



Exponent®
Engineering & Scientific Consulting

Marie BenKinney

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Professional Profile

Ms. BenKinney is an ecotoxicologist with more than 39 years of experience specializing in environmental toxicology and in assessing facility operations, effluent discharges, and the fate, exposure, and environmental effects of substances, mixtures, and formulated products. She has developed, managed, and conducted facility process water, stormwater, groundwater, and wastewater effluent investigations for National Pollutant Discharge Elimination System (NPDES) permitting, treatability, compliance monitoring, total maximum daily load (TMDL) modeling, toxicity identification evaluation (TIE), and toxicity reduction evaluation (TRE).

Ms. BenKinney has managed product and facility due diligence assessments, environmental impact assessments, sustainability strategies, chemical hazard assessments, hazard communication development projects, and design and auditing of environmental management systems. She has designed, directed, and contributed to environmental programs ranging from small site-specific and product-specific assessments to large multimillion-dollar site assessments, historical process and facility release reconstructions for site contamination evaluation, oil spill response, facility operations evaluations, and product development programs.

Ms. BenKinney has extensive experience in designing and conducting laboratory and field aquatic toxicity and environmental fate studies in accordance with rigorous quality assurance and good laboratory practice (GLP) procedures. She has managed the development of overall environmental strategies for new and existing product evaluations and product stewardship program design for consumer products, electronics, medical devices, dyes, flavors and fragrances, specialty and industrial chemicals, and petrochemicals, and has assisted in negotiations with state, federal, and international regulators. Ms. BenKinney is a technical expert in aquatic testing procedures, dispersant use and spill prevention/management, and in assessing the fate, exposure, and environmental effects of petroleum hydrocarbons.

Ms. BenKinney was previously employed for 15 years at Mobil Oil Corporation, where she was responsible for testing and consulting activities concerning product registration; product stewardship, including assistance with Material Safety Data Sheet (MSDS) preparation; and new product development. She served as an advisor to facilities worldwide on environmental issues relating to facility operations and waste emissions, water quality, effluent discharges, stormwater, regulatory permitting, ecological impact, site assessments, and spill prevention/management.

Academic Credentials & Professional Honors

M.S., Biology, Lehigh University, 1984

B.S., Biology/Marine Science, Penn State University, 1981

Prior Experience

Senior Scientist, Managing Scientist, and Group Leader of Ecotoxicology Section, Mobil Oil Corporation, 1983-1998

Professional Affiliations

American Fisheries Society

American Society for Testing and Materials (Committees: E-50—Environmental Assessment, Risk Management and Corrective Action; D-02—Petroleum Products and Lubricants)

Society of Chemical Hazard Communication

Society of Environmental Toxicology and Chemistry

Publications

BenKinney M, Brown J, Mudge S, Russell M, Nevin A, Huber X. Monitoring effects of aerial dispersant application during the MC252 Deepwater Horizon incident. International Oil Spill Conference Proceedings 2011; 2011(1):abs368.

BenKinney M, Parscal B, Huber C, Wood B, Russell M, Nevin A, Gass M. Getting SMARTer: recommendations for improving SMART monitoring procedures based on experiences from the Deepwater Horizon response: Scientific support for Deepwater Horizon (DWH) aerial dispersant operations. International Oil Spill Conference Proceedings 2011; 2011(1):abs349.

BenKinney M, Fuller M. Launderable v. disposable protective clothing: A comparative ecology centered life cycle inventory. Proceedings WM2001 Conference, Phoenix, AZ, 2011.

Kay DP, Newsted JL, BenKinney MT, Iannuzzi TJ, Giesy JP. Passaic River sediment interstitial water Phase I toxicity identification evaluation. Chemosphere 2008; 70:1737-1747.

BenKinney MT How to assess the risk of emerging chemical contaminants in foods. Food Safety Magazine 2008, February/March.

Grives PR, Kamenick PJ, BenKinney MT, Keller JA, Novick NJ. Readily biodegradable and low toxicity railroad track lubricants. Proceedings, Locomotive Maintenance Officers Association Conference, Chicago, IL, 1992.

Cheng VM, Wessol AA, Baudouin P, BenKinney MT, Novick NJ. Environmentally acceptable hydraulic oils. Proceedings, SAE 42nd Annual Earthmoving Industry Conference, Peoria, IL, 1991.

Published Abstracts of Presentations

BenKinney MT, Pelz OX, Rand GM. Acute and chronic toxicity of unweathered and weathered MC252 oil to mysid shrimp (*Americamysis bahia*) and tidewater silversides (*Menidia beryllina*). Society of Environmental Toxicology and Chemistry (SETAC) North America 33rd Annual Meeting, Long Beach, CA, 2012.

Rand GM, Gardinali PR, Echols BS, Stubblefield W, Huddleston M, BenKinney MT, Pelz O. A comprehensive marine toxicity program to address the potential toxicity of petroleum hydrocarbons from the Deepwater Horizon incident in the Gulf of Mexico. SETAC North America 33rd Annual Meeting, Long Beach, CA, 2012.

BenKinney MT, Bruce L, Maki A, Walden T, Brown J, Ahnell A. Synthesis and evaluation of field monitoring and laboratory analytical chemistry data and toxicity test results for water and sediment samples collected during the Deepwater Horizon MC252 response. 243rd American Chemical Society (ACS) National Meeting, San Diego, CA, 2012.

BenKinney MT, Bryant WL, Edwards M, Biedenbach JM, Brown JS. Evaluating the impact of dispersed oil from the MC252 Deepwater Horizon incident based on laboratory studies of field-collected water and sediment. SETAC North America 32nd Annual Meeting, Boston, MA, 2011.

Pelz O, Brown J, Huddleston M, Rand G, Gardinali P, Stubblefield W, BenKinney MT, Ahnell A. Selection of a surrogate MC252 oil as a reference material for future aquatic toxicity tests and other studies. SETAC North America 32nd Annual Meeting, Boston, MA, 2011.

Ott G, BenKinney M. 2011. Rethinking dispersant risk assessment processes: Meeting the information needs of the public. International Oil Spill Conference Proceedings Vol. 2011(1):abs328.

Mudge SM, BenKinney MT, D. Beckmann, and Brown JS. 2011. Tracking the dispersant applied during the MC252 Deepwater Horizon incident. International Oil Spill Conference Proceedings, 2011(1):abs351.

BenKinney MT, Brown JS, Mudge SM. Evaluation of the ecological impact of surface application of Corexit 9500 dispersant on oil from the MC252 Deepwater Horizon incident. SETAC North America 31st Annual Meeting, Portland, OR, 2010.

Mudge SM, Brown JS, BenKinney M, Beckmann D, Krahforst K. Tracking the dispersant. SETAC North America 31st Annual Meeting, Portland, OR, 2010.

BenKinney MT Arora A, Swart J. Medical electronic regulations: What does the future hold? SMTA Medical Electronics Symposium, Anaheim, CA, 2008.

BenKinney MT, Swart J, Arora A. The influence of regulatory changes on unique product designs. IEEE Product Safety Engineering Society Symposium on Product Compliance Engineering, Longmont, CO, 2007.

Dall'Osto M, BenKinney M, Duggan A. Application of HPV and read across strategies to REACH. Federchimica REACH Data Perspectives Workshop, Milan, Italy, 2006.

Pittinger C, Maier A, BenKinney M, Howard K. Emerging mandates for hazard assessment and communications: Analysis of ranking systems for classifying chemical hazards. Abstract presented at Society of Chemical Hazard Communication (SCHC) Meeting, New Orleans, LA, 2004.

BenKinney M, Knorr D. Implications of new environmental trends on the construction industry. Abstract presented at the Associated Builders and Contractors Inc. Attorney's Conference, Tucson, AZ, 2001.

BenKinney MT, Eversen MG, Kay D, Giesy JP, Iannuzzi TJ, Firstenberg C. Conduct of a Phase I toxicity identification evaluation (TIE) for pore water extracted from sediments collected from the Lower Passaic River, New Jersey. Abstract presented at SETAC Meeting, Baltimore, MD, 2001.

BenKinney MT, Burnett D, Breglia R, Bui Q, Koschier F, Lapadula E, Podhasky P, Schreiner C, White R, Rausina G. Acute ecotoxicity of light alkylate naphtha to representative freshwater and marine organisms. Abstract presented at Society of Toxicology (SOT) Meeting, Cincinnati, OH, 1997.

BenKinney MT, Burnett D, Breglia R, Bui Q, Koschier F, Lapadula E, Podhasky P, Schreiner C, White R, Rausina G. Acute ecotoxicity of light catalytically cracked naphtha (LCCN) to representative freshwater and marine organisms. Abstract presented at SETAC Meeting, San Francisco, CA, 1997.

Rausina G, Leak T, Burnett D, BenKinney M, Breglia R, Bui Q, Bucksath J, Koschier F, Lapadula E, McAllister W, Podhasky P, Roy T, Schreiner C, White R. Accurately measuring concentrations of gasoline blending streams in aquatic toxicity studies. Abstract presented at SETAC Meeting, San Francisco, CA, 1997.

BenKinney MT, Barbieri JF, Gross JA, Naro PA. Acute toxicity of methyl-tertiary-butyl ether (MTBE) to aquatic organisms. Abstract presented at SETAC Meeting, Denver, CO, 1994.

Barbieri JF, BenKinney MT, Naro PA. Acute and chronic toxicity of petroleum base stocks to aquatic organisms. Abstract presented at SETAC Meeting, Houston, TX, 1993.

BenKinney MT, Guiseppi-Elie A, Novick NJ, Naro PA. Using a risk assessment approach to handle 'hot spot' remediation in an environmentally-sensitive habitat. Invited presentation at SETAC Meeting, Houston, TX, 1993.

BenKinney MT Current uses and abuses of environmental effects and fate data. Invited Keynote Panel Speaker at ASTM Meeting, Atlantic City, NJ, 1991.

BenKinney MT, Gross JS, Naro PA. A new method for evaluating the aquatic toxicity of greases. Abstract presented at SETAC Meeting, Seattle, WA, 1991.

BenKinney MT, Novick NJ, Gross JS, Naro PA. Environmental characteristics of petroleum products and base stocks: an ecotoxicology assessment. Abstract presented at SETAC Meeting, Seattle, WA, 1991.

BenKinney MT, Novick NJ, Giacobbe TJ, Naro PA. Environmental toxicity of selected non-ionic alcohol ethoxylates. Abstract presented at SETAC Meeting, Washington, DC, 1990.

BenKinney MT, Naro PA, Meeks JR. An oil/water dispersion (OWD) technique for determining acute effects. Abstract presented at SETAC Meeting, Toronto, Canada, 1989.

Selected Invited Presentations

Scott CE, BenKinney MT, Connor KT. Future evolution of polymer products and manufacturing processes—a perspective based on current trends. Society of Plastic Engineers Annual Technical Conference, Nashville, TN, 2003.

Project Experience

Product-Related Experience

Automotive

Assembled and summarized literature on the composition, use, and health effects of metalworking fluids, cutting oils, and machining oils for a confidential client as part of a litigation case.

Consulting expert for product liability case involving exposure to draw oils in an automotive assembly plant. Activities involved review of historical supplier, regulatory, and industry specification changes with time as well as review of machinery maintenance and fluid monitoring records.

Consulting expert for a product liability case involving exposure to metal working fluids in an automotive parts manufacturing facility. Activities involved review of facility and machinery maintenance and fluid monitoring records, and manufacturing practices.

Consulting expert for a product liability case involving exposure to metal working fluids in an automotive assembly plant. Activities involved review of historical product use, composition, and manufacturing practices.

Managed a project team that provided an evaluation of the impact of proposed EPA airborne particulate restriction regulations on behalf of a diesel engine manufacturer.

Prepared 'white paper' on the implications of increased ethanol use on gasoline distribution, storage, and dispense equipment and procedures.

Consumer Products

Evaluated sustainability aspects of single-use relative to multiple-use industrial application garments. Assembled available data and identified data gaps, conducted life cycle inventory analysis, and conducted impact assessments for ecological and human health, resource depletion, emissions, and solid waste generation.

Prepared environmental assessments for new veterinary products to meet U.S., European Union (EU), and international transport requirements. Assisted client with designing testing programs, summarizing generated data, and responding to regulatory queries. Assisted with global safety assessments and provided recommendations on United Nations Globally Harmonized System for Classification and Labeling (GHS) and International Maritime Dangerous Goods (IMDG) requirements for client product portfolio.

Evaluated product composition, conducted regulatory review, and assisted client with preparing internal specifications for component analysis.

Provided product evaluation support for a new concept wastewater treatment product. Assisted with study design and testing oversight, data evaluation, and product registration guidance.

Provided technical expertise as part of an expert team conducting a review of the scientific literature and critique of a regulatory ecological risk assessment report on fluorochemicals on behalf of a major chemical manufacturer. Reviewed original scientific literature and documentation used by government contractor to support regulatory conclusions regarding development of risk characterization criteria for multiple environmental compartments based on EUSES modeling.

Participated on a multidisciplinary product team focused on litigation support that evaluated records from historical product manufacturing activities, identified appropriate candidates for subsequent study, developed facilities to manufacture and evaluate quality control characteristics of the candidates, and participated in manufacturing and evaluating the candidate products.

Retained by legal counsel to prepare robust summaries on ecotoxicity and biodegradation studies conducted on client's major products for litigation support.

Provided technical input on international and country-specific regulations and guidelines for a manufacturer of a new product for consumer and industrial applications. Advised the manufacturer on appropriate testing and marketing-support strategies.

Participated on a project team providing technical input on U.S. regulations and MSDS language for a manufacturer of a broad application herbicide.

Provided technical expertise and developed testing strategies for evaluating environmental fate and ecological effects of a consumer product line designed with "green" characteristics. Assisted in development of marketing strategy, website and consumer handouts explaining the approach and environmental benefits of the redesigned product.

Identified consultant to provide company training on life cycle assessments, and worked with a team to develop a project to conduct a LCA on a company process using conventional and experimental fluids.

Provided technical expertise as part of a project team focused on evaluating a portfolio of company products and ranking them based on composition, available human health and environmental data, regulatory status (existing and future), and potential exposure during manufacture and use.

Provided technical expertise as part of a project team focused on evaluating a suite of products for classification under REACH. Identified data gaps, reviewed company data and literature, and reviewed information provided by component suppliers.

Dyes, Flavors and Fragrances, and Foods

Evaluated data and conducted modeling of physicochemical properties, environmental effects, and fate as part of the preparation of submissions for Pre-Manufacture Notice (PMN) preparation of new fragrance compounds.

Evaluated supplier documentation and composition of dyes/inks used in packaging and printing of labels and instruction manuals. Evaluated regulatory status and potential human health and environmental implications associated with use.

Provided technical expertise and developed testing strategies for evaluating environmental fate and ecological effects of products for U.S. PMN registration. Assembled data, conducted modeling, and prepared overview of potential environmental implications associated with product manufacture, use, and following disposal.

Provided technical expertise, designed and conducted field trials, and designed and oversaw laboratory testing of candidate materials with consumer product and food processing waste treatability applications.

Participated on expert panel of advisors regarding chemical threat prioritization, evaluation, and approach for food manufacturer.

Electronics and Medical Devices

Designed laboratory testing facility and conducted experiments to evaluate chemical composition on hospital surgical instruments as part of a dose-reconstruction evaluation of medical hydraulic fluid exposure.

Provided guidance on product composition and regulatory applicability in the U.S. and EU for a new medical device.

Summarized regulations, industry standards, and voluntary initiatives from around the world that would be applicable to transport, use, and disposal of a new electronic product.

Participated on a multi-disciplinary team evaluating the safety and environmental requirements for a new electronic product and its components, including its power supply, central processing unit, and polymer and metal components. Advised on local, national, and international requirements associated with transport, use, and disposal of the product.

Participated on a project team that compiled a summary of industry practices and regulations worldwide for electronics manufacturer to aid in identifying new product development opportunities. As part of this activity, identified significant regulatory trends affecting product composition, reuse/recycling and end-of-life product disposal, and eco-labeling schemes.

Participated on a multi-disciplinary team evaluating the nature and source of contamination, and the associated human health impact for a manufacturer of medical devices. Advised on chemical

characterization of residue, and strategy for additional testing and chemical analyses.

Participated on a multi-disciplinary team evaluating the safety, regulatory status, and human health and environmental impact of a new electronic product design. Evaluated composition of product, components, and subcomponents; reviewed vendor-supplied information; and determined potential exposure during use, foreseeable misuse, and following disposal. Developed recommendations for component testing and supplier procurement and documentation review. Reviewed regulatory status (current and future) of product and its components in North America, Europe, and Far East with respect to country and region-specific electronic (ROHS, WEEE, ELV) and chemical composition (PMN, HPV, REACH) regulations.

Participated on a multi-disciplinary team evaluating the safety and potential regulatory status of a new electronic product. Assembled overview of state and province-specific requirements and documentation procedures in North America for chemical composition and disposal, recycling, and reuse of product and components (including batteries).

Participated on a multi-disciplinary team evaluating the safety and potential regulatory status of a new electronic product. Assembled overview of regulatory requirements in North America and Europe for evaluating chemical composition of product and components.

Provided overview of impact of worldwide electronic regulations on chemical composition (ROHS, REACH) and disposal (WEEE) on design of a new medical device.

Participated on a team providing litigation support focused on evaluating the nature and source of contamination, and the associated human health impact following accidental exposure to a contaminated medical device. Assisted with study design, development of test data, and interpretation of study results.

Industrial Products

Provided regulatory strategy guidance and REACH pre-registration assistance to an industrial parts manufacturer. Activities included substance inventory; assembly and summarization of client, supplier, and literature data; preparation of pre-registration documents; and general REACH guidance.

Marine Transportation

Participated on a multi-disciplinary team evaluating the cause of a shipboard hydraulic system malfunction. Prepared document discussing the typical composition and characteristics of hydraulic fluids, and designed and interpreted testing of the residue remaining on affected equipment. Participated in discussions of laboratory and shipboard testing results to evaluate potential failure scenarios. Assisted in preparation of a report summarizing the results of our investigations and presented the project results and recommendations to the client.

Evaluated monitoring instrument output from shipboard oil-water separator (OWS) operations for three different vessels on behalf of a shipping company. Worked in conjunction with a marine architect to review vessel piping and tank configuration, and records for vessel operation, fluid type and use patterns, sludge generation, and bilge water discharge.

Designed and coordinated in-house and contract testing programs for product registrations in the United States, EU member countries, Canada, Japan, and Australia for transport classifications needed for international shipping by tanker (MARPOL) and by rail (RID-ADR), and for offshore drilling registration (PARCOM and OSPARCOM). Determined test species and appropriate testing approach, reviewed results, and assembled data submission packages. Responded to regulatory inquiries.

Petroleum Products and Petrochemicals

Participated on a team comparing Kuwait Environment Public Authority's (KEPA's) regulatory chapters and appendices to similar U.S. and EU regulations applicable to the petrochemical industry to assist with

development of an integrated environmental system to handle water and waste.

Provided product and regulatory support to a petrochemical company for REACH compliance. Summarized available client, supplier, and literature data; prepared environmental assessments; and conducted data gap evaluations.

Prepared document reviewing storage conditions, tank system compability, and environmental implications of releases of ethanol and blended gasoline for a confidential client.

Provided on-call services to a chemical manufacturer on a variety of product stewardship issues, including review of ecotoxicity and biodegradation data on existing products and new product candidates. Provided support on product stewardship activities in the U.S., Canada, Europe, and Far East. Developed strategy for incorporating study data into product material safety data sheets (MSDSs), and prepared MSDS language and product environmental statements for a variety of mixtures and formulated products. Coordinated laboratory testing of candidate products and interpretation of study results. Advised on modification of existing product formulations to reduce environmental impact. Reviewed documents and provided input for client participation in American Chemistry Council (ACC) activities.

Provided technical overview on status of regulations, strategies, and ecological characteristics of fluid types to project team on offshore drilling and produced water. Advised on testing program to evaluate the human health and ecological aspects of candidate drilling components and fully formulated fluids. Evaluated feasibility of using chemical analysis and/or Microtox® to provide on-site monitoring of drilling fluid and produced water toxicity prior to discharge from offshore platforms. Conducted contractor laboratory audits, and selected contractors to perform bioassay studies on fluids, produced water, and production chemicals. Reviewed results and prepared summary documents. Assisted with product development and marketing strategies.

Provided technical guidance to a specialty chemical manufacturer on product stewardship with an emphasis on environmental fate and ecotoxicology procedures. Reviewed available mammalian and ecotoxicity study data, recommended a testing program to fill data gaps, and prepared robust summaries for the EPA HPV program. Helped develop a product stewardship program for evaluating new and existing products for human health and ecological impact, and for incorporating this information into MSDSs and the hazard decision-making process.

Provided technical expertise to formulation group composed of chemists, chemical engineers, and process engineers to develop petroleum, natural and synthetic base stocks, additives, and formulated products with better ecological traits than conventional products. Established criteria for evaluating environmental characteristics of a new class of lubricants (Environmental Awareness Lubricants). Developed screening program and provided guidance on product composition and product substitutions to reduce environmental impact. Assisted marketing staff and legal department in developing sales programs and literature for marketing products based on environmental characteristics.

Power Generation and Utilities

Provided sworn testimony to Siting Council in New England regarding use and potential impact on human health and the environment associated with spillage of dielectric fluids from proposed underground power transmission lines.

Specialty and Industrial Chemicals

Reviewed product compositions and assisted client with determining applicability of their product constituents relative to REACH. Conducted literature reviews and data gap analyses.

Assisted client with reviewing sustainability aspects of their products and processes, and provided recommendations.

Evaluated composition, conducted human health and ecological risk evaluations, modeled environmental fate and effects, and prepared PMN registration package for new industrial process chemical.

Provided Canadian product registration support for a coatings manufacturer.

Reviewed product compositions and MSDSs, and assisted client with classifying substances for toxicological and ecotoxicological hazards according to the United Nations Globally Harmonized System for Classification and Labeling (GHS).

Summarized regulations and registration requirements for a new biocide in South America for a confidential client.

Assisted a chemical manufacturer with evaluating environmental characteristics associated with new product development and subsequent registration of the formulated products in Europe. Provided input on ecotoxicity and biodegradability of raw materials, intermediates, and impurities present in the finished products. Advised on the appropriate testing approach, study results, and preparation of dossiers for regulatory submission. Oversaw aquatic and biodegradation testing of candidate drilling fluid components, evaluation of results, and preparation of submission documents for OSPARCOM registration. Evaluated ecotoxicology data on existing products for compliance with EPA TSCA 8e and EU labeling and transportation assessment requirements.

Managed aquatic toxicity and biodegradation testing laboratories for freshwater and marine testing of individual chemicals, mixtures, and formulated products. Coordinated analytical characterization of materials and aqueous solutions. Prepared summary reports and regulatory submission packages.

Provided technical expertise, and developed testing strategies for evaluating environmental fate and ecological effects of individual chemicals, additive packages, mixtures, and formulated products during new product development; Material Safety Data Sheet (MSDS) preparation; competitor product assessments; and to respond to customer queries. Reviewed supplier information and supporting study results. Developed strategy and language for inclusion of ecological data in MSDSs. Provided guidance on impact of international, country-specific, and trade association regulations and guidelines. Assisted with conducting hazard assessments and addressing product liability issues.

Provided technical input, and interacted with scientists specializing in genetic toxicity, mammalian toxicity, metabolism/pharmacokinetics, inhalation toxicity, sensitization, and analytical chemistry to prepare joint human health and environmental assessments of individual chemicals, components and additive packages, and formulated products.

Provided technical expertise on international, country-specific, and “green” labeling regulations and guidelines. Reviewed draft guidelines and provided feedback to the regulatory agencies and affected clients concerning the impact of these regulations. Advised Environment Canada on environmental criteria during development of the Environmental Choice program for “green” lubricants.

Designed and supervised construction, relocation and renovation, and validation of aquatic toxicity and biodegradation laboratories for freshwater and marine testing of individual chemicals, mixtures, and formulated products with fish, invertebrates, and algae. Increased size and scope of facilities, including staffing additions, to support product development and registration activities for client on a worldwide basis. Developed study protocols to handle difficult test materials. Conducted aquatic toxicity and biodegradation studies on behalf of third party clients. Coordinated analytical characterization of test solutions. Prepared summary reports and submission packages for client and regulatory review.

Trade Associations and Consortia

Participated on a team that prepared toxicology summaries for fragrance ingredients and evaluated potential occupational exposures to fragrance ingredients during manufacture for the Research Institute of Fragrance Materials (RIFM).

Assisted with preparation of data summaries on physicochemical characteristics, environmental effects, and fate for cluster groupings of pesticide surfactants (inert ingredients) for the Joint Inerts Task Force (JITF) to fulfill data requirements under the Food Quality Protection Act.

Assisted an industry trade association with issues related to ecotoxicity, environmental fate, and registration of product formulations in the U.S., Canada, and Europe. Assisted in contractor selection, review of study protocols and draft reports, preparation of study summaries in IUCLID format, and interpretation of overall environmental impact as part of the EPA High Production Volume (HPV) and European Screening Information Data Set (SIDS) initial assessment report (SIAR) and SIDS initial assessment profile (SIAP) submissions. Advised trade association on developing environmental issues that may affect classification and marketing of their products in the future.

Reviewed aquatic test data and provided recommendations to industry trade association on aquatic testing and analytical characterization of product formulations to evaluate whether the risk assessment proposed by European regulators for this class of compounds was accurate. Designed test program to evaluate ecotoxicity of representative materials and interpreted study results. Participated in trade association meetings and prepared documents for submission to European and Canadian regulators.

Participated in a project team that summarized available mammalian and environmental study data and prepared robust summaries for the EPA HPV program on behalf of an industry trade association. Responsible for reviewing literature and summarizing studies evaluating ecotoxicity and terrestrial effects, environmental fate, and environmental chemistry characteristics.

Participated in a project team that evaluated chemistry characteristics, mammalian toxicity and environmental fate and effects for a large number of products on behalf of an industry trade association submission for reauthorization of approved use by the U.S. EPA. Responsible for helping to develop and review chemical characterization of the products into groups based on similar structure and/or modes of toxicological activity. Reviewed modeling results and study data, identified data gaps, and prepared discussion documents on the environmental impact of the chemical groups.

Represented Mobil on the American Petroleum Institute (API) biomonitoring task force for 8 years. Participated on API-WSPA-OFA task group developing water quality criteria for MTBE. Assisted in developing the strategy and testing program and in selecting contractor for MTBE studies based on extensive laboratory experience with this material.

Represented Mobil on Concawe Ecotoxicology task force for 10 years that put together a consensus on testing approaches, developed a modified biodegradation procedure, and prepared dossiers on petroleum streams for EU submission.

Served as chairman of three ASTM D-02 work groups for 5 years that focused on developing standards for evaluating the aquatic toxicity and biodegradation of lubricants. Developed draft standards for subcommittee, committee, and society review; prepared revisions; and led work group discussions at bi-annual meetings.

Served as technical advisor and contractor for the Petroleum Product Stewardship Council (PPSC), a division of the Synthetic Organic Chemical Manufacturers Association (SOCMA) regarding the design and implementation of a testing program for evaluating the aquatic toxicity of gasoline hydrocarbon streams.

Oil Spill Response-Related Experience

Coordinated dispersant environmental effects monitoring, including field sampling activities, laboratory toxicity studies and associated chemical analyses, and dispersant effectiveness reviews during oil spill response activities following the Deepwater Horizon explosion.

Provided scientific and technical editorial input to multi-organizational documents summarizing data

generated during the Deepwater Horizon oil spill response. These Operational Science Advisory Team (OSAT) reports were prepared for the U.S. Coast Guard Federal On-Scene Coordinator (FOSC) to assimilate data collected during the Response.

Consulted on environmental and natural resource damage assessment (NRDA) matters following the Deepwater Horizon oil spill, including laboratory toxicity testing.

Assisted with document review and scientific assessment of spill conditions, response actions, oil behavior and fate, and environmental sensitivity information for the coastal areas following the Prestige tanker oil spill.

Facility-Related Experience

Due Diligence Investigations

Participated on a multi-media audit team that evaluated processes and waste emissions at a refinery relative to regulatory and corporate standards.

Managed an audit team that conducted a due diligence inspection and document review of six steel mills for an insurance underwriter on behalf of a purchaser. The audit involved site inspections, records review, and evaluation of proposed remedial approaches and associated costs at the facilities.

Managed an audit team that conducted due diligence document reviews of proposed remedial approaches and associated costs at two manufacturing facilities and associated riverine systems in the Midwest.

Conducted a due diligence site inspection and document review of a fertilizer manufacturing facility on behalf of an insurance underwriter.

Facility Operation and Permitting

Assisted client with evaluating potential human health effects associated with a water treatment system malfunction, including advising on pre- and post-treatment water quality monitoring procedures.

Assisted client with reviewing sustainability aspects of their products and processes, provided recommendations regarding chemical selection and handling.

Managed an industrial hygiene human health assessment of potential effects associated with existing water quality and treatment at a large multi-use complex. Made recommendations regarding water treatment, effectiveness monitoring, and system upgrades.

Managed a project team that evaluated phthalates contributions from on-site and offsite sources, including air monitoring/deposition field surveys and modeling of source contributions.

Evaluated bacteria levels, potential exposure, and conducted a risk assessment of hazard potential of open water system. Provided recommendations to client to upgrade existing system, and monitored effectiveness of client initiatives.

Managed a project team that evaluated perchlorate use and potential offsite migration into groundwater and drinking water. Activities included on-site and offsite source identification, wind and air modeling, groundwater modeling, and water discharge evaluations.

Participated on a team evaluating the transport, fate, and potential effects of a water treatment chemical release.

Managed a groundwater toxicity identification evaluation (TIE), hydrological characterization, and

ecological risk assessment at a petroleum refining facility in California. Phase I, Phase II, and Phase III TIE investigations were completed in accordance with EPA guidance. Program included selection and supervision of project team; development of strategies for groundwater, receiving water, and sediment evaluation; coordination of laboratory toxicity testing and chemistry activities; interpretation of field and laboratory data; discussions with client technical and legal team; and negotiations with state, regional, and federal regulators.

Managed a voluntary stormwater and process water TIE at an entertainment complex. Reviewed historical biomonitoring and facility operation records; designed and managed a field sampling and testing program; and discussed study results and their implications with facility management.

Managed a Phase I TIE for sediment collected from a highly industrialized river system in New Jersey. Designed and implemented work plans and field sampling investigations, including oversight of subcontractors; management of sediment handling and laboratory biological and chemical testing activities; and technical interpretation of study results.

Project manager/technical expert for numerous stormwater, groundwater, and wastewater discharge investigations at more than 15 petroleum refineries and distribution terminals for NPDES compliance. Provided similar assistance to 3 chemical manufacturing plants, and 75 offshore drilling platforms in the Gulf of Mexico. Advised on impact of proposed/current activities on wastewater treatment performance. Conducted TIE/TRE investigations, including both in-house and contractor laboratory evaluations, site remediation, and treatability studies. Assisted with review of proposed NPDES permits, and their impact on facility operations, and with regulatory negotiations. Provided technical expertise in reviewing contractor results, assembled scientific review panel, and conducted regulatory negotiations on dredging strategies for a petroleum distribution terminal in New York.

Prepared a work plan to evaluate the potential uptake of PCBs from stormwater discharged from a manufacturing facility. Proposed study involved exposing representative species to facility discharge, with subsequent evaluation of tissues to determine rate of bio-uptake.

Managed a project team that evaluated potential worker exposure and associated health implications of treated and untreated process water at a facility. Made recommendations to company management about alterations in current procedures.

Managed a project team that developed a computer program for monitoring worldwide facility wastewater and solid waste disposal activities. Designed program, collected data from participating facilities, and prepared series of modules to allow data to be standardized, and evaluated by type of waste, facility characteristics, and geographic region.

Participated on a project team and served as task manager providing litigation support for the NPDES re-permitting of a nuclear facility in New Jersey. Managed preparation of documents on ecological characteristics of saltmarshes, saltmarsh vegetation, and wetland restoration activities. Worked in client offices with scientific experts, senior management, and legal counsel to revise documents prepared by other consultants.

Site Assessment Activities

Managed a historical reconstruction of operations, processes, and associated chemical usage as part of a facility expansion and redevelopment project. Site investigation activities included collection and evaluation of field samples and staff interviews on historical practices.

Provided input on chemical compositions of raw materials, products, and wastes handled at a former chemical manufacturing facility as part of a historical release reconstruction evaluation and site cleanup.

Provided expert analysis and testimony regarding historical activities and waste management procedures at a former fertilizer manufacturing facility in the southeastern U.S.

Developed a historical reconstruction of operations, processes, and associated chemical usage as part of a contamination source evaluation of soils and groundwater for the Bayway and Bayonne refineries in the northeastern U.S.

Quantified emissions sources at Kuwait Oil Company (KOC) operating fields and evaluated potential health risks from these emissions on nearby residential areas. The assessment used air dispersion modeling results, field-collected data, and literature and regulatory information to determine whether there was a potential risk to residents in existing and future cities from constituents in air emissions from the operating fields.

Managed the ecological site assessment activities at a former petroleum refining facility in Rhode Island as part of a team conducting a \$60 million dollar site assessment/remediation program. Designed and implemented work plans for initial phases of this investigation pertaining to impact of offsite petroleum migration, and served as technical advisor for the later stages of the project. Managed data collection and analysis by contractors; reviewed and compiled literature data on the aquatic toxicity of petroleum hydrocarbons and metals; managed laboratory sediment, water, and elutriate bioassays with freshwater organisms; coordinated field investigations including sampling and in situ studies; prepared summary reports; and participated in regulatory negotiations.

Provided technical expertise as part of a team providing litigation support focused on evaluating the environmental impact of historical refinery operations. Developed a timeline of site activities for comparison with chemical usage patterns, sampling data, and site remedial activities.

Managed the ecological and human health assessments conducted as part of an RI/FS of free-phase petroleum hydrocarbon contamination at a deepwater port in Florida encompassing fuel storage and distribution operations for 15 oil companies. Responsible for contractor oversight, including review of work plans, coordination of field sampling, data collection and analysis, aquatic laboratory and field studies, risk assessment modeling for petroleum hydrocarbons, MTBE, and metals under multiple exposure scenarios, and preparation of summary documents. Served as technical lead for team handling regulatory negotiations on soil and groundwater cleanup levels.

Provided technical expertise in developing a more cost-effective, less environmentally destructive cleanup and restoration program at a petroleum-contaminated service station and adjacent stream in New Jersey. Assisted with site assessment, including contractor oversight, interpretation of results, development of restoration options, presentation of findings to multiple regulatory agencies, and oversight of confirmatory laboratory tests.

Managed the conduct of a preliminary ecological risk assessment for a petroleum distribution terminal in Virginia. Evaluated contaminant concentrations in water and sediment relative to published toxicological screening benchmarks and made recommendations on alternative site remediation proposals.

Reviewed draft report from another consulting firm for a client to determine whether bacterial toxicity testing procedures were adequate to assess whether in situ bioremediation techniques could be used to remediate soil contamination at the site of a former manufacturing facility.

Managed an ecological risk assessment for offsite migration and contamination of an adjacent waterway in Massachusetts. Designed and implemented work plans, coordinated field sampling and laboratory testing activities, provided evaluation and interpretation of study results, and prepared documents for regulatory submission.

Participated on a project team providing an ecological assessment of a complex riverine system in New England. Task manager for preparation of a document summarizing the ecological status of the watershed, and summary reports on the effects of polychlorinated biphenyls (PCBs) on birds. Assisted with development and preparation of a document addressing shortcomings of EPA ecological risk assessment for the site. Participated in presentations and strategy discussions with client team and legal

counsel.

Managed evaluation of ecological risks associated with soils and river system in West Virginia affected by offsite migration of volatile chlorinated organic compounds released from a production facility. Assisted client team and legal counsel with preparation of a voluntary cleanup application and presentation of ecological strategy to state regulators as part of a brownfield redevelopment project.

Participated on a project team evaluating the human health and ecological risks associated with offsite migration of contaminants from a former arsenical pesticide manufacturing facility in New York. Participated in document preparation and presentation of study results to senior management and regulatory agency.

Accident Investigation

Managed a multidisciplinary project team providing litigation support focused on evaluating the cause and impact of an airborne chemical release on facility operations, emergency response equipment, and adjacent manufacturing facilities. Activities involved estimating the nature and extent of exposure; evaluating potential electrical, mechanical, and corrosive damage to facilities and response equipment; and assisting the manufacturer and their insurance underwriters with assessing the damages and cleanup costs associated with the release.

Provided technical expertise as part of a team providing litigation support to evaluate the ecological implications of a coastal tanker spill of petroleum hydrocarbons. Prepared input regarding behavior of tanker and cargo at sea, critique of alternative ports of refuge proposal, and evaluation of the activities performed during spill response.

Managed a multidisciplinary team providing litigation support focused on evaluating the source, transport pathway, and cause of an explosion in a subsurface stormwater drainage system in New England.

Managed a project team providing litigation support for a regional wastewater treatment system that received runoff following an incinerator fire. Activities involved evaluating the potential volume and composition from the emergency response and its impact on treatment system operation, and associated water and sludge quality.

Participated on three regional oil spill response teams (North and South America; Europe, Africa and Middle East; Pacific Rim) as an environmental advisor with special emphasis on wildlife rehabilitation, sensitive habitat identification, NRDAs, and cleanup strategies (including dispersants and in situ burning).