

RAS 13904

DOCKETED
USNRC

July 20, 2007 (4:30pm)

OFFICE OF SECRETARY
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UNITED STATES OF AMERICA

NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

_____)	
In the Matter of)	Docket No. 40-8838-MLA
)	
U.S.ARMY)	ASLBP No. 00-776-04-MLA
)	
(Jefferson Proving Ground Site))	July 20, 2007
_____)	

**SUPPLEMENT TO
INITIAL STATEMENT OF POSITION OF INTERVENOR SAVE THE VALLEY, INC.**

Pursuant to 10 C.F.R. § 2.1207(a)(1), the Scheduling Order issued by the Atomic Safety and Licensing Board ("Board") on May 15, 2007, and the extension of time granted by the Board on July 16, 2007, Intervenor Save the Valley, Inc. ("Save the Valley" or "STV") hereby submits its Supplement to its Initial Statement of Position ("Statement") on its previously admitted Contention B-1, as the scope of that Contention has subsequently been defined by the Board's Memorandum and Order of May 1, 2007, LBP-07-07. This Supplement is supported by the testimony of Diane Henshel, Ph.D. and the exhibits thereto. Dr. Henshel's' testimony is being filed with this Supplement.

This Supplement is intended to be incorporated into, and must be read in conjunction with, the Statement as previously filed on July 13, 2007.

V. STV Critique of Biological Components of FSP

The biological components of the FSP are grossly deficient. Indeed, there really is no biological component in the FSP worthy of the name. The only assured biological component of the FSP is a deer sampling study which itself is fatally flawed. As a result , the FSP as it currently stands is simply incapable

TEMPLATE = SELV-037

SELV-02

of providing the comprehensive and accurate assessment of the intake, transport and bioaccumulation of DU by biota needed to produce an accurately predictive RESRAD-based risk characterization, as is scheduled for 2010 (FSP Section 4.2, Table 4.1, page 4-4).

The reasons for this gross deficiency are legion and fundamental. First, more biota than just deer should be sampled in the initial round of sampling. In particular, there should be at least one airborne species, one aquatic species, and one soil-based species to go along with a terrestrial species like deer. Second, the initial terrestrial species sampled should not be deer, but one that is lower in the food chain and a better indicator of DU intake (exposure) and bioaccumulation. A biological characterization program based on multiple species would provide a much more complete and representative sample of biota to assess the extent of biological intake, develop an site-specific model for DU fate and transport, and begin to assess the impact of DU exposure through respiration and ingestion at JPG. In addition, an initial multiple species sampling program would also provide a much firmer foundation for the determination as to whether additional biotic sampling may subsequently be required.

See Henshel testimony, pp. 11 to 13.

VI. STV Critique of Media Sample Collection and Analysis Methods

C. Biological Sample Collection and Analysis Methods.

The sample collection and analysis methods employed by the Army's contractor SAIC in the initial Deer Tissue Sampling Study are seriously deficient in multiple respects. Indeed, a detailed analysis of the data collection and analysis procedures used in the initial Deer Tissue Sampling Study raise serious questions about the reliability of the resulting data. *See Henshel testimony, pages 14 to 24.*

To the extent they may be relied upon, the results of the Deer Tissue Sampling Study indicate that

projectile-derived uranium has moved into the deer population, directly counter to the conclusions of the SAIC tissue study. (See Henshel testimony, pages 16 to 18, 22 to 24.) Since these results document biological uptake, the proper implementation of the FSP should be follow-up testing of deer and the testing of other biota. The implementation of the FSP planned by the Army following the deer study, however, is to forego any additional biota sampling.

In view of these multiple, significant deficiencies, the Deer Sampling Study must be redone and supplemented by additional biota sampling in order to have any utility for its intended purpose within the FSP. See Henshel testimony, p. 11 to 13, 22 to 24.

VII. STV Critique of Absence of Air Pathway Component in FSP

The FSP includes no air sampling component. The lack of this component is a significant inadequacy of the FSP. Contrary to a previous study relied upon by the Army, a recent study performed by scientists at the Los Alamos National Laboratory demonstrates that DU in the soil and vegetation at a contaminated site can be mobilized and transported significant distances, even to and beyond site boundaries, in measurable amounts as a result of fires. There is a program of periodic controlled burns conducted at the Big Oaks National Wildlife Refuge which includes the DU impact area. At JPG, which is a very long and thin property, civilians live at the edge of JPG, and many of them live there for their whole lives. Even more concerning, civilians have moved in to the housing just below the firing line, which is even closer to the DU Impact Area. These people will slowly accumulate the residual DU from their environment in their bodies - in their kidneys, in their brains, in their hearts, and in their bones. Over a lifetime of exposure, the increased dose of airborne DU resulting from controlled burns at JPG could accumulate in these civilians to the point where it could contribute to adverse health conditions. But,

without air sampling associated with the controlled burns at JPG, the Army cannot say with any assurance what that increased dose or resulting increment to health risk will be. To correct this deficiency, the dose and risk assessment models that the Army uses to make decisions about how much DU to leave in the ground and how to manage it really must include reliable data on all likely contributing routes of exposure as the total dose will include DU accumulated through all the contributing routes of exposure, including air.

See Henshel testimony, pp. 25 to 27.

Respectfully submitted,

A rectangular box containing a handwritten signature in black ink, which appears to read "Michael A. Mullett".

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UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION
BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

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In the Matter of)	Docket No. 40-8838-MLA
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U.S.ARMY)	ASLBP No. 00-776-04-MLA
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**PREFILED DIRECT TESTIMONY AND EXHIBITS OF
DIANE S. HENSHEL, PH.D.**

**EXHIBITS DSH AND DSH-1
IN SUPPORT OF CONTENTION B-1
OF INTERVENOR SAVE THE VALLEY, INC.**

I. Qualifications

Q.001 Please state your name, your profession, and your business addresses?

A.001 My name is Diane S. Henshel. I am both a professor of Toxicology and Environmental Science and an environmental consultant. My school address is 1315 E 10th Street, Bloomington, IN 47401 and my consulting address is 4121 Cadbury Court, Bloomington, IN 47401.

Q.002 What is your educational background and professional training?

A.002 I received a B.S. in Biology and a B.A. in English from Brown University, Providence RI, in 1978. I received a PhD in Biology and Biomedical Sciences with a specialty in Neuroscience from Washington University in St. Louis, MO. I did a post-doctoral fellowship in Anatomy at Washington University, and a post-doctoral fellowship in Animal Sciences and Zoology at the University of British Columbia in Vancouver, BC, Canada.

Q.003 For whom do you currently work and in what capacity?

A.003 I am an Associate Professor at the Indiana University School of Public and Environmental Affairs. I teach environmental toxicology, ecotoxicology, risk assessment and risk communication. I do research on the effects of pollutants on health both through laboratory and field research and by analysis of publically available health and environmental data. As a consultant I work for Henshel EnviroComm. I am the principal proprietor, owner and President. Henshel EnviroComm provides technical environmental support for the government and other parties addressing environmental contamination problems. We provide toxicological laboratory support as well as risk communication and risk assessment services.

Q.004 What is your professional work history with regard to toxicology, risk assessment and environmental health?

A.004 A copy of my resume has been provided to the Board and other parties previously and is attached to this testimony as Exhibit DSH-1. I began toxicological research as a graduate student, studying the toxicological effects of monosodium glutamate (MSG) and related excitotoxins on nerve cells. I began studying environmental toxicological problems as a post-doctoral fellow, when I began to work in conjunction with the Canadian Wildlife Service on great blue herons exposed to dioxin in the Strait of Georgia in British Columbia, on double crested cormorants exposed to a mixture of organochlorines and pesticides in the Great Lakes, and on chickens exposed to dioxin as a laboratory model. Once I moved to Indiana University, I began to work with the US Fish and Wildlife Service as well, and began to work on a larger variety of wildlife affected by contaminants at sites across Indiana and on the Great Lakes. In the laboratory we have studied the effects of organochlorines, pesticides, solvents, and heavy metals. We have conducted or participated in risk assessment-related studies on native people in the Amazon, and at the Naval Surface Weapons Center - Crane Division.

Q.005 What are your professional credentials in the areas of toxicology, risk assessment and risk communication?

A.005 I am an author on over 40 peer reviewed papers and chapters and well over a dozen government-published documents. I was a contributing author for a National Research Council book and monograph, and I have made over 170 public lectures and research presentations at

international, national, regional and local symposia, workshops and scientific meetings. I have edited two books and published several editor-reviewed papers and monographs. And I have been an invited teacher in numerous short courses in toxicology and risk assessment given at professional meetings.

I am a member of many relevant professional organizations including (listed alphabetically) the Association for the Advancement of Science, American Society for Testing and Materials (ASTM) Committee E47 (among others) on Biological Effect and Environmental Fate, Association for Women in Science, International Association for Great Lakes Research, International Society for Environmental Bioindicators, Society of Toxicology, Society for Environmental Toxicology and Chemistry, Society for Neuroscience and Sigma Xi. I am on the editorial board of two professional journals (*Environmental Bioindicators*, *Environmental Communication*), and am a frequent peer reviewer for over a dozen other peer reviewed journals in the general fields of environmental health, toxicology, risk assessment and environmental science. I have also served on many grant proposal review panels, including for the EPA and the Army Corps of Engineers.

Q.006 Have you received any academic honors or professional recognition in your fields of study and practice?

A.006 I am a member of Sigma Xi, the academic honors society. I was given the Outstanding Junior Professor award by Indiana University, a Teaching Award from the School of Public and Environmental Affairs, and have been named to the Leadership Circle for the Scholarship of

Teaching and Learning at Indiana University. Work from my laboratory, carried out under my guidance, has won awards from three different professional societies. I have received several service awards from professional organizations, including from the Society for Environmental Toxicology and Chemistry and from the American Society for Testing and Materials Committee E47 on Biological Effects and Environmental Fate for my work on development of standard guidance for environmental assessment and risk assessment, and for my work on the ASTM Committee E47 Board in several positions, including First Vice-President. I have served on several advisory boards including the Science Advisory Board for the International Joint Commission overseeing the US-Canada Boundary Waters Treaty, and a National Research Council (NRC) Panel on Remediation of PCBs in Sediments, and have been asked to give expert testimony and act as an "invited expert" for several EPA workshops and panels related to risk assessment and toxicology, as well as for the NRC Committee on Bioavailability of Contaminants in Soils and Sediments. I was also a reviewer of the NOAA Northwest Research Science Center. I have been awarded federal, state and local grants and contracts for my work, and have also been funded by several foundations and not-for-profit Non-Governmental Organizations (NGOs).

Q.007 Have you testified as an expert previously in any jurisdiction or proceeding?

A.007 No, this is my first opportunity to testify in a formal adjudication.

Q.008 Have you previously served as a consultant with respect to the Army's Jefferson Proving Ground (JPG) or any other site involving significant depleted uranium (DU)

deposition?

A.008 Yes, I served as technical advisor to the JPG Restoration Advisory Board (RAB) from 1999 through 2003 providing technical document review and interpretation assistance to the RAB. I have also worked as a consultant to Save the Valley, Inc., since 2003 with respect to the decommissioning of the JPG DU site. In these capacities, I have attended numerous RAB meetings and reviewed the Army's decommissioning plans as they have progressed through their several iterations.

Q.009 Do you have a written summary of your education, employment, experience and background, and papers and presentations you have had over your career?

A.009 A copy of my *curriculum vita* is attached as an exhibit to this testimony, and includes a brief resume as well.

Q.010 What materials have you reviewed and actions have you taken in preparation for your testimony?

A.010 I have reviewed the initial Field Sampling Plan (FSP) submitted to the Nuclear Regulatory Commission (NRC) by the Department of the Army (Army) in May 2005 for Depleted Uranium (DU) Impact Area Site Characterization at the Jefferson Proving Ground (JPG), Madison, Indiana, as well as the various addenda to the FSP and the related sampling documents which have been submitted subsequently. I have also reviewed:

- all of the available Environmental Radiation Monitoring (ERM) data from JPG;
- all of the biology portions of documents and sources that have been disclosed by parties to

this proceeding; and

- techniques and technical resources for field sampling and laboratory analysis of radioactive isotopes.

Q.011 What are the topics of your testimony?

A.011 I will testify on two general topics. The first general topic is the deficiencies of the biological portions of the FSP, specifically the need for sampling a water-based species, the need for sufficient sampling to develop a model of how the DU moves through the food web, and the multiple serious problems relating to deer sampling, including the sample collection and data analysis protocols, especially in terms of how they have been carried out. The second general topic is the need for an air sampling component in the FSP. In both cases, the testimony will focus on the inability of the FSP, as a result of these deficiencies, to meet its charge to provide characterization of the Depleted Uranium (DU) site at Jefferson Proving Grounds adequate to support the fate and transport modeling and ultimately the risk assessment modeling required for purposes of the ultimate decommissioning of the site in accordance with NRC regulations.

III. Biological Characterization

A. General Considerations

Q.012 As you understand it, what is the basic purpose of the biological characterization activities in the FSP as modified in the addenda?

A.012 The biological characterization activities must provide site-specific input data for any risk characterization activities for JPG. All management decisions are to be based, in part, on the

results of the risk characterization activities that will be used to detect or predict the potential for adverse health effects from exposure to the introduced depleted uranium (DU) at JPG. The risk characterization needs to be based on data that accurately reflects the process(es), exposure pathway(s), rate(s), and timing(s) of DU migration from the impact areas to potential biological receptors both on- and off-site by various transport mechanisms, including but not limited to transport through the food chain. The exposure pathways assessed by the biological characterization activities are established through the conceptual site model. A decision matrix for choosing the exposure pathways to be considered for any given target organism is provided below. This decision matrix is based on virtually all risk assessment guidance currently in use.

Table 1

**Generic Decision Matrix for Choosing Relevant Exposure Pathways to be Included in
Conceptual Site Models for Any Risk Assessment Process***

***This decision matrix is considered separately for every target organism, as every target organism has distinct ways of interacting with the environmental exposure media. For example, deep water fish would have virtually no exposure to air, and only exposed to such dust and vapor that precipitates into it's water environment. A terrestrial animal or person would only have selective exposure to sediment or ground water, and would mostly be exposed to soil and surface water, unless drinking from well water, which pull from ground water and can contain sediment.**

Routes of Exposure into the Organism Environmental media through which exposure occurs ▾	Ingestion (5- 20% can be absorbed, depending on age of animal, form of U)	Yes - as Dust / Small droplets	Yes - as Vapor / Gas / Dust (*fine dusts and droplets enter here, but usually end up ingested)
Air		Yes	Yes - as very fine dust - for any U attached to soil or sediment particles
Soil / Sediment		Yes - surface water directly, ground water through wells and as it transfers to surface water	Yes - as vapor - for water soluble forms of U
Surface Water / Ground Water		Yes	Maybe - if the food has a volatile component and a volatile form of U
Food			

Q.013 By what general mechanisms may DU be transported in addition to biological receptors themselves?

A.013 Generally speaking, DU may be transported by air and by water, both surface water and groundwater, as well as by the biological receptors themselves (i.e. the biota - humans, animals,

plants, and microorganisms).

Q.014 How do biological receptors transport DU?

A.014 This can occur in a variety of ways. A trespassing hunter might find an intact DU round to be an object of curiosity, pick it up, and remove it to a location remote from JPG, say his home or office. Animals may come in contact with soil and vegetation contaminated by DU and transport minute particles to locations on and offsite on their feet and fur. But, of most significance for purposes of the FSP, human, animal, and plant species may take up DU through their respiratory and ingestive processes (especially). Once inside an organism, the DU will interact with soft tissue and bone, and it will bioaccumulate in them and in other organisms further up the food chain (i.e. in the predators and higher organisms that eat the organism which initially accumulated the DU from the inorganic environment).

Q.015 You introduced the term “bioaccumulation.” What does that term mean?

A.015 Bioaccumulation occurs when the rate of intake of a contaminant (here DU) exceeds the rate of elimination of the same contaminant from the body. Bioaccumulation potential is measured by Bioaccumulation Factors, which are determined experimentally as the ratio between the concentration in the biota and the concentration in the relevant environmental medium.

Q.016 Why is bioaccumulation important for purposes of the FSP?

A.016 In chronic exposure situations, such as exists currently at JPG where the DU is always present, and always slowly degrading into the soil and leaching into the water, and moving in the windblown dust (from the soil) into the air, the concentrations of DU in the media at any given

time might be relatively low. However, based on thorough analysis in the literature of other bioaccumulating metals in other ecosystems, and the limited data on bioaccumulation of low levels of uranium that has become available in the literature over the last five to ten years (see e.g. 40 CFR Parts 9, 141, and 142; Warneke 2002; UNEP, 1999 and 2003; Squibb et al, 2006) indicates that chronic low level exposure to DU can result over time in significant and toxicologically effective concentrations of the U in sensitive tissues of the body.

Q.017 What factors influence bioaccumulation of DU in biota?

A.017 First, the bioaccumulation of DU is directly proportional to the concentrations of DU in the four exposure media - air, soil/sediment, water, and food. Second, bioaccumulation rates will be proportional to the amount of food and water ingested, and the rate of respiration of DU dust and vapor- contaminated air. Third, growing organisms, e.g., young children and infants (in the case of humans), absorb DU from the gut more efficiently than do mature animals. As they are still growing, their bodies maximize absorption of metals and other nutrients. (DU, as a metal, is taken into the body through mechanisms which have evolved to absorb such health-essential metals as iron and magnesium.) Fourth, bioaccumulation increases in direct proportion to duration of exposure. For animals and plants on JPG, exposure is chronic. For people living south of the firing line and around JPG, exposure is also chronic, although the route of exposure will be different (through dust in air and through DU carried in water predominantly).

Q.018 What sources and types of biological data are required to meet the needs of a meaningful model of DU fate and transport from the impact area to potential

receptors?

A.018 Meaningful fate and transport modeling requires the following types of biological data:

- Data regarding the species of biota that use or inhabit the DU impact area
- Data regarding the migratory patterns of the biota present in the DU impact area
- Data regarding the food web relationships among the biota present in the DU impact area, as well as the other biota outside the DU impact area
- Data regarding the uptake and bioaccumulation of DU by the various biota identified to be of interest.
- Data regarding the uptake and biotransformation of the different chemical species of weathered DU found in and downstream / downwind from the DU impact area.
- Data regarding the biological effects of low level, chronic DU exposure by the various biota so exposed and identified to be of interest, both directly through respiration or ingestion of air, water, and soil/sediment and indirectly through ingestion of DU-contaminated biota lower in the food chain.

B. Major FSP Biological Elements

Q.019 What are the major elements of the biological characterization in the FSP, as modified in the addenda?

A.019 There is only one defined element of the biological characterization in the FSP, namely deer sampling. Depending on the results of the deer sampling, the Army may also sample other biota, but that contingent element has neither been elected nor defined at this time.

Q.020 In your opinion, are these major elements of the biological characterization sufficient to model accurately the fate and transport of DU from the JPG impact area?

A.020 No, not at all. The deer sampling as outlined and as carried out, and the still as yet undefined “other biota sampling,” are grossly inadequate for the purpose they are intended to serve in the FSP, that is to identify the current and predicted exposure of humans and other potential biotic receptors (i.e. animals, etc) to the DU introduced into JPG by the testing program. Moreover, as cited in the FSP (Section 2.2.3) and other sampling documents, other biota have been sampled previously at JPG but the results of these activities are essentially being discounted by the Army now.

Q.021 Why are these two elements not adequate?

A.021 The reasons are legion, but permit me to mention the most obvious and important.

First, more biota than just deer should be sampled in the initial round of sampling. In order to evaluate and model fate and transport through a food web, representative species of at least several trophic levels in the food web need to be sampled. It is impossible to properly understand whether and how the animals and the plants at JPG are being exposed to and accumulating DU if there is minimal to no data on most of the parts of the ecosystem. Based on virtually all standard risk modeling guidance in the literature (for example, standard texts by Glen Suter et al.) and produced by federal and state governments (for example, the complete set of risk related guidance available through the EPA websites), for an open environmental exposure situation such as exists at JPG, there should be at least one airborne species (e.g, a

bird or flying insect), one aquatic species (e.g., a crayfish), and one soil-based species (e.g., an earthworm or slug), in addition to a terrestrial species (eaten by humans) like deer.

Second, the initial terrestrial species sampled should not be deer, but one that is lower in the food chain and a better indicator of DU movement through the ecosystem (e.g., a small mammal such as squirrel or rabbit). Some other species were sampled during the DU Impact Area Scoping Survey reported by SEG (1995) and summarized in the FSP (Section 2.2.3, Tables on page 2-9). Looking at what little data is available, the bioaccumulation factors (BAFs) for vegetation and the aquatic filter feeders such as crayfish (both of which are eaten by higher animals and humans) are relatively high, on the order of 10^2 to 10^3 orders of magnitude. These BAFs are as high as those for persistent, bioaccumulative, and toxic chemicals (PBTs) listed as being of concern by the U.S. EPA and Environment Canada in the Persistent Organic Pollutants (POPs) Treaty. Based on this data, vegetation and aquatic filter feeders are better indicators of DU migration into the eco-food chain than are deer. Nonetheless, when samples from early and late in DU testing are not combined, it is evident that DU in the deer is increasing over time.

In sum, a more complete and representative sample of biota would enable a more accurate assessment of the extent of biological intake and impact of DU exposure from the residual DU at JPG. More comprehensive sampling results would also provide a much firmer foundation for the future determination as to whether additional biota sampling may be required.

C. Deer Sampling

Q.022 What is the purpose of the deer sampling element of the FSP?

A.022 The purpose assigned by the FSP to the Deer Tissue Sampling Study (ML062210019) is quite limited. Basically, the Army proposed to conduct a single deer hunt in the Fall of 2005 and analyze tissue samples from the harvested deer in order to determine whether DU uptake trends suggested by earlier analyses of deer tissue samples collected ten or more years ago had continued. (FSP, pp. 6-24 to 6-25). If the samples collected as a result of the initial hunt also indicated DU uptake, then additional deer sampling and/or other biota sampling would be considered.

Q.023 Is the initial Deer Tissue Sampling Study adequate to serve its intended purpose in the FSP?

A.023 No, the initial Deer Tissue Sampling Study is seriously inadequate to serve its intended purpose.

Q.024 How is the initial Deer Tissue Sampling Study inadequate?

A.024 Its inadequacies fall into two general categories: sampling methods and data collection, management, and interpretation.

1. Sampling Methods

Q.025 What are the inadequacies in the sampling methods?

A.025 There are two sampling method inadequacies in the Deer Sampling study. The first relates to the origin of the deer that were killed and the second to the representativeness of the uranium composition of the deer killed relative to deer with a natural diet.

Deer could not be harvested during the initial fall kill from the nearby hunting zones, due to displacement resulting from the hunting season that had just ended. The likeliest displacement would be from the areas of hunting toward areas without hunting, the DU impact area. Except for a few killed in the background hunting area, the only deer taken during the fall kill were at the perimeter of the DU impact area or along D road. Whether the deer from the nearby hunting areas displaced and compressed the deer native to the DU impact area or freely mixed with that limited population, the deer that were attributed to the DU impact area are more likely to be deer from the nearby hunting area than deer native to the DU impact area.

The choice of baiting as an integrated portion of the harvest for the deer tissue study introduces another uncertainty in the results and how properly to evaluate them. The Deer Sampling Study observes that the uranium content of wildlife reflects an animal's recent diet (p 1-6). By providing the deer an alternative to their natural diet, the design of the Deer Tissue Sampling Study introduces yet another unevaluated and undiscussed variable that will impact the data collected and the meaning of the results.

2. Data Collection, Management, and Interpretation

Q.026 What are the inadequacies in data collection, management and interpretation?

A.026 There are a significant number of inadequacies, as well, in the collection, management and interpretation of the data collected in the Deer Tissue Sampling Study. There are five that require discussion here.

Q.027 What is the first inadequacy requiring dicussion?

A.027 A fundamental inadequacy of the Deer Tissue Sampling Study in serving its intended purpose is its evaluation of the data produced as being non-indicative of uranium from DU penetrators in the deer tissue sampled. This evaluation is predicated upon such uranium having an isotope activity ratio that is characteristic of metallic uranium of the DU penetrators or of residual uranium in soils where penetrators weather, rather than that of the medium or media from which the deer ingest or inhale DU.

The results of the deer tissue studies confirm the likely uptake of penetrator-derived uranium when one considers the media through which exposure occurs. The deer from the background hunting area had an average isotope activity ratio of 0.94, for those samples for which a ratio could be calculated. (See p. 1-2, Table 1-2, Deer Tissue Sampling Study report) This ratio is what would be expected from an exposure to only natural uranium. It is not clear, as discussed above, that any deer native to the DU impact area were harvested. Taking all deer but those harvested from the background hunting area as a single population, the average isotope activity ratio is only 0.61. This is an activity ratio that is consistent with the deer consuming groundwater from the area around the impact area, base flow from streams around the impact area, and vegetation that relies upon those same waters. As discussed in Mr. Norris' testimony, the activity ratios of those media are just what would be expected assuming that they are being impacted by penetrator-derived uranium which has been subjected to fractionation during oxidation.

The results of the Deer Tissue Sampling Study indicate that penetrator-derived uranium

has probably moved into the deer population, directly counter to the conclusions of the tissue study. Since the deer do show biological uptake, the proper future implementation of the FSP should be follow-up testing of both deer and other biota. The proposed future implementation of the FSP following the deer study, however, is to forego any additional biota sampling.

Q.028 What is the second inadequacy requiring discussion?

A.028 A second basic inadequacy is the failure to meet specified accuracy in the chemical analysis of the deer samples. This deficiency is demonstrated by the discrepancy between the results of the few duplicate samples that were taken and chemically analyzed (one per JPG region). According to Table A3-1 on page A3-3 of the FSP, all duplicate samples are supposed to have less than a 50% difference in value to be considered acceptable. In fact, in the results of the first deer sampling event, as released in the August 2006 report, many of the duplicate sample sets have a measurement difference of 50% or greater, with some showing differences as great as an order of magnitude (i.e. ten-fold). By region, the duplicate sample values with the differences noted are summarized in Table 2 on the next two pages.

TABLE 2: Ratio of U Concentration Values Determined in Duplicate Samples Taken During the Winter 2005/2006 Deer Sampling Event at JPG as an Indicator of the Reliability and Acceptability of the Chemical Analysis*

*Tissue samples from these deer were used to check the quality and technical acceptability of the chemical analyses for the full data set of ten deer sampled per region. For this confirmatory data quality analysis, tissue samples were divided in two duplicate samples and each duplicate sample was analyzed separately in order to assess the accuracy and reliability of the chemical analysis. According to the Quality Assurance criteria set forth in the documents, the differences between the reported chemistry results between the two analyses of the SAME tissue sample should be no more than 50%. In this table, the ratios are set up based on the order given in the document. Thus, a ratio (the third number in each set) of 50% or less or 200% or greater, or an inability to even report the second value, indicates that the duplicate chemical analyses DID NOT MEET THE QUALITY

CONTROL CRITERIA ESTABLISHED BY THE ARMY. These sample sets are in **boldface**.

Deer Sample #	Tissue	U-234	U-235	U-238
Background Hunting Zone:				
DR-BHZ-02	BONE	0.0104 / 0.0108 / 96%	0.0015 / 0.0036 / 42%	0.0086 / 0.0016 / 537.5%
DR-BHZ-02	LIVER	0.0127 / 0.033 / 38.5%	0.0024 / 0.0005 / 480%	0.0014 / 0.0032 / 43.75%
DR-BHZ-02	MUSCLE	0.0036 / 0.0072 / 50%	0.0005 / 0.0009 / 55.5%	0.0006 / 0.0056 / 10.7%
DR-BHZ-04*	KIDNEY	0.0043 / 0.0023 / 187%	0.0031 / 0.0026 / 119%	0.0038 / 0.0015 / 253%

<p>* For some inexplicable reason, a duplicate kidney sample was alleged to have been taken from a different deer than all other duplicate samples for this region. By itself, this is reason to question the validity of all of the sample results, as it indicates that either in the laboratory or in the field or in the analysis and documentation of the data someone made a mistake in labeling. Since there is no way to tell where the quality assurance/quality control procedures fell drastically short, the reliability of all data collected and analyzed during this sampling event are called into question.</p>				
Depleted Uranium Area:				
DR-DUA-04	BONE	0.016 / 0.0041 / 39%	0 / 0.0046 / NO RATIO POSSIBLE	-0.0011[counts as 0] / 0.0014 / NO RATIO POSSIBLE
DR-DUA-04	LIVER	0.0106 / 0.0117 / 91%	0.0007 / 0.0038 / 18%	0.0028 / 0.0008 / 350%
DR-DUA-04	MUSCLE	0.0095 / 0.0073 / 130%	0.0045 / 0.001 / 450%	0.0003 / 0.0001 / 300%
DR-DUA-04	KIDNEY	0.0022 / 0.0034 / 65%	0 / 0.0015 / NO RATIO POSSIBLE	0.014 / 0.0018 / 78%
The Nearby Hunting Zones:				
DR-NHZ-02	BONE	0.0112 / 0.021 / 53%	0.0052 / 0.0064 / 81%	0.0021 / 0.0323 / 6.5%
DR-NHZ-02	LIVER	0.0086 / 0.0116 / 74%	0.0014 / 0.0041 / 34%	0.0016 / 0.0058 / 28%
DR-NHZ-02	MUSCLE	0.0122 / 0.0135 / 90%	0.0016 / 0.0026 / 61.5%	0.0029 / 0.003 / 97%
DR-NHZ-02	KIDNEY	0.0017 / 0.0054 / 31.5%	0.0035 / 0.0036 / 97%	0.0053 / 0.0045 / 118%

Summarizing Table 2, the differences between initial samples and duplicates fall outside the acceptable range as specified in the FSP in 20 out of 36 duplicates, or 56% of the time; the differences effectively reach or exceed an order of magnitude in four out of 36 duplicates, or 11% of the time. In addition, there is a huge question about the accuracy of the sample labeling and tracking that calls into question the entire data set.

Q.029 What is the third inadequacy requiring discussion?

A.029 The third inadequacy of significance is the failure to properly and consistently collect information on the deer samples as they were conducted. This is indicated by observing the field notes in Appendix B: The Log Book, as not all of the data collected are in the formal part of the report. It is clear from the Log Book that some in-field measurements were only made for the Near Hunting Zone (NHZ) and Background Hunting Zone (BHZ) deer, and not at all for the DU Area deer. Specifically, ovary information was recorded periodically for female deer collected at NHZ as well as for BHZ, but not at all for the DU Area deer. Similarly, on-the-spot radiation readings were taken of all deer collected in the NHZ and for 9 out of 10 (90%) of the deer or deer tissues collected in the BHZ. None of the deer samples collected in the DU Area have on the spot radiation readings recorded. This type of data can be used to double check the comparability of the data and demonstrate some differences between the groups, if present. For example, readings in the BHZ samples, taken in the hunting zones about 5 miles from the DU Area, ranged between 6 and 8 uR/hr, with a mean of 6.7 uR/hr. For the NHZ samples, taken in the hunting zones within 2 miles of the DU Area, the readings ranged from 5 to 11 uR/hr, with a mean of 7.6 uR/hr and with 30% higher than the highest readings (8 uR/hr) in the BHZ samples. One can only surmise what the DU Area deer tissue readings might have been, but they would have undoubtedly been higher than those at either the NHZ and the BHZ.

Q.030 What is the fourth inadequacy requiring discussion?

A.030 The fourth inadequacy is the failure to fully collect, preserve, and analyze information about the

deer sampled so that a more accurate assessment of potential ecological impacts could be made. In this context, it is initially important to note that some data are collectable from the field notes (Log Book) that indicate clear differences between the three populations in size and health. However, some data, such as ovarian tissues and health, were apparently observed and collected in the BHZ and the NHZ, but seem to have been completely ignored in the DU area. Yet this kind of information and analysis would be useful in documenting differences in radiation-related effects between the populations and needs to be consistently noted and collected in all regions in all future sampling events.

However, as mentioned above, some telling data are revealed in the Log Book but not included in the Deer Sampling Report which absolutely should have been included and analyzed further. First, and most important from an effects perspective, there is a clear difference in health and fecundity between the three deer populations, assuming as do the Army and SAIC that the meager deer sample of 10 per region is in any way representative. (The assumption that a sample size of 10 is sufficient is not shared by STV and is referenced but not conceded for purposes of this observation.).

The differences are as follows:

1. The percent of each population that was female was very different between sampling regions: 80% (i.e., 8 out of 10 deer sampled) in both the BHZ and the NHZ, and only 40% (i.e., 4 out of 10 deer) in the DU Area. If the assertion made by the Army and SAIC is even partially accurate, and these deer are from relatively separate populations, this difference in the

gender ratio indicates a severe effect on wildlife in the DU area. Even if there is migration between the populations, as we suspect, this is an observation that merits additional field analysis and the initiation of a tracking study to monitor the migration and movements of the deer population at JPG.

2. There is a significant difference in fecundity between the three populations, and this fecundity is clearly related to the Army/SAIC's stated difference in expected exposure to the radiation present in the DU Area (i.e. exposure is greatest for the deer in the DU area, middle for the NHZ deer, and lowest for the BHZ deer). Fecundity as measured by the percent of pregnant female deer is significantly higher in both the NHZ (75%) and the BHZ (67%) than in the DU area (0%). Further, if the number of viable fetuses carried by the pregnant female is an indication of health, as it is considered to be, then the deer in the NHZ (50% the full load of two fetuses, 50% with the reduced load of one fetus) are clearly less healthy than the female deer in the BHZ (83% carrying two fetuses, 17% carrying one fetus).¹

It could be surmised that size and age contributes to these two clear dose-related differences, but a quick evaluation of the data in the Log Book demonstrates that the female deer in the DU area are the largest over all (115 lb, 125 lb, 150 lb, 170 lb), while those in the BHZ and NHZ areas are similar in size (NHZ - Pregnant: 75 lb, 102 lb, 115 lb, 125 lb, 130 lb, 145 lb; NHZ - Not Pregnant: 80lb, 110 lb; BHZ - Pregnant: 105 lb, 120 lb, 130 lb, 135 lb,

¹Another indication of the likely poor health of at least some of the sampled deer in the NHZ is the observation in the field notes / log book for dr-nhz-02 that the pregnant deer carrying only one fetus had only one ovary and that the existing ovary was abnormal, having ovarian cysts.

145 lb, 150 lb; BHZ - Not Pregnant: 60 lb, 75 lb, 125 lb). Without an analysis of the bones to determine true age of each deer, it is not fully possible to determine whether age contributes to the slight discrepancy in weight for the non-pregnant and (evaluated separately) pregnant females of which the BHZ are on average smaller. Without monitoring and tracking the deer populations, one could also not determine whether the differences in size are due to a shifting in birth times during the year, which might also indicate an effect of the DU exposure on wildlife health and function. The number of males collected in the BHZ and NHZ are small, but overall, the males in the DU area appear to be larger, although this could be due to a skewing from the sample size (BHZ: 100 lb; NHZ: 110 lb, 130 lb; DU Area: 75 lb, 75 lb, 110 lb, 130 lb, 140 lb, 160 lb).

Moreover, some of the observed differences discussed above with respect to the deer populations correspond not only to geographic variation but also to temporal variation, i.e., the impact area deer were taken during the fall kill and the other deer during the winter kill. Some differences may causally relate to the temporal variation independent of the geographic distribution, or both variations may act in consort. The failure of the deer tissue study to independently isolate major variables like time and space is another measure of the inadequacy of the implemented study to test a hypothesis of DU uptake by deer.

Q.031 What is the fifth deficiency requiring discussion?

A.031 A fifth deficiency is that a another analysis needed to be conducted on the deer sampling data but was not performed in the Deer Tissue Sampling Study, namely an assessment of

bioaccumulation. Due to the very poor reliability of the data compiled in the initial study, such an assessment using its data would be equally unreliable. In the future, however, with a larger sample size, more duplicates, and consistent collection and measurement procedures, and thus reliable sample results, the study results need to include an evaluation of bioaccumulation rates based on a correction for estimated age of the animals, as uranium does bioaccumulate and thus increases in the animals with age. Until such corrections are done, the differences in the exposures even between different populations in different parts of JPG are simply not subject to reliable interpretation.

Q.032 Deficient as the Deer Tissue Sampling is, do its results provide any useful information for purposes of the FSP?

A.032 To the extent that they may be relied upon, the results of the Deer Tissue Sampling Study indicate that projectile-derived uranium has moved into the deer population, directly counter to the conclusions of the SAIC tissue study. Since these results document biological uptake, the proper implementation of the FSP should be follow-up testing and the testing of other biota. The implementation of the FSP planned by the Army following the deer study, however, is to forego any additional biota sampling. Moreover, a detailed analysis of the data collection and analysis procedures used in the initial Deer Tissue Sampling Study raise serious questions about the reliability of the resulting data. In view of these multiple, significant deficiencies, the Deer Sampling Study must be redone and supplemented by additional biota sampling in order to have any utility for its intended purpose within the FSP.

IV. Air Sampling

Q.033 Does the FSP include an air sampling component?

A.033 No, it does not.

Q.034 Why is there no air sampling component in the FSP?

A.034 Big Oaks National Wildlife Refuge (BONWR) is managed by the US Fish & Wildlife Service (USFWS). USFWS decided that doing controlled burns in the DU Impact Area would not increase human exposure significantly. The USFWS based their decision to burn over the DU Impact Area on a study by Williams et al. (1998) carried out at Aberdeen Proving Ground (APG), a similarly DU contaminated base. ("Current available data suggests that levels of DU carried in smoke associated with burning natural vegetation is not significant. This is the only study we know of that looks at dispersion of DU in smoke in a setting similar to the conditions that are found on the refuge." (Big Oaks National Wildlife Refuge Fire Management Plan, March 2001, p25). The FSP adopted this conclusion and reasoning. (FSP, May 2005, Section 4, p 4-1).

Q.035 Do you agree with this conclusion and reasoning?

A.035 No, this conclusion and reasoning are based on outdated data. Recently (2006), scientists at the Los Alamos National Laboratory (LANL) revisited the question and found that there were significant changes (14% increases on average) in airborne Depleted Uranium at the perimeter of the entirety of the LANL property following the prescribed burns, as are being carried out at JPG/BONWR, including in the DU Impact Area. Interestingly, the increases in airborne DU

JPG/BONWR burns are started, as the vegetation has regrown enough after the winter months to help keep the soil in place in the face of the local ministorms created by the controlled burn. See J.J. Whicker, et al., *From Dust to Dose: Effects of Forest Disturbance on Increased Inhalation Exposure*, Science of the Total Environment (2006).

Q.036 Were these levels high enough to introduce health risks to the workers working on site, based on the calculations in Whicker et al's model?

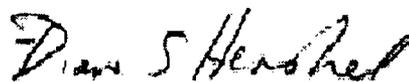
A.036 No, the calculated levels were not high enough by themselves to introduce clearly significant adverse health effects. But, the amount of airborne DU in dust did increase measureably and significantly in one year, in fact in one season, at LANL, including at the boundary of the LANL.

Q.037 How does this LANL data support your conclusion about the need for air sampling as a part of the FSP at JPG.

A.037 At JPG, which is a very long and narrow property, civilians live very near the boundaries, and many of them live there for their whole lives. Even more concerning, civilians have moved in to the housing just below the firing line, which is even closer to the DU Impact Area. These people will slowly accumulate the residual DU from their environment in their bodies - in their kidneys, in their brains, in their hearts, and in their bones. Over a lifetime of exposure, the increased dose of airborne DU resulting from controlled burns at JPG could accumulate in these civilians to the point where it could contribute to adverse health conditions. But, without air sampling associated with the controlled burns at JPG, the Army cannot say with any assurance what that increased dose or resulting increment to

health risk will be. In my expert opinion, the dose and risk assessment models that the Army uses to make decisions about how much DU to leave in the ground and how to manage it really must include reliable data on all likely contributing routes of exposure as the total dose will include DU accumulated through all the contributing routes of exposure, including air.

I declare this 20th day of July, 2007, under the penalty of perjury, that the foregoing testimony and attached exhibit are true to the best of my knowledge, information and belief.



Diane S. Henshel, Ph.D.

Diane S. Henshel

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www.indiana.edu/~speaweb/faculty/henshel.php*

EDUCATION

PhD Biomedical Sciences – Neuroscience, 1987
Washington University School of Medicine, St. Louis MO
BSc, BA Biology (BSc) and English (BA), 1978
Brown University, Providence RI

EMPLOYMENT

1998 – Present Henshel EnviroComm Consulting, Owner and Sole Proprietor
My consulting company focuses on providing technical support for both government and communities addressing environmental contamination problems. We provide laboratory support as well as risk communication and risk assessment related services.

1992 – Present Indiana University, School of Public and Environmental Affairs
Associate (1998- Present) and Assistant (1992 – 1998) Professor
Courses taught: Environmental Toxicology, Risk Assessment, Risk Communication, Master's level Capstone, Controversies in Environmental Health, Endocrine Disruption, Developmental Neurotoxicology, Introduction to Environmental Science
Research Foci:

- 1) Biomarker based research on the effects of pollutants on developing embryos, focus on neuroendocrine, liver, heart and kidney effects, correlating laboratory studies with field studies of environmentally exposed animals.
- 2) Characterization and evaluation of a non-invasive treatment that counteracts oxidative and energy stress-related chemical toxicity.
- 3) Development of landscape scale data mining, analysis and modeling techniques to link indicators of environmental exposure with population scale indicators of related health impacts.
- 4) *Teaching related Research: Development of methodologies to implement and evaluate multi-class, multi-disciplinary service learning components into classroom teaching.*

SELECTED RECENT ACHIEVEMENTS, SERVICE ACTIVITY

US-Canada International Joint Commission Science Advisory Board and Workgroup on Ecosystem Health (1997 – 2001)
National Research Council Committee on Assessment of Risks from Remediation of PCB-Contaminated Sediment (1999 - 2001)
National Oceanic and Atmospheric Administration (NOAA) Northwest Research Science Center, *Facility Review Team* (2005)
Environmental Protection Agency Expert Panels (< 10 years)
Ecological Risk Assessment State of the Practice Review Workshop 2006
Food Quality Protection Act (FQPA) Science Advisory Panel (SAP) (1998 -)

EPA Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) Endocrine Disruptors Screening & Testing Advisory Comm. (EDSTAC) Report Review Panel (1998 - 1999).

Service awards: Society for Environmental Toxicology and Chemistry (SETAC)
Presidential Citation (2006)
American Society for Testing and Materials Committee E47 on Biological Effects and Environmental Fate: Outstanding Service Award (2003),
Exceptional Service Award (1996)
Indiana University: Scholarship of Teaching and Learning Leadership Award (2006), Faculty Research Support Program Awardee (2006), SPEA Teaching Award (2005), Summer Faculty Fellowships (1993, 1996, 2005), Outstanding Junior Faculty Award (1997)
Editorial Boards: Environmental Bioindicators; Environmental Communication: A journal of nature and culture

Publications: 43 Peer reviewed articles, 2 books edited, 3 editor reviewed & book chapters, 103 abstracts of international/national/regional meeting presentations
Mentored: 1 post-doctoral fellow, 8 PhD students (2 completed PhD, 2 in process), 29 master's level research students (3 wrote a master's thesis, 2 more in process), 37 undergraduates, 8 high school students

SKILLS and other EXPERTISE

Environmental Justice, Social Equity, and Sustainability issues
Trained Mediator and Facilitator
Risk and Technical Communication, teacher and practitioner
SWOT //GOS organizational analysis and planning
Workshop and Symposium planning and logistical coordination
Photographer
Computer Programs: Microsoft Office Suite Professional, WordPerfect Office Suite, SAS and other statistical packages, SigmaPlot, Adobe Photoshop, ArcView, ImagePro Plus

ORGANIZATIONS (with highest office)

American Association for the Advancement of Science (AAAS), American Society for Testing and Materials (ASTM) Committee E47 on Biological Effects and Environmental Fate (*Vice Chair*), Association for Women in Science (AWIS; *President, Bloomington Chapter*), International Association for Great Lakes Research (IAGLR; *Life member*), International Society for Environmental Bioindicators (*editorial board*), Society of Toxicology (SOT), Society for Environmental Toxicology and Chemistry (SETAC; *President, Ohio Valley Regional Chapter*), Society for Neuroscience (SfN), Sigma Xi Scientific Honors Society (*Life member*), IUB-wide Environmental Literacy and Sustainability Initiative (*steering committee*), IUB-SOTL Leadership Advisory Team, IUB-Sustainability Task Force -Workgroups on Education and Outreach, and the Indoor Built Environment.

Diane S. Henshel

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EDUCATION

Undergraduate

BS (Biology) 1978

BA (English) 1978

Brown University, Providence R.I.

Graduate

PhD (Neuroscience) 1987

Washington University, Biology and Medical Sciences Program, St. Louis, MO

Dissertation: Electrogenic responses of dissociated Muller (glial) cells from neotenus tiger salamander retina.

Post-doctoral

Washington University Medical School, Department of Anatomy, St. Louis, MO

Research Associate (Dr. Steven Rothman, supervisor), 5/87 - 12/87

University of British Columbia, Departments of Animal Science and Zoology,
Vancouver, British Columbia, Canada

Post-Doctoral Fellow (Drs. Kim Cheng and John Steeves, supervisors), 9/88 - 12/89

University of British Columbia, Department of Zoology, Vancouver, British Columbia, Canada

Research Associate (Dr. John Steeves, supervisor), 1/90 - 7/92

ACADEMIC APPOINTMENTS

Indiana University, School of Public and Environmental Affairs (SPEA), Bloomington, IN

Associate Professor of Public and Environmental Affairs, 1998 - Present

Assistant Professor of Public and Environmental Affairs, 1992 - 1998

OTHER APPOINTMENTS AND PROFESSIONAL CONSULTANTSHIPS

(POST-GRADUATE)

Sole Proprietor, Henshel EnviroComm, Bloomington, IN (1999 - Present)

University of British Columbia, Department of Zoology, Vancouver, British Columbia, Canada

Sessional Lecturer: Animal Physiology, 9/89 - 12/89

LICENSURE AND CERTIFICATION

Mediation Training:

Environmental Mediation (40 hour training)

Basic Mediation Skills (40 hour training)

Public Policy Mediation (40 hour training)

Community Conflict Resolution (40 hour training)

Victim Offender Conferencing (32 hour training)

Large Group Facilitation (9 hour training)

24 Hour HAZWOPER Certification (1993 - 1994, not updated)

PROFESSIONAL SOCIETIES

American Association for the Advancement of Science

American Society for Testing and Materials (Committee E-47 on Biological Effects and Environmental Fate) *First Vice-Chair* (1/98 - 12/03)

Chair: Subcommittee 47.09 Biomarkers (1992 - 1998); 47.92 Symposium Planning

Active Member: Subcommittees .02 Terminology, .04 Wildlife Toxicology,

.12 Behavioral Toxicology, .13 Risk Assessment, .14 Risk Management, .90

Executive

Association for Women in Science, Bloomington, IN chapter

President (1994 - 1995, 1996 - 1998), *President-Elect* (1993 - 1994)

Past-President and Chair, Program Committee (1995 - 1996, 1998 - 1999)

Secretary (1999 - 2006)

International Association for Great Lakes Research, *Life member*

National Association of Environmental Professionals (NAEP)

NAEP Indiana Chapter *Steering Committee* and *Vice-President* (1996 - 1998)

New York Academy of Science

Sigma Xi, the scientific research honors society, *Life member*

Society for Environmental Toxicology and Chemistry (SETAC);

Ohio Valley SETAC (1993- Present); Pacific Northwest SETAC (1990-1994)

Board Member, Ohio Valley SETAC (1995 - 2001; 2003 - 2005)

President, OVSETAC (1999-2000), *President-Elect*, OVSETAC (1998-1999),

Past-President, OVSETAC (2000-2001);
National: Education Committee (2002 - Present);
Government Affairs Committee (1999 - 2001)
Program Committee (2006-2007)

Society for Neuroscience

Society of Toxicology

Pacific Northwest Association for Toxicology (1990-1993)

Specialty Sections: Developmental and Reproductive Toxicology, Neurotoxicology

Indiana University Graduate Faculty; *Full Member*

HONORS and AWARDS

Indiana University Scholarship of Teaching and Learning Leadership Award, 2006

Society of Environmental Toxicology and Chemistry: Presidential Citation, 2006

Indiana University School of Public and Environmental Affairs Teaching Award, 2005

Indiana University Summer Faculty Fellowship, 1993, 1996, 2005

American Society for Testing and Materials Committee E47:

Outstanding Service Award of Appreciation, 2003

Exceptional Service Award, 1996

Indiana University Outstanding Junior Professor Award 1997

Listed in **Who's Who in the World** 1995 -

Listed in **Who's Who in American Women** 1995 -

Listed in **Who's Who in American Education** 1994 -

Listed in **Who's Who in the Midwest** 1994 -

Listed in **Who's Who in Science and Engineering** 1992 -

Listed in **Who's Who in Medicine and Healthcare** 1997 -

Listed in **Who's Who in the West** 23rd, 24th Edition, 1992/1995

New York State Regents Scholarship, 1973

National Merit Scholarship - Letter of Commendation, 1973

GRANTS, CONTRACTS, FELLOWSHIPS and AWARDS (P.I. unless mentioned)

Indiana University Scholarship of Teaching and Learning Fellowship, (awarded to the Environmental Literacy and Sustainability Initiative team, of which I am an equal co-PI and one of the five faculty members participating with my E512/E412 Risk Communication class in the Fall 2006 semester), \$30,000, 2006 – 2008, “Food for Thought”

Indiana University Faculty Research Support Program, 2006 – 2007, \$64,000, “Effect of Red Light Phototherapy on Dioxin-Induced Toxicity in Chick Embryos”

Indiana University Multidisciplinary Ventures and Seminar Fund, 2005 – 2006, \$5,000, “Effect of Near Infra-Red Light on Dioxin Toxicity in Embryos”

**PREFILED DIRECT TESTIMONY OF
DIANE S. HENSHEL, PH.D.**

**SAVE THE VALLEY, INC.
EXHIBIT DSH-1**

Indiana University Grant-in-Aid of Research, 2004 – 2005, \$2,500, “Effect of Near Infra-Red Light on Dioxin Toxicity in Embryos”

Indiana University Summer Faculty Fellowship, 2005, \$8,000, “Effect of Near Infra-Red Light on Dioxin Toxicity in Embryos”

US Fish and Wildlife Service, 1995 – 2006, \$380,600 through IU, \$175,000 through Henshel EnviroComm

“Technical Assistance on the NRDA Sites in Monroe and Lawrence Counties, IN - Histology”

“Technical Assistance on the NRDA Sites in Monroe and Lawrence Counties, IN”

“Histological and Morphometric Analysis of Fish in Streams in Monroe County, IN”

“Barn swallow physiological bioeffects assessment, Grand Calumet River and Indiana Harbor Canal, Lake County, Indiana”

“Patoka River National Wildlife Refuge - Follow-up investigation of problematic contaminant concerns found during the baseline investigation”

“Tree swallow bioeffects assessment, multiple PCB sites in Bloomington, IN”

“Histopathological impacts of PCBs on passerines nesting at the Westinghouse PCB sites, Monroe, Owen, Greene, Martin and Lawrence Counties, Indiana”

US EPA GLNPO Sub-contract under MSU TOSC Grant, 2002 – 2003, \$12,000 for sub-contract.

US Department of Defense, Jefferson Proving Ground Technical Assistance for Public Participation, Contract with Henshel EnviroComm, 1999 – 2003, \$100,000

Indiana Department of Higher Education Eisenhower Profession Development Grant 2001-2002, \$15,000, “SPECIES - Teachers”

US EPA Environmental Community Internship Fellowship 2001, 2002, \$5,300, (Granted to Indianapolis Urban League Environmental Coalition; Intern: Jeremiah Brown; D Henshel primary mentor/grant red tape)

US EPA Environmental Justice Small Grant (Granted to Indianapolis Urban League Environmental Coalition - IULEC), 1999 – 2001, \$20,000,
“GIS Database Development and Urban Community Education”

US Fish and Wildlife Service, Upper New York State Field Office, 1997, \$16,363,
Adverse effects related to environmental contaminants as seen in developing organisms.
Histopathology of Hudson River Tree Swallows”

Indiana University Outstanding Junior Faculty Fellowship/Award, 1996 – 1997, \$12,500

US Fish and Wildlife Service, 1996 – 1997, \$7,824,
“Double-Crested Cormorant Brain Asymmetry Analysis”

Pennsylvania Cooperative Fish and Wildlife Research Unit, Pennsylvania State University, 1995 – 1997, \$25,000, “Measuring tree swallow brains”

Indiana University Summer Faculty Fellowship, 1996, \$6,500, “Effects of PCBs and PAHs on avian wildlife: an integrated, multi-level analysis”

**PREFILED DIRECT TESTIMONY OF
DIANE S. HENSHEL, PH.D.**

**SAVE THE VALLEY, INC.
EXHIBIT DSH-1**

Indiana University Intercampus Research Fund, 1995-1996, \$9,500 (With Elliott Blumenthal)
"Dioxin effects on protein kinase C and tyrosine kinase in the early embryo"

Miles, Inc., Alternative to Animals Research Grant; City of Berkeley, Citizen's Humane
Commission, 1995, \$19,000, "Development of an alternative assay for teratogenicity testing"

US Fish and Wildlife Service, 1993 – 1995, \$21,450, "The reproductive and developmental
toxicity of TCDD-containing soils in the domestic chicken"

US Fish and Wildlife Service, 1993 – 1994, \$7,600, "Assessment of exposure, depuration and
bioeffects in four deformed bald eaglets in Michigan"

US Army Corps of Engineers, 1993 – 1994, \$59,831, "Preliminary assessment of health risks
associated with the Crane Naval Surface Weapons Center"

Biomedical Research Support Grant, 1994, \$7,500, "Developmental neuro- and embryotoxicity
of dioxin-like compounds"

Overseas Conference Fund Travel Grant (Indiana University) 1994, \$600

Arde Bulova Foundation Grant, 1993 – 1994, \$3,000, "The effects of dioxin on the developing
avian embryo"

Indiana University Bloomington Summer Faculty Fellowship, 1993, \$6,500, "The effects of
dioxin on the developing avian embryo"

Sustainable Development Research Initiative Grant (author, contact person, and co-investigator)
funded by the British Columbia Science Council and the British Columbia Environment
Ministry, 1991 – 1992, \$56,500, "Development of a toxic/hazardous waste biomonitoring assay"

National Science and Engineering Research Council (NSERC)-Industrially Oriented Research
Grant (author and co-investigator; John Steeves, P.I.), 1990 – 1992, \$24,000, "The effects of
dioxin on the developing avian embryo"

British Columbia Environment Ministry, 1990, 1991, 1992, \$36,000 total, "Analysis of the
enhanced sensitivity of chicken embryos to dioxin"

Wildlife Toxicology Fund Grant (author and co-investigator; John Steeves, P.I.), 1990-1991,
\$40,000, "The effects of dioxin on the developing avian nervous system"

Private Grants from: Fletcher-Challenge Canada, 1990 – 1991, \$8,000

MacMillan-Bloedel Ltd., 1990 – 1991, \$8,000

Canfor Corporation, 1990 – 1991, \$8,000

Private Grants from: B.C. Wildlife Federation, 1990, \$250

Northwest Territories Wildlife Federation, 1990, \$150

Washington University Institutional Grant, 1986 – 1987

National Eye Institute Vision Training Grant, 1983 – 1986

National Society to Prevent Blindness Grant, 1983 – 1984, \$10,000

National Institutes of Health - Pharmacology Training Grant, 1981

National Institutes of Health - Neuropharmacology Training Grant, 1980 – 1981

TEACHING ASSIGNMENTS

Indiana University, School of Public and Environmental Affairs, Bloomington, IN

1. E300 Introduction to Environmental Science (1993)
2. E311 Introduction to Risk Assessment and Risk Communication (1999, 2001, 2006 [F,S in 2006])
2. E400/E555//E441/E541 Toxicology and the Media//Controversies in Environmental Health (1993, 1995, 1997)
3. E412/E512 Risk Communication (1994, 1996, 1998, 2001, 2004, 2006)
4. E410 Undergraduate Introduction to Environmental Toxicology (1994 - 1998, 2000-2003, 2005, 2007)
5. E520 Graduate Environmental Toxicology (1992 - 1998, 2000-2005, 2007)
6. E560 Risk Decision Analysis (1995)
7. V600 Environmental MSES/MPA Capstone (2002, 2005, 2006)
7. E680 Seminar in Environmental Science (1993 - 1995, 1998, 2005)
8. V691 Workshop in Public Policy (2004)
9. E710/E555 Topics Courses: Dioxins and Endocrine Disruption (1997), Ecological and Aquatic Toxicology (2003), Developmental Neurotoxicology (2005)
10. Environment 99, SPEA sponsored High School Summer Program

Readings Courses

Environmental Equity and Toxicology (Lisa Harris), Spring 1993
Neurotoxicology (Ana Boischio), Spring 1993
Risk Assessment (Kara Morgan), Spring 1994
Biomarkers and their use in Environmental Impact Assessment (Minerva Mercado), Fall 1995
Risk Communication and Hazardous Waste Siting (David Murphree), Fall 1995
Risk Assessment and Environmental Regulations (Mary Beth Schmucker), Fall 1995
Dioxins and Environmental Estrogens (Chris Gabrys), Spring 1997
Environmental Pollutants and Societal Implications (Bill Price), Fall 1997
NIR Light Therapy: Effects of Dioxin on ATP Synthesis (Jill Franzosa), Spring 2005
NIR Therapy: Reduction in Embryo Mortality (Ronnie Yeager), Spring 2005, Fall 2006
NIR Therapy: Biochemical Oxidative Stress Impacts On Embryonic Kidney And Liver (Jinhwan Lim), Spring, Summer, Fall 2006
Analysis of Deformities in the Yellowstone National Park Region (Mary Ruhter), 2007

Laboratory Training Courses

L490 / E490 Undergraduate Laboratory Biology Research (Fall 1995 - Present, every semester including most summers)

Range: 1 - 8 L490/E490 students per semester, including summers

Guest Lectures

V691 Workshop in Public Policy, Spring 2004
L105 Agricultural Biotechnology, Spring 2000, 2001
E200 (Energy Technology and Policy), Spring 1993
E272 Environmental Science, Fall 2002, Spring 1999, 2003, 2004
E300 Introduction to Environmental Science, Fall 1993
V520 Environmental Policy Analysis, Spring 1995
V550 Negotiation and Dispute Resolution for Public Affairs, Fall 1995
E560 Risk Decision Analysis, Spring 1993, 1994, 1997
E560 Risk Decision Analysis, Co-instructor for special session at the Higher School of Economics, Moscow, Russia 2006
V664 Seminar in Policy Analysis, Spring 1998

Special Teaching - Related Activities

Indiana University – Bloomington Environmental Literacy and Sustainability Initiative:
- Coordinating Committee, 2005 - Present
- Institutional Structure Definition Subcommittee, 2004 – Present
- Participant and Presenter in the Teaching Freshman Environmental Literacy Seminar and Workgroup, 2003 – Present

University of British Columbia, Department of Zoology, Vancouver, B.C., Canada

Lecturer/Course Master: Animal Physiology, Fall 1989
Guest Lectures: Environmental Physiology, Fall 1990

University of British Columbia, Faculty of Agricultural Sciences, Vancouver, B.C., Canada

Guest Lectures: Animal Genetics, Spring 1989

Washington University Medical School, Department of Biology, St. Louis, MO

Neurophysiology (teaching assistant and guest lecturer), 1983
Comparative Vertebrate Anatomy and Development (teaching assistant), 1980-1981

Brown University, Department of Physics, Providence, RI

Introductory College Physics (self-paced; proctor [section teacher]), 1975 - 1978

SERVICE

University Committee and Organization Service

IUB Campus Level Service

Bloomington Faculty Council, Research Affairs Committee, 2005 - Present
Indiana Daily Student Opinion Forum member, 2005

Grant-in-Aid Review Committee, 2005
Council on Environmental Stewardship, *SPEA representative*, 2003 - 2006
Women in Science Program (WISP) Advisory Board, *Member*, 2000 - 2002
WISP Fellowship Selection Committee, 2001
Ad Hoc SPEA/COAS/Sch.Ed. committee on Science Outreach, *Member*, 1998-1999
Sustainable Development/Environmental Justice Workgroup – IUB *Chair/Coordinator*
Sponsored by SPEA and the Global Change Center, 1996 - 1997
Summer Faculty Fellowship Selection Committee, *Member*, 1994
Women in Science and Engineering Campus Team, *Member*

Public Service

International:

Second International Conference on Environmental Bioindicators (April 2006) *Coordinating Committee* (2005-2006)

Co-Teacher (Risk Assessment 40 hr class) and Lead Research Dissemination Team Member, USAID funded project with the Higher School of Economics (HSE), Moscow, Russia. (Project: 2005-2007; Trips: October 2005, March, June 2006).
Project Goal: To help the HSE develop into a Western-Style Policy Think Tank. (M. Pirog, PI)

Commission for Environmental Cooperation, Invited participant as public representative to public meeting of the Sound Management of Chemicals Working Group. San Diego, CA, March 2005.

Participant, Trip to the North West Academy of Public Administration (NWAPA), St. Petersburg, Russia. Participated in two-week long trip to NWAPA and affiliate academy in Vyborg, Russia. Delivered lectures, interviewed prospective Russian visitors to the US, participated in NWAPA-sponsored International Workshop on Public Administration and discussed possible future collaborations with science colleague from Vologda, Russia, and policy colleagues from Finland. University Partnership Agreement grant funded by the US State Department (J. Mikesell, PI). November, 2003

Member, Science Advisory Board (SAB) of the International Joint Commission on the Great Lakes (IJC), 1997 - 2001, and of the IJC-SAB Workgroup on Ecosystem Health, 1997 - 2002

- *Planning Committee and Presenter*, International Joint Commission on the Great Lakes Science Advisory Board's Workgroup on Ecosystem Health: Workshop on Methodologies for Community Health Assessment in Areas of Concern, October 4-5, 2000, Windsor, ONT
- *Facilitator*, Discussion on Community Responsiveness of Lakewide Management Plan Process, IJC Biennial Meeting, Milwaukee, WI, September, 1999

- Planning Committee and Facilitator, Workshop on "Great Lakes Lakewide Management Plans" Windsor, ONT, Canada, February 1999

Voting Member of the Multiple Stakeholder's Working Group on Pulp and Paper Management in British Columbia, Canada (1991-1992)

Member, Great Lakes Wildlife Bioeffects Group (1992- 1998)

Member, UBC Hazardous Waste Research Group of the B.C. Sustainable Development Research Initiative, Vancouver, BC, Canada (1990-1992)

National:

Invited Expert, EPA Science Advisory Board Ecological Processes and Effects Committee Workshop on Ecological Risk Assessment – An Evaluation of the State-of-the-Practice, Washington, DC, Feb 7-8, 2006

Facility Review Team, National Oceanic and Atmospheric Administration (NOAA) Northwest Research Science Center, July 2005

Adjunct Member, National Academy of Public Administration Standing Panel on Social Equity (2000 - Present)

Grand Jury Judge, 2002, and Society for Toxicology and Chemistry Special Awards Judge (team leader), 2003, 2004, 2006, Intel Science and Engineering Fair

Member, National Research Council Committee on Assessment of Risks from Remediation of PCB-Contaminated Sediment (1999 - 2001)

Environmental Protection Agency Invited Expert activity:

*Food Quality Protection Act (FQPA) Science Advisory Panel (SAP) (1998 -)
EPA Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) Endocrine Disruptors Screening and Testing Advisory Committee (EDSTAC) Report Review Panel (1998 - 1999).*

Short Course Instructor:

"Biomarkers: Potential Neurotoxicological Biomarkers, Guidelines for Future Biomarkers Development" (2 sections of the course) Society for Environmental Toxicology and Chemistry National Meeting Washington, DC, November 17, 1996

*"Ecological Risk Assessment" (section on Effects Assessment)
Society for Environmental Toxicology and Chemistry, Ohio Valley Chapter Regional Meeting Richmond, KY, June 6 - 7, 1996*

Invited panel member, EPA Workshop on Environmental Estrogens and Risk Assessment

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Panels: Neurotoxicology and Dose-Response Relationships Raleigh, N.C., April 10
- 14, 1995

Presented an Invited Statement before the National Advisory Committee for Environmental
Policy and Technology Superfund Evaluation Committee, September 20, 1993

American Society for Testing and Materials (ASTM), Committee E47 Biological Effects and
Environmental Fate Symposium-Related Coordination Service

- *Symposium Co-Chair*, Fifth Symposium on "Environmental Toxicology and Risk
Assessment: Biomarkers and Risk Assessment," Denver, CO April 3-5, 1995
- *Symposium Chair*, Eighth Symposium on "Environmental Toxicology and Risk
Assessment: Standardization of Biomarkers for Endocrine Disruption and
Environmental Assessment," Atlanta, GA April 19 - 23, 1998
- *Symposium Organizing Committee*, Special Symposium on "Modelling and
Measuring the Vulnerability of Ecosystems at Regional Scales for Use in Ecological
Risk Assessment and Risk Management," Co-sponsored by the US Environmental
Protection Agency Seattle, WA, August 17 - 20, 1998
- *Editorial Advisory Committee* for Ensuing Special Issue of Environmental
Toxicology and Chemistry, 2000

Volunteer scientist, Science by Mail, 1991 - 1997

State:

Indiana Environmental Justice Advisory Committee, 1999 - Present

Indianapolis Urban League:

Environmental Coalition (IULEC) *Charter Member, Steering Committee Member*,
1997 - Present
Program Committee, *Member*, 2002 - 2004

Indiana Faith-Based Global Climate Change Campaign, *Steering Committee Member*, 2000
- 2003, *co-coordinator for two public education workshops*: 2001, 2002

Indiana Interfaith Environmental Task Force

Board of Directors, Charter Member, 2004 - Present

Indiana Junior Academy of Science Outstanding Junior Scientist, *Abstract Reviewer and
Judge*, 2002, 2003, 2004, 2005, 2006

Jefferson Proving Ground Restoration Advisory Board (DOD Funded) /
Save the Valley Technical Support Team

Technical Support, 1999 - Present

EPA/IDEM/DOD/RAB Remedial Investigation/Feasibility Study Review Team, 2001

- 2003

Army Corps of Engineers coordinated *Ad Hoc* Committee on air monitoring for the proposed Indiana Harbor Canal Dredge Project, 2001 - 2002

Indiana Core 40 High School Environ Science Competency-Writing Team, 1997

Indiana Brownfield's Policy Review Group, 1995

Local:

Center for Justice and Mediation / Victim Offender Remediation Program
Volunteer mediator, 2004- Present; Education Committee, 2004 - present

Citizens Information Committee, Bloomington, IN, 1992 - Present
(Addresses and is the community contact point for the EPA with regards to the Bloomington PCB sites)

Save Our Southside Neighborhood, Environmental Coordinator, 1999

Jackson Creek Middle School, Technology Committee Parent Rep, 1999 -2000

Rogers Elementary School, Library Volunteer and Math Club Coord., 1999 - 2001

Brownie Math and Science Days Volunteer, Tulip Trace Girl Scout Council
Pollution Room designer and coordinator, 1995, 1999
Biology room volunteer and planner, 1996-1998, 2000-2001, 2002, 2006

Bloomington Progressive Elementary School, Board member, 1993-1994

Paid Consultantships and Honoraria

Government

- US Department of the Interior, Fish and Wildlife Service, National Fisheries Contaminant Research Center (now the Midwest Science Center of the National Biological Services of the United States Geological Survey), 1993

Industry

- Ice, Miller, Donadio and Ryan, 1995
- Barrett and McNagny, 1993 - 1994
- Reilly Industries, Inc., 1993
- Siemens Pacesetter, Inc, 1993

Academia

- University of Louisville, Department of Biology, 2002
- University of Wisconsin - Milwaukee Marine and Freshwater Biomedical Research Center, 1993

Peer Review Activities

Editorial Board

- Environmental Bioindicators Journal
- Environmental Communication

Peer Reviewing for Journals and Technical Publications

- American Society for Testing and Materials (ASTM) Committee E47, Special Technical Publications (STP)
- Biochemical Pharmacology
- Environmental Health Perspectives
- Environmental Health Perspectives Supplements
- Environmental Monitoring and Assessment
- Environmental Science and Technology
- Environmental Research
- Environmental Toxicology and Chemistry
- Journal of Aquatic Ecosystem Health
- Journal of Toxicology and Environmental Health
- Ohio Journal of Science
- Toxicology and Applied Pharmacology
- Toxicological Sciences

“Best Practices for Effective Public Involvement in Restricted Use Decommissioning of NRC Licensed Facilities”, submitted to DOD by the US Institute for Environmental Conflict Resolution, *Interviewee and Reviewer*

“Quantitative Dose-Response Modeling of Dioxins-Like PBTs in Laboratory and Field Studies of Avian Wildlife”, submitted to EPA by the Eastern Research Group Inc.

Grant Reviewer

- EPA Extramural Grants Program
- EPA Intramural Grants Program
- EPA Environmental Education Grants Program
- EPA STAR Fellowship Program
- March of Dimes, Basil O'Connor Fellowship Program
- Sea Grant (Wisconsin Sea Grant Institute) Program
- Army Corps of Engineers EDRC Program

Textbook Reviews

Introduction to Environmental Toxicology by Landis and Yu (3 chapters)

Lectures/Presentations at Professional Meetings/Workshops/Symposia/Public Venues for which no published abstracts are available. (Presentations for which abstracts are published are listed under Publications at International/National Meetings)

- 4/06 *Invited Panelist Presenter*, Bhopal Then and Now, A Toxicological Travesty, Panel on Bhopal Today, IUB Association for India's Development
- 3/06 *Invited lecture*, Environmental Endocrine Disruption, Calvin College
- 1/06 *Invited lecture*, DU and Public Policy, Franklin College, Franklin, IN
- 11/05 *Panelist Presenter*, Environmental Justice and Land Use: Transportation and
- 7/06 Public Health, Workshop on Where Environmental Justice and Land Use Planning and Zoning Collide: A One Day Workshop for Local Officials, Chicago, IL; Albuquerque, NM
- 10/05 *Invited panel presenter*, Measuring Environmental Literacy and Sustainability Learning, Panel on Disciplinary Perspectives on Evidence: Environmental Literacy and the Assessment of Student Learning, Scholarship of Teaching and Learning Workshop, Indiana University, Bloomington, IN
- 10/05 *Invited lecture*, Science policy research and development of policy, Higher School of Economics, Moscow, Russia.
- 5/05 *Invited Lecture*, Organochlorine Toxicity: Mechanisms and New Directions, Renal Research Rounds, IUPUI Medical School, Indianapolis, IN
- 4/05 *Invited speaker*, Asbestos and Health, Bloomington Earth Week Celebrations, Bloomington, IN.
- 2/05 *Invited panel presenter*, Environmental Justice Research, Methods and Case Studies, Panel on Environmental Justice in the 21st Century, Environmental Management Association Workshop, Indiana University, Bloomington, IN
- 1/05 *Invited Panel Presenter*, DDT and PBB: Literature Update; Pine River Task Force Citizen's Advisory Group Environmental Health Symposium, Alma, MI
- 10/04 *Invited speaker*, Scared to Know: Focus on Environmental Health, Zeta Phi Beta Sorority, Indiana University, Bloomington, IN
- 5/04 *Lecturer*, Depleted Uranium and Human Health, Depleted Uranium Forum, 5th International Organizing Conference on Iraq, Bloomington, IN
- 11/03 *Lecturer*, Environment and Policy, Northwest Academy of Public Administration (NWAPA), St. Petersburg, Russia
- 9/03 *Invited Panel Presenter*, Health as a Social Equity Indicator, Third Social Equity Leadership Conference, sponsored by the National Academy for Public Administration Standing Panel on Social Equity In Governance, Cincinnati, OH
- 6/03 *Poster Presentation*, Using data mining to evaluate the linkage between public health and environmental exposures, Association for Science in the Public Interest Annual Meeting, Fairfax, VA
- 6/03 *Invited Panelist and Participant*, Institutional controls at Jefferson Proving Ground: The problems with depleted uranium, Workshop on Federal Facilities Cleanup Forum: Technical Information and Citizen's Forum, University of Massachusetts, Amherst, MA
- 4/03 *Invited Panelist and Presenter*, Review of Environmental Justice Methodologies, Symposium on Environmental Justice, Valparaiso Law School, Valparaiso, IN
- 2/03 *Poster Presentation*, Correlation Between Environmental PCBs and Mercury Concentrations and Age-Standardized Disease Morbidity and Mortality Rates for the Seventeen Canadian Great Lakes Areas of Concern, (with J. Klump),

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- Workshop on Mercury and Cerebral Palsy, International Joint Commission Science Advisory Board and Workgroup on Ecosystem Health, Windsor, ONT, Canada
- 11/02 *Invited Presenter*, The effect of dioxins and PCBs on avian growth and development: A cross-correlation between laboratory and wildlife-based field studies, University of Louisville, Department of Biology Departmental Seminar, Louisville, KY
- 6/02 *Invited Presenter*, Addressing Environmental Justice Issues in Indianapolis, Indiana Society for Public Administration, Indianapolis, IN
- 6/02 *Invited Panelist and Participant*, Jefferson Proving Ground update, Panel Session on Information Access for Effective Cleanup. Federal Facilities Clean-up Workshop 2002: Empowering Community-Science Partnerships for Effective Military & Nuclear Waste Cleanup, Oakland, CA
- 5/02 *Invited Presenter*, Health effects of pollutants released during open air trash burning, Indiana Recycling Coalition Annual Mtg, Indianapolis, IN
- 4/02 *Invited Presenter*, Environmental Justice Assessment, Northwest Indiana Environmental Justice Workshop, East Chicago, IN
- 4/02 *Presentation*, Correlation of Environmental PCB and Mercury Data with Canadian Infantile Cerebral Palsy Morbidity Incidence Data. (with J. Klump), Consultation on the Effects of Methylmercury on Human Health, International Joint Commission Science Advisory Board and Workgroup on Ecosystem Health, Ann Arbor, MI
- 11/01 *Planning Committee member and Presenter*, Global Climate Change: The basics of the controversy, Workshop on Climate Change: The Environmental Crisis in Indiana and the World, Sponsored by the Indiana Faith-Based Global Climate Change Campaign, Bloomington, IN
- 9/01 *Invited Participant and Presenter*, Risk assessment of the proposed Indiana Harbor and Canal dredging project, IU Northwest Environmental Justice Conference, Gary, IN
- 7/01 *Invited Participant and Presenter*, Is there an Environmental Justice issue in Indianapolis?, National Academy of Public Administration Standing Panel on Social Equity in Governance Mini-Conference on Social Equity and Environmental Justice, Indianapolis, IN
- 7/01 *Invited Participant*, Jefferson Proving Ground: Cooperation Between DOD and Citizens?, Federal Facilities Cleanup Forum: Technical Information and Citizen's Forum, Amherst College, Amherst, MA
- 4/01 *Invited Presenter and Discussant*, Using the precautionary principle when applying bioavailability, National Research Council Committee on Bioavailability of Contaminants in Soils and Sediments, Washington, DC
- 3/01 *Planning Committee member and Presenter*, "The basic science of global climate change" Workshop on Climate Change: The Environmental Crisis in Indiana and the World, Sponsored by the Indiana Faith-Based Global Climate Change Campaign, Indianapolis, IN
- 3/01 *Invited Lecturer*, Breast Cancer and Environmental Chemicals, Olcott Center for Breast Health, Bloomington, IN
- 12/00 *Co-Organizer and Presenter*, Health effects of pollutants found in air, Workshop on What is in the Air You Breathe?, Sponsored by the Indianapolis Urban League Environmental Coalition, Marion County Department of Health, and the Indiana Department of Environmental Management, Indianapolis, IN
- 10/00 *Presenter*, Interim report on the Great Lakes states health statistics databases, Workshop on Methodologies for Community Health Assessment in Areas of

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- Concern Sponsored by the International Joint Commission Science Advisory Board, Windsor, ONT
- 10/00 *Invited Participant (Panel of Experts), Workshop on Avian Vacuolar Myelinopathy*. Sponsored by the USGS Biological Resources Discipline National Wildlife Health Center, A Madison, WI.
- 5/00 *Presenter*, Review of JPG site contamination and recommendations for the RI/FS, Jefferson Proving Ground Remediation Advisory Board and other stakeholders (Public meeting), Madison, IN
- 3/00 *Invited Presenter*, Health effects of NWI air pollutants, Workshop on Clearing the Air: Strategy meeting on cleaning Indiana's air and water resources, Sponsored by the Sierra Club, Hoosier Environmental Council and Grand Cal Task Force, Calumet, IN
- 2/00 *Invited Lecturer*, Effects of PCBs on Developing Avian Embryos, Clemson University, Pendleton, SC
- 8/99 *Featured Presenter*, Developmental PCB Health Effects on Passerines, Conference on Wildlife Applications to Remedial Decision-Making, hosted by Texas Tech University, co-sponsored by the EPA and FWS, Denver, CO
- 3/99 *Invited Lecturer*, Effects of TCDD on Developing Avian Embryos, Ecology Working Group, Indiana University, Bloomington, IN
- 1/99 *Invited Lecturer*, PHAH-induced avian birth defects, Institute Nationale de Recherche Scientific - Sante, Montreal, QUE
- 10/98 *Invited Participant*, Multi-State Working Group on Environmental Management Systems Roundtable Discussion on Research Strategies Regarding Environmental Management Systems. Sponsored by the Environment Council and the JL Kellogg Graduate School of Management, Northwestern University, Evanston, IL.
- 4/98 *Chair and Invited Presenter*, Symposium on Environmental Toxicology and Risk Assessment: Standardization of Biomarkers for Endocrine Disruption and Environmental Assessment Sponsored by American Society for Testing and Materials Comm. E47 on Biological Effects and Environmental Fate, Atlanta, GA
- 9/97 *Participant*, Wingspread Conference on the Policy Implications of New Evidence Regarding Toxic Substances and Human Health, Sponsored by the International Joint Commission on the Great Lakes, Racine, WI
- 9/97 *Presenter*, Effects of PCBs on Barn Swallows from the Grand Calumet River Area of Concern, International Joint Commission - sponsored Lakewide Management Plan and Remedial Action Plan Workshop on Human Health and Aquatic Life Considerations - Examining the Effects of Persistent Toxic Substances, Cleveland, OH
- 9/97 *Presenter*, Service Learning in the Classroom, Collaborative Learning Workshop, Indiana University, SPEA Fall Retreat, Bloomington, IN
- 6/97 *Coordinator*, Annual Meeting of the Ohio Valley Chapter of the Society for Environmental Toxicology and Chemistry, Bloomington, IN
- 9/96 *Presenter*, PCB-induced impacts on avian nestlings, development of a suite of monitoring indicators, International Joint Commission on the Great Lakes Workshop on Environmental Results: Monitoring and Trends of Effects Caused by Persistent Toxic Substances, Windsor, ONT
- 6/96 *Session Moderator and Presenter*, Effects of TCDD on avian brain development, and Effects of TCDD on avian hatchling behavior, Session on "Non-Human Health Effects" MIT Conference on The Future Uses of Chlorine: Issues in Education, Research and Policy, Boston, MA
- 5/96 *Presenter*: TCDD impacts on early avian brain development, International Association for Great Lakes Research, special session on Endocrine and

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- 4/96 *Neurotoxicological Effects of Dioxin-Like Compounds*, Toronto, ONT
Session Chair and Presenter, Symposium on Environmental Toxicology and Risk Assessment, Sponsored by American Society for Testing and Materials Committee E47 on Biological Effects and Environmental Fate, Orlando, FL
- 3/96 *Invited Lecturer*, PCB-induced developmental impacts: Effects on brain development, Institute for Environmental Studies, Lecture Series on Neurotoxicology, University of Illinois, Urbana, IL
- 2/96 *Invited Presenter*, Great Lakes Wildlife Bioeffects Group Spring Meeting, Dayton, OH
- 4/95 *Co-chair*, Symposium on Environmental Toxicology and Risk Assessment - Focus on Biomarkers Sponsored by American Society for Testing and Materials Committee E47 on Biological Effects and Environmental Fate, Denver CO
- 1/95 *Invited Lecturer*, TCDD-induced brain asymmetry, Department of Biology, Indiana University/Purdue University, Fort Wayne, IN
- 10/94 *Presenter*, Great Lakes Wildlife Bioeffects Group Fall Mtg, Madison, WI
- 3/94 *Presenter*, Great Lakes Wildlife Bioeffects Group Spring Mtg, Lansing, MI
- 1/94 *Invited Lecturer*: Indiana University Medical Sciences Program, Bloomington, IN
- 12/93 *Invited Presenter and Participant*, TCDD-induced avian brain asymmetry, Workshop on the Chemically induced alterations in development: The wildlife/human connection Wingspread Conference Center, Racine, WI
- 5/93 *Invited Lecturer*, Effects of PCBs and TCDD on early brain development, Center for Great Lakes Research, Milwaukee, WI
- 4/93 *Invited Lecturer*, TCDD-induced avian brain anomalies, National Fisheries Contaminant Research Center, US FWS, Columbia, MO
- 10/92 *Presenter*, Great Lakes Wildlife Bioeffects Group Fall Meeting, Kalamazoo, MI
- 6/92 *Presenter*, Hazardous, Special and Toxic Wastes Workshop; Sustainable Development Research Initiative, Vancouver, BC, Canada
- 4/91 *Invited Lecturer*, University of British Columbia, Department of Zoology, Vancouver, B.C.
- 3/91 *Invited Lecturer*, Louisiana State University Department of Pharmacology and Toxicology, Shreveport, LA
- 3/91 *Invited Lecturer*, Indiana University School of Public and Environmental Affairs, Bloomington, IN
- 2/91 *Presenter*, Brain asymmetry in heron hatchlings correlated with TCDD exposure, Environmental Effects of Pulp Mill Effluent Workshop, BC Ministry of the Environment, Vancouver, BC, Canada
- 11/89 *Presenter*, BC Great Blue Heron Study Group Workshop, University of British Columbia/Canadian Wildlife Service, Vancouver, BC, Canada

PUBLICATIONS

Books, Peer-Reviewed Articles, Peer-Reviewed Monographs, and Book Reviews; Published and In Press

Yeager, R.L., Parkhurst, D.F. and **Henshel, D.S.** (2007) Graphical Methods for Exploratory Data Analysis with Complex Data Sets. **BioScience**, accepted, in press. (IF 2005: 4.708, citation half life 7.9 yr)

Yeager, R.L., Oleske, D.A., Sanders, R.A., Watkins III, J.B., Eells, J.T., **Henshel, D.S.** (2007) Melatonin as a principle component of red light therapy. **Medical Hypotheses**. Accepted, in press. (IF 2005: 0.92, citation half life 5.2 yr)

Lim, J., DeWitt, J.C., Sanders, R.A., Watkins III, J.B., and **Henshel, D.S.** (2007) Suppression of endogenous antioxidant enzymes by 2,3,7,8-Tetrachlorodibenzo-*p*-dioxin-induced oxidative stress in chicken liver during development. **Arch. Environ. Contam. Toxicol.** In press. (IF: 1.408; citation half life: 7.9 yr)

Yeager, R.L., Lim, J., Millsap, D.S., Jasevicius, A.V., Sanders, R.A., Whelan, H.T., Watkins, J.B.III, Eells, J.T., **Henshel, D.S.** (2006) 670 nm Light Treatment Attenuates Dioxin Toxicity in the Developing Chick Embryo. **J. Biochem. Molec. Toxicol.** 20(6):271-8 (IF 2005 2.0; citation half-life 4.2yr)

Yeager, R.L., Oleske, D.A., Millsap, D.S., **Henshel, D.S.** (2006) Severe craniofacial malformations resulting from developmental exposure to dioxin. **Repro Toxicol.** 22(4):811-812. On-line 7/22/06 (IF 2005:1.635; citation half-life 5.9 yr)

DeSmet, K.D., Paz, D.A., Eells, J.T., Wong-Riley, M.T.T., Henry, M.M., Buchmann, E.V., Connelly, M.P., Dovi, J.V., Liang, H.L., **Henshel, D.S.**, Yeager, R.L., Millsap, D.S., Lim, J., Gould, L.J., Das, R., Jett, M., Hodgson, B.D., Margolis, D., Whelan, H.T. (2006) Clinical and Experimental Applications of NIR-LED Photobiomodulation. **Photomed Laser Surgery** 24(2):121-128. (IF 2005 0.784 – New name for journal in 2005)

Yeager, R.L., Franzosa, J.A., Millsap, D.S., Angell-Yeager, J.L., Heise, S.S., Wakhungu, P., Lim, J., Whelan, H.T., Eells, J.T., **Henshel, D.S.** (2006) Embryonic Growth and Hatching Implications of Developmental 670 nm Phototherapy – Dioxin Co-Exposure. **Photomed Laser Surgery** 24(3): 410-413

DeWitt, J., Millsap, D.M., Yeager, R.L., Heise, S.S., Sparks, D.W., and **Henshel, D.S.** (2006). External heart deformities in passerine birds exposed to environmental mixtures of PCBs during development. **Environ Toxicol Chem** 25(2): 541-551. (IF: 2.414, citation half-life 6.3 yr)

Yeager, R.L., Franzosa, J.A., Millsap, D.S., Lim, J., Heise, S.S., Wakhungu, P., Whelan, H.T., Eells, J.T., and **Henshel, D.S.** (2006) Survivorship and Mortality Implications of Developmental 670 nm Phototherapy – Dioxin Co-Exposure. **Photomedicine and Laser Surgery** 24:29-32.

Henshel, D.S., Sparks, D.W., Simon, T.P., and Tosick, M.J. (2006). Age Structure and Growth of Creek chub (*Semotilus atromaculatus*) (Mitchill) in PCB-contaminated streams in Indiana. **J. Fish Biol.** 68:44–62 doi:10.1111/j.1095-8649.2005.00875.x (IF: 1.188, citation half life 9.5 yr)

Boeglin, M.L., Wessels, D., and **Henshel, D.S.** (2006). An investigation of the relationship between air emissions of volatile organic compounds and incidence of cancer in Indiana counties. **Environ Res** 100(2):242-254. doi:10.1016/j.envres.2005.04.004. (IF 2005: 2.324, citation half life 7.5 yr)

Henshel, D.S and Sparks, D.W. (2006). Site-specific PCB-linked Interspecies Differences in Organ Somatic Indices. **Ecotoxicology** 15:9-18. DOI: 10.1007/s10646-005-0038-0. (IF 2005: 1.552 2005, citation half life 5 yr)

Yeager, R.L., Franzosa, J.A., Millsap, D.S., Angell-Yeager, J.L., Heise, S.S., Wakhungu, P. Lim, J., Whelan, H.T., Eells, J.T., **Henshel, D.S.** (2005) Effects of 670 nm Phototherapy on Development. **Photomedicine and Laser Surgery** 23:268-272.

DeWitt, J.C., Meyer, E.B., **Henshel, D.S.** (2005) Environmental toxicity studies using chickens as surrogates for wildlife: Effects of vehicle volume. **Arch Environ Contam Toxicol** 48(2):260-269.

DeWitt, J.C., Meyer, E.B., **Henshel, D.S.** (2005) Environmental toxicity studies using chickens as surrogates for wildlife: Effects of injection day. **Arch Environ Contam Toxicol** 48(2):270-277.

Henshel, D.S. (2004) Control of glutathione synthesis in early embryo development. **Toxicol Sci.** 81(2):257-259, doi: 10.1093/toxsci/kfh227 (IF 2005: 3.088, citation half life 3.8 yr)

B. Stanton, B., DeWitt, J., **Henshel, D.**, Watkins, S. Lasley, B. (2003) Fatty acid metabolism in neonatal chickens (*Gallus domesticus*) treated with 2,3,7,8-tetrachlorodibenzo-*p*-dioxin (TCDD) or 3,3',4,4',5-pentachlorobiphenyl (PCB-126) in ovo, **Comp Biochem Physiol C. Toxicol Pharmacol** 136(1):73-84. (IF 2005: 1.456, citation half life 7.7)

Henshel, D.S., DeWitt, J., and Troutman, A. (2002). Chicken Embryos for Teratology Studies, **Current Protocols in Toxicology**, MD Maines, ed. J Wiley and Sons, Sec. 13.4

Custer, T. W., C. M. Custer, R. K. Hines, K., L. Stromborg, P. D. Allen, M. J. Melancon, **D. S. Henshel.** (2001) Organochlorine contaminants and biomarker response in double-crested cormorants nesting in Green Bay and Lake Michigan, Wisconsin, USA. **Arch Environ Contam Toxicol** 40:89-100.

A Risk Management Strategy for PCB-Contaminated Sediments (2001) Committee on Remediation of PCB-Contaminated Sediments, Board on Environmental Studies and Toxicology, National Research Council, National Academy Press, Washington, DC

Committee on Remediation of PCBs in Sediments (2001) **A Risk Management Strategy for PCB-Contaminated Sediments: Executive Summary.** National Research Council,

Washington, D.C. Released and presented to Congress and the EPA on January 4, 2001.

Boischio, A.A.P. and **Henshel, D.S.** (2000) Linear regression models on methyl mercury exposure during prenatal and early postnatal life among riverside people along the Upper Madeira River, Amazon. **Environmental Research Section A** 83(2): 150-61.

Boischio, A.A.P. and **Henshel, D.S.** (2000) Fish consumption, fish lore and mercury pollution - Risk communication for the Madeira River people. **Environmental Research Section A** 84:108-126.

Boischio, A.A.P., Cernichiari, E., **Henshel, D.** (2000) Segmental hair mercury evaluation of a single family along the Upper Madeira Basin, Brazilian Amazon. **Reports in Public Health (Cadernos de Saude Publica)** 16(3):681-6.

Henshel, D.S., Black, M, Harrass, M. eds. (1999) Environmental Toxicology and Risk Assessment: Standardization of Biomarkers for Endocrine Disruption and Environmental Assessment (8th Volume), ATSM STP 1364, American Society for Testing and Materials, Philadelphia, PA.

Henshel, D.S. (1999) Detailed Disruptor Data. **Trends in Endocrinology and Metabolism**, 10(5):201-204. (Book Review)

Peden-Adams, M., Alonso, K., Godard, C., Skipper, S., Mashburn, W., Hoover, J., Charbonneau, C., **Henshel, D.**, Dickerson, R. (1998) Effects of environmentally relevant concentrations of 2,3,7,8-TCDD on domestic chicken immune function and CYP450 activity: F1 generation and egg injection studies. **Chemosphere**. 37(9-12):1923-1939. (IF 2005 2.297, citation half life 5.4 yr)

Alonso, K.R., Peden-Adams, M.M., Liu, J.Y., Charbonneau, C., **Henshel, D.**, Dickerson, R.L. (1998) Effects of *in ovo* exposure to 2,3,7,8-TCDD in F1 generation adult chickens (*Gallus gallus*). **Chemosphere**. 37(9-12):1873-1883.

Henshel, D.S. (1998) Developmental and neurotoxic effects of dioxin and dioxin-like compounds on domestic and wild avian species. *Invited manuscript for invitation-only annual review issue* **Environ Toxicol Chem** 17(1):88 - 98

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Henshel, D.S., Martin, J.W., DeWitt, J.C. (1997) Brain Asymmetry as a Potential Biomarker for Developmental TCDD Intoxication: A Dose-Response Study. **Environ Health Perspect**, 105(7):718-725. (IF 2005: 5.342, citation half life 5.7 yr)

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Publications - Submitted and in process

Submitted Papers

Yeager, R.L., Lim, J., Sanders, R.A., Oleske, D.A., Conklin, J.R., Millsap, D.S., Watkins, J.B. III, Eells, J.T., and Henshel, D.S. Energy and glutathione redox balance in developing brain after dioxin exposure and 670nm light treatment. Submitted to **Neuroscience Letters** Nov 2006. (IF 2005: 1.898, citation half life: 7.1 yr)

Henshel, D.S., Sparks, D.W., Simon, T.P., and Tosick, M.J. Reproductive Anomalies in Creek chub (*Semotilus atromaculatus*) (Mitchill) from PCB-contaminated streams in Indiana. Submitted to **J Fish Biol.** Oct 2006.

Millsap, D.S., Wakhungu, P., Yeager, R.L., DeWitt, J.C., Heise, S.S., Sparks, D.W. and **Henshel, D.S.** Cardiac Hypertrophy in Five Passerine Species Developmentally Exposed to Environmental Mixtures of Polychlorinated Biphenyls (PCBs). Submitted to **EcoToxicology.** April 2006.

Papers undergoing revision as recommended by editors

DeWitt, J., Meyer, E.B., **Henshel, D.S.** Effects of 3,3',4,4',5-Pentachlorobiphenyl (PCB-126) or 2,3,7,8-Tetrachlorobenzo-p-dioxin (TCDD) Injected into the Airsacs of Chicken (*Gallus domesticus*) Eggs Prior to Incubation I. Effects of Injection Day

DeWitt, J., Meyer, E.B., **Henshel, D.S.** Effects of 3,3',4,4',5-Pentachlorobiphenyl (PCB-126) or 2,3,7,8-Tetrachlorobenzo-p-dioxin (TCDD) Injected into the Airsacs of Chicken (*Gallus domesticus*) Eggs Prior to Incubation II. Effects of Injection Volume.

Both submitted to **Environ Toxicol Chem.** (Revisions in process as recommended - to combine the papers into one - resubmission planned for this fall according to J DeWitt)

Melillo, P.R., Visser, N.T., Hoponick, J. **Henshel, D.S.** Correlations Between Ground Water Perchlorate Concentrations and Population Level Health Effects in California. Submitted to **Environmental Health Perspectives** (2 14 06.) Under revision as recommended for resubmission

Papers in Process (reviewed once, on hold for now)

Workman, A. Snider, S. and **Henshel, D.S.** Comparison of Cancer Mortality Data in Great Lakes Areas of Concern in Illinois, Indiana, Michigan, Minnesota, Ohio, Pennsylvania and Wisconsin. Submitted to **Environmental Health Perspectives**

Linnet, M., **Henshel, D.S.** Histological effects of TCDD on gonadal development in chicken hatchlings. Submitted to **Reproductive Toxicology**

Workman, A, **Henshel, D.S.**, and Carpenter, D.C., Great Lakes States Health Statistics for Areas of Concern in the United States.

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UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION
BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

_____)	
In the Matter of)	Docket No. 40-8838-MLA
)	
U.S.ARMY)	ASLBP No. 00-776-04-MLA
)	
(Jefferson Proving Ground Site))	July 20, 2007
_____)	

CERTIFICATE OF SERVICE

I hereby certify that copies of the foregoing "Supplement to Initial Position Statement of Save the Valley, Inc.," and "Prefiled Direct Testimony and Exhibits of Diane S. Henshel" have been served this 20th day of July, 2007, upon the following persons by electronic mail and by U.S. Mail, first class postage prepaid.

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U.S. Nuclear Regulatory Commission
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Washington, D.C. 20555-0001

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July 20, 2007

Secretary

U.S. Nuclear Regulatory Commission

Washington, D.C. 20555-0001

ATTN: Rulemakings and Adjudications Staff

Re: Supplement to Initial Statement of Position of Save the Valley, Inc., and
Prefiled Direct Testimony and Exhibit of Diane S. Henshel, Ph.D.

In the Matter of the U.S. Army (Jefferson Proving Ground Site), Docket No. 40-8838-
MLA, ASLBP 00-776-04-MLA

Dear Secretary:

Enclosed please find for filing in the above-referenced docket the original and two
conformed copies of the above-referenced filings, along with the related Certificate of Service.

Thank you for your assistance in this matter.

Respectfully submitted,



Michael A. Mullett

Attorney for Save the Valley, Inc.

cc: Service List – Docket No. 40-8838, ASLBP 00-776-04