



Sophia Sigstedt, MSc.

Hydrogeologist

Professional Summary

Sophia Sigstedt has a M.S. in Hydrology and a B.S. in Environmental Science with an emphasis in Biology. She has six years of practical experience. Professional experience includes hydrogeochemical evolution and water quality analysis, geochemical modeling, applications of stable isotopes to groundwater and water resource studies, radiocarbon dating of groundwater, numerical groundwater water modeling, and basin-scale water resource management.

Her hydrology graduate degree experience includes surface-water, vadose zone and groundwater hydrology with an emphasis in hydrogeology and geochemistry with water resource applications. Undergraduate background includes microbiology, environmental geology, toxicology, ecology and waste water treatment.

She has run stable isotopic analysis using mass spectrometry for the New Mexico Tech Stable Isotope Lab. She has taught laboratory and field techniques in hydrology at New Mexico Institute of Mining and Technology. Techniques included surveying, employing tensiometers and infiltrometers to observe unsaturated flow, solute transport experiments, well hydraulics, and stream gauging.

Summary of Core Skills

Hydrogeologic and hydrogeochemical analysis performed using Modflow2K, Modflow-Surfact, Modflow-USG, MODPATH, PEST, AWAS (Alluvial Water Accounting System), Hydrus, Leapfrog, Netpath, phreeqc, Aquachem, and Arcgis, RockWare.

Employment History

AMEC, Hydrologist, Boulder, CO, 2012 to present
AMEC, Hydrologist, Socorro, NM, 2010 to 2012
NMT, Research Assistant, Socorro, NM, 2008 to 2010
NMT, Teaching Assistant, Socorro, NM, 2009
Laboratory of Biochemical and Biomedical Research, Research Assistant, NM, 2007 to 2008

Detailed Skills by Representative Project

Water Resource, Water Supply, and Water Rights Projects

Conjunctive Administration of Ground Water Rights, Idaho Ground Water Appropriators, ID, USA

AMEC provides oversight of regional ground water model development of the Eastern Snake Plain Aquifer, groundwater modeling in support of management and mitigation plans, and analysis of historical water use data. Ms. Sigstedt provided project support related to modeling review of the Eastern Snake Plain Aquifer MODFLOW Model and its application for conjunctive use management.

Laramie County Control Area Hydrogeologic Model, WY, USA

Under contract with the Wyoming State Engineers Office AMEC developed a hydrogeologic model for management of the Laramie County Groundwater Control Area. Ms. Sigstedt is tasked with data review and development of the hydrogeologic model using MODFLOW-SURFACT of the High Plains Aquifer System. Modeling included developing DCMLs, consumptive use for irrigation withdrawals, recharge estimates, modeling streamflows with the STR MODFLOW Package. The model was calibrated using PEST. The groundwater modeling analysis was aimed at determining the status of appropriable water in the county.

Education

M.S., Hydrology, New Mexico Institute of Mining and Technology, 2010

B.S., Environmental Science with Biology, New Mexico Institute of Mining and Technology, 2008

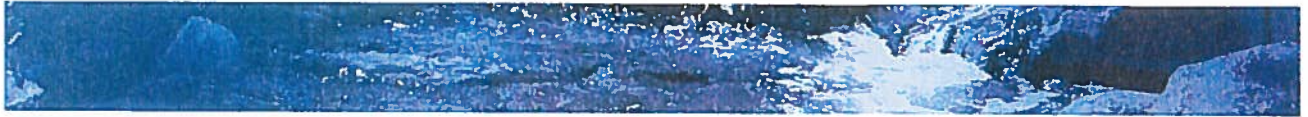
Years of Experience ~6

Professional Affiliations

Member, American Institute of Hydrology

Member, American Water Resources Association

Member, Integrated Groundwater Modeling Center



Navajo Nation Zuni Basin Water Rights Adjudication, NM, USA

Under contract with the Navajo Nation AMEC has provided water resource management consulting for the Zuni basin. Ms. Sigstedt was tasked with DCMI estimates as well as the development of a hydrogeologic model. Geologic model built using Leapfrog Hydro. Groundwater model was run using MODFLOW-SURFACT and used to develop scenarios and determine impacts of claims on available water in the basin.

South Platte River Conjunctive Use Water Rights Availability, Lower South Platte River, CO, NM

AMEC is retained by the City of Boulder, CO to provide groundwater hydrology experts. The evaluations have focused on assessing the quantity and timing of depletions to South Platte flows (caused by groundwater pumping), preparation of expert reports and depositions and testimony in Colorado Water Court. Ms. Sigstedt has provided review on modeling, modeling development, technical memos and expert reports.

National Weather Service Hydrologic Modeling and Support

This ongoing project involves calibrating, evaluating, and implementing models for use in NWS river, flood, and drought forecast processes. Models include SAC-SMA, SNOW-17, LAG/K, RES-J, HEC-HMS, and HEC-RAS. The project includes developing and modifying hydrologic procedures, models, and techniques to ensure optimal use of available technologies and data. Designing and configuring hydrologic workflows and visual displays in FEWS and CHPS will be essential during the project. Ms. Sigstedt is currently involved in the Northeast River Forecast Center (NERFC), Northwest River Forecast Center (NWRFC), Missouri Basin River Forecast Center (MBRFC), and the West Gulf River Forecast Center (WGRFC) calibration tasks, which involve calibration of the SAC-SMA, SNOW-17, and LAG/K hydrologic models. The task was completed using a variety of tools including the CHPS environment, GIS, and Python scripting.

Middle Rio Grande Conservancy District (MRGCD) Ad Valorem Tax Assessment, NM, USA

Under contract with the Bureau of Indian Affairs (BIA), AMEC provided a detailed Ad Valorem tax assessment for properties with acreage benefitted by the Middle Rio Grande Conservancy District (MRGCD) water services. Ms. Sigstedt's analysis included Identifying non-pueblo, irrigable acres which pay a water service charge by parcel number that uniquely identifies the specific acreage, determining the ad valorem tax paid on those non-pueblo irrigable acres which pay a water service charge, as well as, evaluating the ad valorem and water services collections and providing a summary for both the residential and non-residential property for each county within the conservation District. Ms. Sigstedt's data compilation and mapping were performed with the use of Microsoft Access and ArcGIS.

Hydrogeochemistry with Water Resources Application

Characterization of the Salt Basin Groundwater System, NM, USA

Under contract with the NM Interstate Stream Commission (ISC) Ms. Sigstedt acted as a hydrogeochemist for the analysis of the Salt Basin groundwater system to determine water resources available for permit applications. For this project Ms. Sigstedt's primary tasks included developing a geochemical model based on environmental tracers collected from groundwater, surface water and precipitation sources within the basin. Ms. Sigstedt collected samples for carbon-14, tritium, oxygen and deuterium stable isotopes, and general ion chemistry analysis. Ms. Sigstedt analyzed the environmental tracers and general ion chemistry data to delineate recharge zones, identify groundwater flow paths, estimate groundwater flow rates and permeability and elucidate the controls on the evolution of groundwater chemistry and the water quality distribution of the basin.

Regional Groundwater Chemistry Mapping for the Island of Newfoundland, Canada

Under contract with the Water Resources Management Division Department of Environment and Conservation for the Government of Newfoundland and Labrador Ms. Sigstedt acted as hydrogeochemist to determine groundwater chemistry distributions for the Island of Newfoundland for the drilling of water supply wells. For the analysis, USEPA software Pro UCL, Excel, and ArcGIS were used to evaluate the statistical relationships between geologic data and water quality information. Groundwater quality maps for the island of Newfoundland were created by developing geostatistical relationships between available groundwater chemistry data and regional geochemical datasets including: bedrock core, till geochemistry, and geochemistry of lake sediments.



Support for Non-Minimal Impact Exploration Permit Application, Confidential Clients, NM, USA

For this project Ms. Sigstedt acted as hydrogeochemist to analyze monitoring approaches of surface water and groundwater in proximity of small-scale mineral exploration site. For the analysis Ms. Sigstedt used the USEPA software Pro UCL to establish sample distributions and background threshold values to evaluate whether water quality at the site had been impacted by drilling or post drilling activities. Monitoring parameters included field parameters, general chemistry, trace metals and endangered species populations. Impact concerns were primarily related to riparian, stream, or spring environments at the site.

Middle East Arid Zone-Basin Scale Hydrogeochemistry and Isotope Hydrology Study, Confidential Clients, Saudi Arabia

For this project Ms. Sigstedt acted as hydrogeochemist to determine aquifer properties and the water balance of the basin. Specific studies on aquifer hydrochemistry and geochemistry include isotope chemistry, recharge sources and rates, hydraulic properties, and flow path characterization. Environmental tracers included: field parameters, general chemistry, trace metals stable isotopes $\delta^2\text{H}$ and $\delta^{18}\text{O}$, dissolved gases (Ar, CO_2 , He, H_2 , H_2S , CH_4 , N_2 , O_2), $\delta^{13}\text{C}$ and $\delta^{34}\text{S}$ - SO_4 and $\delta^{18}\text{O}$ - SO_4 , $^{87}\text{Sr}/^{86}\text{Sr}$, $\delta^{15}\text{N}$ - NO_3 and $\delta^{18}\text{O}$ - NO_3 , arsenic speciation, and tritium. Focused study goals included safe yield and recharge determination. Water quality was also used to determine contamination sources within the aquifer system.

Groundwater Modeling and Geochemistry for Mining Projects

Antamina Mine Project Regional Hydrogeologic Integration and Hydrogeologic Geodatabase, Peru

Under contract to Antamina, Ms. Sigstedt served as a hydrologist for the AMEC team charged with integrating all hydrogeologic data collected since site inception into an ArcGIS geodatabase, and compiling a hydrogeologic integration report. The hydrogeologic integration report involved summarizing all past work, with a particular focus on site studies undertaken since 2008, identifying important data gaps, and developing a site-wide integrated hydrogeologic conceptual model that could be used to provide a framework for interpreting existing and newly acquired site data. Ms. Sigstedt's work focused primarily on hydrogeology and groundwater movement, water quality and geochemical evolution and developing the ArcGIS geodatabase.

Carmen de Andacollo Project – Hydrogeologic Analyses in Support of Tailings Facility Expansion, Chile

On contract to Compania Minera TECK, AMEC is providing hydrogeological characterization and analyses in support of expansion of the mine tailing facilities. As part of this effort Ms. Sigstedt provided consulting to the AMEC E&I team in Santiago on water quality and geochemical evolution, stable isotope analysis and development of the hydrogeological modeling with MODFLOW-SURFACT.

Ollachea Mine Project Hydrology and Hydrogeology for Feasibility Study, Peru

Under contract to Compania Minera Kuri Kullu, AMEC is providing hydrology and hydrogeological characterization for the Ollachea underground gold mine site for operational planning. Ms. Sigstedt was tasked with the development of the hydrogeological modeling with MODFLOW-USG to determine impacts on streamflow and estimate mine tunnel inflows.

Corani Mine, Water Resources Lead for EIA, Peru

Under contract to Bear Creek Mining Company, AMEC provided environmental impact analysis for the site. Ms. Sigstedt was tasked with the surface water and groundwater quality analysis. Analysis included water quality comparisons to environmental standards, temporal and spatial distributions of contaminants of concern using ArcGIS mapping, analysis of geochemical evolution through the use of Piper and Stiff diagrams, stable isotope analysis, and identifying and analyzing impacts from existing environmental liabilities. Ms. Sigstedt assisted in the groundwater model development of a MODFLOW-SURFACT model to determine wetland impacts at the mine site.

Publications and presentations

"Environmental tracers in groundwater of the Salt Basin, NM, and implications for water resources" Sophia Sigstedt. New Mexico Water Research Symposium, Socorro, NM. 2010