



State requirements and guidance on emerging contaminants may vary, making it challenging to comply with the disparate and dynamic regulations.



Service Areas

- Strategic planning and management
- Field sampling design and investigation
- Fate and transport
- Human health and ecological risk assessment
- Conceptual site models
- Treatment technology evaluation, engineering design, and construction management
- Regulatory negotiation

Contaminants of Emerging Concern: Studies and Strategies

Integral Consulting is a top choice for clients needing immediate answers and longer-term strategic and technical support on issues involving contaminants of emerging concern.

A wide-ranging group of chemicals generally referred to as “contaminants of emerging concern” (CECs) increasingly have been found in waterways and water systems. CECs include pharmaceuticals, chemicals in personal products such as soaps and cosmetics, and industrial and agricultural chemicals. In many cases the risk to human health and the environment from these chemicals is not clear, and standards and guidance applied by regulators may vary based on different interpretations of toxicity information.

Integral scientists have extensive experience in evaluating and managing concerns associated with a variety of CECs, including per- and polyfluoroalkyl substances (PFASs), 1,2,3-trichloropropane (TCP), and 1,4-dioxane. With our multidisciplinary expertise, we help our clients respond in a credible, cost-effective, and responsible manner to the challenges posed by CECs in the environment.

Strategic Planning and Management

Integral staff are at the forefront of research and strategic risk management related to emerging contaminants. Our staff contribute to state-of-the-science approaches and research, participate on advisory boards, and lead workshops on topics involving CECs, which ensures that our professionals are knowledgeable and up-to-date on the complex and evolving information related to CECs. Integral works with clients to design and implement strategies that reflect the latest technical knowledge and regulatory contexts. We advise clients on ways to assess and minimize potential liabilities and offer insight on methods to conduct and streamline evaluations. Integral scientists have experience providing the technical support needed for development of corporate policies and guidance to effectively manage the emerging risks presented by CECs. In addition, our engineers are skilled in CEC treatment technology evaluation and treatment system design. We also have unique experience assessing human exposure to CECs including design and data analysis of human serum biomonitoring studies and assessing site-specific exposure compared to national baseline levels.

Field Sampling Design and Investigation

Environmental sampling of CECs can present challenges—from a lack of standard analytical methods to complex sampling procedures and ill-defined or dynamic data quality objectives. Integral has experience providing recommendations for CEC sampling design, and sample collection and analysis procedures. We also perform direct oversight of contractors during various phases of environmental work such as drilling, well construction,

Contaminants of Emerging Concern: Studies and Strategies

surveying, and water sampling. Integral staff have conducted numerous field tasks related to CECs, including site characterization, soil and groundwater sampling, well gauging, air monitoring and testing, pumping tests, and pilot tests to address the challenges brought by CECs in the environment.

Fate and Transport

Our staff have the technical expertise to successfully resolve questions on the nature, magnitude, fate, and transport of many contaminants, including CECs. Integral has evaluated fate and transport as well as human health risk issues related to emerging chemicals in a variety of environmental media, and we have developed site-specific strategies for risk management.

Human Health and Ecological Risk Assessment

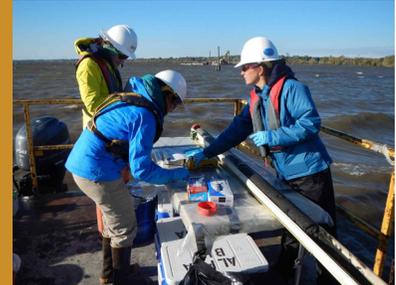
Integral's key scientists are leaders in the areas of CEC toxicology, exposure pathway analysis, programmatic strategy, data interpretation, and stakeholder engagement. We assist clients with developing strategies for risk communication at all phases of investigations. Our scientists specialize in the translation of human health toxicology assessments into appropriate state and federal environmental regulations, and the critical evaluation of inappropriate criteria. One of our key staff formerly led the U.S. Air Force Emerging Issues/Contaminants Program, and others are nationally known for their work on changes in toxicity standards and regulations. In addition, Integral's ecologists have recognized expertise in assessing injury to threatened and endangered species, and in the development and implementation of population and ecosystem models.

Conceptual Site Models

Integral has extensive experience utilizing multiple lines of evidence to establish an accurate conceptual site model used to guide remedial investigation, support risk evaluations, and characterize the nature and extent of CEC contamination. Our conceptual site models describe the temporal and spatial interplay of the physical, chemical, and biological processes that govern exposure pathways and relevant toxicity and risk assumptions. This allows us to negotiate reasonable site-specific remedies and risk mitigation plans.

Treatment Technology Evaluation, Engineering Design, and Construction Management

Integral has been engaged for its expertise on treatment technology evaluations for 1,4-dioxane, PFASs, 1,2,3-TCP, and other CECs. We are experienced in the evaluation of technology effectiveness, implementability, and cost. In addition, our engineers are veterans of past CEC regulatory cycles including the evaluation and remediation of hexavalent chromium and perchlorate. We closely track developments on *in situ* and *ex situ* remediation technologies and have completed numerous remediation system designs including those for potable water treatment systems. We also support our clients in construction procurement, contracting, and oversight.



Integral provides recommendations for CEC sampling design, sample collection, and analysis procedures. We also perform numerous field tasks.

Integral CEC experience

- Flame Retardants
- Metals
- Microplastics
- Personal Care Products
- Pesticides
- Solvents and Surfactants

Recent CEC examples

- 1,2,3-Trichloropropane
- 1,4-Dioxane
- Hexachlorocyclohexane
- Pentachlorophenol
- Perfluoroalkyl Substances

Contaminants of Emerging Concern: Studies and Strategies

Regulatory Negotiation

As new chemical products are developed, their effects on human health and the environment may not be clear. This can result in a complex and challenging regulatory environment for emerging chemicals. Integral staff are skilled in addressing the complexities and drivers related to CEC research and regulatory action. We can provide insight to clients on how emerging contaminant programs are evolving in the U.S., Canada, and the European Union. Our scientists are skilled in working with regulators and the public to gain stakeholder understanding and consensus on approaches and monitoring efforts. We have experience providing the technical support and information necessary to effectively manage the emerging risks and challenges associated with dynamic regulatory circumstances.

Selected Projects

Toxicology, Fate and Transport, and Regulatory Guidance, Perfluoroalkyl Chemicals, U.S.

Integral is leading multiple efforts involving toxicology, fate, and treatment technology evaluation and system design related to the presence of PFASs in the environment. We are also significantly engaged with regulatory agencies as new guidance and policies are being proposed. Our project responsibilities include reviewing and summarizing toxicology literature and regulatory approaches to develop groundwater and drinking water standards, and coordinating investigation for PFASs in groundwater, drinking water, surface water, soil, sediment, and sediment porewater. In addition, to better manage and quantify business risk, we have developed conceptual site models in complex regional environments to guide investigations and closely track available and developing soil and groundwater treatment technologies, and have designed PFAS treatment upgrades for existing potable water treatment systems.

Emerging Contaminants in the Great Lakes, U.S. and Canada

Integral participated in an international panel convened to address needs for assessment and management of emerging contaminants in the Great Lakes. The objective of the workshop, sponsored by the International Joint Commission Multi-Board Workgroup on Chemicals of Emerging Concern, was to seek input and refine a draft strategy for monitoring the ecosystem effects of CECs in the Great Lakes.

Emerging Issues and Contaminants Program Management, U.S.

An Integral scientist, under prior employment, served as program manager of an emerging contaminants program with a \$1.2 million annual budget. The primary responsibility of this program was to provide strategic planning and technical support to inform corporate risk management activities related to CEC environmental liabilities. This involved working with diverse stakeholders, including high level management, legal counsel, industry



Integral has completed numerous remediation system designs, including those for potable water treatment systems.



Integral is significantly engaged with regulatory agencies as new guidance and policies are being proposed.

Contaminants of Emerging Concern: Studies and Strategies

experts, regulators, and affected public. The program's risk management options addressed changing regulatory and political arenas that impacted ongoing environmental cleanup costs, schedules, and procedures and policies. Specific topics included vapor intrusion, PFASs, 1,4-dioxane, chlorinated solvents, and pesticides.

Nanomaterials, U.S.

Our staff has conducted reviews of toxicological properties of a variety of nanomaterials.

Natural Resource Damage Assessment of Perfluoroalkyl Compounds, U.S.

Integral evaluated natural resource damages under state law related to PFASs in groundwater, rivers, and lakes. To assess damages, we used resource equivalency and other economic methods. Our support included negotiations with trustees. Other projects have included an analysis of the transport and fate of a CEC in groundwater in response to a natural resource damage claim involving alleged groundwater quantity and quality impacts associated with contamination of a water supply aquifer. We provided technical consultation, developed a written report in response to the natural resource damage claim, and offered critical strategic input that resulted in favorable claim settlement terms for the client.

1,4-Dioxane *In Situ* Treatability Evaluation at a Chemical Facility, California

Integral is conducting groundwater remediation for a chemical facility in California. 1,4-Dioxane is present in shallow groundwater along with volatile organic compounds (VOCs). Because of site-specific conditions, *in situ* treatment of 1,4-dioxane is being evaluated. Integral conducted bench-scale treatability testing to determine the effectiveness of *in situ* chemical oxidation treatment of the VOCs and 1,4-dioxane in soil and groundwater. Performance of the unactivated persulfate during the bench-scale test indicates effective removal of constituents, thus providing cost and performance advantages over other treatment technology options.



Key Contacts

Janet Anderson, Ph.D., DABT
San Antonio, TX
(830) 751-2434
janderson@integral-corp.com

Bridgette DeShields
Santa Rosa, CA
(707) 636-3222
bdesields@integral-corp.com

Judi Durda
Annapolis, MD
(410) 573-1982
jdurda@integral-corp.com

Avram Frankel, P.E.
San Francisco, CA
(415) 393-4750 x850
afrankel@integral-corp.com

Philip Goodrum, Ph.D., DABT
Fayetteville, NY
(315) 446-5090
pgoodrum@integral-corp.com

Other Leads

- Steven Helgen
- Russell Keenan, Ph.D.

Full resumes are available at
www.integral-corp.com.

