretation of Seismicity of the Korean Peninsula, International Workshop on Technology Development of Site-Specific Design Ground Response Spectrum Considering the Geological and Seismological Characteristics of the Korean Peninsula, for Korea Electric Power Engineering Corporation, Taejon, Korea, May 26, 1999.

Klimkiewicz, G. C., June, 1995, Seismicity of the Northeast - An Empirical Overview, in Session E - Methods and Data for Characterizing the Seismicity Parameters of Seismic Source Zones, Atomic Energy Control Board Workshop on Seismic Hazard in Southern Ontario, Ottawa, ONT, Canada, June 19-21, 1995.

Klimkiewicz, G. C., 1995, Liquefaction Hazard Assessment and Site Improvement Using Dynamic Densification - A Case Study, , presented at the ASCE Spring Geotechnical Seminar, North Carolina A & T State University, Charlotte, NC, April 13, 1995.

Klimkiewicz, G. C., 1995, Seismicity of the State of Maine, Invited keynote speaker at the Maine Section of the ASCE, Augusta, ME, March 1995.

Klimkiewicz, G. C., 1995, Earthquake Ground Motions for Landfill Design, in *GEOENVIRONMENT 2000*, Proceedings of a Specialty Conference sponsored by the Geotechnical Engineering and Environmental Engineering Divisions/ASCE, New Orleans, LA, February 24-25, 1995.

Klimkiewicz, G. C., 1994, Earthquake Ground Motions for Application in Landfill Design, Proceedings of the Symposium on the Application of Geophysics to Engineering and Environmental Problems, ASCE, New York, NY, March 1994.

Klimkiewicz, G. C., 1993, Seismic Hazard Implications of Recent New England Seismicity, presented at New England Water Works Association, December Meeting, Randolph, MA, December 16, 1993.

Leblanc, G. and G.C. Klimkiewicz, 1993, Seismological Issues, Expert report prepared for the Attorney General of Canada et al. for proceedings in Ontario Court, General Division, Action No. 46878/90, April, 1993.

Klimkiewicz, G. C., 1992, Seismic Hazard Considerations for Landfills, paper presented at Environmental Geotech Symposium, Earthquake Response of Waste Containment Systems, American Society of Civil Engineers, 1992 International Convention, New York, N.Y., September 16, 1992.

Klimkiewicz, G.C., 1991, Spatial and Temporal Characteristics of Seismicity of the Southern Great Lakes and Implications for Probabilistic Seismic Hazard Assessments, , in Proceedings, Geological Survey of Canada Workshop on Eastern Seismicity Source Zones for the 1995 Seismic Hazard Maps, Ottawa, 18-19 March, 1991, Geological Survey of Canada Open File Report 2437, 432 p.

Klimkiewicz, G.C., July 1986, Project Manager for: Seismic hazard methodology for the Central and Eastern United States, Vol. 5 – Tectonic interpretations by Weston Geophysical Corporation, NP-4726, Vol. 5, Research Project P101-19.

Corporate Experience Record

Weston Geophysical Engineers (WGE) is located in Acton, Massachusetts and was founded in 1957. WGE provides seismological, geological, geophysical, and environmental science consulting services to various clients in the public and private business sectors. WGE has provided geoscience services to federal, state, and local government projects and to commercial projects located in 45 states and 20 foreign countries.

WGE has completed extensive site assessments, including geophysical sub-surface investigations and regional geologic and seismologic studies, for the design, construction, or retrofit of major critical facilities. These facilities include nuclear power plant projects located in the US, Canada, Brazil, South Korea, and Taiwan. Projects at other critical facilities, such as hydroelectric power stations, dams, solid and hazardous waste containments, gas storage facilities, highways, tunnels, and bridges have been completed at various global locations including the following locations:

- North America (US and Canada),
- Central America (Guatemala, Honduras),
- South America (Brazil, Venezuela),
- Caribbean (Puerto Rico, Trinidad),
- Europe (Ireland, Spain, West Germany),
- Africa (Egypt, Liberia),
- Middle East (Israel, Iraq, Jordan),
- Asia (India, Japan, South Korea, Taiwan, Thailand, and Turkey),
- Pacific (Indonesia)
- Australia.

Seismological Services for Critical Projects

On many projects WGE used statistical and probabilistic methods to determine site-specific seismic and geologic hazards. These investigations served to provide a technical basis for recommendations of seismic design criteria, including design response spectra and earthquake ground acceleration time histories. Seismic design criteria were supplied for new construction, as well as for the re-evaluation and possible retrofit of existing structures.



Critical Project Experience

Staff at WGE has a long association, spanning more than 30 years, with major probabilistic seismic hazard assessments. WGE participated on the pioneering seismic hazard work performed by the Lawrence Livermore National Laboratory (LLNL), sponsored by the US Nuclear Regulatory Commission (NRC). This project examined the probability that seismic designs of older operating nuclear reactors could be exceeded (i.e. LLNL, 1983, NUREG/CR-1582). WGE worked on extensions of this program to perform probabilistic seismic hazard analyses (PSHA) at sites of 69 nuclear reactors operating east of the Rocky Mountains (LLNL, 1989, NUREG/CR 5250). In addition, WGE was one of six prime contractors that worked on a multi-year PSHA commissioned by the Electric Power Research Institute (EPRI) to formulate an evaluation methodology and to compute seismic hazard at all eastern US reactor sites (EPRI, 1989, NP-6395-D). A special task delegated to WGE was to refine, clarify, and update the earthquake catalog for the Northeast quadrant of North America, including the New York state, the New England states, and adjacent southeastern Canada.

More recently, WGE performed seismic hazard analyses for the Canadian Atomic Energy Control Board and the Canadian Attorney General's Office. These projects included the conduct of PSHA's for sites of 20 CANDU reactors. Results of these PSHA's and an exploration into the history of power plant siting procedures and regulations in Canada were entered into evidence in a 1993-1994 Canadian civil litigation. WGE's president and senior seismologist co-authored the expert report and provided expert testimony at the trial. Subsequently, the Weston Geophysical report received peer review by the Geological Survey of Canada, and was published as Canadian Open File Report No. 2929 (1994).

Maintenance of Geophysical Databases

Vital resources developed and maintained and rigorously updated include an Earthquake Database and a Strong Motion Accelerogram Database. These computerized files contain information on earthquake dates, locations, magnitudes, cultural and structural damage effects, and recorded peak ground motions, and computed response spectra. The Earthquake Database was assembled under strict Quality Assurance procedures (10 CFR, Part 50, Appendix B) required for all technical work related to safe design and operation of US nuclear power plants. This database includes approximately 30,000 earthquake entries for eastern North America and is currently updated through June, 2008. Our worldwide database includes descriptions for ½ million earthquakes reported by global networks. These databases are routinely accessed for mapping, statistical, and spatial analyses using Geographic Information System (GIS) software.



The advent of GIS and the ability to geocode and simultaneously analyze seismologic, geologic and geophysical data presently allows for performance of sophisticated seismic hazard analyses in a timely and cost-effective manner.

The Strong Motion Database includes a comprehensive assemblage of more than 20,000 global records of strong earthquake ground motions. These records have been researched by WGE's seismologists and have been applied on numerous projects to predict important characteristics of strong ground motions associated with the occurrence of a design earthquake.

List of Recent Projects (2000 – 2010)

Weston Geophysical Engineers conducts integrated site assessments that include acquisition of site-specific geologic and material property data using geophysical tests, and performance of site-specific seismic hazard analyses to support recommendations of seismic design criteria. Listed are recent and ongoing projects performed using scientific methods proven to expedite the technical review and licensing process for siting of these various critical facilities.

Geophysical Site Characterization for the AREVA US LLC Eagle Rock Enrichment Facility, Bonneville County, Idaho, for Nuclear Technology Solutions LLC (2009 – 2010)

*Services: Crosshole seismic velocity measurements in 2 borehole arrays
Downhole seismic velocity measurements in 2 borehole arrays
Seismic refraction velocity profiling on land (12,000 linear ft)*

Deterministic Seismic Hazard Assessment for the Nepaug Dam Stability Evaluation, Connecticut, for GZA GeoEnvironmental, Inc. (2009)

*Services: Regional geologic and seismologic investigation
Site-specific deterministic seismic hazard assessment using US
Army Corps of Engineers Regulations and Engineering Manuals
Recommendation of seismic design response spectra*

Synthetic Ground Motion Time History Generation for the Eagle Rock Enrichment Facility, Bonneville County, Idaho, for AREVA NP, Inc. (2010 – 2011)

*Services: Modeling of site-specific earthquake ground motion using
recorded and simulated acceleration time histories.*



Probabilistic Seismic Hazard Assessment for the Eagle Rock Enrichment Facility in Bonneville County, Idaho, for AREVA NP, Inc. (2008 on-going)

Services: *Regional geologic and seismologic investigation
Site-specific probabilistic seismic hazard assessment
Recommendation of seismic design response spectra*

Geophysical Testing to Support Site Characterization for the Berwick Nuclear Plant COLA, for P.C. Rizzo Associates, Inc. (2008)

Services: *Seismic refraction velocity profiling on land (10,000 ft)*

Geophysical Testing to Support Site Characterization for the Nine Mile Point Unit 3 Nuclear Plant COLA, for GEI Consultants, Inc. and AREVA NP, Inc. (2007 – ongoing)

Services: *Crosshole seismic velocity measurements
Seismic refraction velocity profiling on land (16,000 ft)
Seismic refraction data interpretation of marine profiling in L. Ontario
Developed seismic source zones and earthquake recurrence models for performance of probabilistic seismic hazard sensitivity analyses
Member of Technical Advisory Group for geophysical and seismological site characterization*

Probabilistic Seismic Hazard Assessment for the Calais ME LNG Project, for GZA GeoEnvironmental, Inc. (2008 - ongoing).

Services: *Probabilistic site-specific seismic hazard assessment
Seismic refraction velocity profiling
Crosshole seismic velocity measurements
Recommendation of seismic design criteria*

Probabilistic Seismic Hazard Assessment for the Tarbert/Ballylongford LNG Project, Shannon Ireland, for Hess LNG (2007-2008)

Services: *Probabilistic site-specific seismic hazard assessment
Recommendation of design response spectra*



Geophysical Testing to Support Development of Seismic Design Criteria for the Louisiana Energy Services National Enrichment Facility, Lea County NM, for Nuclear Technology Solutions, LLC (2005).

Services: *Crosshole seismic velocity measurements*
Seismic refraction velocity profiling to > 50 meters
Recommendation of design accelerograms for soil response study
Performed using QA Level 1 Procedures (10CFR App B to Part 50)

Seismic Hazard Assessment for the Louisiana Energy Services National Enrichment Facility Site, Lea County NM, for Framatome ANP (2003).

Services: *Probabilistic site-specific seismic hazard assessment*
Recommendation of design response spectra

Earthquake Hazard Assessment for the Longfellow Bridge, Boston MA, for Jacobs Engineering, Inc., ongoing (2005 – 2006).

Services: *Crosshole seismic velocity measurements*
Probabilistic site-specific seismic hazard assessment
Structure vibration measurements
Recommendation of seismic design criteria

Earthquake Hazard Assessment and Recommendation of Seismic Design Criteria for the Sakonnet River Bridge, Rhode Island, for Commonwealth Engineers and Consultants, Inc., ongoing (2005 – 2006).

Services: *Probabilistic site-specific seismic hazard assessment*
Seismic refraction velocity profiling
Recommendation of seismic design criteria

Geology, Seismology and Geotechnical Engineering Site Evaluation, Weaver's Cove Energy, Fall River MA, for Poten and Partners, Weaver's Cove Energy LLC, ongoing (2003 -).

Services: *Probabilistic site-specific seismic hazard assessment*
Seismic refraction velocity profiling
Crosshole seismic velocity measurements
Recommendation of seismic design criteria for land-based structures
Marine refraction data interpretation
Recommendation of seismic design criteria for marine-based berth and LNG transfer system



Crosshole Seismic Velocity and Structure Vibration Measurements at the MHD Willimansett Bridge, Chicopee MA, for Prototype Engineering, Inc. (2006)

Services: *Crosshole seismic velocity measurements*
Structure vibration measurements

Geophysical Seismic Velocity Measurements at the Second Avenue Subway Project 97th Street and Chatham Square, New York NY, for DMJM+Harris ARUP (2005)

Services: *Crosshole seismic velocity measurements*
Seismic refraction velocity profiling to > 50 meters depth

Geophysical Investigation to support the design and construction of an Independent Spent Fuel Storage Installation at the Grand Gulf Nuclear Power Station, Grand Gulf, Mississippi, for Entergy Corporation, (2005)

Services: *Seismic refraction profiling at ISFSI pad footprint*
Crosshole seismic velocity measurements

Geophysical Investigation to support the design and construction of an Independent Spent Fuel Storage Installation at the Entergy Vermont Yankee Nuclear Power Station, Vernon, Vermont, for Entergy Corporation, (2004)

Services: *Underground utility clearance at pad and along transport path*
Crosshole seismic velocity measurements

Geophysical Investigation to support the design and construction of an Independent Spent Fuel Storage Installation at the Millstone Nuclear Power Station, Waterford, Connecticut, for Dominion Nuclear Company, (2003)

Services: *Seismic refraction profiling at ISFSI pad footprint*
Underground utility clearance at pad and along transport path
Crosshole seismic velocity measurements



Geophysical Investigation to support the design and construction of an Independent Spent Fuel Storage Installation at the Haddam Neck Nuclear Power Station, Haddam Neck, Connecticut, for Connecticut Yankee Power Company, (1999)

Services: *Underground utility clearance at pad and along transport path
Crosshole seismic velocity measurements*

Earthquake Hazard Assessment for the Konaktepe Hydroelectric Project, Eastern Turkey, prepared in association with Department of Earth and Planetary Sciences at MIT for The Shaw Group, Inc., (2003-2004)

Services: *Probabilistic site-specific seismic hazard assessment
Recommendation of seismic design criteria*

Seismic Design Recommendation for the RIDOT Washington Bridge No. 200, Providence RI, for Vanasse Hangen Brustlin, Inc. (2000).

Services: *Probabilistic site-specific seismic hazard assessment
Recommendation of seismic design response spectra
Development of earthquake time histories
Crosshole seismic velocity measurements*

Probabilistic Seismic Hazard Analysis of the Dams of the Catskill and Delaware Watersheds-New York Water Supply System, for GZA GeoEnvironmental of NY, Inc. (2000-2002).

Services: *Probabilistic site-specific seismic hazard assessment
Recommendation of seismic design criteria*

Seismic Hazard Analysis for the Cobble Mountain Reservoir Dam, Western MA, for the Springfield Water and Sewer Commission (2000).

Services: *Probabilistic site-specific seismic hazard assessment
Recommendation of seismic design criteria*

Technology Development of Site-Specific Design Ground Response Spectra for the Korean Peninsula, Contract KC01-98-05, for the Korea Power Engineering Co., Inc. (2000).

Services: *Workshop moderator – Seismicity of Korean Peninsula*



*And implementation of seismic hazard study for
4 South Korean nuclear power plant sites
Probabilistic site-specific seismic hazard assessment*

**Seismic Design Recommendation for the MWRA Norumbega Covered Storage D/B
Project, subcontract No. 250539, for Metcalf & Eddy, Inc. (2000).**

Services: *Probabilistic site-specific seismic hazard assessment
Recommendation of seismic design criteria*



Project Summary 1960 - 2000

Following are additional clients and projects completed over the previous 4 decades during which Weston Geophysical Engineers provided seismological consulting services including, deterministic and probabilistic seismic hazard assessments, preparations of preliminary and final safety analysis reports for nuclear power utilities, and recommendations of seismic design criteria for various critical facilities.

Client	Project
Alcan Smelters, LTD., Canada	Chute-a-Caron Dam
Alcan Smelters, LTD., Canada	Isle-Maligne Dam
Atomic Energy Control Board, Canada	Pickering 1 and Gentilly 2 CANDU reactor sites
Attorney General of Canada	Pickering, Darlington, Bruce, and Point LePreau CANDU reactor sites
Boston Edison Company	Pilgrim Unit 1 nuclear power station
Boston Edison Company	Pilgrim Unit 2 nuclear power (proposed)
Cabot LNG Corporation	Trinidad LNG storage facility
Cabot LNG Corporation	Wells, ME LNG storage facility
Cabot LNG Corporation	Hooksett, NH LNG storage facility (proposed)
Cleveland Electric Illuminating Co.	Perry, OH nuclear power station
Commonwealth Gas	Hopkington, MA LNG storage facility
Consumers Power Co.	Midland, Michigan nuclear power station
Detroit Edison	Fermi nuclear power station
General Public Utilities	Oyster Creek nuclear power station
GZA GeoEnvironmental, Inc.	Six Dams of the Catskill-Delaware Watersheds of the New York City Metro Water Supply System
Illinois Power Corporation	Clinton nuclear power station
Korea Power Engineering Co., Inc.	Sites of 4 nuclear plants. Ulgin, Kori, Wolsung, And Yungkwang
LTV Steel Corporation	Waste Containment sites in northern Indiana
Massachusetts Water Resources Authority	Deer Island secondary wastewater treatment plant, and 9-mile long bedrock outfall tunnel
Massachusetts Water Resources Authority	Norumbega Covered Storage Facility
New York Power Authority	Blenheim-Gilboa pumped storage facility
New York Power Authority	St. Lawrence Project, Long Sault Dike
New York Power Authority	PSHA for all nuclear, hydroelectric, and fossil plants in the State of NY power grid
Niagara Mohawk Hydroelectric Corporation	Soft Maple, Moshier, and Terminal Dam facilities
Northeast Utilities	Haddam Neck nuclear power station
Northeast Utilities	Millstone Units 1, 2, and 3 nuclear power stations



Client	Project
Occidental Chemical Co.	Bangpu, Thailand chlorine gas storage facility
Occidental Chemical Co.	Niagara, NY chlorine gas storage facility
R.G. Gerber, Inc.	Norridgewock, ME solid waste containment
Shaw Group, Inc.	Konaktepe Hydroelectric Dam, Turkey
Tennessee Valley Authority	Sequoyah, Watts Bar, and Bellefonte nuclear power stations
Town of Gloucester, MA	Cape Pond Reservoir embankments
US Steel (USX)	Solid waste containments in Northern Indiana
Weaver's Cove Energy, LLC	Weaver's Cove LNG receiving terminal
Yankee Atomic Electric Co.	Yankee Rowe nuclear power station

Contact Information

Weston Geophysical
ENGINEERS

20 Main Street
P.O. Box 977
Acton, MA 01720

(978) 263-3600
(978) 263-3605 fax

George C. Klimkiewicz President, Sr. Seismologist gcklim@weston-geo.com
Peter B. Hubbard Project Geophysicist phubbard@weston-geo.com

