UNITED STATES DISTRICT COURT
WESTERN DISTRICT OF WASHINGTON
AT SEATTLE

SIERRA CLUB; and CENTER FOR ENVIRONMENTAL LAW AND POLICY,

Plaintiffs,

and

THE SPOKANE TRIBE OF INDIANS,

Plaintiff-Intervenor,

v.

DENNIS McLERRAN; GINA McCARTHY, and UNITED STATES ENVIRONMENTAL PROTECTION AGENCY,

Defendants,

and

SPOKANE COUNTY; KAISER ALUMINUM OF WASHINGTON LLC; and STATE OF WASHINGTON DEPARTMENT OF ECOLOGY,

Defendant-Intervenors.

No. 11-1759BJR

DECLARATION OF ALLAN CHARTRAND



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I, Allan Chartrand, declare the following based on personal knowledge to which I am competent to testify:

1. I have prepared this declaration at the request of plaintiffs Sierra Club and Center for Environmental Law & Policy to support their motion for additional relief and to aid the Court in understanding technical and scientific issues important to this matter. I am an independent consulting toxicologist, environmental scientist, and an expert in the subject area of the Clean Water Act, the NPDES program, and Total Maximum Daily Load (TMDL) issues in particular. I have developed or contributed to developing many types o TMDLs in numerous areas throughout the country. I have also worked on numerous PCB projects over the course of many years, and I am knowledgeable about the chemistry, toxicity, environmental fate properties of PCBs in the aquatic environment, and I am knowledgeable about relevant regulatory requirements and toxicity-based benchmarks. I provide consulting services in the area of toxicology, risk assessment, water quality, and contaminated sediment. My current CV is attached.

2. I earned and received a Bachelor of Science degree from the University of California, Berkeley, in entomology in 1978 and a Master of Science in Public Health degree in toxicology from the University of California, Los Angeles, in 1982. I was awarded a Pre-Doctoral fellowship in 1982 from the Rotary Foundation International and performed research and coursework toward a Doctorate in toxicology at the Hebrew University in Jerusalem, Israel, but did not complete this degree.

3. Since that time I have been continually practicing professionally in the field of toxicology and risk assessment, frequently in a consulting capacity, specializing in ecotoxicological effects of environmental contaminants PCBs to fish, wildlife, and within the



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aquatic and marine environment in general, emphasizing surface water, sediment, and biological tissue. I have been practicing in this field of expertise for well over 30 years. I have conducted numerous human health and ecological risk and hazard assessments, and evaluated potential environmental effects associated with exposure to a wide range of organic contaminants, including PCBs, pesticides, toxic metals, and many others. I have also conducted risk assessments and toxicity evaluations for nutrients such as nitrates and ammonia and for a variety of pesticides such as phenoxy herbicides, DDT and related compounds, organochlorine and organophosphate pesticides, and related compounds. I have also been involved with many projects related to dioxins/furans, persistent organic pesticides, including Agent Orange, and numerous other persistent, bioaccumulative, and toxic (PBT) compounds. I also have very extensive project experience with other organic contaminants such as VOCs, PAHs, and various petroleum derivatives.

4. Earlier in my career (1980's) I also served as a State water quality regulatory scientist for the Los Angeles Regional Water Quality Control Board in California, and this background provided me with experience related to water quality permit writing and enforcement, and allowed me to develop expertise in the areas of Clean Water Act, TMDLs, NPDES, and related regulatory requirements, as well as the scientific thinking and rationale behind many of these regulations. I also served as an expert witness on behalf of the US Department of Justice and National Oceanic and Atmospheric Administration (NOAA) in the Montrose Chemical DDT trial during the early 2000's, testifying in matters relating to toxicity, bioaccumulation, regulations, and environmental fate and transport of DDT, and secondarily of PCBs, within the Southern California Bight. More recently I was deposed and testified in court



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as an expert witness on a Clean Water Act case involving illicit discharges of PCBs and other contaminants to the waters of the Puget Sound in Seattle, Washington.

5. As a result of my expertise and years of experience as a practicing toxicologist, including extensive laboratory testing, field work, and academic and background, I became eligible under the requirements of the American Board of Toxicology (ABT) to sit for the written examination to become a Diplomate (DABT). I passed this exam in 1997 and became certified as a Diplomate, which requires a comprehensive level of understanding of toxicological principles, and confers a high level of legitimacy and peer acceptance to a practicing professional toxicologist.

6. In addition to information and knowledge I have accumulated through my career as a toxicologist, the facts and data I considered in preparing this report includes the documents cited in the Reference section of this declaration.

**SUMMARY**

**7.** I have examined relevant materials concerning the issue of developing a TMDL for PCBs in the Spokane River watershed. In summary, my declaration concludes: (1) that EPA and Ecology should fully implement and incorporate all the tools at their disposal to expeditiously prepare and implement a TMDL for PCBs in the Spokane River watershed; (2) Using rationale from its own guidance documents, EPA should focus on developing a TMDL rather than temporizing or rationalizing to avoid or delay development of the TMDL process; (3) EPA and Ecology should phase the TMDL process, consistent with EPA's extensive guidance, beginning with a Phase 1 TMDL, and progressing as more information becomes available; (4) A very adequate and extensive data base for PCBs in the Spokane River watershed has been developed, which is entirely adequate for TMDL development in a manner consistent with



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EPA's 2011 guidance on PCB TMDLs; (5) The Spokane River Regional Toxics Task Force (TTF) may plan an important role in identifying and controlling sources of PCBs, expanding the data set for PCBs in the watershed, and continuing to work on reductions in PCB discharges in a TMDL context; (6) It is important to continue to emphasize and monitor solids and "conventional" pollutant removal and reduction from discharges, as they are important to continuous PCB reductions, although solids removal and reduction, as required of Spokane River dischargers under the dissolved oxygen TMDL, is inadequate in and of itself to sufficiently reduce or eliminate PCB loadings; (7) Although EPA focuses on achievement of water quality standards as benchmarks for regulatory compliance and source reduction goals attainment, it is important to note that Spokane River 303(d) water body impairment listings for PCBs are based on fish/shellfish tissue data, which are an actual measure of biological exposure (as opposed to water quality data), tissue data should also be considered in assessing compliance and developing goals for attainment; (8) Any reasonable milestones toward restoration of the Spokane River to compliance with water quality standards should focus on PCB data for sediment rather than or in addition to water column data, as sediment contamination is the crucial vector for tissue contamination and PCBs are easier to detect and track in sediment because they tend to sorb out of the water column and concentrate in sediment, and Washington State has sediment criteria that are actually enforceable, similar to water quality criteria.

**PHASED APPROACH PCB TMDL DEVELOPMENT**

8. The following discussion provides more detail on why EPA should move forward with developing and implementing a PCB TMDL for the Spokane River watershed without delay.



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9. At Dkt. 129-1 p. 12, EPA states that "the schedule does not contemplate immediate initiation of a [PCB] TMDL because, in EPA's judgment, developing the TMDL at a later date is justified by the reductions that will occur and the data that will be gathered, as well as the like changes to relevant water quality standards." EPA also states (page 1) that a PCB TMDL developed later would be more defensible than any developed "in the interim," thus asserting that insufficient data, means, and information currently exist to develop a PCB TMDL at this time.

10. EPA is incorrect. Even if large volumes of PCB data were not available, it would still be possible to develop and enforce a Stage 1 TMDL framework, including quantitative WLA/LAs, to develop a framework for point and non-point source attainment of appropriate benchmarks. Then, as more data become available, it will be possible to continue to fine-tune attainable goals for source reduction. Although part of the PCB discharges to the watershed are as yet unidentified (estimated to be 66% of PCB sources by the Spokane River Regional Toxics Task Force (TTF) [2015]) with the Phase 1 TMDL framework in place it will become easier to identify individual sources and quantify and attain reduction goals.

11. It is not necessary or desirable to establish a TMDL, especially for a complex multi-jurisdictional watershed, as a single-phased, simple process. In fact, among EPA's wide variety of guidance documents for preparing and implementing TMDLs (e.g. EPA [2011], EPA [2006], and EPA [1991]), TMDL development and implementation is promoted as a flexible yet invaluable process that provides a framework for developing, enforcing, and attaining source reduction goals for a specific pollutant or group of pollutants. The *PCB TMDL Handbook* (EPA 2011) promotes this flexibility and phasing, recognizes uncertainty, encourages an adaptive implementation approach, and allows for adjustment and refinement of the TMDL framework as



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new data (e.g. a previously uncharacterized PCB discharge) become available. Thus a phased approach to TMDL development is conducive to setting, refining, and meeting increasingly effective reduction goals over the course of time as new tools and new information become available.

12. EPA's statement (Dkt. 129-1 p. 13) that nonpoint source control will "likely not be done" unless the Spokane River Regional Toxics Task Force (TTF) continues to do this work is at odds with TMDL law and practice. EPA and Ecology have the appropriate authority through the Clean Water Act and elsewhere to see pollution control measures implemented. For point sources, the primary mechanism is the inclusion of numeric effluent limitations derived from TMDL-established wasteload allocations (WLAs) in NPDES permits. TMDLs that depend on nonpoint source reductions must include "reasonable assurances" that these reductions will occur based on the implementing agencies' exercise of their authorities under any regulatory regime, including, for example, land use (zoning) regulation, landowner incentive programs, grants for direct improvements to control pollution, and the state's authority to regulate nonpoint sources via permit or rule, as well as water quality trading between WLAs, (for point sources) and LAs, (for nonpoint sources). The TTF may well continue to work on collective reductions in PCB inputs, evaluate the efficacy of nonpoint control measures, and continue to develop and compile a comprehensive database for PCB in the watershed to the extent possible. Indeed, work of this nature is imperative to the adaptive implementation concept typically underlying phased TMDLs, and a collaborative body comprising dischargers, regulators, and river users, such as the TTF, is a preferred mechanism for achieving these objectives.



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**SUFFICIENCY OF INFORMATION RELATED TO PCBS**

13. Elevated concentrations of total PCBs are and have been historically found in Spokane River consistently in a number of environmental media, including river water, sediments, biological tissue, wastewater effluent, stormwater, and others. Numerous investigations have characterized this contamination along many reaches of the river (example reports include Johnson 2001, Ecology 1995, Anchor 2004). In addition, Ecology's 303(d) impaired water body listings for total PCBs (found at www.ecy.wa.gov/programs/wq/303d/index.html) show fifteen waterbody segments or "reaches" of the Spokane River, Lake Spokane, and Little Spokane River on the 303(d) list for PCBs in fish tissue, which is a clear indication of water quality impairment for PCBs. Most of the Spokane River fish tissue analyzed for PCBs exceeded state surface water quality standards established to protect beneficial uses of surface waters, including fish consumption, and fish advisories were issued in 2003 for reaches of the river (Spokane Regional Health District and WA Department of Health, 2003).

14. The Spokane River has also been subjected to a major CERCLA action for PCBs at Avista Development, Kaiser Aluminum, and other Spokane sites (Anchor 2004, Anchor 2005a, Anchor 2005b, Ecology 2005), which included the development and evaluation of substantial data and additional information. Ecology's (2011) *Source Assessment for PCBs* 2003-2007 presents perhaps the most comprehensive, voluminous and relatively recent compilation of PCB data for surface water, sediment, suspended particulates, industrial and municipal effluent, stormwater, and biological tissue, along the river. More recently, LimnoTech, serving as advisor to the TTF, prepared a data assessment for PCBs in the watershed (Limnotech 2013), and concluded that the watershed has benefitted from a robust data base for PCBs, which



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provides a good estimate of quantities of PCBs entering the river from stormwater, WWTPs, and other sources. They further concluded, however, that PCB sources are very diffuse throughout the watershed, and that data needs include source identification in stormwater, upstream sources of PCBs, and contributions from atmospheric and groundwater sources. They also proposed (LimnoTech 2014) a synoptic data collection strategy as part of the TTF's comprehensive plan to supplement data and reduce PCBs in the Spokane River. According to information provided in EPA's plan, a monitoring effort is underway to fill these data gaps and should be completed by the end of 2017.

15. The summary above clearly shows that a robust and even comprehensive data set for Spokane River PCBs has been developed and is available from the sources summarized above along with many others. In fact, as much or more data are available for PCBs in the Spokane River watershed than are often available for other PCB-impaired watersheds throughout the country for developing a complex, multi-jurisdictional TMDL, including those cited as exemplary by EPA's 2011 *PCB TMDL Handbook*. Consistent with this PCB TMDL guidance, it simply is not necessary to have a large dataset in order to conduct a TMDL and to set WLAs and LAs per 40 CFR 130.2(i), as the goal of the TMDL is to set allocations for the watershed and a timetable by which these allocations must be attained. Three examples from around the country for PCB TMDLs identified by the *PCB TMDL Handbook* as examples include a TMDL set for San Francisco Bay, CA (EPA 2008); a PCB TMDL established for the Delaware River (EPA 2003), and a PCB TMDL established in Eastern Washington State (Ecology 2007). After reviewing these documents, it was clear to me that these watersheds did not necessarily have larger or more extensive data sets for PCBs than the Spokane River. Moreover, these TMDLs were highly complex, in some cases spanning multiple states and other jurisdictions, and



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multiple targets were used to define impairment and to set allocation goals. The above discussion clearly runs counter to EPA's (2015) current assertion that inadequate data have been collected to date to support development of a TMDL for PCBs.

16. EPA (Dkt. 129-1) states that advanced solids removal from WWTP effluent to meet the nutrient-reduction requirements of a dissolved oxygen TMDL will provide *de facto* reductions of PCB loadings to the river, implying that the solution to the problem is currently underway, albeit indirectly, as PCB inputs and concentrations in the watershed have dropped dramatically during recent years (shown in Ecology [2011]). Two factors are at play here: 1) that total suspended solids (TSS) controls for nutrient reduction are not equivalent to technology and BMPs to control PCBs; and 2) that the TMDL is integral to setting targets, and it is inappropriate to wait for non-PCB-targeted facility upgrades before setting PCB reduction requirements for NPDES permittees. EPA's discussion (Dkt. 129-1 p. 6) lends support for this thinking, but doesn't focus on the fact that PCBs have been banned from the products they mention since the 1970s, and that attenuation is therefore inevitable.

**BENCHMARKS AND TRIGGERS**

17. In its discussion on proposed scheduling of the PCB TMDL issue, EPA (Dkt. 129-1 pages 11 to 13) assigns thresholds for further TMDL deferral solely on the attainment of ambient water quality criteria. However, given the chemical and physical nature of PCBs, attainment of sediment and biological tissue criteria are also important and, indeed, at least as important as ambient water criteria. Ambient criteria have a long history with EPA or being the preferred benchmark, but PCBs are unique because of their chemical and environmental properties. Also, tissue residue concentrations form the basis for the State's 303(d) listings as well as the fish consumption advisories developed for the Spokane River. The exposure of fish to



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contaminated sediments, not ambient water, is the primary vehicle for tissue contamination, and the acute and chronic toxicity of PCBs in sediments is well documented. Also, tissue residue analysis is a measure of actual exposure, which is toxicologically significant, rather than merely documenting the presence of PCB residues in the environment,. Moreover, it is far easier to regulate PCBs in sediment than in the water column, as PCBs are hydrophobic, sorb very strongly to sediments, and are easier to detect and quantify

18. The EPA's plan to defer TMDL development to an indeterminate point in the future if water column PCB concentration targets are met is unscientific and unsupportable. In addition to overlooking the significance of the more direct relationship between sediment and tissue contamination and non-attainment of PCB WQS criteria, the EPA benchmarks are somewhat ambiguous and may already be actually attained in some cases. For example, Table 44 in the *Spokane River PCB Source Assessment* (AR at 164) shows that 2003 – 2004 water column data indicates that in-river concentrations at the stateline, Upriver Dam, Monroe St., and Little Spokane River are 106 pg/L, 117 pg/L, 199 pg/L, and 199 pg/L, respectively, which are already below the 200 pg/L target that EPA would set for the end of 2020. Dkt. 129-1 at 11. Further, the wording of the thresholds in EPA's plan, that determining attainment of the numeric threshold is "based on the annual central tendency of the preceding year" is vague; it does not clarify what data is to be averaged, does not characterize statistical distribution, or whether any weighing of data will be done. More importantly, it does not identify the specific locations for this determination. Under the formulation presented by EPA's plan, there is far too much discretion left to EPA to determine whether thresholds or benchmarks are met.

19. In addition to in-stream PCB concentration-based thresholds based on attainment at specified locations on the river, including on the Spokane Tribe's downstream section, I



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recommend that any plan for deferring the PCB TMDL (which, as explained above, is not necessary or appropriate) be based on trends for and compliance with PCB sediment criteria at specified, representative locations, as well as on assessment of fish tissue concentrations. These measures would provide a more comprehensive understanding of the attainment of PCB thresholds, and provide a more relevant and scientifically rigorous picture of progress towards compliance with PCB tissue criteria.

Signed this 2nd day of October, 2015, under penalty of perjury under the laws of Washington.

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Allan B. Chartrand

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# Allan B. Chartrand, DABT

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## SUMMARY OF EXPERIENCE

Mr. Chartrand has approximately 30 years of experience as a practicing environmental scientist and project manager, performing a wide variety of environmental projects. Mr. Chartrand's technical experience and expertise extends to investigation and evaluation of contaminated sites, risk assessment, ecological restoration, regulatory compliance and permitting, sampling and monitoring of sediment, dredging and water quality projects, project and data QA/QC, and toxicological services. Extensive experience in performing projects under CERCLA, MTCA, NRDA, CWA, OPA, and numerous other regulations, including extensive international experience. Experience with wide-ranging public and private sector clientele, including federal agencies (NOAA, EPA, USACE, USAID, USGS, NAVFAC) and private sector clients. Excellent verbal and written communication, mentorship, and leadership skills. Research background in toxicology, chemistry and life sciences, with foreign language background and over five years of living and working abroad.

## PROJECT EXAMPLES (CONTAMINATED SEDIMENT)

***Contaminated Sediment Dredge and Remediation Characterization and Planning for Former Pulp and Paper Site in Puget Sound, Port Gardner, WA, 2013 to present.*** Mr. Chartrand is currently serving as the lead environmental scientist and project toxicologist in support of a confidential industrial client group for the purpose of characterizing sediments that have been contaminated over the course of decades by industrial discharges related to pulp and paper industrial processes. This large waterfront property, contaminated with wood debris and other contaminants, is being prepared for sale by the former owner to an industrial buyers' group. Mr. Chartrand worked with the USACE Seattle District's Dredge Material Management Office representatives to prepare a Sampling and Analysis plan, and he was responsible for oversight of chemical, biological and physical data collection, data analysis, and data interpretation. He works closely with a client working group consisting of managers, attorneys, and other scientists and engineers. He has negotiated specific technical requirements with oversight agencies, and has earned a level of credibility and trust with the agencies because he has worked with them on many projects over the course of years in and around the Puget Sound.

***RI/FS Field Sampling Plan and NRDA Injury Assessment Support for Offshore DDT Contamination in Sediment, Palos Verdes Shelf, EPA Region 9 and State Water Resources Control Board, Los Angeles, CA.*** Provided technical input to the Palos Verdes Shelf offshore sediments DDT project over the course of more than 20 years (intermittently) in various capacities, including expert testimony at the USDOJ trial with Montrose in support of the NRD claim. In 2009-10, Mr. Chartrand served as sediment investigation technical lead and toxicologist for co-designing a Field Sampling Plan for characterizing DDT in surface and subsurface sediments (post-ROD) adjoining the Los Angeles County outfalls and along established monitoring transect isobaths.

### Experience and Knowledge

- Recognized expertise in contaminated sediment issues related to both remediation and dredging.
- Has worked on over 100 CERCLA/MTCA RI/FS and risk assessment projects.
- Extensive project management as well as technical leadership experience.
- Extensive background with both private and public sector clients.
- Former water quality regulatory scientist for State of California (RWQCB).
- Expertise in contaminated sediments, water quality, toxicology, chemistry, biology, permitting, planning, restoration and remediation planning.

### Education

BS, Entomology, University of California College of Natural Resources, Berkeley, CA.

MSPH, Environmental Toxicology, University of California School of Public Health, Los Angeles, CA.

PhD work (incomplete) in Toxicology, Hebrew University, Jerusalem, Israel

### Certifications

- Diplomate, American Board of Toxicology (exp)
- HAZWOPER - 40-Hour OSHA 29 CFR 1910.120 (current since 1990)
- California Department of Fish & Game Scientific Diver Certification Program (through NAUI)

- Negotiated with USEPA and USGS to obtain approval for field sampling plan; data used to support pre-remedial design following evaluation of alternatives; technical approach was innovative, cost-effective, and incorporated historical data base developed as part of sediment investigations.
- During an earlier phase of the project, including NRDA injury assessment, Mr. Chartrand led an interdisciplinary team of scientists to design and perform a comprehensive, multi-year investigation of fate and effects of DDT-contaminated sediment and fish/shellfish in Santa Monica Bay.
- Served as sampling crew leader and principal investigator for multi-year investigation of both sediment and biological sampling in both shallow and deeper basins in Santa Monica Bay (up to 1,000 m in depth) sampling locations.

***Lower Duwamish River Superfund Site Injury Assessment in Support of NRDA—NOAA and Muckleshoot Tribe, Seattle, WA.*** Extensively involved in the investigation and NRDA injury assessment of the Lower Duwamish waterway in Seattle, WA., to develop an injury assessment work plan to investigating injury and potential claims along the waterway associated with extensive sediment contamination of PCBs, PAHs, and numerous other contaminants in waterway sediments and biological tissue. This investigation involved conducting chemical, toxicological, and biological sediment evaluations, characterized fate and effects of sediment-associated contaminants in the waterway, and participating in risk-based cleanup evaluation for sediments. He closely coordinated with other trustee and oversight agencies, especially NOAA, in evaluating resource injury and laying the groundwork for subsequent mitigation and restoration planning. He was also involved in several phases of the ecological risk assessment of contaminated sediments on behalf of King County Department of Natural Resources in the waterway in the vicinity of the Duwamish Diagonal and Norfolk Way CSOs, which was incorporated into the larger context of the subsequent RI/FS and NRDA injury assessment.

***Machado Lake Dredging and Rehabilitation Project, City of Los Angeles,, Bureau of Engineering, Los Angeles, CA.*** Served as the technical lead for a large multidisciplinary team on a hydraulic dredging project, focusing on surface and subsurface characterization of contaminated freshwater sediment and evaluation of placement options as part of CWA Section 404, Section 10, and TMDL State requirements.

- Successful negotiations with oversight agencies led to a streamlined, cost-effective sampling and analysis plan for sediment core sampling.
- Nearshore fill (preferred placement option) would save the client up to $8M; assisted in selecting appropriate polymer and geotube design for optimizing return water quality after dewatering.

***Characterization and Remedial Design of Agent Orange in Soil and Sediment, Da Nang Airport, Vietnam, USAID.*** Lead scientist in preparing a field sampling plan and evaluating the distribution, fate and potential toxicity of 2,3,7,8-TCDD [dioxin] residues (active ingredient of the phenoxy herbicide defoliant Agent Orange) remaining from the Vietnam War.

- Field sampling plan designed to optimize selection of the most effective of three remedial action alternatives candidate remedies.
- Interpreted existing dioxin database developed through previous investigations to enhance understanding of nature and extent of contamination before collecting new field data.
- Co-designed a streamlined, cost-effective investigation of Agent Orange dioxin and served as field team co-leader in collecting soil, sediment, surface water, and groundwater samples for dioxin and other analyses in Da Nang.

***Commencement Bay Waterways Superfund Site Injury Assessment in Support of NRDA—Tacoma, WA***
Mr. Chartrand represented several private sector PRP clients in providing technical input on injury assessment investigations and planning to investigate resource injury along various waterways within the Commencement Bay Superfund site. Extensive investigation of numerous contaminant mixtures in waterway sediments and biological tissue, including chemical, toxicological, and biological sediment evaluations. Mr Chartrand served on a number of work groups tasked with evaluating data in support of injury assessment and risk-based cleanup evaluation for sediments. He closely coordinated with trustee and oversight agency groups in determining the most effective strategies for evaluating resource injury, remediation, and mitigation and restoration planning.

***Tributyltin (TBT), Aquatic Ecological Risk Assessment, Puget Sound Sediments (U.S. Army Corps of Engineers, Seattle District), WA.*** This risk assessment was conducted as part of the PSDDA process of evaluating contaminated sediments within the Puget Sound. TBT was a new contaminant of concern to PSDDA. This report was used to build the database and support development of guidance documents in Puget Sound for toxicity of specific compounds in sediments.

***Ecological Risk Assessment for Contaminated Sediments at Mare Island Naval Station (U.S. Navy CLEAN II Program), EFA West, Vallejo, CA.*** Served as lead toxicologist for designing field investigations and conducting an ecological risk assessment for PAH-contaminated sediment and other units at the former Mare Island Naval Station in Vallejo, California. Used a unique accelerated cleanup strategy approach, which identified 'presumptive remedies' for contaminated areas, including extensive chemical and biological testing, in effect using the FS evaluation process to drive sediment characterization.

***Baseline Water Quality Characterization for Copper Concentrate in Marine Sediment (Phelps Dodge Mining Corporation), Copiapo, Chile, South America.*** Co- investigator/toxicologist for this marine water/sediments study to determine whether a proposed marine transfer facility would cause harmful effects to the marine environment. Baseline benthic biology, sediment toxicity testing, and water column/sediment chemical measurements were taken and a risk assessment performed to establish baseline conditions at the mine tailings site.

***Field Investigation and Ecological Risk Assessment for Contaminated Sediments in Devil's Swamp (NPC, Inc.), LA.*** Lead toxicologist in supporting NPC on this project, which involved extensive contamination of sediments by petroleum distillates, hexachlorobutadiene, hexachlorobenzene, and other petroleum derivatives. A key focus of the project was the potential for food web effects via bioaccumulation of organic contaminants.

***Sediment Characterization and Suitability Determination for Dredge Material Placement in Lower Columbia River, Warrenton, OR.*** Served as the principal investigator in designing, performing comprehensive sediment data collection, analyzing and interpreting the data, and providing recommendations regarding placement suitability within the Lower Columbia River.

- Wood debris identified as part of the first phase of sediment characterization, which required a subsequent evaluation of the toxicity of wood debris in sediment using current testing techniques.
- Prepared a draft DMMP for placement options near the mouth and on both the Washington and Oregon sides of the Columbia River. Required numerous interagency meetings and negotiation with multiple stakeholders at local, regional, state and federal levels.

***Sediment and Water Quality Evaluations for Environmental Dredging Project for Docks 14-20, Port of Stockton, CA.*** Served as project manager and senior scientist for evaluating surface water and sediment quality, toxicity analysis and potential short- and long-term biological effects associated with a long-term environmental dredging project on the San Joaquin River. Project conducted in support of the Port's plans to expand this portion of the riverfront and involved detailed sediment, dewatering, water quality, and toxicological evaluation of the sediment requiring dredging and monitoring.

***Draft Work Plan for Pilot Study of Remedial Cap Design, Sulfur Bank Mercury Mine, USEPA Reign 10, Clear Lake, CA.***
Served as the lead sediment toxicologist in preparing a work plan concerning evaluation of contamination potential from the proposed cap (i.e. due to mercury biomethylation) due to pore water seepage in the sediment-water interface to other reaches of Clear Lake, including potential threats to fishing and other beneficial uses.

***Draft Dredge Material Management Plan for Lower Willamette River, USACE Portland District, Portland, OR.*** Assisted in preparing the evaluation of dredge placement alternatives in the Lower Willamette based on sediment characterization from various locations in the federal Navigation Channel. Placement alternatives included unconfined open water, nearshore/beach nourishment placement, upland/CDF placement, and flow-lane placement alternatives.

***Contaminated Sediment Evaluation, Lower Willamette Working Group, Portland Harbor Superfund Site, Portland, OR.*** Provided senior consulting guidance and assistance, including review and interpretation of chemical and toxicological data and preparation of technical memoranda, for private corporate client relating to contaminated sediment issues on or adjoining client property in the Lower Willamette River.

***Comprehensive Survey of Contaminated Sediment and Fish/Shellfish in Southern California Bight (Los Angeles Regional Water Quality Control Board), CA.*** Served as the lead scientist and principal investigator in conducting a multiyear study of the effects of DDTs and PCBs in the southern California marine environment, as a corollary to the Montrose Chemical NRDA action. Sediment, fish, and shellfish samples were taken from Santa Monica Bay and the Channel Islands to conduct this investigation.

***Porewater and sediment toxicity associated with groundwater discharge for confidential industrial client, Columbia Slough, Portland, OR.*** Designed and implemented porewater survey and toxicity evaluation of groundwater and its potential impacts to the receiving waters of the Slough at a former smelting facility in Portland, OR. Current status of project is to evaluate how

groundwater contamination from former sludge ponds can potentially contribute to focused Feasibility Study and assist with designing remedial alternatives for the site.

***U.S. Navy Everett Homeport 401 Water Quality Certification Program, EFA Northwest, Silverdale, WA.*** Served as lead scientist in conducting multi-year environmental monitoring program of surface water, sediment, and biological tissue for the purpose of characterizing baseline conditions in the area of the Homeport prior to construction. This report was incorporated into the 401 Water Quality Certification issued to the Navy from the WA Department of Ecology.

***Characterization of Contaminated Sediments in Chena River, Fairbanks, AK.*** As part of a TMDL study and watershed management plan on behalf of USEPA and in collaboration with Alaska Dept. of Environmental Conservation, Mr. Chartrand served as Project Manager and senior scientist in preparing the QAPP and work plans, in leading field sampling operations, in negotiating requirements with EPA and ADEC, and interpreting the resulting data in light of TMDL requirements for this impaired water body.

***Remedial Design/Remedial Action Approaches for Evaluating Contaminated Sediments in Industrial Settings (confidential industrial client), three locations in the US (WA, OR, and MD).***
Served as lead sediment specialist and task manager in developing streamlined, cost-effective RD/RA approaches for developing contaminated sediment sampling design for three complex industrial sites throughout US, including grab sampling, coring, chemical, biological, and lithological evaluations. Involved detailed communication and negotiation with regulatory agencies and stakeholders.

***RI/FS and Baseline Risk Assessment for Contaminated Sediment Site in Eagle Harbor, Puget Sound, Seattle, WA.*** Served as toxicologist and risk assessor on behalf of the WA Dept of Transportation in evaluating the long-term effects of creosote, mercury, and other contaminants of potential concern to marine and estuarine communities in subtidal waters of Puget Sound adjoining the former Wyckoff creosote facility.

***Ecological Risk Assessment for Columbia Slough Sediments (City of Portland, Bureau of Environmental Services), OR.*** Served as principal scientist for evaluating existing data and designing a field study for use in human health risk assessment for the site. The focus of this risk assessment was to evaluate the potential for biouptake of petroleum hydrocarbons into edible fish and shellfish organisms in the Columbia Slough. Risk assessment conducted to implement source control and eventual cleanup strategies to protect human health and the environment.

***Remedial Investigation/Feasibility Study, Contaminated Sediments Operable Unit (U.S. Navy CLEAN II), Long Beach, CA.*** As principal investigator, negotiated regulatory requirements with oversight agencies, designed and implemented extensive multi-phased field investigations of the Shipyard, authored the Remedial Investigation report, conducted baseline risk assessment, formulated risk-based remedial strategies for Long Beach Naval Station and Shipyard, managed project team, and presented investigation results and conclusions to internal and external agencies.

***Ecological Risk Assessment of Contaminated Sediments at Castro Creek in Chevron Oil Refinery, Richmond, CA.*** Served as senior scientist in evaluating data and reviewing ecological and human health risk assessment for large, multi-year risk assessment relating to evaluating the potential effects of petroleum-contaminated sediments on Threatened & Endangered and other species. This risk assessment considered the potential bioaccumulation and food web effect of uncommon organic pesticide and petroleum derivatives, important for the FS and remedial alternative evaluation.

***Risk-Based Evaluation of Contaminated Freshwater Sediment at Port Quendall Facility (Muckleshoot Indian Tribe), Lake Washington, WA.***
Served as lead scientist on behalf of the Tribe in providing oversight on the design and characterization of the contaminated sediments investigation at this facility. Duties included interpreting chemical and biological data with a focus on evaluating potential human health toxicity from the sediments and preliminarily evaluating remedial alternatives for wood waste-containing sediments.

***Risk-Based Evaluation of Remedial Alternatives for Contaminated Sediments, Lake Onondaga, NY (confidential industrial client).***
Served as senior scientist in toxicologist and risk assessor in evaluating potential remedial alternatives for contaminated sediment based on contamination and risk assessment.

## PROJECT EXAMPLES (TOXICOLOGY AND RISK ASSESSMENT, CERCLA/MTCA RI/FS)

***On-Call Technical Services Contract for Puget Sound Partnership, Seattle WA.***

Served as the technical team lead for a large multidisciplinary team, including assistance as managing sediment specialist for Puget Sound sediment issues. Attended Partnership Science Panel and Leadership Council meetings, Topic Forums, and co-hosted a symposium on multiple key issues affecting the Puget Sound.

***Bunker Hill CERCLA Site Operable Units 2 and 3, USEPA Region 10, Kellogg, ID.*** Prepared post-remediation guidance for O & M, including post-remedial restoration, for key units within OU2 (the "Box") and the Coeur d'Alene River basin. Assisted in preparing work plan for pilot study for characterizing and performing a dredging pilot study for contaminated sediments from depositional zones within the Coeur d'Alene River.

***White Paper and Toxicity Reduction Evaluation Work Plan, Puerto Rico Association of Sewage Authorities (PRASA), San Juan, Puerto Rico.*** Served as the lead sediment toxicologist in researching and evaluating the most effective way to use whole effluent toxicity (WET) testing data to evaluate the most effective approach to using this data to satisfy the EPA requirement for performing Toxicity Reduction Evaluation (TRE) studies when toxicity does occur when monitoring the effluent.

***RI/FS for Camp Murray Maintenance Compound, WA Military Department, Camp Murray, WA.*** Currently serving as project manager and lead environmental scientist in characterizing soil and subsurface contamination for Building 31 maintenance compound on Camp Murray Army National Guard military installation. Involves designing and implementation field sampling plan, preparing RI report, and using findings to support potential remedial action alternatives.

***Remedial Investigation and Risk Assessment Work Plan for former Klau-Buena Vista mercury mine, USEPA Region 9, CA.*** Served as the RI technical lead and ecotoxicologist in preparing a multi-disciplinary field investigation work plan concerning evaluation of mercury discharging from the former mercury mine.

- Emphasis on bioavailability of mercury residues in pore water, tissue, and sediment/soil allowed for streamlining and large-scale reduction in sampling and analysis costs to the client.
- Innovative, screening-based technical approach streamlined the RI and resulted in substantial savings while providing comprehensive data to support the RI and quantitative ecological exposure and risk assessment.

***Risk-Based Cleanup Strategy Development for Former U.S. Air Force Airfield (U.S. Army Corps of Engineers, Anchorage District), Alaska.*** Served as principal scientist for evaluating existing data and designing field study for use in human health risk assessment of petroleum hydrocarbons and pesticides on Native American populations living in the vicinity of this site, located in Northway, Yukon. Studies were conducted for the purpose of identifying cleanup strategies to protect both human health and the environment.

***Characterization and restoration studies of mercury-contaminated waterways in Northern California (Calfed), Sacramento, CA.*** Served as senior scientist and toxicologist for evaluating the toxicity, environmental fate, and bioavailability of mercury in freshwater riverine sediments of former gold mining districts in the Sacramento and American River systems of Northern California. Results were used to using these results to mitigate contamination and construct a restoration plan for part of the Sacramento River delta system.

***Ecological Risk Assessment for the Insecticide Chlorpyrifos for Golf Course Applications, Makhteshim-Agan Company, NJ.*** Performed detailed ecological risk assessment and served as project manager for project required in support of EPA FIFRA pesticide registration requirements. Project involved bench scale toxicity and fate/transport testing of chlorpyrifos and derivatives, exposure modeling (e.g. WASP V) for environmental fate and effects in golf course ponds.

***Developing RI/FS and Ecological Risk Assessment Work Plan for characterizing contaminated site at Miramar Marine Corps Air Base, San Diego, CA.*** Currently serving as lead scientist in designing the RI/FS Work Plan for this large contaminated refuse disposal facility, including surface and subsurface characterization, identification of compounds of potential concern, baseline risk assessment, conceptual site model, and designing the field investigation to support these determinations.

***Risk-Based Sediment Evaluation and Risk Assessments for CSOs at Lake Union (King County Dept. of Natural Resources), Seattle, WA.*** Participated in human health risk assessment to define toxicity and bioaccumulation-related hazards associated with contributions from CSOs to Lake Union in Seattle, WA.

***TIE/TRE for Evaluating Unidentified Toxicity of Municipal Wastewater Effluent, City of Stockton, Stockton, CA.*** Served as project manager and toxicologist specializing in evaluating the toxicity of identified agents to algae observed during wastewater effluent testing. Scope included revisions to TIE/TRE work plan as part of permit revision for submittal to Regional Water

Quality Control Board in Sacramento, CA. Also performed evaluation of chemical and toxicological database and compliance with wastewater discharge permit requirements.

***Ecological/Human Health Risk Assessment (Tesoro Oil Company), AK.*** Served as the lead toxicologist and risk assessor in evaluating potential bioavailability and toxic effects associated with petroleum and its by-products, as well as toxic trace metals, discharged from a Tesoro refinery located on the Kenai Peninsula, AK.

***Characterization and Restoration of Contaminated Lake in Sacramento, CA (Sacramento Flood Control District).*** Served as senior scientist and toxicologist/risk assessor in evaluating potential bioavailability and toxic effects associated with PAHs, metals, and pesticides in lake sediments, evaluating mitigation remediation measures, and using results to construct a restoration plan for the lake (part of the Sacramento River delta system).

***Model Toxics Control Act (MTCA) Method A and Method B Human Health and Ecological Risk Assessments, WA.*** Served as lead scientist and risk assessor in performing numerous small to medium sized human health risk assessments around the State of Washington in compliance with MTCA requirements. These investigations were used to determine the ultimate cleanup or other remedies for various contaminated industrial facilities.

***Total Maximum Daily Loads for Various Water Quality Constituents, EPA National Contract, Washington, D.C.*** Served as water quality specialist and project manager in developing TMDLs in various EPA regions throughout the U.S. This involves data collection, water quality modeling, and preparing detailed technical reports. Recent TMDL development experience includes:

- Various trace metals in Waltz Creek, PA (EPA Region 3);
- Hardness-dependent metals (e.g. copper) and mercury in the Neosho River watershed in southeastern Kansas (EPA Region 7);
- Fecal coliform in various watersheds of South Carolina (EPA Region 4);
- Trace metals in Illinois River watershed, Arkansas (EPA Region 6).

***Ecological Risk Assessment of Crude Oil and Drilling Muds/Cuttings on the Tropical Marine Environment (Maxus Oil Corporation), Jakarta, Indonesia.*** Served as the lead toxicologist for evaluating the potential effects of crude oil and drilling muds/cuttings on marine biota in the Java Sea. These baseline studies were required to determine potential effects associated with oil spillage or other release scenarios, which were part of a larger planning project by the Indonesian government.

***Exxon Valdez Post-Spill Offshore Investigations in Support of NRDA Injury Assessment—Exxon Corporation, Prince William Sound, AK***
While working for Dames & Moore, Mr. Chartrand worked with Exxon Corporation in helping to develop and execute field investigations that provided very extensive and intensive environmental data in support of the injury assessment claim associated with Exxon during the March 1989 spill in Valdez, AK. These investigations involved short- and long-term post-spill monitoring of sediments and marine biota, including chemical testing of oil derivatives and toxicological investigations of using an oil dispersant such as Corexit to disperse oil residues following the spill. He participated in a number of biological and monitoring assessments in Prince William Sound, including herring, salmonids, intertidal and shallow subtidal invertebrate communities. Data from these studies were incorporated into the massive database that was collected following the spill event and used to support the injury assessment and subsequent damage claim.

***Ecological Risk Assessment for Wetland Adjoining Mississippi River (Ilada Energy Corporation), Cape Ghirardeau, IL.*** Lead scientist and risk assessor for evaluating existing data and designing a field study for use in a risk assessment for this wetland site, which adjoins the Mississippi River. The study was conducted to identify risk-based strategies for cleaning up a contaminated site located in an ecologically sensitive area.

***Baseline Human Health/Ecological Risk Assessment for Ross Complex, Bonneville Power Administration, Vancouver, WA.*** Served as project toxicologist in designing and conducting the baseline human health and ecological risk assessment for different Operable Units at the Ross Complex. Work performed as part of the RI/FS and subsequent RD/RA for the Complex. Results of the multi-pathway risk assessment were used to support risk-based decision-making and evaluate various remedial alternatives related to contaminated soils, groundwater, and air quality.

***RI/FS and Risk Assessment for Multiple Operable Units, at Bangor/Silverdale Naval Stations, EFA Northwest, U.S. Navy, Silverdale, WA.***
Served as project toxicologist and risk assessor in designing field investigations, evaluating environmental data, preparing RI/FS

reports for multiple Operable Units (Site A, Site F, Manchester Units), conducting multi-pathway environmental and human health risk assessments, and evaluating remedial alternatives for each site.

***Restoration of Mercury-Contaminated Guadalupe Creek (Santa Clara Valley Water District), San Jose, CA.*** Served as senior scientist in using chemical and toxicological data on mercury contamination in Guadalupe Creek to design restoration of creek. Prepared Sampling and Analysis Plan, evaluated mercury bioavailability, bioaccumulation potential, and acute and chronic toxicity associated with mercury contamination. Results of this investigation were integrated into mitigation measures required to prevent harmful exposures of fish and wildlife communities and to design restoration of the waterway.

***NPDES 301(h) Marine Biomonitoring Program for City of Los Angeles, Hyperion Wastewater Treatment Plant, Los Angeles, CA.*** Served as regulatory scientist in co-designing extensive marine permitting and biomonitoring requirements for 301(h) and secondary treated wastewater to the Hyperion Treatment Plant. The key emphasis was evaluating the potential short and long-term toxicological effects of contaminants in wastewater effluent on marine organisms as well as biouptake/bioaccumulation and potential effects on human health. Mr. Chartrand was heavily involved in public meetings concerning the environmental implications of implementing these permitting requirements.

***Ecological Risk Assessment (U.S. Department of Agriculture, Denver Wildlife Research Center), CO.*** Project manager and principal investigator for this ecological risk assessment of 50 chemical pesticides used to control vertebrate pests. This project was conducted as part of a programmatic EIS and focused on potential effects to threatened and endangered aquatic and terrestrial species. The project involved extensive toxicological literature review, derivation of dose-response benchmark values, and quantitative fate and transport modeling for terrestrial, airborne, and aquatic pathways. The approach used for this project was later adopted as a model approach for conducting ecological risk assessment of pesticides by both the USDA and EPA.

***Investigating Stormwater Runoff of PAHs in an Urban Environment, Los Angeles, CA.*** Served as lead scientist in designing and implementing multi-year study focused on evaluating the potential toxicity, bioavailability, and effects of PAHs and other related contaminants in the Los Angeles basin, including the discharge of these materials into the receiving waters of the adjoining marine environment (Santa Monica Bay, CA).

***Toxicological Evaluation of Non-Target Environmental Effects of Agricultural Insecticides, Citrus Marketing Board, Rehovot, Israel.*** Served as entomologist and toxicologist in conducting field and laboratory toxicological studies to determine long-term effects of methyl parathion, azinphos methyl, and other organophosphate insecticides on non-target species.

***Evaluating the Toxicity of By-Products formed by Disinfection by Chlorine and Chloramine on Municipal Drinking Water Supply, Hebrew University, Jerusalem, Israel.*** Served as toxicologist and project scientist in conducting field and laboratory water quality studies to determine the potential fate and effects of chlorine and chloramine by-product formation associated with drinking water disinfection in Lake Kinneret, Israel. Involved HPLC, GC/MS, molecular biological culturing and testing, gel electrophoresis, and other biochemical methods.

***Evaluation of Non-Target Environmental Effects of Phenoxy Herbicides on Aquatic Communities, California Department of Food and Agriculture, Sacramento, CA.*** Served as post-graduate intern scientist in conducting field toxicological surveys in Northern California to determine unintended aquatic effects of 2,4-D, 2,4,5-T, Silvex, and other herbicides associated with "broad-lead suppression" forest spraying operations in Trinity and Humboldt Counties, CA.

## *Employment History*

- Independent Environmental Consulting Scientist, January 2013 to present, Seattle, WA
- Associate Environmental Scientist, Robinson Noble, Inc., Woodinville, WA
- Principal Environmental Scientist, CDM Smith, Bellevue/Seattle, WA
- Senior Environmental Scientist, CH2M Hill, Inc., Bellevue, WA
- Senior Toxicologist, Jones & Stokes, Inc., Bellevue, WA
- Senior Toxicologist, Dames & Moore, Inc., Seattle, WA
- Project Toxicologist/Environmental Scientist, Hart Crowser, Inc., 1989 to 1992, Seattle, WA
- Water Quality Regulatory Scientist, Los Angeles Regional Water Quality Control Board, Los Angeles, CA
- Toxicology Researcher and Graduate Student, Jerusalem/Tel Aviv, Israel

### *Work Groups and Professional Affiliations*

EPA Region 10 Bioaccumulation Work Group, Seattle, WA.

WA Dept of Ecology Sediment Management Standards Implementation Group, Lacey, WA.

Confined Aquatic Dredge Disposal (S-4) Sediment Quality Standards Committee (WA Department of Ecology), Lacey, WA.

Model Toxics Control Act (MTCA) Committee for developing procedures and guidance for conducting Ecological Risk Assessment, Lacey, WA.

Endangered Species Act and Puget Sound Initiative Business Coalition, Seattle, WA.
Chairperson, Northwest Toxicity Assessment Group (1998 - 2003)

Society of Environmental Toxicology and Chemistry (both regional and national)

### *Publications and Presentations*

Chartrand, A.B. 2011. Toward More Effectively Applying Ecotoxicology to Help Formulate Water Quality Regulations and Policy. Presented at Salish Sea Ecosystem Conference, October 2011, Vancouver BC, Canada.

Chartrand, A.B. 2011. Ecotoxicology, the Endangered Species Act, and Contaminated Sediments in the Northwest. Presented at Society for Military Engineers Chapter Meeting, May 2011, Seattle, WA

Chartrand, A.B. 2010. Final Removal Action Sampling and Analysis Plan, for Environmental Remediation Project: Engineering Design and Planning for Dioxin Containment at Da Nang Airport, Vietnam. Prepared for USAID Vietnam, January 2010.

Chartrand, A.B. 2009-2010. Contaminated Sediments and Dredging: Overview of Environmental Issues. Seminar/webinar presented as Sediment Practice Lead for environmental scientists and engineers at CH2M Hill and Robinson Noble, Seattle and Tacoma, WA.

Chartrand, A.B., D. Holmes, T., Hamaker, J. Chen, and M. Rivera. 2007. Interpreting WET Data from *Arbacia punctulata* using Wastewater Treatment Plant Effluent in Puerto Rico. Presented at 26th Annual Meeting of Society of Environmental Toxicology and Chemistry at Milwaukee, WI.

Chartrand, A.B., J. Chen, J. Stockner, and D. Bos. 2006. A Unique Approach to Defining a Nutrient TMDL for Black Lake, Idaho. Presented at the American Water Resources Association Annual Meeting, Missoula, MT, 27 June 2006.

Chartrand, A.B., J. Chen, J. Stockner, D. Bos, and J. Carlin. 2005. Using Paleolimnology to Define a TMDL Target in a Nutrient-Limited Lake. Presented at 26th Annual Meeting of Society of Environmental Toxicology and Chemistry at Baltimore, MD.

Chen, J., A. Chartrand, J. Stockner, D. Bos, and J. Carlin. 2005. Defining a Nutrient-Based TMDL Target at Black Lake, ID. Presented at Annual Meeting of American Water Resources Association, Seattle, WA, Nov. 2005.

Chartrand, A.B., and J. Chen. 2003. Optimizing WET testing Protocols for More Meaningful Routine Testing and TIEs: the *Selenastrum capricornutum* example. Accepted at Society of Environmental Toxicology and Chemistry for Annual Meeting in Austin, Texas.

Chartrand, A.B., and J. Chen. 2003. Optimizing WET testing Protocols for More Meaningful Routine Testing and TIEs: the *Selenastrum capricornutum* example. Presented at Northwest Toxicity Assessment Meeting in Port Townsend, WA.

Chartrand, A.B., and K. Bergmann. 2001. Have we been missing the true mechanisms of PBT chemical toxicity in protecting rare species? Presented to 22nd Annual Society of Environmental Toxicology and Chemistry, Baltimore, MD, November 2001.

Chartrand, A.B. 2000. Summary briefing on Montrose Chemical DDT Trial and Natural Resource Damage Case. Presented to Northwest Toxicity Assessment Group (NWTAG), December 2000, Seattle, WA.

Chartrand, A.B. (Northwest Toxicity Assessment Group Chair) and S. Singleton (Pacific Northwest SETAC), May 11, 2000. Threatened and Endangered Pacific Northwest Species: Aquatic Toxicity Issues Workshop. Co-sponsored by Northwest Toxicity Assessment Group Chair) and Pacific Northwest SETAC, May 11, 2000.

Chartrand, A.B. 1998. 'Towards More Ecologically Relevant Biological Testing in Contaminated Sediments: (1) Concordance of Benthic Bioassessment with Laboratory Chronic Bioassay Data under Washington's Sediment Management Standards.' Presented at the Nineteenth Annual Meeting of the Society of Environmental Toxicology and Chemistry in Charlotte, NC.

Venkatesan, M.I., G.E. Greene, E. Ruth, and A.B. Chartrand. 1996. 'DDTs and Dumpsites in the Santa Monica Basin, California.' (Institute of Geophysics and Planetary Physics, Contribution No. 3981). The Science of the Total Environment 179: 61-71.

Chartrand, A.B. 1995. 'Defining site-specific sediment quality objectives for contaminated marine sediments.' Presented at Society of Environmental Toxicology and Chemistry, Sixteenth annual meeting in Vancouver, B.C., November.

Chartrand, A.B., V.A. Artman, A.D. Every, J.P. Pecoraro, and G. Connolly. 1995. Invited manuscript for 'Refining the Ecological Risk Assessment of Pesticides,' for EPA Office of Pesticide Programs, Washington, D.C.

Chartrand, A.B.. G.S. Reub, S.L. Shaner, J.L. Cameron, J.L. Dudley, and L. Jollan. 1993. 'Using ecological risk techniques to site a mining transfer facility in a marine embayment.' Presented at Fourteenth Annual meeting of Society of Environmental Toxicology and Chemistry, Houston, Texas.

Chartrand, A.B., V.A. Artman, A.D. Every, J.P. Pecoraro, and G. Connolly. 1993. 'Risk Assessment of Wildlife Damage Control Methods used by the USDA Animal Damage Control Program. Supplement to Draft EIS on the Animal Damage Control Program.' Findings presented at Fourteenth Annual meeting of Society of Environmental Toxicology and Chemistry, Houston, Texas.

Chartrand, A.B., K.P Campbell, and L. Faha. 1991. 'Toxicity Evaluation and Ranking of Columbia Slough Sediments.' Presented at Twelfth Annual meeting of Society of Environmental Toxicology and Chemistry, Seattle, WA.

Venkatesan, M.I., G.E. Greene, and A.B. Chartrand. 1991. 'Transport dynamics of chlorinated pesticides in the Santa Monica Basin, California.' Presented at the 21st International Symposium on Environmental Analytical Chemistry, May 20-22, 1991, Atlanta, Georgia.

Chartrand, A.B. 1989. 'LARWQCB survey of organochlorine contaminants in southern California waters.' Proc. Oceans 89; Seattle, WA, September.

Risebrough, R.W., W.M. Jarman, B.R.T. Simoneit, and A.B. Chartrand. 1989. 'Persistence of DDT and refinery wastes at offshore dumpsites in southern California.' Estuarine, Coastal, and Shelf Sciences 179: 61-71.

Chartrand, A.B., and R.D. Cardwell. 1988. 'Aquatic ecological and human health risk assessment of butyltins in Puget Sound and Lake Washington sediments.' PSDDA report, prepared for the US Army Corps of Engineers, Seattle District.

Chartrand, A.B., H.A. Schaefer, and V.A. Venkatesan. 1987. 'Identification of nonpoint source contaminants in stormwater runoff.' Proceedings of California Water Pollution Control Federation Conference, San Diego, California, April 1987.

Perkins, E.M., A.B. Chartrand, R.W. Risebrough, and D.B. Ebenstein. 1987. 'Fish histopathology and contamination in California's Channel Islands.' Proceedings of Coastal Zone 87, Seattle, WA, May 1987.

Guttman-Bass, N., M.B. Albuquerque, S. Ulitsur, and A.B. Chartrand. 1987. 'Effects of chlorine and chlorine dioxide on mutagenic activity of Lake Kinnereth water.' Environ. Sci. Technol. 21(3): 252-260.

Chartrand, A.B. 1986. 'Montrose Chemical Corporation: Strategies for managing a widespread point source contaminant.' Proc. Managing Inflows Symposium, Monterey, California, November 1986.

Chartrand, A.B., S. Moy, T. Yoshimura, and L.A. Schinazi. 1985. 'Ocean dumping under Los Angeles Regional Water Quality Control Board permit: A review of past practices, potential adverse impacts, and recommendations for future action.' LARWQCB Report No. 235, March 1985.