MOHAMMAD N ISLAM, PHD

Consultant, Geotechnical Engineer

Years with the firm

3 Years 4 Months

Years total

20

Areas of practice

Geotechnical

Geomechanics

Finite Element Model

Pavement

Forensic Investigation

www.nislamce.com

CAREER SUMMARY

Mohammad Islam is a geotechnical engineering consultant with more than 12 years of experience. He has worked on civil, geotechnical, and geomechanics projects, including slope stability analyses, earthworks, groundwater control, retaining wall designs, settlement analyses, ground improvements, pile foundation designs, drilled shafts and sheet piles, shallow foundations, mat foundations, noise walls, soil nails, anchoring, ground anchors, sign structures, cofferdams, flood walls, pavement engineering, tunnel engineering, airport hangars, and historic structures restoration. Mohammad has also assisted with infiltration drainage basins, forensic investigations, seepage analyses, rapid drawdown analyses, erosion control mats, buttresses, ripraps, carbon sequestration, wellbore integrity, hydraulic fracture, geothermal energy, enhanced oil and gas recovery, and manual and wireless instrumentation designs. He has performed analytical and coupled finite element modeling of geotechnical structures and evaluated their long-term response. Mohammad has conducted seismic site class, liquefaction potential, and earthquake analyses using PLAXIS software. He has monitored field embankments' performance using settlement plate, piezometer, horizontal profile gauge, and inclinometer. Mohammad has also determined ground improvement techniques like surcharge-preloading, prefabricated vertical drains, and stone columns to meet project performance requirements. He has investigated subsoil using sonic drilling, hollow stem auger, mud rotary drilling, hand auger, and non-destructive tests, including ground penetrating radar and falling weight deflectometer tests. Mohammad has collaborated with contractors, clients, and design consultant teams and supervised construction work to ensure compliance with the specification and design. He has worked with geologists, collected, processed, and logged geological samples, conducted laboratory tests, and prepared reports.

EDUCATION

PhD, Civil Engineering, University of New South Wales, Australia (2011 -2014)
MSc., Civil and Environmental Engineering, Saitama University, Japan (2007-2009)
BSc., Civil Engineering, Rajshahi University of Engineering and Technology, Bangladesh (2000-2004)

COMPUTER LITERACY

Bentley Software: PLAXIS 2D, PLAXIS 3D, STADD Pro, gINT
GeoStudio Software: SLOPE/W, SIGMA/W
Ensoft Software: APile, LPile, Group, Shaft, PyWall
RocScience Software: Slide, RS, EX3, Settle, RSPile
Itasca Software: FLAC, UDEC
Computer and Structures: ETABS
Structure Point Software: spwall, spslab, spbeam, spmats, spcolumn
Mathematical Software: MAPLE, Mathcad, Mathematica, Octave
Subsurface Simulation Software: OpenGeoSys, Code_Aster, TOUGH
Computational Fluid Dynamics: OpenFOAM, Code_Saturn
Pavement Design Package: PaveExpress
Plotting Software: Origin, Gnuplot, Grapher, CPeT IT
Others: SRWall, SNAP-2, AutoCAD, QGIS

PROFESSIONAL EXPERIENCES

- WSP EXPERIENCES (JULY 2021 TO PRESENT)

— **NJDOT Statewide Pavement Engineering, New Jersey (July 2021 to Present):**
Dr. Islam supervises testing activities and provides pavement designs, evaluations, and engineering services. Mohammad plans, directs, and oversees the fieldwork, laboratory tasks, and data collection activities. All applicable activities conform with the 1993 AASHTO guide

for the design of pavement structures, FHWA manual, AASHTOWare pavement ME design manual, NJDOT roadway design manual, NJDOT standard items, specifications, and details, and NJDOT's ride quality specification. The activities also involve existing pavement design data, including average annual daily traffic data, heavy truck percentage, and directional distribution. The pavement design data consists of the design service start year, anticipated design service life of the pavement, international roughness index, skid number; collection of pavement and subgrade soil information such as soil mechanics, resilient modulus, and subsurface drainage; and non-destructive field visual distress survey per the strategic highway research program distress identification manual for the long-term pavement performance project. He also conducts field destructive methods to retrieve pavement cores of the existing pavement, subsurface characterization with dynamic cone penetrometer for subgrade below the pavement cores to assess compactness and consistency, and laboratory tests to determine the physical properties of existing sub-grade soil materials, including resilient modulus, and California bearing ratio. Mohammad is assisting with the U.S. Routes 1&9, 13, 19, 22, 23, 26, 27, 33, 35, 36, 40, 45, 46, 47, 53, 70, 76, 78, 80, 124, 130, 154, 166, 167, 173, 181, 183, 202, 206, 278, 280 and 440. WSP is providing statewide pavement engineering services to NJDOT.

— **Route 80 Westbound Reconstruction (July 2021 to Present):**
Dr. Islam was responsible for designing and analyzing sixteen noise barrier structures, fourteen retaining walls, and sign structures for I-80's PE report (from milepost 56.4 to milepost 65.4). He also investigated regional geology and historical borehole data from the NJDOT GDMS and Rutgers Report and recently drilled 20 boreholes and laboratory results to prepare geotechnical design parameters and subsurface stratum. He also defined geotechnical model parameters for below grade structures and utilities. He reviewed preliminary design drawings along the roadway for each structure. He performed a geotechnical risk assessment. Dr. Islam used LPile and Slope/W for numerical modeling and hand calculation to analyze and design each structure. He also used PLAXIS to evaluate the impact of the construction crane on the existing and proposed foundations. Dr. Islam also performed seismic analysis, design, and vibration analysis to assess the impact on existing structures. All analysis and design were in accordance with AASHTO, FHWA, NEHRP, and the NJDOT Bridges and Structures Design Manual.

— **Cass Street to Calhoun Street Floodwall Reconstruction and Repair, Trenton, New Jersey (March 2023 to Present):**
Dr. Islam worked as a subject matter expert (SME) for this project and resolved the ongoing complexity of the cofferdam and floodwall construction. Mohammad identified the issue's source and provided technical support to the WSP design, NJDOT construction, and NJDOT geotechnical teams. He also monitored the failure and ineffectiveness of the cofferdam before and after local tornado and flood events. Mohammad evaluated differing site conditions, failure behind the sheet pile installation means and methods of contractors, and the vibratory hammer's ineffectiveness sources. The team also proposed alternative design methods. WSP is providing NJDOT with engineering and construction support services for more than 700 feet of floodwall along the Delaware River. The project will upgrade the roadway drainage system to comply with NJDOT spread criteria and install backflow preventors for 15 outfalls that discharge into the river. The project also includes two landscape retaining walls in the park area behind the reconstructed floodwall.

— **Tweed Airport in East Haven, Connecticut (March 2024 to Present):**
Dr. Islam supervised forty-eight borings, thirty dynamic cone penetration tests (DCPT), five temporary wells, and four Cone Penetration Testing (CPT) and Seismic Cone Penetration Testing (SPTC) soundings to assess the subsurface conditions of the airport project. Borings

were drilled from the existing grade to the bearing stratum, a maximum of 120 feet, using rotary drilling.

— **Dewatering Plan, Atlantic St. Stormwater Control Project, Elizabeth, NJ (Dec 2023 to Feb 2024):**
Dr. Islam was responsible for constructing a dewatering plan at the Atlantic St Stormwater Control project in Elizabeth, New Jersey. The plan includes calculations for construction dewatering rates, volume, durations, dewatering-induced settlement calculations, and calculations of influence zones due to lowering the groundwater table. A perimetric sheet pile wall was proposed to be installed with interlocking sheet piles around the site perimeter. The sheeting tip is also proposed to be socketed into bedrock (approximately 25 to 30 ft below the ground surface) and will serve as a cofferdam to isolate the site from the local groundwater table. The design and analysis were in accordance with the US Department of Defense, the US Department of Interior Bureau of Reclamation, Naval Facilities Engineering Command's Design Manual, and the USGS Reports.

— **New Jersey Wind Port Access Rd Pavement Evaluation and Design Recommendations (Jan 2024 to Feb 2024)**
Dr. Islam was responsible for the pavement evaluation of the New Jersey Wind Port (NJWP) Access Road, which carries traffic to a PSEG Nuclear facility. He also provided pavement design recommendations, performed a visual distress condition survey, and measured settlement along the roadway. Dr. Islam also provided the traffic impact of NJWP heavy equipment by comparing traffic data from PSEG Nuclear facility traffic. The subsurface investigation involved 12 borings and 62 cone penetration tests. The ground penetrating radar survey was used to find the potential sinkhole location. Dr. Islam prepared a subsurface summary based on the geotechnical investigation and back-calculated settlement parameters based on the laboratory results and CPT data interpretations. This project supported the resolution of the dispute between the NJWP and PSEG.

— **Geotechnical Engineering Report for Intelligent Transportation System and Dynamic Messages Route 78, Route 22 RI Drift Road/Dale Road (Dec 2023 to April 2024)**
Dr. Islam supervised eighteen borings and lab assignments to assess the subsurface conditions for the camera surveillance system (CSS) and dynamic message sign (DMS) structures at Route 78 from MP 3.90 to MP 41.87. He performed all field work at night in challenging weather from December to January. Shallow bedrock was encountered at 5 of 13 CSS, which was the main design challenge to control the overturning moment. Dr. Islam designed all CSS and DMS structures. He calculated bearing capacity, sliding resistance, and overturning moment and prepared the report. He used LPile, StaddPro and PLAXIS for analysis and design. He performed geotechnical risk assessment and seismic analysis. The design and analysis were in accordance with AASHTO LRFD Bridge Design Specification, AASHTO LRFD Specifications for Support for Highway Signs, Luminaires and Traffic Signals with current Interims, and NJDOT Bridges and Structures Design Manual.

— **Soldier Pile Wall Design, NJ 23, High Crest Drive to Macopin River, West Millford, NJ (Oct 2023 to Nov 2023):**
Dr. Islam was responsible for the soldier pile wall design, which consisted of cast-in-place reinforced piles (W-sections) and concrete lagging. The length of the wall is 491 ft. Precast panels dimensions are 10 ft x 2 ft x 0.5 ft @ 10 ft center to center. Three W-type piles (W12X170, W14X120, and W18X192) with a length of 15 feet were analyzed. Pile section W12X170 with a 15 ft length was selected, with a 7.0 ft embedment depth to satisfy the section modulus and shear capacity against the loading conditions. TL-4 barrier impact load was considered in the analysis. LPile was used for the numerical analyses. He performed geotechnical risk assessment and seismic analysis. The design and analysis were in

accordance with the AASHTO LRFD Bridge Design Specification and NJDOT Bridges and Structures Design Manual.

— **Mechanically Stabilized Earth Retaining Wall at the Herring River, Wellfleet, Massachusetts (Nov 2023 to Dec 2023):**
Dr. Islam was responsible for the MSE Wall design at the Herring River, Wellfleet, Massachusetts. The length and height of the wall are 88 ft and 7.5 ft, respectively. The front face of the wall is a combination of Tensar HPDE UX Geogrid and SierraScape Wire Form. Both the static and seismic analyses were performed for internal and external stability. The subsurface profile for the analyses was developed based on the boring logs and laboratory data. The design and analysis were in accordance with the AASHTO LRFD Bridge Design Specification and the FHWA design manual.

— **Springfield Gardens Reconstruction (Phase 5), Queens, NY (Sept 2023 to Nov 2023):**
Dr. Islam was responsible for the supervision of the reconstruction of Springfield Gardens (Phase 5). The project includes soil boring at 93 locations, NYCDEP-style permeability testing at 109 locations (at depths of 5 feet and 10 feet below the ground surface) and observation well installation at 19 locations as per NY DDC. He prepared field reports including soil classification as per USCS Classification and NYCBC Material Class and permeability tests calculations. All field activities were in accordance with the NYCBC, ASTM, DDC Office of Geotechnical Investigations, and NYC Stormwater Manual.

— **Camera Surveillance System (NJ 23 MP 9.24) and Dynamic Message Sign (NJ 23, MP 7.69) foundation design, NJ Route 23, Township of Wayne, Passaic County, New Jersey (Sep 2023 to Oct 2023):**
Dr. Islam was responsible for the geotechnical analysis of Camera Surveillance System (NJ 23 MP 9.24) and Dynamic Message Sign (NJ 23, MP 7.69) foundation design in Passaic County, New Jersey. The Camera Surveillance System is type A with height of 75 ft. A deep foundation system consisting of 54-inch diameter drilled shafts, with a length of 16 feet was analyzed using LPile. Broms analysis was used to satisfy the overturning and torsional resistance of driiled shaft. Class B: Spread footing was used for a non-breakaway ground mounted dynamic message sign. Overturning and sliding resistance against the loading condition was also analyzed for spread footing. He performed geotechnical risk assessment and seismic analysis. The design and analysis were in accordance with AASHTO LRFD Bridge Design Specification, AASHTO LRFD Specifications for Support for Highway Signs, Luminaires and Traffic Signals with current Interims, and NJDOT Bridges and Structures Design Manual.

— **Atlantic Aviation 2021 Technical Services, Hanger 3, Teterboro Airport, New Jersey (Nov 2021 to Dec 2023):**
Dr. Islam supervised twenty-four borings, temporary wells, and lab assignments to assess the subsurface conditions of Atlantic Aviation's Hangar 3 Complex. Borings were drilled from the existing grade to the bearing stratum, with average depth of 84 feet, and a maximum depth of 110 feet below ground surface using rotary drilling. He also analyzed lab results for foundation selection. He performed load-settlement analysis to evaluate both shallow and deep foundation systems based on the provided structural loads and site soils. A deep foundation system using driven HP pile support was evaluated. One driven pile under each column was analyzed with pile lengths ranging between 92 and 115 ft and types HP14x117 and HP16x183. Battered group piles of HP 16X183 were analyzed and selected to resist high shear forces. Dr. Islam also estimated slab on grade settlement based on the design aircraft and slab's dead load. He also evaluated seismic site classification based on the site soils and project location following International Building Code and ASCE Seismic Map. The design and analysis followed the Federal Aviation Administration AC 150/5320-6G-Airport Pavement Design and Evaluation, the New Jersey Department of Transportation, the American Association of State Highway and Transportation Officials, and the American Society for

Testing and Materials standards. He used APile, LPile, Group and PLAXIS for analyses and design.

— **Route 35 Osborne Avenue, Lawrenceville, New Jersey & Route 53 Pondview Avenue, Parsippany-Troy Hills, New Jersey (July 2021 to August 2023):**
Dr. Islam was responsible for the investigation of the regional geology and historical boreholes data from the NJDOT's GDMS and Rutgers Report to prepare geotechnical design parameters and subsurface stratum. He analyzed and designed the soil nail, erosion control mat, spike plate, and wire mesh following the NJDOT, AASHTO, and ASTM standards. He outlined the soil nail testing method for field conditions and the procedure for the restoration of damaged manholes and guide rail per NJDOT requirements. He also prepared cost estimation, specification preparation following the NJDOT's standard specifications and itemized cost estimation. For finite element modeling, he used PLAXIS for slope stabilization. He also prepared the design drawings and the final report.

— **NPS 2021 Architectural Engineering Indefinite Delivery and Indefinite Quantity, Nationwide (Dec 2022 to May 2023):**
WSP is responsible for water treatment and distribution, wastewater treatment and conveyance improvements, and new facilities for several national parks across the U.S. Water projects involve small, less than 1 million-gallon-per-day, groundwater systems. Wastewater projects include gravity sewer replacement and rehabilitation and the design of on-site treatment and disposal systems.

  NPS Jones Mill Pond Dam Design Services, Nationwide: Dr. Islam was responsible for the geotechnical analysis of the proposed rehabilitation to the Jones Mill Pond Dam, in York, Virginia. The proposed improvements include regrading at the skirt of the dam embankment, placement of Articulating Concrete Blocks (ACB) over geogrid, and geotextile, repair of the spillway toe and the tunnel spillway. He conducted finite element analysis, using PLAXIS, including embankment stability due to drawdown, concrete block sliding, seepage, and slope stability analysis. The factor of safety analysis against piping is also modeled using PLAXIS. Helical piles are selected and recommended to maintain the embankment stability in areas where the embankment has a low factor of safety with articulated concrete blocks against sliding. Helical piles are designed using HeliCAP and LPile. The design and analysis were in accordance with the U.S. Department of the Interior Bureau of Reclamation, Virginia Building Code, and AASHTO.

— **NJ Transit Hudson-Bergen Light Rail Train System Rebid Support, Jersey City, New Jersey (Feb 2023 May 2023):**
Dr. Islam investigated the Hudson Bergen Light Rail (HBLR) Bergenline station tunnel seepage evaluation. He reviewed the as-built drawings. He also prepared report from the tunnel visit on water from inefficient/failed drainage system, uncontrolled drainage over the rail track, seepage along the rock joints, seepage across lining concrete joints, seepage from shotcrete, rock bolt and spike plates. He also prepared logs along the Station number for East Tunnel section and West Tunnel section. Dr. Islam also proposed tunnel remediation evaluating an infrastructure consulting firm's design set. WSP is supporting NJ Transit in bidding for a new operator of the Hudson-Bergen Light Rail Train System by preparing a condition assessment of assets and developing options and recommendations for a restated operations and maintenance contract and contract management.

— **Chesapeake & Ohio Canal National Historical Park Infrastructure Preservation, Choh, West Virginia (August 2021 to April 2022):**
Dr. Islam supervised subsurface investigations for the final design of the restoration of the historic dry-stone wall (log wall). The log wall is approximately 1,015 foot long, on average 35 ft high drystone wall with a tow path and historic canal located directly behind the wall.

The long-term stability issues developed in the log wall due to sinkholes development adjacent to the towpath. Investigations include boreholes drilling to the bedrock using sonic drilling, installation of inclinometers for long-term monitoring, geotechnical field testing and environmental analysis of canal sediment to assess beneficial reuse of the material, seismic refraction surveying, and a Ground Penetrating Radar (GPR) survey. He developed stabilizations of the wall, which included stone buttressing at its base and soldier piles (micro piles) and rock anchor system soldier piles behind the wall. For numerical modeling, he used PLAXIS, UDEC, Group and hand calculation using finite difference method. The design and analysis were in accordance with Maryland Department of the Environment, National Park Service guidance, US Department of Interior, Bureau of Reclamation and the ASTM.

- **Red Bull Arena Field Improvements (July 2022 to July 2022):**
  Dr. Islam was responsible for the investigation of the subsurface conditions based on 42 boreholes (rotary drilling), performed lab assignment and analysis of laboratory results to define the subsurface, prepared boring logs, conducted geotechnical analysis of basements and foundations design of proposed structures, and prepared subgrade for soccer fields. Mohammad performed seismic analysis and evaluated corrosion and sulfate attack potential. The project included nine soccer fields, a main building with a loading dock and basement, a field house, an indoor field building, a women's pro structure, a girl's academy, two groundskeeping annexes, an agility training area, sitting steps, a front office, a seating structure, field lighting poles, a video tower, site access road, and at-grade parking. All design works followed the International Building Code, U.S. Department of the Interior, NEHRP, USGS, and NJDEP requirements.

- **Infiltration Characteristics of Drainage Basin:**
  - **NJ Route 76 over Route 130 (December 2022 to January 2023)**
  - **NJ Route 70 Bridge over Mount Misery Brook Pemberton (February 2022 to March 2022)**

  Dr. Islam was responsible for subsurface exploration program to evaluate the infiltration characteristics of NJ Route 76 over Route 130 and NJ Route 70 Bridge over Mount Misery Brook Pemberton. Borings were drilled using hollow stem auger. The projects consist of five drainage basins, seven boreholes, seven temporary wells, twelve test pits, twenty infiltration tests. He determined the seasonal high-water table (SHWT) based on groundwater observations in temporary monitoring wells SHWT. He calculated hydraulic conductivity based on infiltration testing conducted on the most hydraulically restrictive soil encountered above the seasonal high-water table. He also determined hydrologic soil groups based on USDA soil maps, visual observations, and infiltration test information. He prepared boring logs using gINT. Dr. Islam performed drainage basin task in accordance with New Jersey Stormwater BMP manual, New Jersey Geological Survey, United States Department of Agriculture, ASTM.

- **Interstate 76/Interstate 676 Bridge Deck and Superstructure Replacements and Roadway Resurfacing (June 2022 to Nov 2023):**
  Dr. Islam was responsible for design and analysis of foundation for proposed bridge deck/superstructure replacement, noise barriers and sign structure at Interstate 676 between MP 0.0 to 1.00 and Interstate 76 between MP 1.59 and 2.10. He also designed the stability of embankment using sheet pile. He investigated regional geology and historical boreholes data from the NJDOT's GDMS and Rutgers Report and recently drilled 26 boreholes and laboratory results to prepare geotechnical design parameters and subsurface stratum. Dr. Islam also reviewed as built drawings, interpreted pile integrity testing and existing bridge pile capacities calculations, seismic design. He also defined geotechnical model parameters for below grade structures and utilities. He performed geotechnical risk assessment. Dr. Islam used LPile, Slope/W for numerical modeling and hand calculation for analysis and design of each structure. He also used PLAXIS to evaluate impact of construction

crane on existing and proposed foundation. Dr. Islam also performed seismic analysis and design and vibration analysis to assess the impact on existing structures. All analysis and design were in accordance with AASHTO, FHWA, NEHRP, NJDOT Bridges and Structures Design Manual.

— **Lorton Landfill, VA (June 2022 to June 2022)**
Dr. Islam was responsible for geotechnical analysis of proposed structures at the top of closed Lorton Landfill, including a pergola pavilion, a sculpture park, scenic overlook, amphitheater, exercise stations, public restrooms, benches, pedestrian trails and parking. Client invited WSP to review consulting firm's design set and estimated settlement. Client also requested WSP to provide technical support. Dr. Islam back calculated loads for all structures and defined subsurface for geotechnical model. He used PLAXIS, RSPile, and Lpile for geotechnical analysis and calculated immediate settlement, secondary settlement and bearing capacity. He also prepared memo report to address clients' technical questions on consulting firm's proposed design, future impact and possible alternative design. Dr. Islam also proposed foundation including micropile. He provided design for the floor support including deep dynamic compaction, surface compaction, and soft surfacing to minimize the load.

— **Todd Elementary School, Briarcliff Manor, NY (Aug 2022 to Feb 2023)**
Dr. Islam was responsible for Todd Elementary School's extension of playground area and school's exit entrance to playground, including concrete sample collection for slump test, cylindrical sample preparation for unconfined compression tests, reinforcement placement, concrete placement, compaction and formwork condition, compaction of subgrade before asphalt placement, temperature of sample, quality assurance of sample and construction. Dr. Islam performed the site supervision as per design and school district requirements.

- MARINO ENGINEERING ASSOCIATES, INC, ST. LOUIS, MO
Senior Geotechnical Engineer (Oct 2020 to July 2021)

— **Investigation of Retaining Wall Damage and Remedial Measures: Sam's Club, Monroeville, PA**
Dr. Islam was responsible for the investigation of retaining wall damage and drainage at Sam's Club, Monroeville, PA. The retaining wall's length and maximum heights are 1,300 ft and 65 ft, respectively. The investigations consisted of Phase I, Phase II, Phase III and Phase IV. Phase I consisted of investigation of existing retaining wall failure, including internal and external stability, design review, assessment of wall damage, topographic fracture, drainage system, seepage and washout of fine through retaining wall blocks, degradation of retaining wall blocks, as-built drawings review, and subsoil data review. Phase II involved subsurface investigations using sonic drilling (horizontal and vertical), hollow auger drilling, ground penetrating radar and laboratory tests. Dr. Islam supervised subcontractors for remedial construction of damaged section of the retaining wall, an inlet excavation, test pit excavations, instruments installation for long term monitoring, field nuclear density tests and ground water sampling and analysis. He also prepared scope of work and reviewed proposals and project cost from subcontractors. Dr. Islam developed numerical models using FLAC for Phase III: Remediation plan and outlined report for Phase IV: reconstruction stages.

— **Slope Failure and Remedial Measure: Walmart, Huntingdon, PA**
Dr. Islam was responsible for the subsurface investigation of slope failure and remedial measures of Walmart, Huntingdon. Maximum height of the embankment section was 55 ft. with steep slope without bench and improper drainage facility. He reviewed as-built drawing, boring logs, laboratory results, subcontractors' reports, site visit to collect soil samples and data. Dr. Islam performed coupled finite element model to assess the stability of existing slope considering (i) flattening of existing slope, (ii) soldiers pile with concrete panel, and (iii) soil

nail with shotcrete fascia and soil nail with wire mesh. He used FLAC, SLOPE/W, and SIGMA/W for numerical modeling.

- NATIONAL ENERGY TECHNOLOGY LABORATORY, US DEPARTMENT OF ENERGY, PITTSBURGH, PA & MORGANTOWN, WV
  Researcher (Feb 2017 to Sept 2020)

— **Fluid Leakage through Faulted Reservoir**
Dr. Islam was responsible for finite element modeling of fluid leakage through faulted reservoir. The study domain is comprised of a CO2 storage reservoir, aquifers and caprocks. The model domain's top surface is located 3,281 ft below the ground surface to ensure the supercritical CO2 and considered miscibility of an aqueous and CO2-rich phases. A fault aperture is also considered in the domain for migration of CO2. In this regard, Dr. Islam used numerical model of multicomponent miscible fluids and non-isothermal model during phase change including the Equation of State. He also calculated pressure buildup due to CO2 injection and safe pressure threshold before starting the fault fracture propagation and fluid migration. Dr. Islam also used finite element model to evaluate the near field fluid injection effect to the far field. He used OpenGeoSys for finite element simulation, Gmsh for 2D finite element mesh generation and ParaView for post processing.

— **CO2 Leakage through Micro-annulus in Cement Sheath**
Dr. Islam was responsible for finite element modeling of CO2 leakage through micro-annulus/crack in a compromised well. The legacy well consisted of the geological storage medium with a porous storage reservoir, relatively impermeable caprock, and overburden pressure above the caprock. A micro-annulus/crack was considered in the steel casing wall. Dr. Islam investigated the coupled hydro-mechanical response in the near field and the far field due to CO2 injection in the compromised legacy wells. For finite element modeling, he used immiscible fluid flow coupled with deformation flow. He used OpenGeoSys for finite element simulation.

— **Hazardous Waste Disposal**
Dr. Islam was responsible for coupled thermo-hydro-mechanical model of nuclear waste type hazardous repository. Nuclear waste canisters are stored in the drifts excavated in granite type rock mass and the medium was fully saturated, fractured and sealed with partially saturated bentonite buffer. Canister is the source of heat generation. Dr. Islam used Brooks and Corey model and van Genuchten model to capture the wetting and non-wetting phase transition. He used OpenGeoSys and Code_Aster for finite element simulation, Gmsh and Salome_Meca for 2D finite element mesh generation and ParaView and VisIt for post processing.

- UNIVERSITY OF PITTSBURGH, US DEPARTMENT OF ENERGY, PITTSBURGH, PA

  Researcher & Visiting Scholar (Aug 2015 to Feb 2017)

— **Legacy Wellbore Plugging in the Oil and Gas Industry**
Dr. Islam was responsible for numerical modeling, laboratory testing and field monitoring of legacy wellbore plugging in the oil and gas industry. Average cost to plug a 3,000 ft shallow deep borehole well is approximately $60,000, while the plugging and abandonment of the Marcellus shale gas in Pennsylvania is approximately $700,000 per well. Also, the number of onshore abandoned well in the USA is more than 3.0 million. Dr. Islam collaboratively worked with the National Energy Technology Laboratory and Pacific Northwest National Laboratory under the US Department of Energy to address the legacy wellbore plugging issues. He was the technical lead for finite element model and discrete element model development using opensource codes and laboratory scale model to find the solution of the field problem. Dr. Islam used OpenGeoSys and Code_Aster for finite element simulation, Yade for discrete

element model, Gmsh and Salome_Meca for 2D finite element mesh generation and ParaView and VisIt for post processing.

- UNIVERSITY OF NEWSOUTH WALES, CANBERRA, AUSTRALIA

  Doctoral Researcher & Research Fellow (Feb 2011 to Aug 2015)

  Projects are as follows:
  - Nerang Broadbeach Roadway (NBR) embankment in Queensland, Australia: Ground Improvement using Surcharged Preloading.
  - Coombabah Creek Trial Embankment in Queensland, Australia: Ground Improvement using Surcharged Preloading and Stone Column.
  - Ipswich Motorway, in Brisbane, Australia: Ground Improvement using Preloading and Surcharging.
  - Sunshine Coast Motorway in Queensland, Australia: Ground Improvement using Prefabricated Vertical Drains.
  - Leneghans embankment, New South Wales Australia: Ground Improvement using Prefabricated Vertical Drain.

  Dr. Islam was responsible for interpretation of field data including, CPT, CPT-u test data, vane shear test, SPT test and laboratory measured data including, triaxial tests, direct shear tests, Atterberg Limit tests, moisture content, consolidation tests. He also interpreted field monitoring data obtained from settlement plate, piezometer, inclinometer, settlement marker, and horizontal profile gauge. He performed technical analyses of survey data, for topology development, subsurface profile, hydrological data and prepared technical reports. Dr. Islam performed finite element model to predict the long-term behavior of roadway embankment. He also analyzed the effectiveness of ground improvement using surcharged preloading, prefabricated vertical drain, and stone column based on the soil profile.

- RAJSHAHI UNIVERSITY OF ENGINEERING AND TECHNOLOGY, RAJSHAHI BANGLADESH

  Consultant and Assistant Professor (July 2005 to Feb 2011)

  Dr. Islam was responsible for the following projects.
  - Padma River Protection in Rajshahi, Bangladesh.
  - A case study of the Jamuna Bridge (Bangabandhu Bridge, the 11th longest bridge in the world).
  - Telecommunication Towers Foundation Analysis and Design.
  - Analysis and Design of Residential and Commercial Buildings using ETABS and STADDPro.
  - Subsoil investigation of government and private organizations.

- STRUCTURAL STEEL BANGLADESH LTD. DHAKA, BANGLADESH

  Assistant Engineer (March 2004 to July 2005)

  Dr. Islam was responsible for the design and analysis of the ACI salt Industry, including superstructure, substructure, ground improvement, drainage, and roadway design. He used STADDPro and ETABS for structural analysis and design.

AWARDS

- **Award-** Outstanding reviewer, Applied Mathematics and Computation, Elsevier (2018)
- **Award** - University Best Student Award, B.Sc. in Civil Engineering, RUET, Rajshahi, Bangladesh (2004)

– **Gold Medal** - For the First Class First position and outstanding result, BSc in Civil Engineering, RUET, Rajshahi, Bangladesh (2004)

PUBLICATIONS & PRESENTATIONS

Book Chapter

— **Islam, M.N.**, Gnanendran, C.T. and Sivakumar, S.T. (2015) "*Prediction of embankment time-dependent behaviour of on soft soils: effects of preloading, surcharging and the choice of lab versus field test data for soft soil parameters*", Ground Improvement Case Histories, Edited by Indraratna, B., Chu, J. and Cholachat, R., Vol.1, Chapter.13, page 359-379, Elsevier. https://doi.org/10.1016/B978-0-08-100192-9.00013-2

Journals

— **Islam, M.N.** (2022) "*Finite Element Simulations of Fluids Leakage through the Faulted Reservoir*", Geotechnics, 2(4), 908-934, MDPI. https://doi.org/10.3390/geotechnics2040043

— **Islam, M.N.**,Gnanendran, C.T. and Sivakumar, S.T. (2022) "*Interpretation of Cone Penetration Test Data of an Embankment for Coupled Numerical Modeling*", Appl. Mech. 2022, 3, 14-45. https://doi.org/10.3390/applmech3010002

— **Islam, M.N.** (2020) "*Small Scale Experiments to Assess the Bearing Capacity of Footings on the Sloped Surface*", Eng 2020, 1(2), 240-248, MDPI. https://doi.org/10.3390/eng1020016

— **Islam, M.N.**, Huerta, N. and Dilmore, R. (2020) "*Effect of Computational Schemes on Coupled Flow and Geo-Mechanical Modeling of CO2 Leakage through a Compromised Well*", Computation 2020, 8(4), 98, MDPI. https://doi.org/10.3390/computation8040098

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