



Geo-Congress 2024

GSP 353

Geotechnical Systems

Selected Papers from Geo-Congress 2024
Vancouver, British Columbia, Canada | February 25–28, 2024

Edited by

T. Matthew Evans, Ph.D.
Nina Stark, Ph.D.
Susan Chang, Ph.D., P.E.

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GEO-CONGRESS 2024

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Preface

This Volume is the sixth of six Geotechnical Special Publications (GSPs) containing papers from Geo-Congress 2024: Bridging Government, Industry, and Academia for Resilient Mega-Communities, held in Vancouver, British Columbia, Canada on February 25-28, 2024. Notably, this was the first Geo-Congress held outside of the United States, and the Canadian Geotechnical Society and Vancouver Geotechnical Society served as partnering organizations. The conference hosted the Terzaghi, Peck, Seed, and Prakash Lectures, numerous invited presentations on selected topics addressing the state of the art and practice in geotechnical engineering, and many technical sessions, panel sessions, short courses, and student competitions.

The call-for-papers was distributed internationally and resulted in 885 submissions. Several strong technical themes were observed in the submissions. These included cold regions engineering, machine learning and artificial intelligence, and sustainability, in addition to other traditionally strong tracks such as deep foundations, geosystems, and geoenvironmental engineering. We see these tracks as a reflection of both the location of the Geo-Congress and the topics currently at the forefront of geotechnical research and practice.

This volume includes a collection of papers in the fields of Embankments, Dams, and Slopes; Pavements; Unsaturated Soils; and Education in Geotechnical Engineering. Each paper was subjected to a rigorous technical assessment by two or more independent peer reviewers. Acceptance required concurrence by at least two peer reviewers, and final decisions were made only after review coordinators confirmed that authors satisfactorily addressed any reviewer comments on their original submission. Ultimately, this resulted in acceptance of 366 papers in total, 41 of which are in this volume. All accepted papers are presented at the conference as posters or technical talks and are eligible for applicable ASCE Awards.

The success of this conference and proceedings would not have been possible without the participation and collaboration of many individuals, including the tireless staff at the Geo-Institute: Barbara Curtis, Lucy King, Krystina Scott, Sean Herpolsheimer, and Brad Keelor. We would also like to extend our gratitude to the Session Chairs and Reviewers, who provided thorough reviews and assessments of the submissions in a timely manner.

The Editors,

T. Matthew Evans, Ph.D.
Nina Stark, Ph.D.
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Investigation of Geotechnical Impacts in Response to 2022 Hurricane Ian

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ABSTRACT

On September 28, 2022, Hurricane Ian made landfall near the city of Fort Myers, Florida, as a category 4 hurricane, which brought sustained winds of 150 mph, observed storm surge heights of up to 12 ft, and rainfall totals up to 20 in. Coastal communities around Fort Myers were the most heavily impacted, including 148 deaths and an estimated 113 billion dollars' worth of damage. The inflation-adjusted economic impact is projected to make Hurricane Ian the third most costly hurricane in United States history. Three weeks after the storm impact, from October 18 to 22, a five-member NSF-sponsored Geotechnical Extreme Events Reconnaissance (GEER) Association team was deployed to Fort Myers and the surrounding areas to study the geotechnical impacts resulting from Hurricane Ian. Primary technologies used to study impacts included a terrestrial light detection and ranging (LiDAR) system, unmanned aerial systems (UAS), soil sampling equipment, and mobile phone cameras. Additionally, two team members returned during November 29–30 to study the recovery progress and implement a multispectral imaging workflow to further investigate impacted structures. Primary surveyed locations include the city of Fort Myers, Fort Myers Beach, Pine Island, Port Charlotte, and the Peace and Caloosahatchee Rivers. Primary observations include a rail bridge failure, sea wall failures, varying degrees of foundation performance, and high degrees of scour and erosion along coastal sites. This GEER deployment allowed for rapid and high-fidelity data collection on impacts related to geotechnical assets following a major hurricane. The dataset and subsequent GEER report from this deployment will allow for improved study of hydraulic and erosional processes related to soil-structure interactions, which will in time improve flood and storm design practices in coastal communities.

INTRODUCTION

Since 2017, there are on average over 17 severe storms and weather patterns per year in the United States and since 1980 these storms have caused over $2 trillion in damage (NOAA 2021).

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