CHRIS WOODS, P.E., G.E., D.GE., LEED^{AP} BD+C
Vice-President

Ground Improvement
Geotechnical Engineering
Construction Inspection
Waterfront Construction
Geotechnical Instrumentation

EDUCATION M.E. Civil Engineering, Virginia Polytechnic Institute and State University, 2002
B.S. Civil Engineering, Purdue University, 1999

YEARS WITH DENSIFICATION: 7
TOTAL YEARS EXPERIENCE: 21

EXPERIENCE:

Densification, Inc.
Vice-President, Paeonian Springs, VA 12/2013 - Present
Chief Engineer, Paeonian Springs, VA 2012-2013

- Currently the Vice-President for the specialty dynamic compaction contractor, Densification, Inc. Responsibilities include development and oversight of technical work plans, project management, and engineering evaluation of on-going ground improvement work. Also provides consulting engineering services to support dynamic compaction projects worldwide. Additional responsibilities include direction of overall marketing strategies for the firm, oversight and management of all corporate IT systems, and general company management.

George Mason University
Practitioner Adjunct Faculty, Fairfax, VA Fall 2015 - Present

- Presently teaching a graduate level course in Ground Improvement to teach as an adjunct professor at George Mason University.

Geo-Strata Magazine
Editorial Board Member, Reston, VA 2/2015 - Present

Langan Engineering & Environmental Services
Intern, Elmwood Park, NJ Summer 1999
Staff Engineer, Elmwood Park, NJ and Philadelphia, PA 2000-2001
Senior Staff Engineer, Elmwood Park, NJ 2003-2004
Assistant Project Manager, Elmwood Park, NJ and New York, NY 2004-2008
Project Manager, New Haven, CT 2008-2010
Senior Project Manager, New Haven, CT 2010-2012

- Managed Langan's New Haven, CT geotechnical engineering group, while maintaining a strong active presence in Langan's New York City and Elmwood Park, New Jersey offices.
- Main duties included day-to-day management of the New Haven group including project allocation, business development, staff billability, account receivables, client management, proposal preparation, preparation and senior level review of engineering reports and designs.
- Responsible for the overall management of several multidisciplinary projects (civil, geotechnical, environmental, and survey), with expertise in due diligence, subsurface investigation, foundation design, and construction oversight and management.
- Responsible for coordination of several in-house training courses, including field investigations and construction oversight, as well as co-coordinator for the Firms' Annual Geotechnical Workshop.
- Key member of corporate recruitment committee. Assisted in development of company

policies and guidelines with respect to recruitment at the collegiate level, and was extensively involved with recruitment efforts at both Purdue and Virginia Tech.

Virginia Polytechnic Institute and State University
Graduate Research Assistant, Blacksburg, VA 2001-2002

Anselmi & DeCicco
Intern, Maywood, NJ Summer 1998

Significant Career Project Experience:

County Line, Hialeah Gardens, FL – Project executive and engineer responsible for the direct design and implementation of a dynamic compaction program to improve up to 15 million square feet of municipal solid waste in preparation of vertical warehouse construction. Specific tasks included design of the ground improvement program, oversight of vibration monitoring and implementation of mitigation measures, when needed, and on-site evaluation and resolution of anomalous conditions periodically during the course of work.

Beacon Logistics, Hialeah, FL – Project executive and engineer responsible for the direct design and implementation of a dynamic compaction program to improve approximately 3 square feet of uncontrolled limerock fill in preparation of vertical warehouse construction. Specific tasks included design of the ground improvement program, oversight of vibration monitoring and implementation of mitigation measures, when needed, and on-site evaluation and resolution of anomalous conditions periodically during the course of work.

Riverview, Phoenix, AZ – Project executive and engineer responsible for the direct design and implementation of a dynamic compaction program to improve approximately three million square feet of uncontrolled limerock fill in preparation of vertical warehouse construction. Specific tasks included design of the ground improvement program, oversight of vibration monitoring and implementation of mitigation measures, when needed, and on-site evaluation and resolution of anomalous conditions periodically during the course of work.

I-40, Cibola County, NM – Project executive and engineer responsible for the direct design and implementation of a dynamic compaction program to improve miscellaneous fill material and loose alluvial sands to provide foundation support of a new overpass. Specific tasks included design of the ground improvement program, oversight of vibration monitoring and implementation of mitigation measures, when needed, and on-site evaluation and resolution of anomalous conditions periodically during the course of work.

St. Joseph's Energy Center, New Carlisle, IN – Project executive and engineer responsible for the direct design and implementation of a dynamic compaction program to improve miscellaneous fill material to provide foundation support of a new energy center. Specific tasks included design of the ground improvement program, oversight of vibration monitoring and implementation of mitigation measures, when needed, and on-site evaluation and resolution of anomalous conditions periodically during the course of work. At the onset of the work, was responsible for development of a detailed test section (including all pre- and post-improvement testing) to support and verify the applicability of dynamic compaction work to densify loose sands beneath the proposed treatment plant.

Midway Stadium, St. Paul, MN – Project executive and engineer responsible for the direct design and implementation of a dynamic compaction program to improve miscellaneous fill material to provide foundation support of a new energy center. Coordinated with another contractor who was installing stone columns on the other half of the proposed warehouse footprint. Specific tasks included design of the ground improvement program oversight of vibration monitoring and implementation of mitigation measures, when needed, and on-site evaluation and resolution of anomalous conditions periodically during the course of work. Following the completion of the dynamic compaction program, a detailed post-improvement investigation was conducted, and

settlement estimates were performed to verify long-term foundation performance of the proposed warehouse.

Confidential Project, Shenyang, Liaoning, China – Provided consulting engineering services for a proposed 4-mllion square foot industrial plant in the Northeast of China. Specific tasks included review of available project geotechnical and liquefaction assessment reports, participation in contractor workplan review, and development of project acceptance criteria. Additional tasks consisted of review of Contractor documents and work plans, along with site visits to review work, as necessary.

Holcim Concrete Storage Facility, Tarahan, Lampung, Indonesia – Provided consulting engineering services for a proposed concrete storage and crushing facility along the coast of Lampung Bay in Indonesia. Specific tasks included review of available project geotechnical and liquefaction assessment reports, in order to prepare an opinion document on the viability of dynamic compaction at the proposed site. Future work to consist of review of Contractor documents and work plans, along with site visits to review work, as necessary.

Southwest Delivery Station Water Treatment Plant, Colorado Springs, CO – Responsible for development of a detailed test section (including all pre- and post-improvement testing) to support and verify the applicability of 1,000,000 square feet of dynamic compaction work to densify loose sands beneath the proposed treatment plant.

Canal Dock, New Haven, CT – Responsible for development and oversight of an extensive on-water geotechnical investigation for the proposed Canal Dock project in New Haven Harbor. The project is to consist of a 3 acre +/- pile-supported concrete platform constructed over New Haven Harbor to host a newly constructed New Haven boathouse. Design responsibilities included evaluation of deep foundation systems for the platform and evaluation of the existing bulkhead structure which separates Long Wharf Drive from New Haven Harbor and will be the terminus point for the platform.

South Yoloten Gas Field Development, South Yoloten, Mary, Turkmenistan – Lead geotechnical engineer providing technical third-party oversight of a dynamic compaction program being implemented to support the construction of an $11 billion natural gas development infrastructure program in southern Turkmenistan. Oversaw two staff who provided full-time on-site oversight (on a 9-hr time difference) and reviewed all post-improvement investigation data to verify the acceptability of the program.

Prudential Center, Newark, NJ – Chief foundation designer for 340,000 square foot arena which is home to the New Jersey Devils hockey team. Design responsibilities included oversight of subsurface investigation and development of geotechnical foundation recommendations. Aspects of design included development of a ground-improvement program consisting of dynamic compaction and removal and replacement, and evaluation of a ground improvement test section to determine highest allowable bearing capacity for Arena foundations. Provided general oversight of all foundation-related construction tasks, including ground improvement, foundation construction, and earthwork.

MetLife Stadium, East Rutherford, NJ – Part of design team for foundation system for the proposed New Meadowlands Stadium within the NJSEA Sports Complex in East Rutherford, New Jersey. Design responsibilities included design and oversight of subsurface investigation and laboratory testing program, and development of recommendations for deep foundations as well as other geotechnical aspects of design and construction. Construction phase responsibilities included oversight of pile driving operations, rock anchor installation, and utility construction. Additional responsibilities included extensive NJSEA and utility markout coordination to allow for subsurface investigation.

Courtyard Marriott, Newark, NJ – Project engineer responsible for design and oversight of subsurface investigation and laboratory testing program, and development of recommendations for ground improvement and shallow foundations as well as other geotechnical aspects of design and

construction for the proposed 20,000 square foot, seven-story hotel next the Prudential Center in Newark, NJ.

Fairfield Inn and Suites, 325 W. 33rd Street, New York, NY – Project engineer responsible for foundation design for a 27-story hotel one block from Madison Square Garden in New York City. Design responsibilities included oversight of a subsurface investigation program, preparation of a geotechnical engineering study, preparation of excavation support drawings, and interaction with the project team during design development. Additional responsibilities included overall project coordination with the surveying and site/civil departments, and interaction with Amtrak and LIRR to obtain approval to construct the project in the vicinity of New York Penn Station, which underlies 33rd Street adjacent to the project.

Crown Heights Charter High School, Brooklyn, NY – Project engineer responsible for foundation design for a proposed six-story charter high school in the Crown Heights section of Brooklyn, New York. Design responsibilities included oversight of a subsurface investigation program, preparation of a geotechnical engineering study, preparation of excavation support drawings, and interaction with the project team during design development. Additional responsibilities included overall project coordination with the surveying and site/civil departments, and interaction with LIRR to obtain approval to construct the project in the vicinity of an elevated rail line.

Little Theatre, New Haven, CT – Project engineer responsible for design and oversight of underpinning and foundation design associated with the renovation and construction of a new basement beneath the existing 100+ year old ACES Little Theatre in New Haven, Connecticut. Additional responsibilities included development and oversight of subsurface investigation program, interaction with the structural engineer, and coordination with various utilities entering the structure.

Mulford Gardens HOPE VI Redevelopment, Yonkers, NY – Project engineer responsible for design and oversight of foundations and retaining walls for the proposed housing redevelopment in Yonkers, New York. Specifically, significant grading restraints at the site required the design of over 20 modular block reinforced and reinforced concrete walls up to 40 feet high. Additional responsibilities included development and oversight of subsurface investigation program, interaction with the structural engineer, and coordination during demolition of the previous site development. Construction phase responsibilities included oversight and certification of various ground improvement programs across the site, along with foundation subgrade preparation and retaining wall construction.

Giants Training Facility, East Rutherford, NJ – Design engineer for foundation system for the proposed new Giants Training Facility within the NJSEA Sports Complex in East Rutherford, New Jersey. Design responsibilities included design and oversight of a preliminary subsurface investigation and laboratory testing program, and development of preliminary recommendations for foundations as well as other geotechnical aspects of design and construction. Additional responsibilities included extensive NJSEA and utility markout coordination to allow for subsurface investigation.

J. Owen Grundy Park Rehabilitation Project, Jersey City, NJ – Chief engineer for 350 feet of bulkhead and walkway replacement adjacent to the Exchange Place PATH Station on the Hudson River waterfront in Jersey City, New Jersey. Responsibilities included oversight of design and contract drawing preparation and oversight of a subsurface investigation. Construction responsibilities included submittal review, daily oversight, and attendance at project meetings to coordinate work with the City of Jersey City and the Contractor for the project.

New Jersey 9/11 Memorial, Jersey City, NJ – Coordinated and conducted a subsurface investigation for the construction the Memorial. Prepared geotechnical report which included recommendations for deep foundations with associated design bearing pressures, post-construction settlement estimates, and lateral pressures to be used for design of retaining structures. Provided recommendations for subgrade improvement including the surcharging of the

earthen mounds to be constructed as part of the Memorial. Prepared project technical specifications for geotechnical aspects of construction.

158 Madison Avenue, New York, NY – Project engineer responsible for foundation design of a proposed 50-story residential tower on Madison Avenue in New York, New York. Design responsibilities included oversight of a subsurface investigation and preparation of a geotechnical engineering study. Additional responsibilities included interaction with Amtrak to gain approval for construction, as active Amtrak tubes run adjacent to both sides of the site underlying 32nd and 33rd Streets.

DSNY Manhattan Districts 1/2/5 Garage, New York, NY – Project engineer responsible for foundation design for a proposed six-story DSNY garage adjacent to the West Side Highway and Holland Tunnel, in New York, New York. Design responsibilities included oversight of an extensive subsurface investigation, preparation of a formal geotechnical study, and project team interaction. Additional responsibilities included interaction with the Port Authority of New York and New Jersey to obtain approval for the proposed foundation construction and construction monitoring.

Meadowlands Golf Resort, Lyndhurst, NJ – Project engineer responsible for ground improvement and foundation design for a proposed high-rise hotel and residential complex within the Meadowlands EnCap project. Due to the compressible soils present at the site, work included design of ground improvement measures including a surcharge program and dynamic compaction, along with foundation recommendations which included an alternate pile foundation system. Additional responsibilities included a site-specific seismic study to determine the seismic parameters to be used for structural design.

Greenville Yards, Jersey City, NJ – Chief designer in charge of all aspects of design and construction inspection of the foundations of a 340,000 square foot warehouse. Work related to the project included developing a ground improvement program consisting of dynamic compaction and surcharge, and review and augmentation of the design of a 700 foot long Sierrascape geogrid wall. Inspection work included oversight of dynamic compaction and the associated vibration monitoring, surcharge monitoring, construction of three geogrid reinforced retaining walls, building pad fill placement, and footing construction.

Claremont Tower, FBI Headquarters, Newark, NJ – Lead field engineer responsible for oversight of steel pile installation, vibration monitoring program, surcharge monitoring program, and utility installation for the 12-story office building on the Passaic River in downtown Newark, N.J. Also conducted extensive subsurface investigation program which included 30+ test pits and environmental sampling. Required national security clearance.

Former BP-Amoco Marcus Hook Refinery, Marcus Hook, PA – Field engineer responsible for oversight of innovative bulkhead investigation. Work included construction cost estimating for both the investigation and for potential remedial solutions, the installation of 16 remote imaging access points beneath the timber relieving platform, video and test boring inspection, and design and implementation of a test pit program along the bulkhead.

Training and Professional Affiliations

Registered Professional Engineer in:
CT, NJ, NY, PA, MA, MD, DE, VA, NC, IL, OH, FL, DC, WV, CA, AK, IN, MN, NV
Registered Geotechnical Engineering in California
Diplomate, Geotechnical Engineering (D.GE.)
LEED Accredited Professional, BD+C Specialty
40 hour OSHA health and safety trained and 8-hour refresher
Troxler Certified
CPR and First Aid Certified
Confined Space Entry Certified

Member of the following organizations:

- Deep Foundations Institute (DFI) – Ground Improvement Committee Member

- American Society of Civil Engineers (ASCE) – Member of Soil Improvement Committee of Geo-Institute
- Academy of Geo-Professional (AGP) of ASCE
- ASFE / The Geoprofessional Business Association – Member of Geotechnical Committee
- International Society for Soil Mechanics and Geotechnical Engineering

Publications

Gutierrez, M., Duncan, J.M., Woods, C., and Eddy, M., (2003). "Development of a Simplified Reliability-Based Method for Liquefaction Evaluation", *Research Report funded by the United States Geologic Survey*, Blacksburg, Virginia.

Meyer, M., Woods, C., and Axhushi, N., (2013). "Reconstruction of a Deteriorating, Tiered, MSE Wall Structure in Connecticut", *Seventh International Conference on Case Histories in Geotechnical Engineering*, Chicago, IL, April 29-May 4.

Woods, C. (2017). "Ground Improvement: A 2017 Discussion on Dynamic Compaction", *4th International Conference on Deep Foundations*, Mexico City, Mexico, November 15-16.

Woods, C. (2016). "How Ground Improvement Contributes to the Green Building Movement", *GeoChicago 2016: Sustainability, Energy, and the Geoenvironment*, Chicago, IL, August 14-18.

Woods, C. (2014). "Karst-Related Sinkholes", *GeoStrata*, November/December.

Woods, C. (2012). "Urban Fills; How Ground Improvement Can Eliminate the Need for a Costly Deep Foundation System", *Structure Magazine*, December.

Woods, C., Drumheller, S., and Drumheller, J., (2016). "Ground Improvement on Strip-Mined Sites: Using Dynamic Compaction to Remediate Mine Spoil Sites", *GeoStructures 2016*, Phoenix, AZ, February 14-17.

Woods, C., Drumheller, J., and Huber, K., (2013). "Building the Devil's Playground: How a Ground Improvement Program Eliminated the Need for Pile Foundations", *38th Annual Conference on Deep Foundations*, Phoenix, AZ, September 25-28.