# Nicholas Santella, Ph.D., P.G.

## Principal Geochemist

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## **Areas of Specialization**

- Tracer Hydrology
- Analytical and Numerical Modeling
- Environmental Chemistry
- Probabilistic Risk Analysis
- Environmental Site Assessments
- Geographic Information Systems
- Environmental Forensics

## **Overview of Professional Experience**

- Over 23 years of applied experience in the environmental science and engineering fields
- Authored and co-authored numerous peer reviewed journal articles regarding environmental chemistry/transport and risk management
- Coauthor or participant in NJDEP, DNREC, ASTM and ITRC standard and guidance development

## **Select Projects**

- Compliance Activities for Closed Municipal Landfill Performed air permitting, perimeter air monitoring and groundwater investigations at a closed municipal landfill in NJ. Included assistance to council in negotiating administrative consent order.
- Vapor Intrusion Assessments Developed and performed programs for soil gas and indoor air sampling as well as vapor intrusion risk assessments at multiple complex industrial, retail petroleum and solid waste sites using J&E model and other methodologies.
- Third Party Review of CERCLA Removal Actions and Risk Assessment - Provided third party technical review of a multi decadal history of EPA removal actions and risk assessments at a riverine PCB remediation site. Included evaluation of PCB and PCDD/PCDF data in multiple environmental media and of PCB biomarker data for legal counsel.
- **CERCLA PRP Technical Support** Provided technical support to legal counsel for PRP at for several large Superfund sites. Tasks include forensic analysis of PCB, PAH and metal impacted soils and sediments as part of site listing and initial allocation of liability, provision of strategic direction during RI design and support in selection of interim removal actions.

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### Education

Ph.D., Geochemistry Columbia University, 2005

B.S., Chemistry **Rutgers University**, 1999

#### **Registration/Certification**

Professional Geologist, DE, PA

OSHA certified Hazardous Waste Operations and Emergency Response

#### Affiliations

American Geophysical Union

National Ground Water Association

#### **Software Expertise**

AQTESOLVE (hydrogeologic analysis) AquaChem (groundwater chemistry) ArcGIS suite (geospatial analysis) CORMIX (surface water mixing) EPANET (water distribution system modeling) HELP (landfill design) HEC-RAS (surface water modeling) ISCST3 (atmospheric transport) LDRM (LNAPL recovery) MATLAB (data processing, time series analysis) MODFLOW (groundwater modeling) SEVIEW (unsaturated zone and groundwater modeling) SHAW (soil heat and moisture modeling) SPSS (statistics) Surfer (data analysis and mapping) Rockworks (data visualization)

Vensim (system dynamics modeling)



- **Conceptual Site Model Report** Primary author of a CSM document comprehensively evaluating site conditions and remedial progress at a complex chlorinated solvent remediation site. Included evaluation of effectiveness of ERH and pump and treat remediation and development of recommendations for remedial optimization and monitoring.
- Wastewater Treatment Consulting Counseled client in multistep evaluation of root cause of wastewater permit violations, available technologies for upgrades, cost benefit evaluation and optimal sequencing of capital investments.
- Mining Reclamation Plan and Residual Waste Disposal (Expert Opinion) Assisted large hard rock quarry mining operation in Maryland/Pennsylvania with a proper disposal plan and Best Management Practice (BMP) for managing residual fine grained mining sediment. Solutions included OSHA and Mining Regulation air monitoring plan for silica and other airborne contaminants and working material into Reclamation Plan.
- Expert Opinion for PCE Source Litigation Evaluated source location and PCE impacts to indoor air for a large redevelopment project in Washington, D.C.
- Forensic Modeling of Groundwater PCE Plume In support of an insurance claim, designed data collection program and performed a numerical modeling study to constrain the date of a release at a former dry cleaner.
- Forensic Sediment Sampling Implemented forensic sediment transport investigation of a high profile environmental remediation site. Services included reviewing depositional features to identify sampling locations, performing sampling activities via watercraft, and analyzing compound ratios from source to downstream deposits.
- **Portfolio of Unsaturated Zone Fate and Transport Modeling -** Unsaturated zone fate and transport modeling including development of plans for data collection and unsaturated and saturated zone fate and transport modeling to develop NJ SRP alternate remediation standards for the soil to groundwater pathway at multiple sites.
- **Groundwater Fate and Transport Modeling** Completed a multiphase development and calibration of a large scale groundwater flow and contaminant transport model for a tidally influenced remediation site. Developed a plan for additional data collection to support recalibration and validation requested by regulatory agency. Final modeling product fulfilled work plan element and supported project closure.
- **DE Evaluation of Sea Level Rise Risk** Under contract with state contributed to an assessment of sea level rise impacts to DNREC regulated sites.
- PCB Trackback Study Lead an effort to identify sources of PCBs within the service area of a county sanitary sewer network as part of a Pollution Minimization Plan (PMP) associated with a municipal NPDES permit.
- LNAPL recovery modeling Calibrated and implemented a site specific LNAPL recovery model to facilitate remedial system design.
- Assessment of Natural Disaster HazMat Risk Evaluated risks of and prevention and remediation methodologies for hazardous material releases associated with natural disasters at storage tanks and other facilities. Directed four part-time staff in conducting surveys and performing data analysis.
- Evaluation of Veterans Interests in STEM Education Lead the development, programing and piloting of an extensive electronic survey of veterans utilizing Post 911 GI Bill benefits. Conducted focus groups and synthesized input from a team of subject matter experts.
- Validation of a Critical Infrastructure Protection Decision Support System Developed validation methods and collection of a variety of infrastructure system data for Los Alamos National Lab. The success of an initial project led to a larger contract to serve as a third-party reviewer of critical infrastructure modeling research at LANL for the Department of Homeland Security Science and Technology Directorate.
- Managed CERCLA Fractured Rock Remediation Site Managed the activities of a Superfund Site including the scheduling, coordination, and implementation of treatment system performance monitoring, groundwater sampling, and preparation of quarterly and annual reports to USEPA, NJDEP and the client.

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- Groundwater Assessment of a Large and Complex Hexavalent Chromium Site Project oversight, data management and reporting for characterization and groundwater remedial design of a chromium waste disposal site with a focus on characterization and mitigation of discharge of impacted groundwater to estuarine surface water.
- Data Management and Analysis for a Large Brownfield Site Developed and maintained an extensive database of soil and sediment analytical data and developed and implemented statistical methods for data evaluation and display for a large brownfield site in accord with risk based environmental standards.
- Hydrologic Tracer Investigations Responsible for planning and implementation of tracer studies in groundwater, rivers and indoor/outdoor air including sampling, laboratory analysis and interpretation of data. Applications included evaluation of in-situ chemical oxidation programs, groundwater dating and quantification of atmospheric gas exchange rates and advection/dispersion properties of the Hudson and East Rivers and Newark Bay. Results of these studies were ultimately used for calibration of the Port of New York/New Jersey Operational Forecast System.

## **Select Publications**

- Santella N., Growing Vulnerability: Facing Natural Hazard-Related Environmental Liability, NJ Municipalities, November 2015
- Santella N., Ho D.T., Schlosser P., Gottlieb E., Munger W.J., Elkins W.J., Dutton G.S. Atmospheric variability and emissions of halogenated trace gases near New York City, Atmospheric Environment, 47, 533-540, 2012
- Santella N., Steinberg L.J., Aguirra G. A. Empirical Estimation of the Conditional Probability of Natech Events Within the United States, Risk Analysis, 31 (6), 951-968, 2011
- Santella N., Steinberg L.J. Accidental Releases of Hazardous Materials and Relevance to Terrorist Threats at Industrial Facilities, Journal of Homeland Security and Emergency Management, 8 (1), 53, 2011
- Steinberg L.J., Santella N., Zoli C. Baton Rouge Post-Katrina: The Role of Critical Infrastructure Modeling in Promoting Resilience, Homeland Security Affairs, 7, 7, 2011
- Santella N., Sengul. H., Steinberg L.J. Petroleum and Hazardous Material Releases from Industrial Facilities Associated with Hurricane Katrina, Risk Analysis, 30(4), 635-649, 2010
- Santella N., Steinberg L.J., Parks K. Decision-Making for Extreme Events: Modeling Critical Infrastructure Interdependencies to Aid Mitigation and Response Planning, Review of Policy Research 26 (4), 409-422, 2009
- Santella N., Ho D.T., Schlosser P., Stute M. Widespread elevated atmospheric SF6 mixing ratios in the Northeastern United States: Implications for groundwater dating, J. of Hydrology, 349 (1-2), 139-146, 2008
- Santella N., Schlosser P., Smethie W.M., Ho D.T, and Stute M. Seasonal variability and long term trends of chlorofluorocarbon mixing ratios in the unsaturated zone, Environ. Sci. Technol., 40 (14), 4414 -4420, 2006
- Caplow, T., P. Schlosser, D.T. Ho, N. Santella, *Transport dynamics in a sheltered estuary and connecting tidal straits:* SF<sub>6</sub> tracer study in New York Harbor, Environ. Sci. Technol., 37, 5116-5126, 2003
- Santella N., Ho D.T., Schlosser P., et al., *Distribution of atmospheric SF*<sub>6</sub> near a large urban area as recorded in the vadose zone, Environ. Sci. Technol. 37 (6): 1069-1074, 2003
- Schulze S.M., Santella N., Grabowski J.J, Lee J.K. The anionic oxy-Cope rearrangement: Using chemical reactivity to reveal the facile isomerization of the parent substrates in the gas phase J. Org. Chem. 66 (22): 7247-7253 2001

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## Nicholas Santella, Ph.D., P.G.

#### **Select Lectures**

The Impact of Extreme Weather on Hazardous Material Releases, AEHS, Amherst, MA, October 2019

- Hurricane vs. Environmental Infrastructure: Who Wins and Can We Really Protect Ourselves?, RTM, Philadelphia, PA, April 2017
- A.M. Best Webinar: What Insurance Professionals Need to Know About Weather-Linked Environmental Risks, Oldwick, NJ, September 2014
- Reconsidering TPH in a Risk Based Corrective Action Framework, 24th National Tanks Conference, Denver, CO, September 2013
- Remedial Risk Assessment: Releases from Storage Tanks During Natural Disasters, EPA Region 3 States LUST Technical Workshop, Rehoboth Beach, DE, September 2011
- Quantification of Occurrence and Cumulative Probability of Natechs in the U.S, International Disaster and Risk Conference IDRC Davos, Switzerland, June 2010
- Validation of a CIPDSS analysis of Hurricane Katrina's Impacts on Baton Rouge LA, DHS Office of Science and Technology, Washington DC, June 2008
- Spatial Distribution of Gases Emitted from Large Urban Areas: SF6 Measurements, American Geophysical Union, San Francisco, CA, December 2004

