PROBABLILITY OF CROSS CONTAMINATION OF AGENT ORANGE/DIOXIN RESIDUES IN THE THEATER OF COMBAT

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BLUE WATER NAVY VIETNAM

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A PROFESSIONAL OPINION

For

MILITARY-VETERANS ADVOCACY, INC
SLIDELL, LA
USA

By

Dr. Wayne Dwernychuk
Agent Orange Specialist

MAY 1, 2022

1.0 Statement of Facts

With Contributions from:
Commander John B. Wells U. S. Navy (Retired)
Attorney at Law
Chairman
Military-Veterans Advocacy, Inc.
&
Mr. John P. Rossie
U. S. Navy Vietnam Veteran
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1.1 Fleet Air Support Unit (FASU) and Carrier Onboard Delivery (COD)

During the Vietnam War, naval task groups were centred on aircraft carriers operating in the Gulf of Tonkin off the coast of Vietnam, and in the South China Sea off the coast of South Vietnam (*see* Page 16). An important facility in the successful operation of U. S. Naval forces was the Fleet Air Support Unit (FASU) terminal located on the Da Nang airbase (Photo 1).

The location of FASU terminal was just off to the side of one of the runways situated down runway from the Ranch Hand location. The Ranch Hand area was where Agent Orange was stored, mixed, loaded on to either C-123 fixed wing aircraft or helicopters, often spilled, and where Agent Orange tanks on aircraft were washed with drainage simply being on to the tarmac. The location of the FASU terminal is presented in Figure 1.

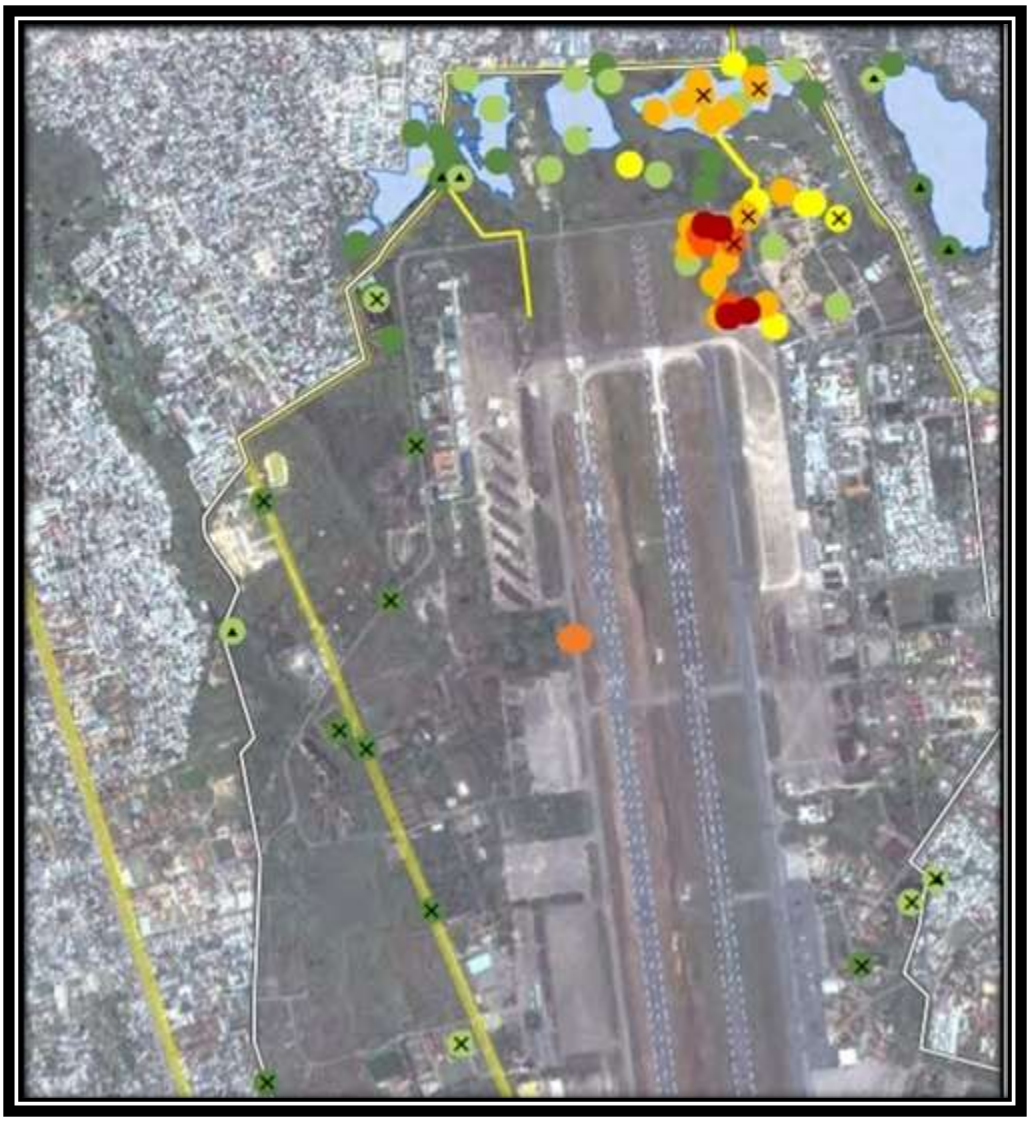

FIGURE 1. Da Nang airbase. Northern sector with the deepest red circles was the Ranch Hand Agent Orange storage and mixing/loading sites. Dioxin sampling sites noted (coloured circles). Positioning of in-transit canvas mail bags destined for COD displayed. SOURCE: Hatfield Consultants 2009 final Da Nang report. *LARGER ORANGE DOT IN THE MIDDLE OF THE IMAGE IS THE FASU TERMINAL STAGING AREA FOR MATERIALS PRIOR TO COD TRANSPORT DURING THE VIETNAM WAR (SOURCE: pers. comm., John Rossie)*

Figure 2 summarizes the dioxin TEQ levels (Toxic Equivalency Levels) within the northern sector of the Da Nang airbase where Ranch Hand was situated.

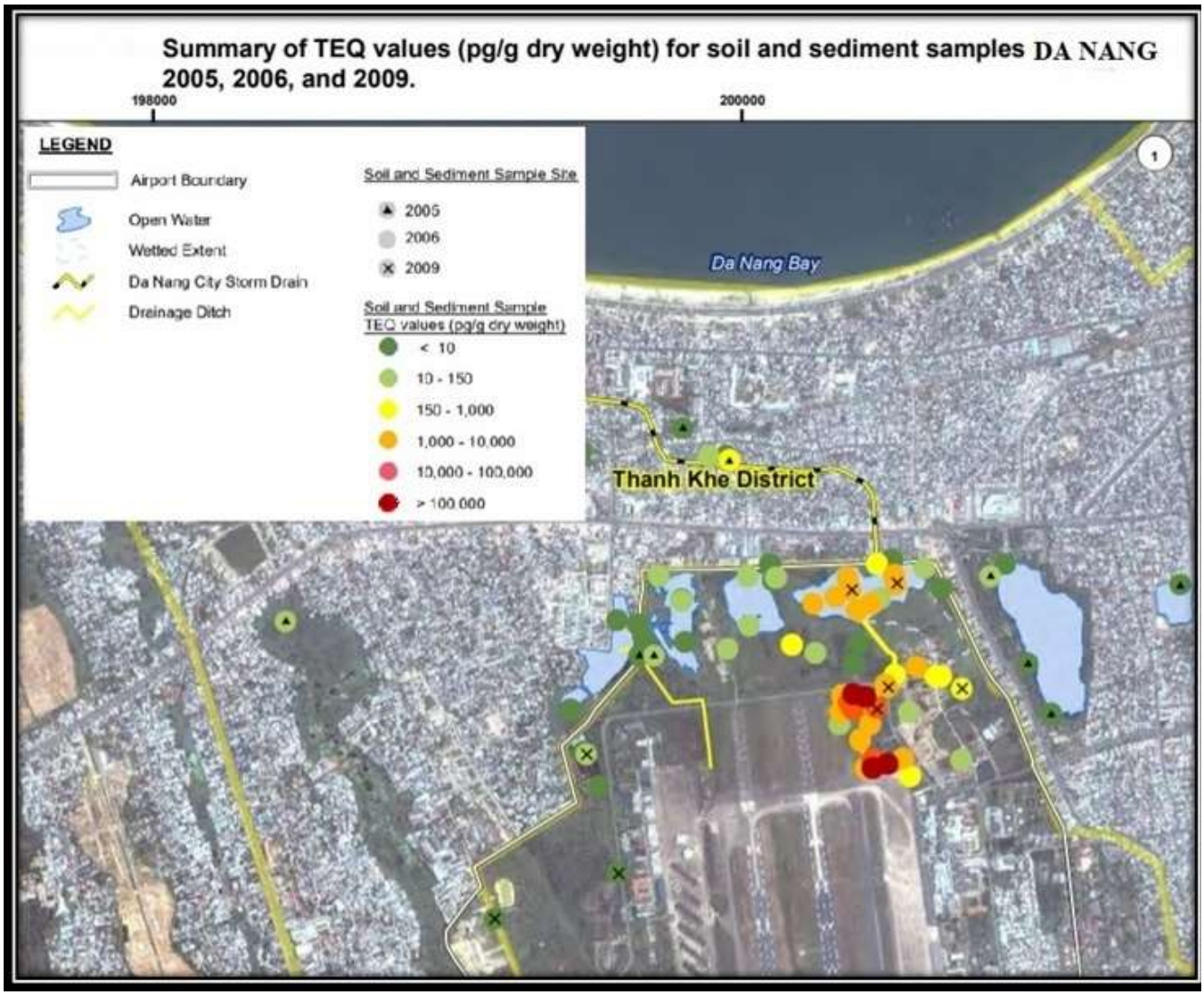

FIGURE 2. Summary of dioxin TEQ levels in the northern sector of the Da Nang airbase. The highest levels of dioxin contamination (10,000 – 100,000 and >100,000 ppt) occurred at the Ranch Hand Agent Orange storage site (northern deep red circles) and the Agent Orange mixing/loading area (southern deep red circles). (SOURCE: Hatfield Consultants 2009 final report on dioxin contamination on the Da Nang airbase):

https://www.hatfieldgroup.com/wp-content/uploads/2020/05/da-nang-2009-report.pdf

The primary function of the FASU terminal was a staging area for materials destined for the carriers and subsequently on to other fleet members. Such materials consisted of canvas mail bags, supplies, spare parts, cargo, personnel and their luggage, pallets, canvas sea bags, packages, cardboard containers, etc. Personnel and the various in-transit materials were often staged outside the FASU terminal near the tarmac. For more information regarding the FASU terminal, see Supplement 1.

Materials staged (sometimes for days) at the FASU terminal where subsequently transported to the carrier via Carrier Onboard Delivery aircraft (COD; Photo 2). COD aircraft flew on a daily basis (or more often) to Da Nang from the carrier, where they would pick up the tarmac-staged materials and transport these back to the carrier for replenishment of the carrier and task force members.

Photo 2. A Grumman C-2 Greyhoud. The prime COD U. S. Navy aircraft since the mid-1960's.

Once the COD aircraft landed on the carrier (Photo 3), all packages and personnel bound for this carrier would remain on the vessel. Cargo was offloaded and remained on the flight deck until it was taken down into the ship, often by elevators. The cargo would be distributed throughout the ship. Mail would be taken to the post office where various mail petty officers would sort and deliver the mail to all personnel.

Photo 3. COD aircraft being unloaded by Navy personnel on the flight deck of an aircraft carrier.

All materials and personnel bound for other smaller ships would subsequently be distributed to such vessels (e.g., destroyers). These smaller ships would often be in a Carrier Task Force, meaning they would be moving along with the carrier and would use the carrier as a source of fuel, at which time supplies and personnel could be transferred while underway

(Photo 4; *see* Page 16). Helicopters were also used to transfer materials to other fleet members.

Photo 4. The transferring of cargo, fuel, and personnel from an aircraft carrier to a smaller vessel in the Carrier Task Force.

Supplement 2 is a professional opinion undertaken for Mr. John R. Richardson regarding his potential contamination from Agent Orange/Dioxin exposure in the performance of his duties in the U. S. Navy (Vietnam Veteran, Store Keeper Third Class and/or Lead Supply Department Yeoman, SK-3/E-4).

The Richardson opinion centred on Agent Orange/Dioxin laden organic sediments onto which were adsorbed residues of this toxin originating from within the Ranch Hand sector of the Da Nang airbase. Richardson was involved in the handling of canvas mail bags that were collected by the Fleet Air Support Unit (FASU) in Da Nang, flown by COD and unloaded onto the USS Aircraft Carrier Ranger. Richardson experienced medical conditions as a result of his repeated collecting/carrying canvas mail bags

stored on the tarmac at FASU and transporting these via COD to the carrier.

Dirt and dust particulates from the Ranch Hand Agent Orange storage/mixing/loading areas would be suspended in the air and blown towards the mail bags situated on the in-transit area (FASU). At Ranch Hand, substrates onto which AO was spilled were dried in the sun. The dried substrate particles could be blown around by prop- and jet-wash, eventually being transported down runway onto whatever was residing on the tarmac … which included canvas mail bags.

With each cycle of handling mail bags, Richardson was exposed to TCDD/DIOXIN (TCDD is the most toxic of the dioxin family), as likely as not (a probability level of a minimum of 50%). With the significant longevity of this molecule, each mail cycle 'added' to the Veteran's body burden of the contaminant. In other words, the body burden would increase or 'biomagnify' over time. Therefore, there was opportunity for the transfer and 'bioaccumulation' with 'biomagnification' of the contaminant in his body. It is highly probable that TCDD exposure contributed to the 'skin rash' and other medical issues Richardson reported, as likely as not.

It is not the intent of this opinion to reiterate the Richardson study/opinion. Only certain highlights of his document are presented above to provide the reader with an associated scenario for further understanding. It is recommended that if readers wish to peruse his opinion further for a more complete/comprehensive assessment, please refer to Supplement 2.

1.2 FASU Terminal In-Transit Supplies, Personnel, Cargo, etc.

In conjunction with in-transit canvas mail bags, FASU was the prime staging area for supplies, spare parts, personnel, and other forms of cargo destined for the carriers and associated smaller vessels in the Blue Water

Navy Carrier Task Force. These staged materials were usually placed on the tarmac in front of the FASU terminal (*see* Photo 1, Page 2).

As noted in Section 1.1, above, and Supplement 2, the exposure of staged materials on the tarmac to TCDD dioxin, originating from the Ranch Hand sector of the Da Nang airbase was highly probable (probability of at least 50%). This eventuality resulted from aircraft activity (prop- and jet-wash, landing/take off turbulence) and directional winds transporting contaminant laden sediments/particulates to be deposited on the in-transit staged materials on the tarmac in front of FASU, as likely as not.

1.3 Carrier Attack Aircraft

Aircraft carriers would launch air strikes in both North and South Vietnam using various attack aircraft including the A-1, A-4, A-6 and A-7. The Navy and Marine Corps employed A-1, A-4, A-7, and to a lesser extend A-6 aircraft for close air support. Navy F-4 Phantoms were also used during ground attacks releasing bombs and unguided rockets.

Attack aircraft, especially the A-4 and the A-7, would engage in very close air support. Debris from exploding bombs/rockets projected herbicide permeated soil into the atmosphere if such attack runs were in areas of Agent Orange applications. Anecdotally, aircraft would fly through these clouds of inorganic/organic debris while making subsequent bomb runs.

While attack aircraft usually returned to the carrier post-mission, this protocol was not always the case. On occasion, aircraft would land at Da Nang for refuelling and/or repairs. Some aircraft, not necessarily attack aircraft, were parked near the FASU terminal. As an example, note aircraft parked near FASU in Photo 1 (*see* Page 2).

Anecdotally, when attack aircraft returned to the carrier, members of the flight deck crew would invariably find an oily film on the underside and sides of the aircraft. The flight deck crew had to climb onto the aircraft and often wash down the body of the aircraft causing filmy puddles on the carrier deck. It was possible that the procedure of washing down

particulates off some of these aircraft resulted in the deposition of dioxin residues on the carrier deck.

2.0 Cross Contamination Assessments in Conjunction with the FASU Terminal, COD Transport and Carrier Activities

Specific questions have been posed related to TCDD/DIOXIN contamination resulting from Agent Orange. This exposure and contamination is examined from the perspective of materials in-transit at FASU, and if such placement on the FASU tarmac constituted a potential contaminant pathway to service personnel.

2.1 … If there were in-transit cargo, mail, supplies, spare parts, food-stuff containers, cardboard boxes, sea bags, personnel luggage, etc. on the FASU tarmac, would these items and materials, eventually being picked up by COD, have been subject to potential dioxin contamination originating from the Ranch Hand operation up-runway from FASU? What would the probability of personnel clothing and boots/shoes be contaminated?

If other 'materials' were situated on the FASU tarmac staged for COD (Carrier Onboard Delivery) aircraft to transport these cargo items to the aircraft carrier, these items would collect TCDD/DIOXIN residues (originating from the Ranch Hand Agent Orange spray compound; Supplement 2). It is my contention this contamination occurred as likely as not … i.e., probability of at least 50%. This scenario leads to the question of air crew contamination on the loaded COD planes returning to the aircraft carrier. Personnel unloading the COD on the carrier may also have become contaminated. I contend there was also a probability of at least 50% that some of these crew members could come in contact with and be contaminated by TCDD/DIOXIN molecules, with the caveat that it would be necessary for such crew members to actually handle these in-coming transported materials.

Personnel clothing and foot attire may also have been contaminated if same were in contact with 'materials' on the FASU tarmac. Foot attire may have been contaminated if personnel tracked over the sediments/soils containing dioxin residues. If this scenario occurred, I would consider this eventuality at least a 50% probability to occur, as likely as not.

2.2 ... If clothing of COD and carrier crews unloading supplies from FASU did come in contact with dioxin residues, is there a potential for cross contamination while these clothes were washed with uncontaminated clothing?

If contaminated clothes were laundered with uncontaminated articles there is a very slight chance of limited cross contamination. However, with high water dilution, agitation, and successive rinsing protocols, I would suggest this mode of contaminant transfer be considered inconsequential.

2.3 ... Once 'materials' were off loaded from COD and further handled for delivery throughout the carrier, what would the potential be for further passage of contaminant residues to successive handlers of said materials.

Once the TCDD contaminated cargo materials were deplaned on the aircraft carrier from COD, some of these materials were further sorted and distributed by servicemen on the carrier and also to other smaller Navy vessels. With each 'transport' path and 'handling' of materials from the Da Nang FASU terminal, there likely was a reduction in the actual amount/concentration level of TCDD/DIOXIN contamination due to articles being moved/handled/sorted. Consequently, the concentration level of TCDD/DIOXIN available to service personnel probably experienced a decrease with these follow-up cargo activities. However, whether or not there was a chance of contamination, I contend it could occur as likely as not.

3.0 TCDD/DIOXIN Contamination and Carrier Attack Aircraft

Section 1.3 (*see* Page 9) summarizes activities of carrier attack aircraft and the association of some of these aircraft with the Da Nang airbase. Questions have also been posed in attempt to determine if some of the aircraft landing at Da Nang had the potential to be contaminated with TCDD/DIOXIN residues. Heavy perimeter spraying of Agent Orange occurred at Da Nang with spray drift probably encroaching on to the base proper and runways.

3.1 … Would there be any chance of dioxin contamination to fixed winged aircraft and helicopters landing at Da Nang airbase?

The most concentrated levels of dioxin in soils/sediments/particulates on the Da Nang airbase occurred on Ranch Hand real estate situated at the northern end of the Da Nang runway (*see* Figures 1 and 2; Pages 3 and 4). As noted in Supplement 2, aircraft activity and atmospheric factors transported some dioxin-laden sediments/particulates on to the runway and towards the FASU terminal.

Aircraft landing/taking off at Da Nang may come in contact with dioxin residues that may be on the runway. The occurrence of this phenomenon is considered inconsequential in terms of overall toxic concentrations. However, if some carrier or other aircraft were parked near the FASU terminal (*see* Photo 1, Page 2), there was at least a 50% probability they would have been subject to the deposition of dioxin residues originating from the Ranch Hand site, as likely as not … which was also the projection for in-transit cargo/materials staged in front of the FASU terminal awaiting COD transport to the carrier.

3.2 … It was introduced in Section 1.3 (see Page 9), that anecdotal information claimed that aircraft close air support would have been subject to dioxin residues in soils/sediments/particulates when flying through clouds of debris/soil particles/sediments soon after bomb/rocket explosions.

If a scenario did exist wherein an attack aircraft did pass through explosions causing dust/dirt clouds laden with dioxin residues to stick onto the aircraft, I would surmise this would have a 50% chance of occurring, as likely as not. One must not discount the possibility of dust/dirt particles adhering to the skin of the aircraft being possibly removed from the skin by the rapid air passage of the jet propelled aircraft.

3.3 ... Attack aircraft were often washed down on the flight deck of an aircraft carrier upon return. It was surmised that water from the washing process may be contaminated, perhaps with Agent Orange/dioxin residues due to the 'sheen' in puddles of water noted on the flight deck.

Herbicide was mixed with petroleum products in spray tanks. This could suggest herbicide was the origin of the sheen in deck puddles. However, if minor oil leaks from the aircraft occurred, and this being washed off the aircraft, this could cause sheens on water puddles on the flight deck. Sufficient information does not exists to categorically connect washing an attack aircraft thus causing dioxin contaminated puddles on the flight deck.

3.4 ... Flight crews servicing an aircraft carrier were responsible for unloading FASU cargo and materials from the COD and transporting these throughout the ship and preparing in-transit shipments to other smaller vessels in the fleet. It has been shown that there was dioxin contamination of cargo and other materials staged at FASU (as likely as not) awaiting COD transport to the aircraft carrier.

Those servicemen responsible for unloading COD aircraft invariably handled dioxin contaminated materials, as likely as not. With movement of servicemen and unloaded supplies, etc. to other sectors of the carrier, they contracted dioxin residues at least to the 50% probably level, as likely as not.

With each 'transport' path and 'handling' of materials from the Da Nang FASU terminal, to COD, to the carrier, and beyond, there likely was a reduction in the actual amount/concentration level of TCDD/DIOXIN contamination due to articles being moved/handled/sorted/transported. Consequently, the concentration level of TCDD/DIOXIN probably

experienced a decrease with these follow-up cargo activities. However, whether or not there was a chance of contamination, I contend it could occur as likely as not.

4.0 Clarification of Expressions: "… occurred as likely as not" and "… occurred at least at a 50% level of probability"

In the preparation of this professional opinion, it should be noted that when the opinion of the author states that an event or scenario occurred as likely as not, or at a minimum of 50% probability of occurrence, there is no affiliated expression of actual dioxin concentration level associated with these statements which would be expressed as the amount of a substance in a defined space; for example, ppm or parts per million; ppt or parts per trillion.

Given no quantitative data are available wherein actual chemical measurements were taken, the quantification of the dioxin residue in an environmental medium or biological tissue, which would corroborate or refute the presence of the contaminant, is not feasible. As a result of the lack of quantifiable data, a professional opinion is presented as a best approximation based on over 30 years of Agent Orange/Dioxin/TCDD studies and experience in the countries of Vietnam and Canada. My credentials are presented in Supplement 3.

5.0 Concluding Remarks

During the Vietnam conflict, the Blue Water Navy was instrumental in the formation of a Carrier Task Force consisting of an aircraft carrier and a host of smaller vessels accompanying the carrier during their missions off the coast of Vietnam. An integral facility that serviced the Task Force was the FASU terminal at the Da Nang Airbase. At this location, all forms of cargo and Navy personnel were staged at/in front of the FASU terminal until a COD aircraft was available to ferry cargo/personnel to the Task Force Carrier.

The FASU terminal was situated just down runway from the Ranch Hand facility where Agent Orange was stored, mixed, loaded onto C-123 or helicopters, and occasionally spilled onto the tarmac. No specific clean-up activities were directed at spilled Agent Orange or spray tank wash waters used to clean on-board Agent Orange tanks. Dust/dirt on the tarmac would often be flooded with the Agent Orange mixture and left to dry in the sun.

Dust/dirt/soil particulates on the Ranch Hand site could be transported across the runway toward the FASU terminal by prop-/jet- wash and directional winds. It is conceivable, as likely as not, that such transported dust/dirt/particulates could have settled on those cargo and other materials situated in front of the FASU terminal awaiting COD transport to the carrier. It was not uncommon for these in-transit items to be staged in front of the terminal for several days, thus increasing the potential for deposition of dioxin-laden soil particulates onto the waiting in-transit items.

Navy personnel directed to load cargo, etc. from the terminal tarmac to the COD aircraft, invariably came in contact with articles whose surface had a layer of sediment particles originating from the Ranch Hand location. As a result, there was at least a 50% probability, as likely as not, that these personnel became contaminated with unknown levels of dioxin. Similarly, those navy personnel tasked with unloading the COD on the aircraft carrier had the potential to be contaminated with dioxin residues, as likely as not.

If aircraft were staged near the FASU terminal, they too were subject to the deposition of dioxin-adsorbed particulates originating from the Ranch Hand site.

The handling/transfer/movement of contaminated materials throughout the carrier and onto other smaller vessels in the Task Force, realistically resulted in a gradual reduction of dioxin residues on these materials. The rapidity of such decreases in toxic levels cannot be ascertained without quantifiable data.

This professional opinion is respectfully submitted to:

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SUPPLEMENT 1

FLEET AIR SUPPORT UNIT

FASU TERMINAL
DA NANG
VIETNAM

FASU Da Nang

By JO2 Gene Costello
and PH2 Carey Krause

It isn't much to look at, just a nondescript, barn-like metal building sitting at the end of the runway. The only thing that distinguishes it from the other warehouses and sheds in the area is a small blue and yellow sign on the sliding door. Inside, the facilities are spartan – two picnic-type benches, a luggage rack and a bare concrete floor.

But to thousands of Navy men, the Fleet Air Support Unit (FASU) passenger terminal at Da Nang, RVN, is as welcome a sight as JFK or Los Angeles International Airport.

They come wandering in at all hours of the day and night, wearing blues, dungarees, combat greens or whites. Most of them are tired and weary from traveling. Many of them are bewildered. A few are scared. All of them want transportation.

They may have to wait a day or two but eventually get the flight they want – thanks to the hard-working enlisted men who staff the terminal.

The terminal is operated by FASU, but the men who work there are attached to the Air Terminal Division, NAS Cubi Point, R.P. The Cubi Point Navy men, who volunteer for the job at Da Nang, began working in the terminal on a rotating basis in October 1969 when the Navy halted direct flights between Cubi Point and ships off Vietnam and started moving personnel via Da Nang.

The work in Da Nang can be described as fatiguing. The men are on their feet an average of 18 hours a day trying to keep up with the workload. During April, for example, the five-man terminal crew handled 2,039 passengers – and that doesn't include those traveling on emergency leave orders.

The terminal workers never know how many passengers they will have from one day to the next, or when they will arrive. On a typical day, four Navy men walk into the terminal seeking transportation to Cubi Point. Within four hours, 30 others have showed up with the same request. None of them were expected, but all are accommodated.

"That's the way it always is," says AB2 William C. Miller. "Your passenger backlog can jump from 10 to 100 in an hour."

EO1 John W. Ludlum, who is currently the leading petty officer at the terminal, points out that all of the passengers are in a hurry. "Some of them don't realize the problems involved in getting transportation. They think they can walk up to the counter, put their names on the list and go. Unfortunately it doesn't work that way. We're not TWA."

The bulk of FASU's passengers are traveling to and from Seventh Fleet ships off the coast of Vietnam. This means flying in the C-1A *Trader* or in unscheduled helicopters launched and recovered aboard carriers in the area. When configured for passengers, the

C-1 can carry only eight persons; configured for mail and cargo – which normally takes priority – there is room for only one passenger.

Consequently, if the terminal has 25 or 30 persons waiting for transportation to a particular ship, they have to wait a day or two to get to their destination, depending upon the amount of mail and cargo scheduled for delivery to the fleet.

Most of the shuttle flights between Da Nang and the carriers are flown by VRC-50's detachment in Da Nang, but each carrier on Yankee Station usually sends one plane into Da Nang every day for passengers, mail and cargo. Helicopters are also sent if the backlog of passengers on the ships or in Da Nang is quite heavy.

To get passengers to other destinations such as Saigon, Cubi Point, Japan or the United States, the terminal crew makes use of anything available – scheduled and unscheduled Navy, Air Force and Marine Corps flights.

PO Ludlum and his co-workers try to make the wait for flights as brief and painless as possible. "Guys coming through here have it kind of rough," he says. "They don't know where to go, what to do or how to do it. There's no snack bar, no comfortable seats, and the passengers can't leave the area. So, all that's left is to sit around, play cards or sleep on the floor."

AB2 Miller explains that there are a dining hall, club and transient barracks within the compound. But the club and mess are open only at certain hours, and most passengers are reluctant to go to the transient quarters for fear of missing a plane.

"Quite a few of our passengers will sleep on the floor here in the terminal rather than go to the barracks and risk missing a flight," Miller says.

To make waiting a little more bearable, the terminal crew acquired a coffee pot, a supply of coffee and paper cups. They also installed a refrigerator in their small office and now sell cold and sometimes not-so-cold soda.

The terminal crewmen also have newspapers, books, magazines and a couple of decks of cards on hand.

"Most Navy men going through FASU in Da Nang expect something that at least looks like an air terminal," Miller states. "It doesn't, but one way or another, we get a flight for everyone who walks in here, and that's what counts."

A metal building on the edge of the runway is the Da Nang passenger terminal. Above left, AB2 William C. Miller, FASU, helps passengers into life jackets. In a familiar scene, above, AB2 Ronald A. Quinn announces the passenger list for the next scheduled flight, one of eight daily. And below, Navy men en route to Seventh Fleet ships prepare to board a VRC-50 C-1A.

SUPPLEMENT 2

Mr. John R. Richardson, Vietnam Veteran

A Professional Opinion addressing the probability of this Veteran's exposure to military herbicides (Agent Orange and TCDD[DIOXIN]) during military service in the United States Navy, November 1967 to May 1969

PREPARED BY

Dr. Wayne Dwernychuk
Environmental Scientist
Agent Orange Specialist

TO WHOM IT MAY CONCERN

MAY 26, 2020

REGARDING

Mr. John R. Richardson, Vietnam Veteran

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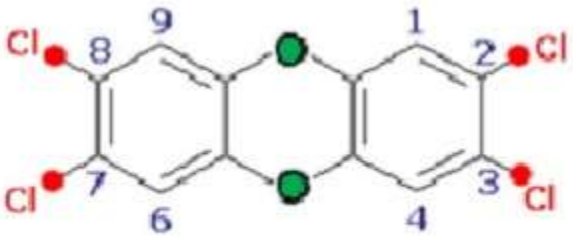


2,3,7,8-Tetrachlorodibenzo-*p*-dioxin

TO WHOM IT MAY CONCERN

MAY 26, 2020

Re: John R. Richardson – A Professional Opinion Regarding Exposure to TCDD(DIOXIN) During Military Service

INTRODUCTION

I have been asked to provide a professional opinion on the probability of dioxin (2,3,7,8-Tetrachlorodibenzo-*p*-dioxin or TCDD) exposure to Mr. John R. Richardson (the Veteran) during his tenure in the US Navy during the Vietnam War. Agent Orange (AO) was a 50:50 mixture of two phenoxy herbicides, 2,4-D and 2,4,5-T. The 2,4,5-T fraction contained the TCDD dioxin impurity generated during this herbicide's manufacturing process.

To paraphrase the **Terms of Reference** for this opinion, the BOARD OF VETERANS' APPEALS (the BOARD) presented a letter to Mr. John R. Richardson, dated February 14, 2020, file C.25.124.339 (Appendix 1), containing their requirements, as a result of their REMAND decision (*"Additional development is needed"*):

> *" … an opinion from an appropriate specialist … regarding whether it is at least as likely as not (i.e., a 50 percent probability or greater) that the Veteran's reported exposure to mail bags … resulted in his exposure to herbicide agents."*

Pertinent facts related to this opinion (*pers. comm.*, Mr. John R. Richardson, US Navy Veteran, Store Keeper Third Class, SK-3/E-4; Mr. John Rossie, US Navy Veteran, Boatswain's Mate Third Class, BM-3/E-4):

1. … This Veteran served as a Store Keeper and/or Lead Supply Department Yeoman on the USS Ranger (CVA-61) (*see* Photo Page 17). His tenure in the US Navy was November 1967 to May 1969, with additional service in the Navy Reserve.

2. … The Veteran's second cruise on the USS Ranger was January 7 - 30, 1969, and February 15 - March 16, 1969, that is, 55 days present in the Official Waters of Vietnam. One of the duties of this Veteran on the

cruise involved the handling of canvas mail bags that were collected by the Fleet Air Support Unit (FASU) in Da Nang and unloaded onto the USS Ranger. The Veteran would intermittently handle the canvas bags once they were deposited in the Mail Room, Supply Office, and/or other holding areas.

3. … It was noted by the Veteran that on many occasions the mail bags were often covered in oily/greasy deposits with dirt and dust accumulations on their surfaces.

4. … The mail bags waited for pickup on the tarmac near the FASU site at Da Nang airbase, which was in relatively close proximity to the Ranch Hand sector of the base (*see* FIGURE 2, Page 11).

5. … Once on the carrier, the Veteran would typically carry a mail bag on his shoulder, with his cheek in contact with the canvas bag. These bags were usually stuffed full and heavy. The Veteran developed an acne-form of rash on his cheek and in his hair.

6. … Specifically, the Veteran claims that on or about March 1, 1969 while in the performance of his duties, he handled one or more mail bags that were apparently contaminated with some form of 'toxin'. The toxin was at a sufficiently high level of concentration to raise a severe rash on his hand. He was concerned enough to mention this to his wife in a letter home dated March 1, 1969 (Appendix 2). Within 3 – 4 weeks, the Veteran began developing an acne-form of rash in the areas of his left cheekbone which was determined to be service related. Photos were presented to the Board. Further investigation suggested that the rash could be chloracne due to exposure to dioxin. However, this conclusion was not accepted by the Department of Veterans Affairs.

7. … The mail bags would sit on the runway at Da Nang airbase for hours or even days waiting to be picked up by the Carrier Onboard Delivery planes (COD). The Fleet Air Support Unit (FASU) at Da Nang was located literally just down the runway from where Agent Orange was

mixed and loaded onto C-123 aircraft by Ranch Hand personnel at the north end of the runway. The Agent Orange storage yard was immediately north of the Agent Orange mixing/loading zone.

8. … Dirt and dust particulates from the Ranch Hand Agent Orange storage/mixing/loading areas would be suspended in the air and blown towards the mail bag 'resting' area. Substrates onto which AO was spilled (*see* Photo Page 18) were rinsed and dried in the sun. The dried substrate particles would be blown around by prop- and jet-wash, eventually being transported down the runway onto whatever was residing on the tarmac … which included stacks of canvas mail bags.

9. … Oily/greasy deposits were common on the tarmac. Dirt/greasy deposits, as noted, were common on the canvas bags in the area where FASU would collect the mail bags for delivery to the USS Ranger.

DISCUSSION

My personal experience, regarding Agent Orange/Dioxin investigations, is summarized in my detailed CV (Appendix 4, with an overview Brief on my experience, *see* Page 19). I served as the Chief Scientist on numerous scientific studies in Canada and Vietnam documenting the impact of Agent Orange/TCDD on local natural environments and associated human populations living near AO storage areas and former US military bases in Vietnam, and within and in close proximity to areas sprayed with AO by C-123 aircraft during the war. My tenure on these research programs extended from 1994 through 2006, with an advisory role following retirement. Continuation of my personal efforts regarding Agent Orange extend to present day … 2020.

A significant fact involving TCDD is the persistence of this contaminant in the natural environment. Hatfield Consultant studies in the late 1990s involved the collection of ploughed-field soils in the A Luoi Valley; this being the A Shau Valley, named so during the conflict.

These agricultural fields were ploughed for agricultural purposes by local hill-tribes people a number of times per year. Within the Valley, *per se*, there were no industrial developments which may have generated 'confounding' variables as to the origin of TCDD. Our data show that nearly 30 years following the cessation of hostilities, TCDD remained in the surface soils of these ploughed fields and unquestionably originated as a result of applications of AO during the conflict (*see* Hatfield Consultant studies …https://www.hatfieldgroup.com/agent-orange/agent-orange-reports-and-presentations/), and more specifically those studies related to the Da Nang airbase:

https://www.hatfieldgroup.com/wp-content/uploads/2020/05/da-nang-2009-report.pdf – the 2009 Final Report on Da Nang airbase;

https://www.hatfieldgroup.com/wp-content/uploads/2020/05/dandi1283-summary-document-v4-protected.pdf – the 2007 Summary Report on Da Nang airbase; and

https://www.hatfieldgroup.com/wp-content/uploads/2020/05/dandi1283-final-report.pdf – the 2007 Final Report on Da Nang airbase.

The implication of these data is that once dioxin originating from AO is present, there is no rapid decomposition, this being the case on the Ranch Hand location in Da Nang and that area used for mail bag storage prior to being picked up for transport. TCDD dioxin has a very high level of persistency, given the strong bonds of the Chlorine molecules on the 2,3,7,8 positions of the two benzene rings (*see* TCDD molecule on Page 1).

Paustenbach *et al.* (1992) in his research, concluded that TCDD can remain in soil for well over 100 years. My work in Vietnam indicated that the upper soil fraction (top 10 cm) proved to be the primary location for TCDD accumulation (*see* Hatfield Consultant studies, *see* CITATIONS). The ability for the dioxin molecule to 'filter' through numerous soil strata is very limited due to adsorption onto inorganic particulates and absorption into organic particulates found in the upper soil strata.

During Ranch Hand operations on the Da Nang airbase, those sectors of the base used for storage of AO, flushing of herbicide tanks in the C-123s, and inadvertent AO spillage in the mixing/loading area would undoubtedly have resulted in high levels of accumulated TCDD in surface soils and upper soil strata of these base sectors. In fact, when flushing of the C-123 Agent Orange tanks on board the aircraft occurred, wind gusts could render either 'pure' AO or somewhat diluted AO droplets/mist across the runway toward the waiting mail bags.

There exist three avenues of dioxin entrance into the human body … inhalation, dermal absorption, and ingestion. In the case of inhalation, winds undoubtedly caused fine sediments in the treatment areas to be carried by winds around the base, with military personnel breathing in fine particulates. The TCDD molecule is adsorbed onto fine inorganic particulate matter, and absorbed into fine organic materials, which in turn can be inhaled. Similarly, contaminated particulate matter settling on human skin could result in dermal absorption of dioxin into the body.

Canvas mail bags left for any extended duration on the tarmac near the Ranch Hand sectors would have been exposed to the toxic compound TCDD/DIOXIN. It should be noted that the northern sector of the Da Nang airbase where Ranch Hand was situated in the 1960s, was totally devoid of vegetation leaving only open dirt surfaces. There were no encumbrances to the movement of wind carrying dust particles throughout the northern sector of the runway. Mail bag contamination occurred during winds stirring up contaminated surface sediments/particles and depositing these particles onto the mail bags and undoubtedly other open surfaces. Prop- and jet-wash from aircraft, including helicopter activity at the northern end of the Da Nang airbase would have also contributed to the disturbance of surface dust/sediments rendering them airborne facilitating passage and settling onto mail bags.

When the Veteran carried these mail bags, as a result of his duties on board the USS Ranger, he came into contact with TCDD-contaminated mail bags. Whether this was a consistent/regular occurrence during all mail drops from Da Nang is difficult to ascertain. The chances of coming in contact with the contaminant would be dependent upon the length of time the mail

bags were 'resting' on the tarmac before being lifted/carried onto the COD planes and transported to the USS Ranger and unloaded by Fleet Personnel. Wind frequency, speed, and direction on the airbase would also be a factor on the level of TCDD contamination settling on the mail bags. As noted above, prop- and jet-wash would undoubtedly cause dust/surface sediment dispersal down the runway onto waiting canvas mail bags and other surfaces. It is not possible to ascertain the actual level of TCDD contamination on the bags. The longer these canvas bags remained on the tarmac, the higher the probability of dust/contaminant being deposited on these bags.

As the Veteran shouldered mail sacks on board the USS Ranger, bag materials often brushed his hands, arms, neck, cheeks, and hair, and legs if wearing shorts. The opportunity for transfer of TCDD laden dust particles onto the Veteran as he performed his duties is high. I have no doubt there was transfer of TCDD molecules from the mail bags to the Veteran, as likely as not. In terms of probability of TCDD exposure to the Veteran, I would rate this probability at a minimum of 50%, as likely as not. It is not possible to rate the probability level higher, given the number of site-specific variables that would have influenced the level of mail bag contamination while the mail bags were on the tarmac in Da Nang.

Hatfield Consultants have determined that the Ranch Hand area of the Da Nang airbase contained very high levels of TCDD contamination. The following is an excerpt from the Hatfield 2007 Summary Report on Da Nang airbase (*see* FIGURE 1, Page 10):

> *"The maximum soil TEQ (Toxic Equivalency) concentration recorded in this study was 365,000 ppt* [parts per trillion]*, from samples collected from the former* [Ranch Hand] *Mixing and Loading* [of AO] *areas. This is 365 times the globally acceptable maximum standard of 1,000 ppt (ATSDR 1997).*

Such high levels of dioxin contamination being 'available' for transfer to mail bags and ultimately to the Veteran cannot be refuted if the mail bags were 'resting' on the tarmac for extended periods of time and subject to natural and/or aircraft turbulence raising dust particles in the air. The longer the oil-spotted mail bags 'rested' on the tarmac, and given wind

activity the greater the probability of TCDD transfer to the bags and ultimately the Veteran.

Figure 2 (*see* Page 11) depicts the approximate location of the 'resting' site of canvas mail bags scheduled for COD to offshore destination. Often these bags would remain on the tarmac for several hour to several days before being picked up for delivery by the planes. As the area was basically a dirt substrate throughout, except for the runways, there was a clear line of travel for dust particulates to be blown from the Agent Orange storage area in conjunction with particulates from the Agent Orange mixing/loading/spillage sector of Ranch Hand.

It should be recognised that the 365,000 ppt TEQ was the level of contamination in soil samples collected by Hatfield Consultants between October 2006 and April 2007 at Ranch Hand mixing and loading areas on the Da Nang airbase.

A logical conclusion is that the level of contamination in the 1960's was higher, given that over the course of time between the 1960's and 2006/07 there was probably some limited natural decomposition of TCDD during this period of time. This being the case, the TCDD contamination level on the Ranch Hand site during the tenure of the Veteran was unquestionably higher.

TCDD has a very high affinity for fatty materials in the human body, that is, it is considered highly lipophilic. Consequently, dioxin accumulates in the liver, blood of exposed individuals, and any high-fat concentration organ or body fluid (e.g., nursing mother's milk).

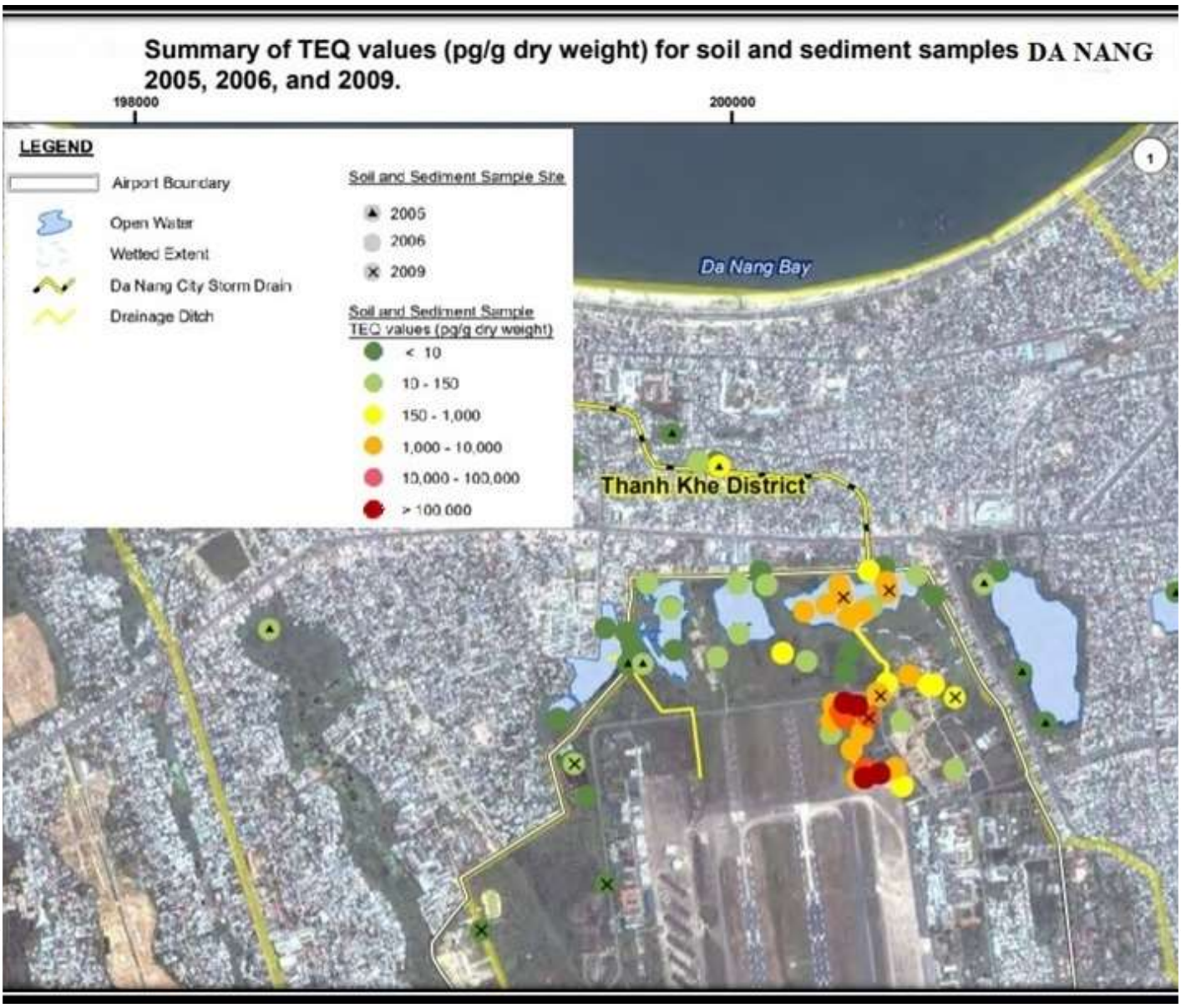


FIGURE 1. Summary of dioxin TEQ levels on the northern sector of the Da Nang airbase. The highest levels of dioxin contamination (10,000 – 100,000 and >100,000 ppt) occurred at the Ranch Hand Agent Orange storage site (northern deep red circles) and the Agent Orange mixing and loading area (southern deep red circles). (SOURCE: Hatfield Consultants 2009 final report on dioxin contamination on the Da Nang airbase):

https://www.hatfieldgroup.com/wp-content/uploads/2020/05/da-nang-2009-report.pdf

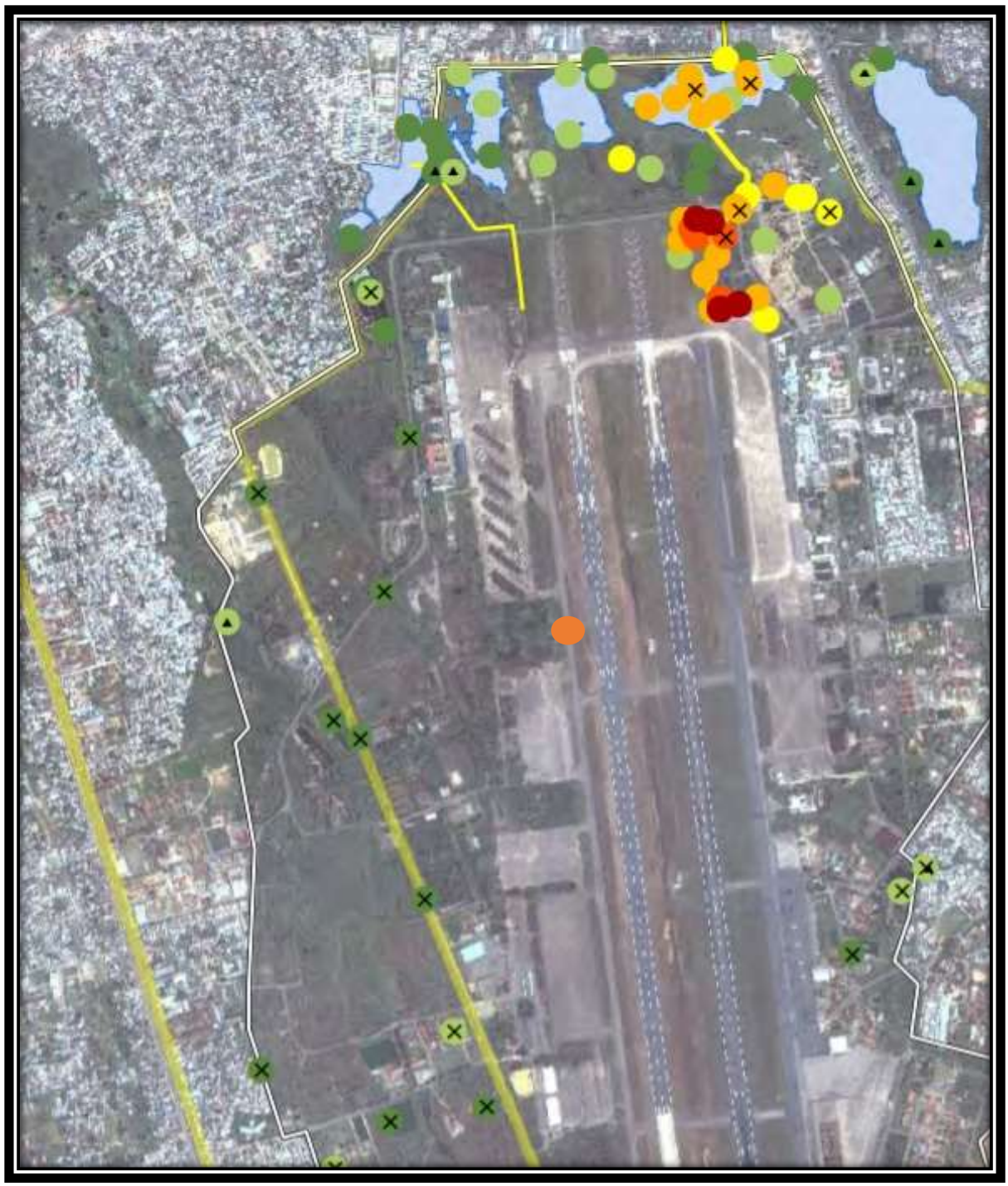


FIGURE 2. Da Nang airbase. Northern sector with the deepest red circles was the Ranch Hand Agent Orange storage and mixing/loading sites. Dioxin sampling sites noted (coloured circles). Positioning of 'resting' canvas mail bags destined for COD displayed. SOURCE: Hatfield Consultants 2009 final Da Nang report. *LARGER ORANGE DOT IN THE MIDDLE OF THE IMAGE IS THE MAIL BAG 'RESTING' LOCATION PRIOR TO COD TRANSPORT DURING THE VIETNAM WAR (SOURCE: pers. comm., John Rossie)*

CONCLUSIONS

It is my professional opinion:

1) A high probability existed for contaminated soils/sediments from the Ranch Hand sectors of the Da Nang airbase during the Vietnam War (Agent Orange storage site, the mixing and loading site of Agent Orange onto spray aircraft) to be mobilized by wind and aircraft turbulence. Such gusts of wind and aircraft 'wash' invariably resulted in transport and accumulation of contaminated soil/sediment particles onto various sectors of the base, including the canvas mail bags temporarily stored on the airport tarmac waiting to be picked up by COD planes.

2) During the Veteran's second cruise on the USS Ranger, he would have experienced coming in contact with contaminated mail bags when handling them on board USS Ranger. The probability of contamination during the Veteran's second cruise is 50%, and would occur as likely as not.

3) Defining a possible range of probabilities is difficult, given the level of contamination would be a function of natural atmospheric conditions, frequency of aircraft turbulence, and length of stay the mail bags remained on the tarmac before being collected and transported to their destination.

4) It is highly plausible that there were instances of much higher TCDD contamination levels on some of the mail bags, which would be dependent upon the settlement rate of contaminated dust/mist on these exposed surfaces.

5) TCDD/DIOXIN possesses the characteristic of bioaccumulation, that is, this molecule has the feature, if entering the body, to accumulate in the organism. This molecule also has the attribute of 'biomagnification'. Over the course of this Veteran's tasks of handling contaminated canvas mail bags, TCDD/DIOXIN molecules

entered his body through dermal absorption, inhalation (inhaling contaminated dust particles), and/or ingestion if particles entered his mouth, especially if he neglected to wash his hands prior to eating.

6) With each cycle of handling the mail bags, he was exposed to TCDD/DIOXIN, as likely as not (a probability level of a minimum of 50%). With the significant longevity of this molecule, each mail cycle 'added' to the Veteran's body burden of the contaminant. In other words, the body burden would increase or 'biomagnify' over time. Therefore, there was opportunity for the transfer and bioaccumulation with biomagnification of the contaminant in his body. It is highly probably that dioxin exposure contributed to the 'skin rash' and other medical issues the Veteran has reported.

7) Dr. Wedge's email to Mr. John R. Richardson (Appendix 3) states:

> "*I must tell you that we received no information that such a scenario* [TCDD contamination of canvas mail bags] *was possible but that is not to say it could not have happened.*"

I am convinced that, in fact, there was a transfer of TCDD/DIOXIN, originating from the RANCH HAND sectors of the Da Nang airbase onto the waiting canvas mail bags, and depending on individual or a combination of circumstances, high levels of TCDD/DIOXIN conveyance were possible at a probability level of at least 50%, as likely as not.

My assessment is based solely on science and my direct Vietnam in-country experience and associated research programs related to the Da Nang airbase, addressing TCDD/DIOXIN contamination in the environment, human food items, human blood, and human breast milk. I possess over 17 years of experience studying dioxin contamination in Canada (see Dwernychuk detailed CV, Appendix 4). Various studies focussing on Vietnam may be reviewed in Hatfield Consultants reports (*see* CITATIONS).

The Veteran, Mr. John R. Richardson, is not known to me. I have received pertinent information related to the Veteran's claim via email from Mr. John Rossie, who I do know, and Mr. John R. Richardson. I understand Mr. Rossie is assisting the Veteran with his claim.

CITATIONS

ATSDR (AGENCY FOR TOXIC SUBSTANCES AND DISEASE REGISTRY) 1997. Interim Policy Guideline: Dioxin and dioxin-like compounds in soil. US Dept. of Health and Human Services, Public Health Service. Atlanta, Georgia, p. 10 (with appendices).

Board of Veterans' Appeal,
For The Secretary of Veterans Affairs,
Letter to John R. Richardson from the Board,
February 14, 2020,
File C.25.124.339,
Decision of Appeal,
Signed by: K. Osborne, Deputy Vice Chairman

Hatfield Consultants:

1) … Website reference to general Vietnam Studies: https://www.hatfieldgroup.com/agent-orange/agent-orange-reports-and-presentations/

2) … Website reference to the 2009 Final Report, Da Nang Airbase: https://www.hatfieldgroup.com/wp-content/uploads/2020/05/da-nang-2009-report.pdf

3) … Website reference to the 2007 Summary Report, Da Nang Airbase: https://www.hatfieldgroup.com/wp-content/uploads/2020/05/dandi1283-summary-document-v4-protected.pdf

4) … Website reference to the 2007 Final Report, Da Nang Airbase: https://www.hatfieldgroup.com/wp-content/uploads/2020/05/dandi1283-final-report.pdf

Paustenbach, *et al.*, 1992. Recent developments on the hazards posed by 2,3,7,8-Tetrachlorodibenzo-*p*-dioxin in soil: Implications for setting risk-based clean-up levels at residential and industrial sites. Jour. of Toxicology and Environmental Health 36:103-149

Mr. John R. Richardson … *Personal Communication*,
US Navy Veteran,
Store Keeper Third Class,
SK-3/E-4.

Mr. John Rossie … *Personal Communication*,
US Navy Veteran,
Boatswain's Mate Third Class,
BM-3/E-4,
Executive Director,
Blue Water Navy,
Vietnam Veterans Association, 2006 to 2017.

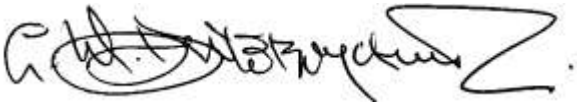
Appendix 1 … Board of Veteran' Appeal decision regarding Mr. John. R. Richardson's appeal. Letter dated February 14, 2020.

Appendix 2 … Email from Mr. John. R. Richardson to Mr. John Rossie outlining details of his appeal situation, including a letter from Mr. Richardson to his wife describing his 'rash', dated March 1, 1969.

Appendix 3 … Email from Dr. Roberta Wedge (Study Director, Senior Program Officer, Institute of Medicine) to Mr. John R. Richardson regarding the re-opening of Mr. Richardson's Agent Orange claim, dated January 31, 2013.

Appendix 4 … CV Dr. Wayne Dwernychuk

Submitted, with respect …



Dr. Wayne Dwernychuk
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CANADA

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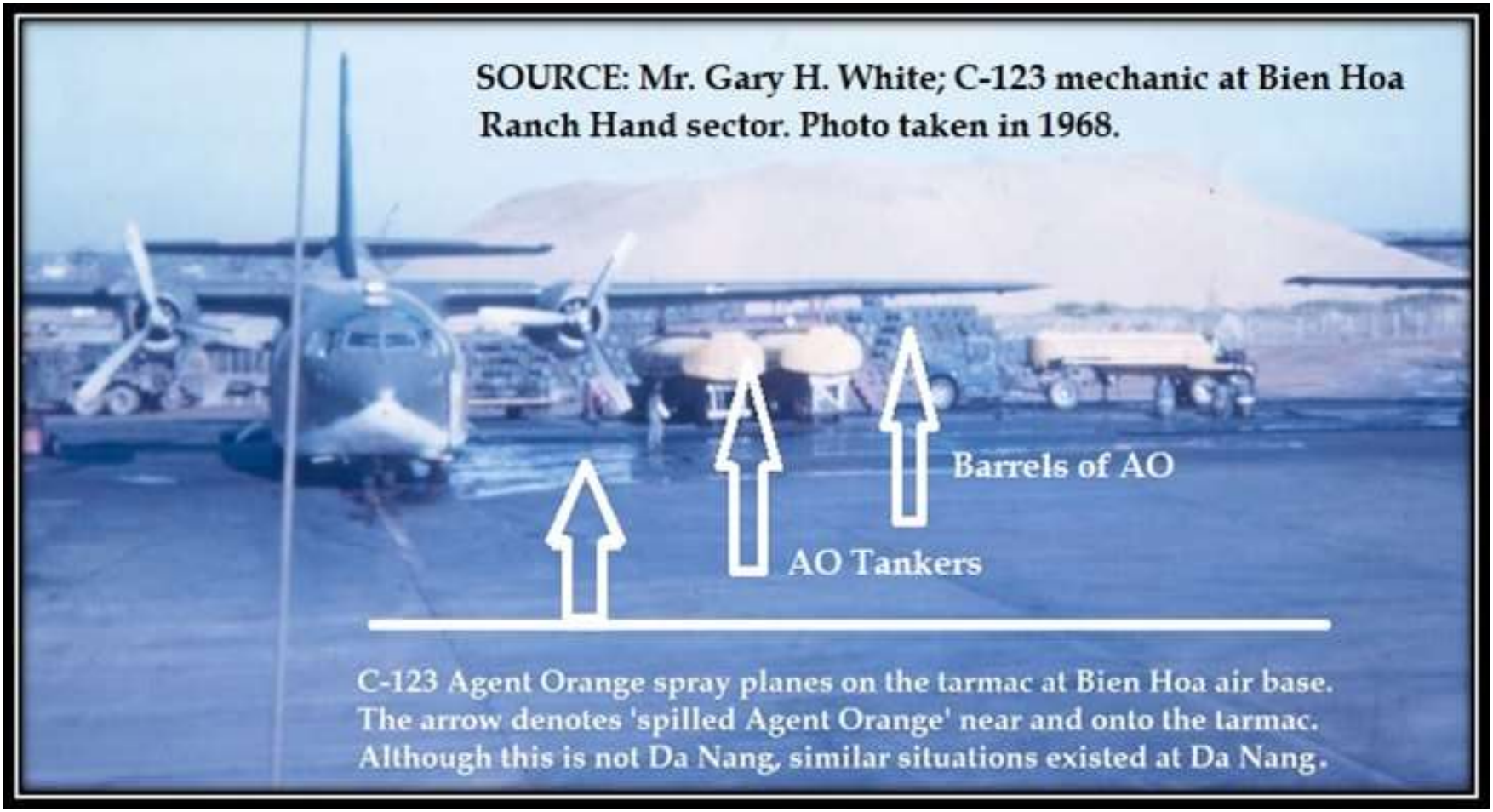
USS RANGER


SOURCE: Mr. Gary H. White; C-123 mechanic at Bien Hoa Ranch Hand sector. Photo taken in 1968.
Barrels of AO
AO Tankers
C-123 Agent Orange spray planes on the tarmac at Bien Hoa air base.
The arrow denotes 'spilled Agent Orange' near and onto the tarmac.
Although this is not Da Nang, similar situations existed at Da Nang.

SUPPLEMENT 3

CURRICULUM VITAE

DR. WAYNE DWERNYCHUK

AGENT ORANGE SPECIALIST

CURRICULUM VITAE

DR. WAYNE DWERNYCHUK

B.Sc. [Hons. Zoology], M.Sc. [Zoology], Ph.D. [Biology]

ENVIRONMENTAL SCIENTIST

AGENT ORANGE SPECIALIST

BRITISH COLUMBIA

CANADA

(Senior Vice President, Hatfield Consultants, Retired 2006)

C-123 AGENT ORANGE SPRAY PLANES, SOUTHERN VIETNAM (AP Photo)

(See Related Agent Orange & Unexploded Ordnance [UXO] Photos Pages 25 – 40)

SUMMARY OF EXPERIENCE

Dr. Dwernychuk has designed, implemented, and authored numerous environmental assessments and monitoring studies for over 45 years. The impact of industrial developments (existing and proposed) on physical/chemical/biological components of ecological systems constitutes a major segment of his expertise. The integration of water quality/physical data with biological information has been a key approach in understanding temporal and spatial changes in biological communities as they may relate to potential sources of environmental perturbations.

Dr. Dwernychuk has functioned extensively in the capacity of Project Director/Advisor, Project Manager, and Principal Scientist responsible for all aspects of projects, including compliance to budgets and schedules, in conjunction with administrative/liaison duties associated with environmental investigations. Project planning, experimental design, data collection, analyses, and authorship of interpretive documents have been primary responsibilities.

Dr. Dwernychuk has been extensively involved in study design and the execution of environmental monitoring programs in Canada and abroad. The environmental assessment of chemical contaminants and physical disruptions on biological systems forms a substantial segment of his expertise. He served as Chief Scientist for Hatfield Consultants comprehensive studies in Viet Nam from 1994 through 2006 involving the impact of dioxins on the environment and humans. Dioxin was present in the Agent Orange herbicide mixture which was sprayed extensively over southern Viet Nam during the American/Viet Nam War. Mitigative strategies were developed to address chemical contamination in populated areas.

Dr. Dwernychuk was involved in Hatfield Consultants' investigation in Viet Nam focussing on landmines, unexploded ordnance, and chemical contamination, which was an integrated approach to landmine/unexploded ordnance clearance in areas also potentially contaminated with war chemicals (i.e., herbicides, explosives, etc.).

Dr. Dwernychuk also served as a Director/Senior Scientist for Hatfield Consultants' joint-venture companies in Indonesia (PT Hatfindo Prima) and Thailand (Pro-En Environsciences Ltd.). He retired from his position of Senior Vice President and part owner of Hatfield Consultants Ltd. in November 2006; however he continues to serve as a senior scientific advisor to Hatfield Consultants on select projects.

POINT OF INTEREST

Early on in Dr. Dwernychuk's career, he, through his research on island-nesting waterfowl (1965 – 1967), documented peculiar behavioral patterns in the selection of nesting habitat. Nesting waterfowl on the islands were constructing their nests among gull colonies. On the islands, colonial gulls would provide protection to waterfowl nests/eggs by attacking other avian predators (e.g., crows, magpies). Gulls would completely ignore the existence of waterfowl nests and eggs on the islands. Subsequent

to hatching of waterfowl eggs, while females were leading their ducklings to water, waterfowl families would again be ignored by gulls as they 'waddled' through the gull colonies, with adult gulls making way for females and their ducklings. However, once the waterfowl family entered the water and were metres off shore, gulls would attack the family, and, in many cases, devour all the ducklings while mothers frantically tried to protect their little ones. An anthropogenic interpretation of these events states that these island-nesting waterfowl were 'trapped' into a false sense of security thought to be provided by colonial gulls in their provision of protection from other avian predators.

In 1972, Dwernychuk and his research advisor on his M.Sc. program (Dr. D. A. Boag) formulated and published the concept of the 'ecological trap'. Ecological traps are scenarios in which rapid environmental change and certain ecological factors lead organisms to prefer poor-quality habitats, which may result in detrimental consequences for the wildlife species in question.

More on the ecological trap concept may be reviewed at:

https://en.wikipedia.org/wiki/Ecological_trap

A SAMPLING OF ARTICLES/COMMENTS

- https://www.hatfieldgroup.com/wp-content/uploads/2020/05/chemosphere-hotspots.pdf
- https://www.hatfieldgroup.com/wp-content/uploads/2020/05/chemosphere-1.pdf
- http://www.salem-news.com/articles/february022012/ao-controversy-wd.php
- http://www.thanhniennews.com/2010/pages/20120928-a-de-facto-admission-of-agent-orange-guilt.aspx
- https://www.japantimes.co.jp/community/2013/08/26/voices/denials-of-defoliant-at-former-u-s-base-site-in-okinawa-fly-in-the-face-of-science/#.XmUtdKhKhPY
- http://www.thanhniennews.com/pages/results.aspx?k=dwernychuk
- **HATFIELD CONSULTANTS ON '60 MINUTES (CBS NETWORK):**
  - https://youtu.be/gFLdfR7O9xc?t=18

EDUCATION

1975 Doctor of Philosophy (Biology), University of Saskatchewan, Regina, Saskatchewan, Canada

1968 Master of Science (Zoology), University of Alberta, Edmonton, Alberta, Canada

1967 Bachelor of Science with Honours (Zoology), University of Alberta, Edmonton, Alberta, Canada

AWARDS AND SCHOLARSHIPS

- Queen Elizabeth Scholarship (2): 1964-65, 1965-66
- University of Alberta First Class Standing Prize (1): 1964-65
- National Research Council of Canada Scholarship (4): 1967-68, 1968-69, 1970-71, 1971-72
- Canadian Wildlife Service Scholarship (3): 1969-70, 1972-73, 1973-74
- University of Saskatchewan Graduate Scholarship (3): 1972-73, 1973-74, 1974-75

HONOURARY AWARD

Dr. Dwernychuk was nominated by the Vietnam Veterans of America and Associates of Vietnam Veterans of America, and on September 22, 2002, invested into *The Legion of Honor* of "The Chapel of Four Chaplains" (https://en.wikipedia.org/wiki/Four_Chaplains#Chapel_of_Four_Chaplains). This honor was bestowed for his work on Agent Orange, and for recognition of Hatfield Consultants' research in Vietnam on Agent Orange and the benefits accrued to Vietnam Veterans and their families as a result of these studies. Dr. Dwernychuk is only the fifth Canadian to be invested into the *Legion of Honor* since its inception in the late 1940's, and the first Canadian west of Ontario.

SPECIFIC CAREER EXPERIENCE

The following synopses are presented as a general overview of studies with which Dr. Dwernychuk has had direct involvement:

- Viet Nam/Agent Orange/Dioxin
- Initial Environmental Evaluation Studies
  - Mining
  - Pipeline Construction
  - Thermal Power Plant
  - Housing Development
  - Oil Exploration

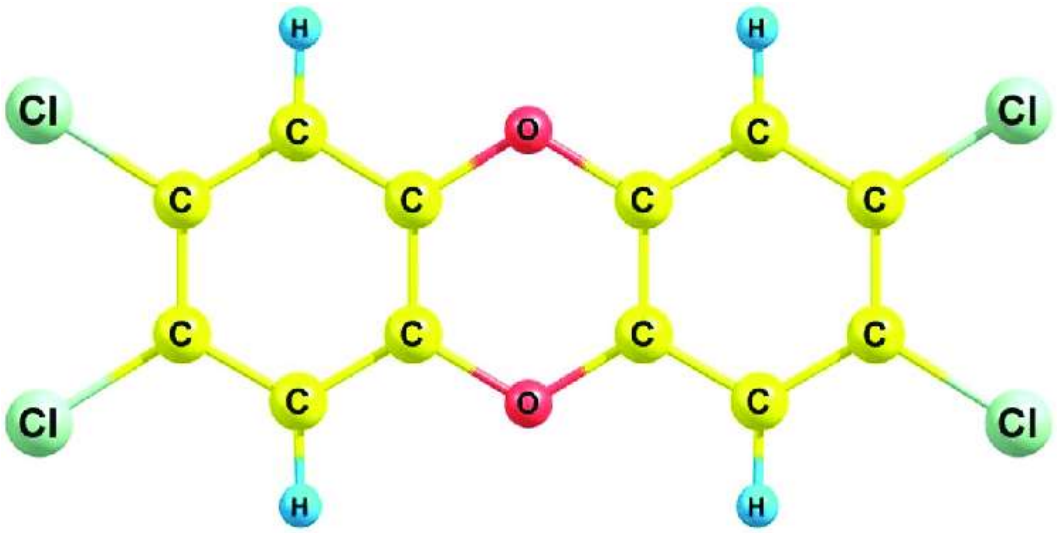
- Environmental Impact Assessment of Industrial Operations/Discharges
  - Mining
  - Pulp and Paper/Forest Industry
  - Chemical Industry
- Other Investigations
  - Pulp and Paper/Forest Industry
  - Fisheries
  - Impact Assessments
- Aquaculture Related Studies

COUNTRY EXPERIENCE

- Argentina
- Chile
- Italy
- Singapore
- Sweden
- Finland
- Russia
- Laos
- Turkey
- Thailand
- Indonesia
- Philippines
- Vietnam
- Nigeria
- Germany
- Hong Kong

KEY PROJECT EXPERIENCE

Viet Nam/Agent Orange/Dioxin



2,3,7,8 – Tetrachlorodibenzo-p-dioxin = TCDD = DIOXIN

- **Mr. John Rossie –** Mr. Rossie, a Vietnam Veteran, requested a professional opinion regarding the movement of contaminated (TCDD/DIOXIN) items from mainland Vietnam to aircraft carriers during the Vietnam War. **2022**

- **Mr. George Black –** Mr. Black, a New York author requested I review/edit his forthcoming book: **"The Long Reckoning – A Story of War, Peace, and Redemption in Vietnam." 2021**

- **Mr. John T. Biciocchi** – This Vietnam War Veteran requested a professional opinion from Dr. Dwernychuk regarding his potential exposure to Agent Orange during his service a the Nakhon Phanom (NKP) Air Force Base in Thailand. The VA APPEAL BOARD granted a Permanenet Total Disability Award. **2021/2022**

- **Dr. Kenneth R. Olson and Dr. Larry Cihacek** – Dr. Dwernychuk provided editorial comments on the paper entitled "*The Fate of Agent Blue, the Arsenic Based Herbicide, Used in South Vietnam during the Vietnam War*" … https://www.scirp.org/pdf/ojss_2020112716124414.pdf . **2020**

- **"The Travels of Orange and Other Toxins"** - Dr. Dwernychuk edited this book and assisted the author, Donna Tornoe, during the course of her writing and producing the final. Her efforts focussed on the examination of herbicides in the Panama Canal Zone. **2020**

- **Contract employee working to repair and overhaul damaged helicompter returned to the US from Vietnam at the Corpus Christi US Army Depot, Texas.** Some of these choppers were used for spraying Agent Orange. I was asked to provide an opinion as to the potential of this employee being contaminated with herbicide during the performace of his duties. It is believed Agent Orange residues were present on the interiors for these choppers. **2020**

- **Vietnam Veteran Who Served on the USS RANGER Aircraft Carrier during the Vietnam War –** The Board of Veterans' Appeals requested an opinion on the likelihood of this veteran being exposed to Dioxin contaminated mail bags, which were delivered to the carrier from a site near the Ranch Hand Agent Orange location at Da Nang airbase. **2020**

- **Military-Veterans Advocacy, Inc., United States** – Dr. Dwernychuk provided a written scientific opinion regarding the exposure to Agent Orange of U.S. military personnel serving on Johnston Atoll where over 32,000 55 gallon barrels of Agent Orange were being stored after the Vietnam War. **2020**

- **Military-Veterans Advocacy, Inc., United States** – Dr. Dwernychuk provided a written scientific opinion regarding the exposure to Agent Orange of U.S. military

personnel serving on over 50 U.S. military installations in Thailand during the Vietnam War. Agent Orange was used for base perimeter spraying and also throughout the confines of each of these military installations. **2020**

- **The New York Times Magazine/Mr. George Black** – The New York Times Magazine commissioned Mr. George Black, a journalist/author, to prepare an article on Agent Orange. Dr. Dwernychuk was contacted by Mr. Black to provide a face-to-face interview on the subject of Agent Orange in Vietnam. The interview was conducted in British Columbia. **2019**

- **Leonard Weizer** – This Vietnam Veteran was denied compensation by the Dept. of Veterans Affairs for exposure to Agent Orange. Mr. Weizer requested Dr. Dwernychuk provide a professional opinion as to his claimed exposure by reviewing all the circumstances. The presiding judge of the appellate court agreed with Dr. Dwernychuk's assessment and granted Mr. Weizer compensation. **2018**

- **American Vietnam Veterans** – Dr. Dwernychuk provided advice, information, and opinions on the exposure of individual American Vietnam Veterans to Agent Orange/Dioxin during their service in Vietnam. This includes family members of Vietnam Veterans. Most of his involvement was assistance/opinions to Veterans or their family members struggling to receive compensation from the U.S. Department of Veterans Affairs for dioxin exposure. He is pleased to report that some Veterans, who initially were rejected for compensation, did receive their due compensation once the judiciary in the U.S. considered his written opinions on their exposure during military service. **2005 – Ongoing**

- **C-123 Air Crews** – Dr. Dwernychuk provided advice, information, and opinions to specific members of the C-123 Agent Orange spray planes that were returned to America following their service during the Vietnam conflict. The aircrews associated with these planes were suspected to have been contaminated by residues of Agent Orange/Dioxin remaining inside these aircraft subsequent to their return to the U.S. mainland. Aircrews submitted requests for compensation from the U.S. Department of Veterans Affairs. Dr. Dwernychuk submitted an opinion on the exposure potential of C-123 air crews to Agent Orange/Dioxin during their use in the U.S. **2016/17**

- **U.S. Blue Water Navy** – Dr. Dwernychuk provided advice, information, and opinions to the Blue Water Navy addressing the exposure potential of Navy service men to Agent Orange/Dioxin while they were serving on Navy ships during the Vietnam conflict. Dr. Dwernychuk's opinions centred on Navy ships in close proximity to Vietnam's land mass, specifically Da Nang Harbour. His opinions were submitted to the U.S. Department of Veterans Affairs supporting exposure of service men during the conflict. **2016 – 2019**

- **U.S. Veterans who served in Panama** – Dr. Dwernychuk provided advice, information, and opinions to a Veteran who served in Panama. The Veteran had multiple health issues and suspected exposure to either Agent Orange/Dioxin or 2,4,5-T, one of the herbicides in Agent Orange which contained 'dioxin', per se. Dr. Dwernychuk provided a written opinion of exposure potential which was submitted to the U.S. Department of Veterans Affairs. **2017**

- **Various news outlets** – Dr. Dwernychuk provided opinions/articles to news outlets addressing the potential for Agent Orange/Dioxin contamination in Okinawa. He also provided opinions/articles on the use of Scientology's Hubbard Method for the excretion of dioxin from the human body (this being impossible). He provided articles on the cleanup of dioxin contaminated lands in Vietnam. **2012 – 2016**

- **Ford Foundation** – Dr. Dwernychuk served as supporting environmental scientist and advisor during a comprehensive investigation of dioxin residues in soils, sediments, foods, human blood and human breast milk collected on and in the vicinity of the Bien Hoa airbase, Viet Nam. **2010/2011**

- **Renaissance Journalism Center, San Francisco State University *(Pro Bono)*** - Dr. Dwernychuk presented overviews of Agent Orange and dioxin Hot Spots in Viet Nam. Fellows at the Center are travelling to Viet Nam to undertake a variety of journalistic projects in country addressing Agent Orange and its impacts. **May 2010**

- **Ford Foundation** – Dr. Dwernychuk served as supporting environmental scientist and advisor during a comprehensive investigation of dioxin residues in soils, sediments, foods, human blood and human breast milk collected on and in the vicinity of the Da Nang airbase, Viet Nam. **2006 to 2009**

- **Ford Foundation** – Dr. Dwernychuk served as principle scientist on a study of dioxin residues at seven former US military bases in southern Viet Nam. **2004 to 2006**

- **Agent Orange Research and Policy Briefing, Washington, D.C.** – Dr. Dwernychuk was invited to present the Hatfield Agent Orange studies and comment on the most recent research on defoliant use during the Viet Nam war. The session was opened by Congressman Lane Evans. Those in attendance included the US State Department, NGOs, academics, The Viet Nam Veterans of America and embassy representatives from Viet Nam and Lao PDR. The panel meeting was sponsored by the Fund for Reconciliation and Development (New York), Oxfam America and the American Friends Service Committee. **July 8, 2003**

- **Dr. Dwernychuk has presented the Hatfield Agent Orange investigations at numerous venues during 1998 - 2004:**
    - Vietnam Veterans of America Leadership Convention, Buffalo, New York
    - Vietnam Veterans of America Convention, Pennsylvania Chapter, Pennsylvania State University, University Park, PA
    - Health Canada, Ottawa, Ontario
    - Canadian International Development Agency, Ottawa, Ontario
    - University of British Columbia, Vancouver, British Columbia
    - Langara College, Vancouver, British Columbia
    - Capilano College, North Vancouver, British Columbia
    - British Columbia Institute of Technology, Vancouver Campus, Vancouver, British Columbia
    - Canadian Deptartment of Indian Affairs and Northern Development, Ottawa, Ontario
    - Conference on the Long-Term Environmental Consequences of the Viet Nam War, Stockholm, Sweden
    - Government of Vietnam, Hanoi, Vietnam
    - American Ambassador, U.S. Embassy, Hanoi, Vietnam
    - Canadian Ambassador, Canadian Embassy, Hanoi, Vietnam
    - Washington University, Seattle, Washington
    - Dr. Dwernychuk was unable to attend; an alternate presented Hatfield's Vietnam studies, Paris, France
- **Government of New Zealand, Ministry of Health** – Retained by the Ministry of Health to critique a study plan investigating dioxin contamination in humans, resulting from potential exposure to materials associated with historical chemical manufacturing (New Plymouth, New Zealand). **2002**
- **Nominated by The Vietnam Veterans of America and Associates of The Vietnam Veterans of America for investiture in "The Legion of Honor"** (https://en.wikipedia.org/wiki/Four_Chaplains#Chapel_of_Four_Chaplains) of "The Chapel of Four Chaplains" for work on Agent Orange and for recognition of the benefits that Hatfield's work on Agent Orange has had to Viet Nam veterans and their families. Dr. Dwernychuk is only the fifth Canadian to be vested into the Legion of Honor, and the first Canadian west of the Ontario US Coastguard Base, Cape May, New Jersey. **September 2002**

- **International Conference on the Ecological and Health Effects of the Viet Nam War** – Invited to present the Hatfield Agent Orange studies in Viet Nam at the conference at Yale University, New Haven, Connecticut. **September 13-15, 2002**

- **Rockefeller University, New York** – Invited to present the Hatfield Agent Orange studies at a seminar session which focussed on Agent Orange investigations in Viet Nam and Lao PDR. **September 2002**

- **Vietnam-United States Scientific Conference on Human Health and Environmental Effects of Agent Orange/Dioxin** – Invited to present the Hatfield Agent Orange studies in Viet Nam at the international conference in Ha Noi. **March 3-6, 2002**

- **Development of Methodologies and Technology for Supporting Clearance of Landmines and Unexploded Ordnance (UXO) in Viet Nam** – Senior Scientist. This work included using satellite remote sensing, topographic maps and military archive information to create Geographic Information System (GIS) products to efficiently provide landmine/UXO clearing personnel with historic and present day site information relevant to planning and carrying out their programs. The project also included the development of landmine/UXO clearing protocols in chemically contaminated soils and for rehabilitating cleared sites. **2001 to 2002**

- **International Conference on the Long-Term Environmental Consequences of the Viet Nam War (Stockholm, July 26-28, 2002)** – Served on the conference Steering Committee, and the sub committee on "Ecosystems" for the Stockholm conference (**http://www.nnn.se/vietnam/environ.htm**). **2000 to 2002**

- **United States National Institute of Environmental Health Sciences (NIEHS)** – Served as a member of an *Ad Hoc* Panel charged with developing strategies for investigating the environmental/human health consequences of herbicide use during the Viet Nam War. Discussions preceded the signing of a collaborative agreement between the US and Viet Nam to initiate in-country investigations. **2000 to 2001**

- **Royal Danish Embassy, Ha Noi, Viet Nam** – Senior Scientist. Investigations on dioxin contamination of soils near a former US military fire base in Quang Tri province, Viet Nam. **1999 to 2000**

- **Environmental Impacts and Mitigation Strategies, Addressing the Use of Agent Orange Herbicide During the Viet Nam War, Aluoi Valley, Viet Nam** – Senior Scientist. Studies involved field investigations, laboratory analyses and preparation of two reports (October 1998 and April 2000) focussing on soils, food, human blood and breast milk. Recommendations were prepared in order to assist local authorities in reducing contaminant exposure and intake. Studies extended from 1994 to 2000. Studies were funded by various Canadian government agencies. **1994 to 2000**

- **Hatfield general photos from Vietnam related to our research:**

  1… **THIS ftp LINK WILL OPEN 'ONLY' WITH THE INTERNET EXPLORER BROWSER**:

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  3… Photos Hatfield 2000 Report:

  https://www.hatfieldgroup.com/wp-content/uploads/2020/05/cida849-agent-orange-v1-report-plates.pdf

Initial Environmental Evaluation Studies

The following studies involved collection, analysis and interpretation of physical/chemical/biological data associated with aquatic systems located near proposed developments; these facilities had the potential for environmental disruptions due to physical and/or chemical factors related to construction/operation of the development.

Mining

- **Lakefield Research** (a division of Falconbridge Limited), Lakefield, Ontario – Data analysis and synthesis focusing on benthic macroinvertebrate communities in Meadow and Fairless Creeks. **1992**
- **Strathcona Mineral Services Limited** (Midway Project) – Project Manager; Principal Aquatic Scientist; Author. **1990**
- **Corona Corporation** (Mt. Milligan Project) – Aquatic Scientist; Contributing Author. **1990**
- **Minnova Inc.** (Samatosum Mountain Project) – Principal Aquatic Scientist; Contributing Author. **1988**
- **Esso Minerals** – Principal Aquatic Scientist. **1988**
- **Skyline Explorations Limited** – Contributing Author. **1987**
- **Mascot Gold Mines Limited** (Hedley, British Columbia) – Project Manager; Principal Aquatic Scientist; Author. **1985**
- **Utah Mines (Carbon Creek)** – Project Manager; Principal Aquatic Scientist; Contributing Author. **1982**
- **Cadillac Explorations Limited** (Northwest Territories rivers and streams) – Project Manager; Principal Aquatic Scientist; Author. **1980 to 1982**
- **Pan Ocean Oil Ltd.** (Yukon rivers and streams) – Principal Aquatic Scientist; Contributing Author. **1979**
- **Erickson Gold Mines** (Yukon rivers and streams) – Principal Aquatic Scientist; Contributing Author. **1978**
- **DuPont of Canada Explorations Limited** (Northern British Columbia streams) – Project Manager; Principal Aquatic Scientist; Author. **1976**
- **Texas Gulf Inc.** (Northern British Columbia streams) – Project Manager; Principal Aquatic Scientist; Author. **1975**

Pipeline Construction

- **Foothills Pipeline Ltd.** (Yukon rivers and streams) – Field Scientist. **1979**

Thermal Power Plant

- **British Columbia Hydro** (Hat Creek) – Project Manager; Principal Aquatic Scientist; Contributing Author. **1980 to 1981**

Housing Development

- **Daon Development Corporation** (Vancouver, British Columbia) – Principal Aquatic Scientist; Contributing Author. **1975**

Oil Exploration

- **Panarctic Oils Limited** (High Arctic Islands) – Field Scientist. **1975**

Environmental Impact Assessment of Industrial Operations/Discharges

The following studies involved assessment of industries on aquatic environments (i.e., physical, chemical and biological), where physical/chemical issues related to the development may have impacted local environments. Dr. Dwernychuk served as Project Manager, Principal Aquatic Scientist and Author for all the following studies:

Mining

- **Noranda** (Bell Mine), Granisle, British Columbia. **1991**
- Expert witness re: impact of a supernatant spill into Babine Lake, British Columbia
- **Noranda** (Bell Mine), Granisle, British Columbia. **1988 to 1989**
- **Skyline Explorations Limited**, Vancouver, British Columbia. **1988 to 1989**
- **Corona Corporation Ltd.** (formally Mascot Gold Mines Ltd.), Vancouver, British Columbia. (Two studies). **1986 to 1987**
- **DuPont of Canada Explorations Limited**, Vancouver, British Columbia. **1982**
- **Highland Valley Copper**, Logan Lake, British Columbia. **1975 to 2002**

Pulp and Paper/Forest Industry

- **MacMillan Bloedel Limited**, Powell River, British Columbia. **1988 to 1989**
- **Quesnel River Pulp Company**, Quesnel, British Columbia. (Approximately 5 studies). **1982 to 1987**
- **Celgar Pulp Company**, Castlegar, British Columbia. (Approximately 4 studies). **1980 to 1988**
- Expert witness on Environmental Appeal Board Hearings (effluent impacts on the river receiving environment)
- **Skeena Cellulose Inc**., Prince Rupert, British Columbia. (Approximately 11 studies). **1979 to 1989**
- **Manitoba Forestry Resources Limited**, The Pas, Manitoba. **1979 to 1980**
- **Crestbrook Pulp and Paper Ltd**., Skookumchuk, British Columbia. **1979**
- **Canadian Forest Products Ltd**., Port Mellon, British Columbia. **1978**
- **Proctor and Gamble of Canada Limited**, Grande Prairie, Alberta. **1977 and 1980**
- **Cariboo Pulp and Paper Company**, Quesnel, British Columbia. (approximately 12 studies). **1975 to 1987**
- **Prince George Pulp and Paper Limited**, Prince George, British Columbia. (Approximately 12 studies). **1975 to 1987**

- **Northwood Pulp and Timber Limited**, Prince George, British Columbia. (Approximately 12 studies). **1975 to 1987**
- **Intercontinental Pulp Company Limited**, Prince George, British Columbia. (Approximately 12 studies). **1975 to 1987**
- **Pacifica Papers**, Powell River, British Columbia. **1998 and 1999**
- Expert witness on Environmental Appeal Board Hearings (impacts of recovery and power boiler emissions on the marine environment).

Chemical Industry

- **Ocelot Ammonia Company**, Kitimat, British Columbia. **1989**
- **FMC of Canada Ltd.**, Squamish, British Columbia. **1975 to 1990**

Other Investigations

*Pulp and Paper & Forest Industry/**Organochlorines/Dioxins/Furans***

- **International Finance Corporation (World Bank Group), Washington, DC** – Expert Panel member reviewing the environmental impacts of two bleached Kraft pulpmill developments in Uruguay. **2006**
- **Project Director/Senior Aquatic Scientist** for pre-design and design phases of the Environmental Effects Monitoring program for each industrial complex related to the federal *Fisheries Act* (Cycle One: 1993-1996; Cycle Two: 1997-2000; Cycle Three: 2001-2004). Studies are required in the vicinity of all pulp and paper mills in Canada to assess environmental effects of wastewater discharges.
    - Howe Sound Pulp and Paper Limited, Port Mellon, British Columbia
    - Western Pulp Inc./Western Pulp Limited Partnership (Squamish Operation), Squamish, British Columbia
    - Norske Skog Canada Limited (formerly Fletcher Challenge Canada), Crofton Pulp and Paper, Crofton, British Columbia
    - Norske Skog Canada Limited (formerly Fletcher Challenge Canada), Elk Falls Pulp and Paper, Campbell River, British Columbia
    - NorskeCanada, Port Alberni, British Columbia
    - NorskeCanada (formerly MacMillan Bloedel Limited), Powell River Division, Powell River, British Columbia
    - Western Pulp Inc./Western Pulp Limited Partnership (Port Alice Operation), Port Alice, British Columbia
    - Canadian Forest Products Ltd., (formerly Northwood Pulp and Timber Limited), Prince George, British Columbia
    - Cariboo Pulp and Paper Company, Quesnel, British Columbia
    - Quesnel River Pulp Company, Quesnel, British Columbia
    - Skeena Cellulose Inc., Prince Rupert, British Columbia

- Tembec Industries Inc. (formerly Crestbrook Forest Industries Ltd.), Cranbrook, British Columbia
- Celgar Pulp Company Castlegar, British Columbia
- Fiberco Pulp Inc., Taylor, British Columbia
- Scott Paper Limited, New Westminster, British Columbia
- Weyerhaeuser Canada Ltd., Kamloops, British Columbia

- **Sandwell Inc., Vancouver, British Columbia** – Senior Aquatic Scientist on an Environmental Impact Statement regarding a greenfield pulpmill in Sabah, Malaysia. **1999**
- **Project Manager and Principal Aquatic Scientist** for implementation of **dioxin/furan** trend monitoring studies in sediments and biological tissues collected from marine environments associated with each industrial complex. **1996 to 2006**
  - Howe Sound Pulp and Paper Limited, Port Mellon, British Columbia
  - Western Pulp Inc., Western Pulp Limited Partnership (Squamish Operation), Squamish, British Columbia
  - Skeena Cellulose Inc., Prince Rupert, British Columbia
  - Norske Skog Canada Limited (formerly Fletcher Challenge Canada), Crofton Pulp and Paper, Crofton, British Columbia
  - Norske Skog Canada Limited (formerly Fletcher Challenge Canada), Elk Falls Pulp and Paper, Campbell River, British Columbia
  - Pacifica Papers Inc. (formerly MacMillan Bloedel Limited, Powell River Division), Powell River, British Columbia
- **NLK Consultants Inc., Vancouver, British Columbia** – Project Manager, Principal Aquatic Scientist for a study involving a potential pulpmill in Central Kalimantan, Indonesia. **1994**
- **Project Manager and Principal Aquatic Scientist** for implementation of **dioxin/furan** trend monitoring studies in sediments and biological tissues collected from marine environments associated with each industrial complex. **1993, 1994 and 1995**
  - Howe Sound Pulp and Paper Limited, Port Mellon, British Columbia
  - Western Pulp Inc./Western Pulp Limited Partnership (Squamish Operation), Squamish, British Columbia
  - Skeena Cellulose Inc., Prince Rupert, British Columbia
  - Fletcher Challenge Canada, Crofton Pulp and Paper, Crofton, British Columbia

- Fletcher Challenge Canada, Elk Falls Pulp and Paper, Campbell River, British Columbia
- MacMillan Bloedel Limited, Powell River Division, Powell River, British Columbia
- MacMillan Bloedel Limited, Alberni Pulp and Paper Division, Port Alberni, British Columbia

- **Institute of Ecological Toxicology, Baikalsk, Irkutsk Region, Russia** – Invited to attend a symposium on "Environmental Chemistry and Toxicology of Chlorinated Organic Pollutants". **1990**
- **Western Pulp Inc., Western Pulp Limited Partnership (Port Alice Operation), Port Alice, British Columbia** – Environmental overview of Neurotsos Inlet, related to pulpmill effluent discharges. **1992**
- **Sandwell Inc., Vancouver, British Columbia** – Project Manager/Senior Environmental Scientist for an independent evaluation of an initial environmental assessment report (bleached Kraft pulpmill in Sumatra, Indonesia) submitted by an environmental consultant to Sandwell Inc. Dr. Dwernychuk was retained by CIDA through Sandwell to provide a critique on the document following a site visit and discussions with other project professionals. **1992**
- **Project Manager and Principal Aquatic Scientist** for implementation of **dioxin/furan** trend monitoring studies in sediments and biological tissues collected from marine environments associated with each industrial complex. **1992**
  - Howe Sound Pulp and Paper Limited, Port Mellon, British Columbia
  - Western Pulp Inc./Western Pulp Limited Partnership (Squamish Operation), Squamish, British Columbia
  - Skeena Cellulose Inc., Prince Rupert, British Columbia
  - Fletcher Challenge Canada, Crofton Pulp and Paper, Crofton, British Columbia
  - Fletcher Challenge Canada, Elk Falls Pulp and Paper, Campbell River, British Columbia
  - MacMillan Bloedel Limited, Harmac Division, Nanaimo, British Columbia
  - MacMillan Bloedel Limited, Powell River Division, Powell River, British Columbia
  - MacMillan Bloedel Limited, Alberni Pulp and Paper Division, Port Alberni, British Columbia
  - Campbell River Mills Ltd., Campbell River, British Columbia
- **External Affairs and International Trade Canada** – Invited to attend and participated in a Pulp and Paper Trade Mission to Indonesia. Presentation of

qualifications/experience, mill visits, and formal functions in Jakarta, Bali, and Surabaya. **1992**

- **Weyerhaeuser Canada Ltd., Kamloops, British Columbia** – Data analysis and synthesis focusing on benthic macroinvertebrate communities of the Thompson River. **1991**
- **H.A. Simons Limited, Vancouver, British Columbia** – Senior Aquatic Scientist on an Environmental Impact Assessment Study of a proposed pulpmill in East Kalimantan, Indonesia (PT Kiani Kertas, Jakarta, Indonesia). **1991 to 1994**
- **Canadian Pulp and Paper Association** – Advisor to the industry on the design and implementation of the proposed federal regulations focusing on Environmental Effects Monitoring. **1991 to 1992**
- **H.A. Simons Limited, Vancouver, British Columbia** – Initial Environmental Evaluation of a proposed greenfield pulpmill in East Kalimantan (PT Kiani Kertas, Jakarta, Indonesia). **1991**
- **Project Manager and Principal Aquatic Scientist** for implementation of **dioxin/furan** trend monitoring studies in sediments and biological tissues collected from marine environments associated with each industrial complex. **1991**
    - Howe Sound Pulp and Paper Limited, Port Mellon, British Columbia
    - Western Pulp Inc./Western Pulp Limited Partnership (Squamish Operation), Squamish, British Columbia
    - Skeena Cellulose Inc., Prince Rupert, British Columbia
    - Fletcher Challenge Canada, Crofton Pulp and Paper, Crofton, British Columbia
    - Fletcher Challenge Canada, Elk Falls Pulp and Paper, Campbell River, British Columbia
    - MacMillan Bloedel Limited, Harmac Division, Nanaimo, British Columbia
    - MacMillan Bloedel Limited, Powell River Division, Powell River, British Columbia
    - MacMillan Bloedel Limited, Alberni Pulp and Paper Division, Port Alberni, British Columbia
    - Raven Lumber, Campbell River, British Columbia
- **Project Manager and Principal Aquatic Scientist** for **dioxin/furan** studies in biological tissues collected from remote regions along the British Columbia coast. **1991**
    - Howe Sound Pulp and Paper Limited, Port Mellon, British Columbia
    - Western Pulp Inc./Western Pulp Limited Partnership (Squamish Operation), Squamish, British Columbia
    - Skeena Cellulose Inc., Prince Rupert, British Columbia
    - Fletcher Challenge Canada, Crofton Pulp and Paper, Crofton, British Columbia

- Fletcher Challenge Canada, Elk Falls Pulp and Paper, Campbell River, British Columbia
- MacMillan Bloedel Limited, Harmac Division, Nanaimo, British Columbia
- MacMillan Bloedel Limited, Powell River Division, Powell River, British Columbia
- MacMillan Bloedel Limited, Alberni Pulp and Paper Division, Port Alberni, British Columbia

- **International Conference: Environmental Fate and Effects for Bleached Pulpmill Effluents; Stockholm, Sweden** – Co-authored a paper titled *Monitoring Environmental Effects of the Pulp and Paper Industry: A Regulatory Approach.* **November 1991**
- **Project Manager and Principal Environmental Scientist** for baseline **organochlorine** contamination studies in the Fraser and Thompson Rivers (effluents, drinking water, sediments, biological tissues). **1990 to 1991**
  - Northwood Pulp and Timber Limited, Prince George, British Columbia
  - Prince George Pulp and Paper Limited, Prince George, British Columbia
  - Intercontinental Pulp Company Limited, Prince George, British Columbia
  - Cariboo Pulp and Paper Company, Quesnel, British Columbia
  - Weyerhaeuser Canada Ltd., Kamloops, British Columbia
- **British Columbia Ministry of Environment, Victoria, British Columbia** – Project Manager and Principal Environmental Scientist for **dioxin/furan** sample collections: Lower Mainland/ Vancouver Island/Skeena/Interior Regions (pulp and paper/forest industry sites in addition to PCB storage sites, oil refineries, sewage sludge, municipal waste, biomedical waste). **1990 to 1991**
- **Project Manager and Principal Environmental Scientist** for development and implementation of comprehensive effects monitoring of pulpmill effluents on the marine receiving environment of Howe Sound (effluents, receiving waters, bottom sediments, subtidal benthic macroinvertebrate communities, contaminant loading in biological tissues, etc.). **1990 to 1991**
  - Howe Sound Pulp and Paper Limited, Port Mellon, British Columbia
  - Western Pulp Inc./Western Pulp Limited Partnership (Squamish Operation), Squamish, British Columbia
- **Skeena Cellulose Inc., Prince Rupert, British Columbia** – Project Manager and Principal Environmental Scientist for development and implementation of comprehensive effects monitoring of pulpmill effluents on the marine receiving environment near Skeena Cellulose (effluents, receiving waters, bottom sediments, subtidal and intertidal benthic macroinvertebrate communities, macroalgae, contaminant loading in biological tissues, etc.). **1990 to 1991**
- **Crestbrook Forest Industries Ltd., Cranbrook, British Columbia** – Project Manager and Principal Environmental Scientist for baseline **organochlorine**

contamination studies in the Kootenay River (effluents, drinking water, receiving waters, sediments, biological tissues). **1990 to 1991**

- **Project Manager and Principal Environmental Scientist** for environmental studies addressing **organochlorines** in the forest industry and their concentration in receiving waters, effluents, sediments and biological tissues (i.e., groundfish, crab, prawns, clams, oysters) collected from marine receiving environments associated with the forest industry operations. **1990**
    - Fletcher Challenge Canada, Crofton Pulp and Paper, Crofton, British Columbia
    - Fletcher Challenge Canada, Elk Falls Pulp and Paper, Campbell River, British Columbia
    - MacMillan Bloedel Limited, Harmac Division, Nanaimo, British Columbia
    - MacMillan Bloedel Limited, Powell River Division, Powell River, British Columbia
    - Raven Lumber, Campbell River, British Columbia
- **MacMillan Bloedel Limited, Alberni Pulp and Paper Division, Alberni, British Columbia** – Project Manager and Principal Environmental Scientist for environmental studies addressing **organochlorines** in pulp and paper discharges at Port Alberni (effluents, receiving waters, sediments and biological tissues). **1990**
- **United Nations Economic Commission for Europe – Task Force on the Environment, Baikalsk (Lake Baikal), USSR** – Presented studies on the effects of pulpmill effluents on receiving waters in British Columbia, Canada. Participated in Workshop and Task Force activities regarding a United Nations document on environmental impacts and prediction. **1990**
- **Orenda Forest Products Ltd., West Vancouver, British Columbia** – Project Manager and Principal Aquatic Scientist for environmental activities/assessments related to the proposed pulpmill near Stewart, British Columbia, subsequently relocated near Terrace, British Columbia. **1990**
- **Project Manager and Principal Environmental Scientist** for supplementary sampling and chemical analyses (**organochlorines**) on biological tissues collected from additional sites near each pulp and paper operation. **1990**
    - Fletcher Challenge Canada, Crofton Pulp and Paper, Crofton, British Columbia
    - Fletcher Challenge Canada, Elk Falls Pulp and Paper, Campbell River, British Columbia
    - MacMillan Bloedel Limited, Harmac Division, Nanaimo, British Columbia
    - MacMillan Bloedel Limited, Powell River Division, Powell River, British Columbia
- **Project Manager and Principal Environmental Scientist** for environmental studies in the Fraser River system addressing **organochlorines** in pulp and paper

effluents (Western Canada pilot study related to the proposed federal environmental monitoring guidelines for Canadian pulp and paper mills). These studies focus on the chemical characterization of mill effluents, receiving river water and river bottom sediments, bioassays on raw effluents and dilutionof ambient river water, benthic macroinvertebrate communities and fish tissue analyses involving enzyme activation tests and contaminant loads. **1989 to 1990**

  - Northwood Pulp and Timber Limited, Prince George, British Columbia
  - Prince George Pulp and Paper Limited, Prince George, British Columbia
  - Intercontinental Pulp Company Limited, Prince George, British Columbia
  - Quesnel River Pulp Company, Quesnel, British Columbia
  - Cariboo Pulp and Paper Company, Quesnel, British Columbia
  - Environment Canada
  - British Columbia Ministry of Environment

- **Western Pulp Inc., Western Pulp Limited Partnership (Squamish Operation), Squamish, British Columbia** – Project Manager and Principal Environmental Scientist for water quality studies and **dioxin/furan** studies on crab tissues collected from Howe Sound. **1989 to 1990**
- **Western Pulp Inc., Western Pulp Limited Partnership (Squamish Operation), Squamish, British Columbia** – Project Manager and Principal Environmental Scientist for **dioxin/furan** studies on dredgate material collected near the Western Pulp operation. An assessment of bottom materials for ocean dumping approval by Environment Canada. **1989 and 1990**
- **Project Manager and Principal Environmental Scientist** for environmental studies addressing **organochlorines** in pulp and paper effluents (i.e., guaiacols, extractable organic halides, dioxins, furans) and their concentration in sediments and biological tissues (i.e., groundfish, crab, prawns, mussels) collected from marine receiving environments associated with pulp and paper operations. **1988 to 1989**
  - Howe Sound Pulp and Paper Limited, Port Mellon, British Columbia
  - Western Pulp Inc., Western Pulp Limited Partnership (Squamish Operation), Squamish, British Columbia
  - Skeena Cellulose Inc., Prince Rupert, British Columbia
- **H.A. Simons Ltd., Vancouver, British Columbia** – Principal Environmental Scientist and Author for environmental impact assessment of a proposed bleached kraft pulpmill on Rio Uruguay, Argentina. On-site investigations were undertaken in Argentina and Uruguay. **1988 to 1989**
- **Principal Environmental Scientist and Author** conducted visits to Sweden, Finland and West Germany to obtain environmental perspectives regarding **chlorinated organics** in pulpmill effluents. Government and industry agencies

were interviewed (regulatory and research groups) to assess conditions in the Baltic Sea and Bay of Bothnia. **1988**

  - MacMillan Bloedel Limited, Vancouver, British Columbia
  - Fletcher Challenge Canada, Vancouver, British Columbia
  - Western Pulp Inc., Vancouver, British Columbia
  - Cariboo Pulp and Paper Company, Vancouver, British Columbia

- **Northwood Pulp and Timber Limited, Prince George, British Columbia** – Project Manager, Principal Aquatic Scientist and Author for thermal profiling of the Fraser River near the effluent diffuser related to expansion of the mill facility. **1988**
- **Skeena Cellulose Inc., Prince Rupert, British Columbia** – Project Manager, Principal Aquatic Scientist and Author for environmental impact studies and assessment of pulpmill effluent on water quality, subtidal and intertidal benthic invertebrates, intertidal macroalgae, sediments and fish utilization. **1987 to 1988**
- **Crestbrook Pulp and Paper Ltd., Skookumchuk, British Columbia** – Principal Aquatic Scientist for studies examining the psychophysical impacts of pulpmill effluent colour (Kootenay River) on human observers randomly selected from Cranbrook, British Columbia. **1977**
- **Turkish State Organization for the Pulp and Paper Industry, Ismit, Turkey** – Principal Aquatic Scientist and Author for biological and water quality studies of Karamik Lake, Turkey, prior to receipt of effluents from a proposed pulpmill complex. **1976**

Fisheries

- **Estudios Technicos Ltda., Bogota, Colombia** – Project Manager, Principal Aquatic Scientist and Author for study reviews focusing on hydroelectric reservoir clearance of forested areas and associated impacts on water quality and fish production. **1984**
- **Ladner Downs**, Barristers and Solicitors, Vancouver, British Columbia
- **Campney and Murphy,** Barristers and Solicitors, Vancouver, British Columbia
- Expert advisor to defense counsel for clients charged with the discharge of deleterious substances into fish-bearing waters. **1981**
- **Department of Fisheries and Oceans**, Vancouver, British Columbia – Authored a report on the effects of the proposed Kemano II project on chinook salmon resources of the Nechako River. **1975**

Impact Assessments

- **Peigan Nation, Brocket, Alberta** – Principal Aquatic Scientist and Author on Assessment of the effects of the proposed Oldman River Dam on fisheries resources, water quality, benthic communities and associated parameters of the Oldman River situated within the Peigan Reserve boundary. **1986**

- **Dene Nation, Yellowknife, Northwest Territories** – Principal Aquatic Scientist and Author for preparation of a training manual for winter and summer environmental monitoring addressing hydrocarbon, mining and road developments in the north. Workshops and seminar sessions were held in Northwest Territories communities with local Dene people. **1985**
- **Dene Nation, Yellowknife, Northwest Territories** – Project Manager and Principal Aquatic Scientist for participation in the development and implementation of a major fisheries program in the Mackenzie River addressing potential contaminants in fish tissues. **1985**
- **N.D. Lea Associates, Vancouver, British Columbia** – Principal Aquatic Scientist and Contributing Author on Aquatic studies on the impact of the Annacis Bridge freeway alignment. **1982**
- **British Columbia Hydro, Vancouver, British Columbia** – Project Manager, Principal Aquatic Scientist and Contributing Author on pre-construction monitoring of fisheries and invertebrate fauna in Hat Creek and the Bonaparte River related to the Hat Creek power project. **1981**
- **Public Works Canada, Vancouver, British Columbia** – Principal Aquatic Scientist and Author on studies assessing the impact of improvements to the Fraser River shipping channel on benthic fauna. **1981**
- **Department of Supply and Services (Canada)** – Principal Aquatic Scientist and Author on studies reviewing the impact of linear facilities in northern ecosystems on aquatic habitats. **1979**
- **Twinriver Timber Limited, Terrace, British Columbia** – Project Manager, Principal Aquatic Scientist and Author on studies addressing the use of a logging canal by spawning salmonids. Examined sediment structure as a factor in limiting use of gravels for spawning. **1977**

Aquaculture Related Studies

- **Aquastar Services Limited and Farmers, Bangkok, Thailand** – Hatfield Consultants conducted extensive field studies and an Environmental Impact Assessment (EIA) of a large shrimp farming development in Ranot area of southern Thailand. The project supported 400 ha of shrimp ponds with plans to expand to 10,000 ha. The work involved assessment of land, freshwater and marine resources in the area, an evaluation of impacts of the project on these resources and the formation of a mitigation plan. An oceanographic computer model was developed by the study team for the west coast of the Gulf of Thailand to assist in the process. **1990**
- Dr. Dwernychuk was responsible for design and supervision of water quality and macroinvertebrate surveys and interpretation of impacts on these preceding resources. He also directed design of the mitigation plan. **1990 to 1992**

- **Canadian International Development Agency (CIDA), Ottawa, Ontario, Canada** – Contributing Aquatic Scientist for environmental review/assessment of aquaculture facilities (hatchery and marine grow-out sites) – Hong Kong, Thailand, Singapore and Indonesia. **1989 to 1990**
- **Moore-Clarke Co. Inc., Vancouver, British Columbia, Canada** – Aquatic Scientist for site selection studies for hatchery and marine grow-out facilities in Chile (aerial and ground reconnaissance programs). **1988**
- **Patagonia Salmon, S.A., Buenos Aires, Argentina** – Aquatic Scientist for pre-feasibility investigations regarding development of salmon farming operations and joint ventures in Argentina. **1988**
- **Aqua Terra Technologies Limited, Victoria, British Columbia, Canada** – Contributing Aquatic Scientist and Author for feasibility studies on a land-based salmon farm in British Columbia. **1987**
- **Salt Spring Aquafarms Ltd., Salt Spring Island, British Columbia, Canada** – Principal Aquatic Scientist for Training programs for salmon farm personnel regarding water quality control, experimentation and data analyses. **1987**
- **Salt Spring Aquafarms Ltd., Salt Spring Island, British Columbia, Canada** – Principal Aquatic Scientist for design of *in situ* monitoring programs for a salmon farm in British Columbia. **1987**
- **Hatfield International S.A., Puerto Montt, Chile** – Contributing Aquatic Scientist advising personnel in Chile. Activities involved water quality, administrative issues and general pollution control at joint venture salmon hatchery and marine grow-out sites. **1986 to 1988**
- **Subsecretaria de Pesca, Fisheries Department, Santiago, Chile** – Executive Director for preliminary on-site field activities related to transplanting salmon to Chilean coastal waters. **1982**
- **Electrowatt Consulting Engineers and Planners, Zurich, Switzerland** – Project Manager, Principal Aquatic Scientist and Author for studies on the fisheries potential of a hydroelectric reservoir for increasing fish as a Native food resource in remote areas of Nigeria. On-site activities in Nigeria were supplemented with literature reviews at Food and Agricultural Organization libraries in Rome, Italy. **1982**

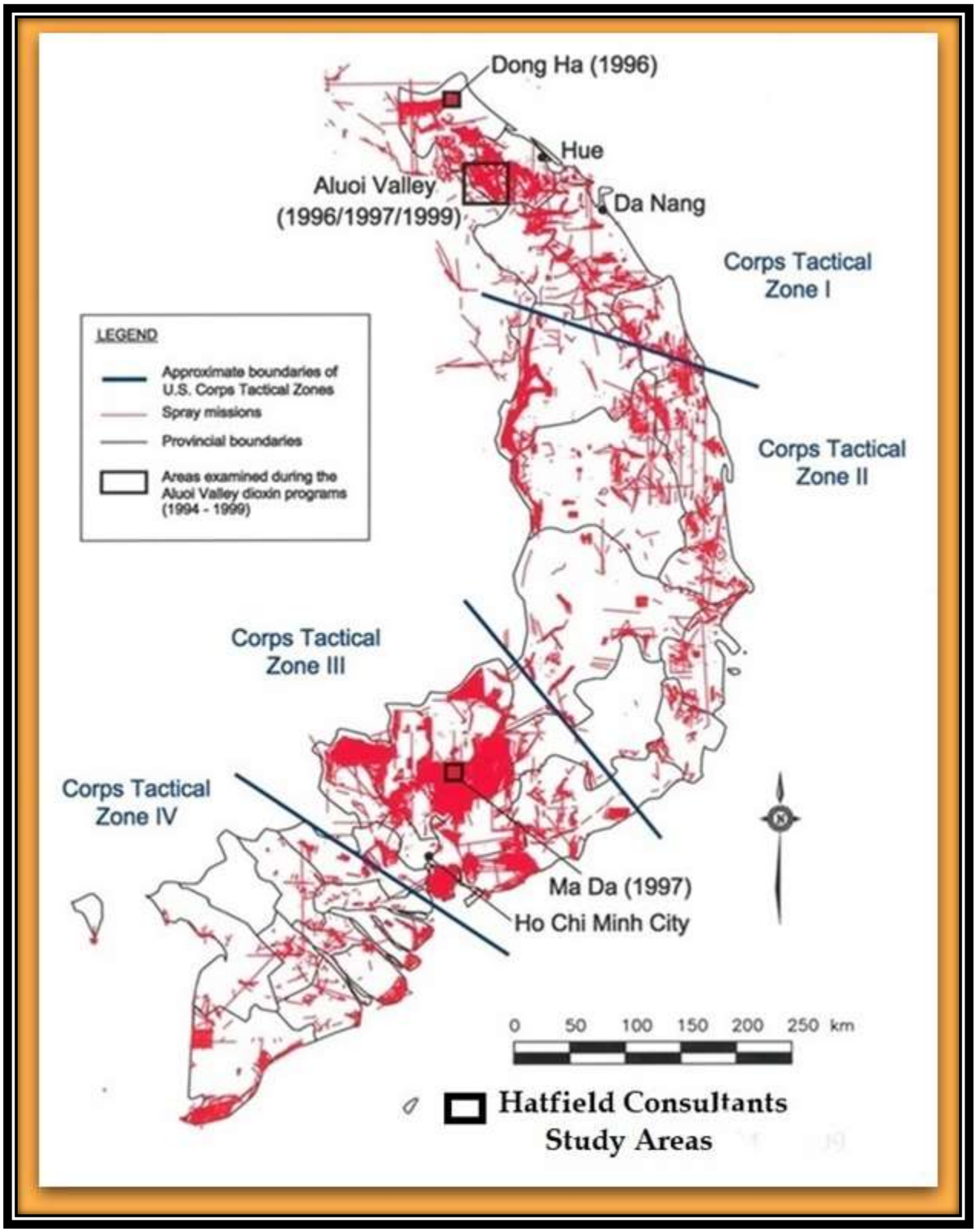
DRUMS OF AGENT ORANGE WITH DISTINCTIVE ORANGE BANDS

HUEY HELICOPTER AND FIXED WING AIRCRAFT SPRAYING AGENT ORANGE, SOUTHERN VIETNAM. VIEW RIVER BANK SPRAYING WITH AGENT ORANGE FROM A SPECIALLY EQUIPPED WATER CRAFT ...
https://www.youtube.com/watch?v=wUZA0GAMmfI

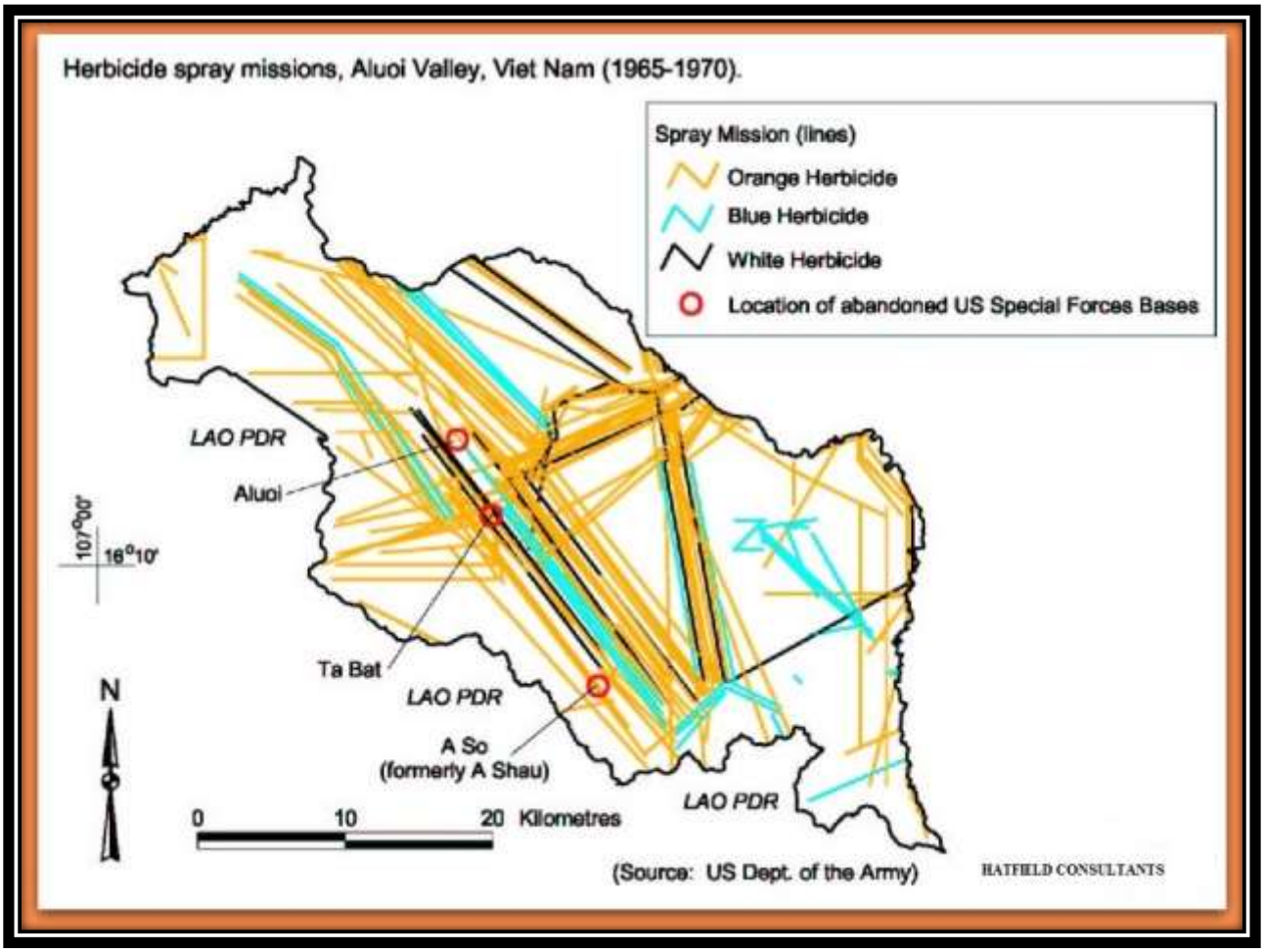
BACK PACK AND TRUCK MOUNTED SPRAYING OF AGENT ORANGE, SOUTHERN VIETNAM

C-123 AGENT ORANGE SPRAY PLANES ON A SPRAY MISSION TRANSECT, SOUTHERN VIETNAM

AGENT ORANGE SPRAY MISSIONS, SOUTHERN VIETNAM (1962 – 1971)



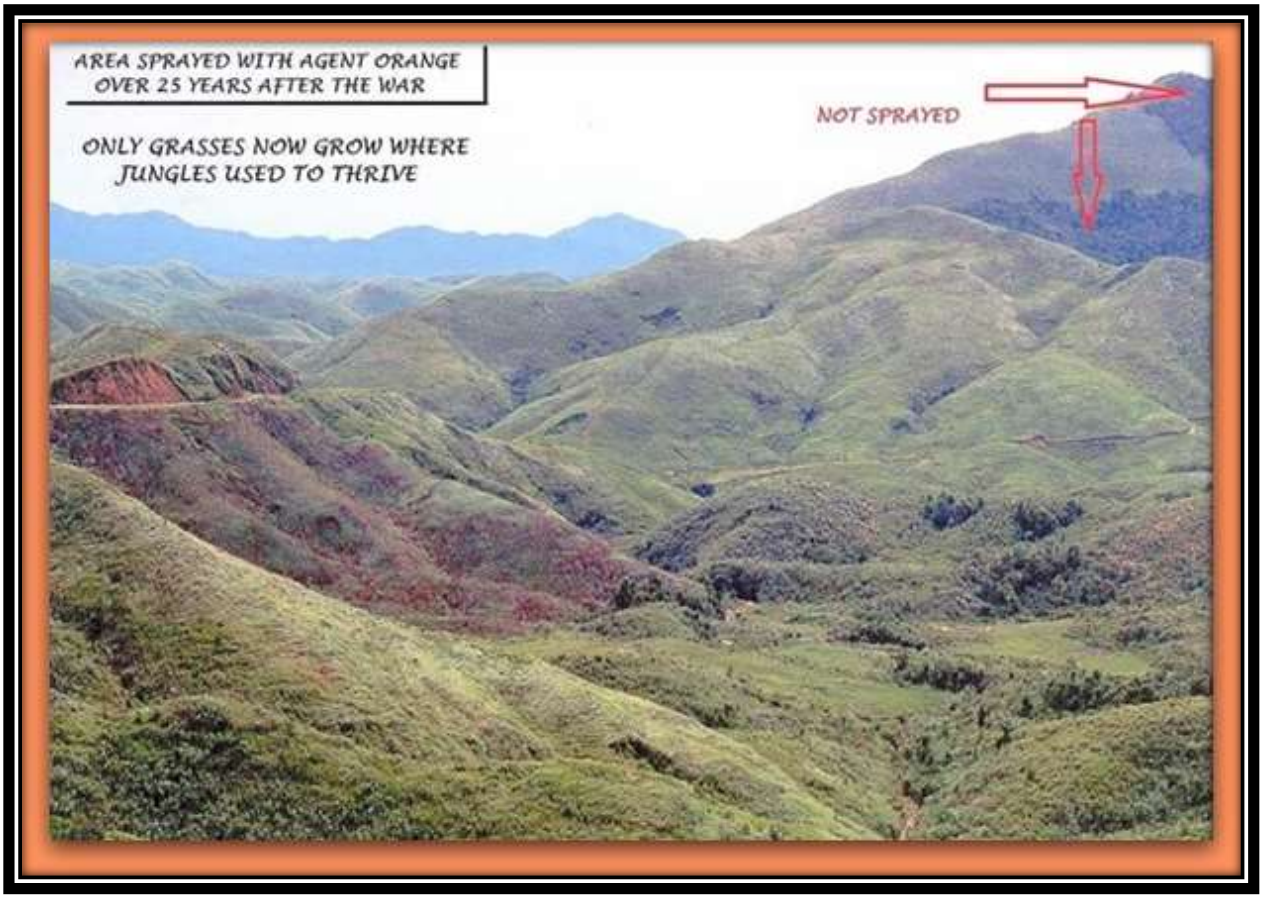
A LUOI VALLEY WHERE HATFIELD CONSULTANTS PERFORMED RESEARCH ON AGENT ORANGE SHOWING HERBICIDE SPRAY TRANSECTS AND LOCATION OF FORMER US SPECIAL FORCES BASES



AN AREA ADJACENT TO THE A LUOI VALLEY, SOUTHERN VIETNAM WHERE HATFIELD CONSULTANTS INITIATED AGENT ORANGE INVESTIGATIONS 1994

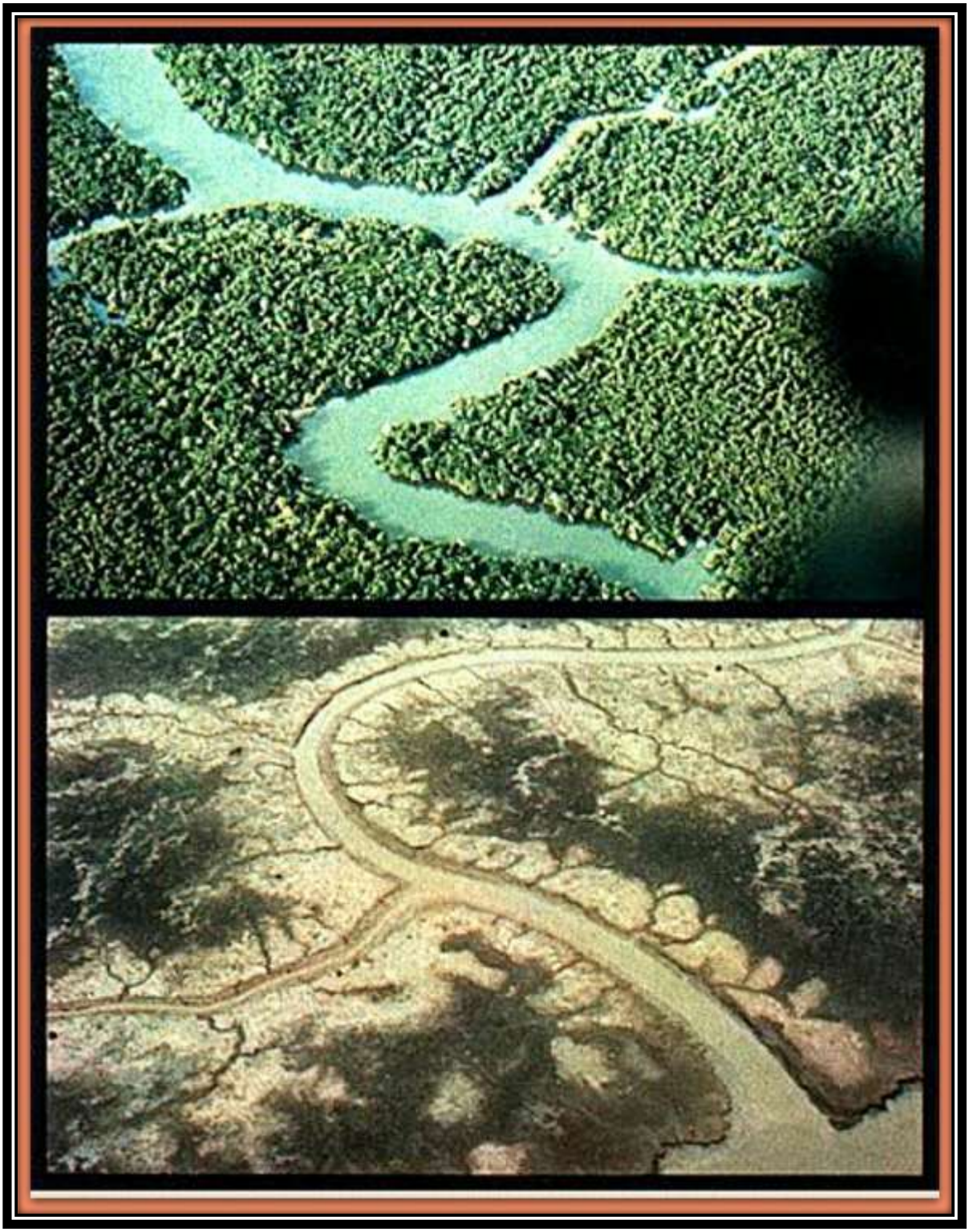
THE A LUOI VALLEY WAS CALLED THE A SHAU VALLEY DURING THE CONFLICT

THE HAMBURGER HILL BATTLE OCCURRED IN THE A SHAU VALLEY



BEFORE AND AFTER AGENT ORANGE SPRAYING OF JUNGLE FORESTS NEAR THE A LUOI VALLEY, SOUTHERN VIETNAM

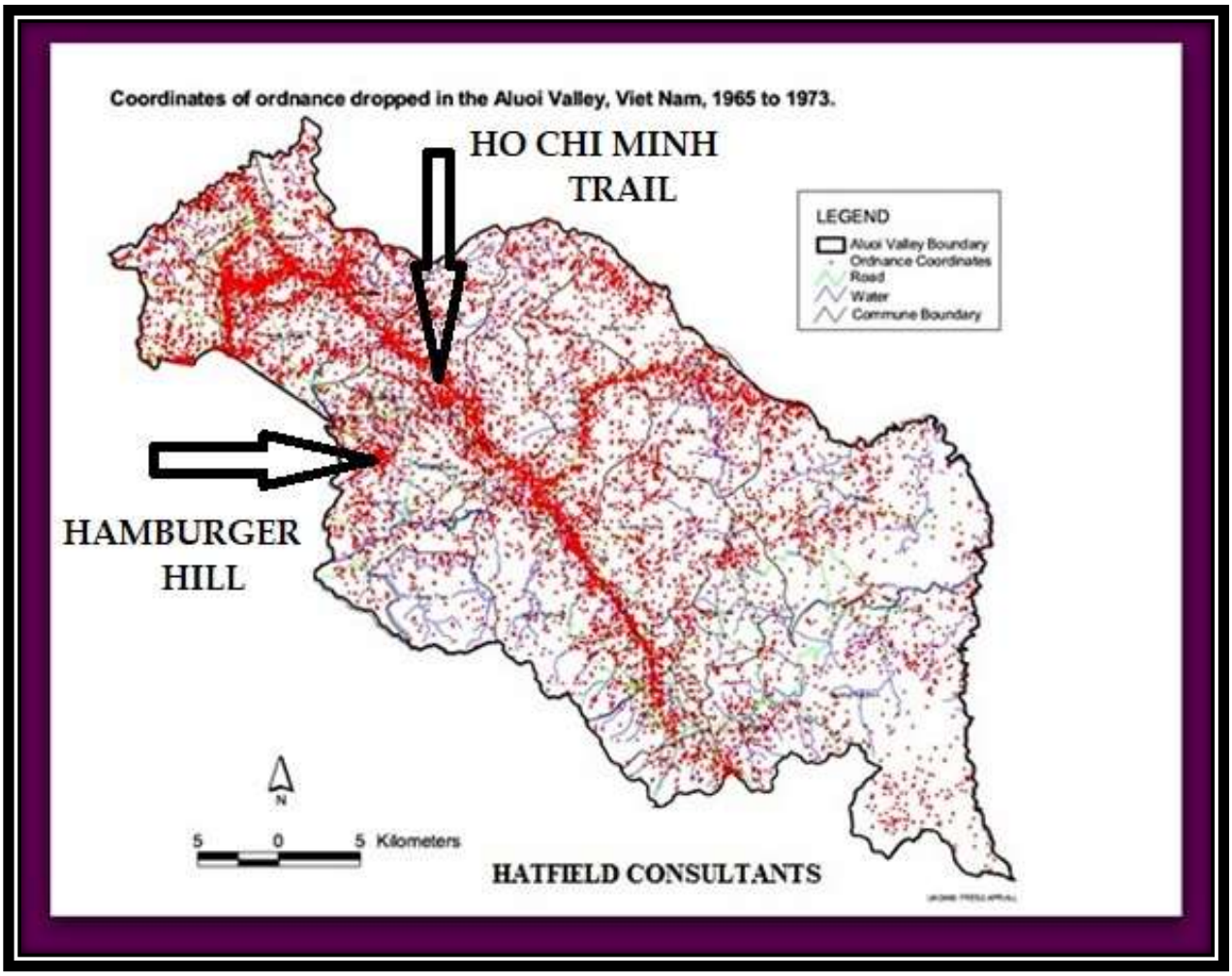
BEFORE AND AFTER AGENT ORANGE SPRAYING OF SOUTHERN VIETNAM'S MANGROVE FORESTS



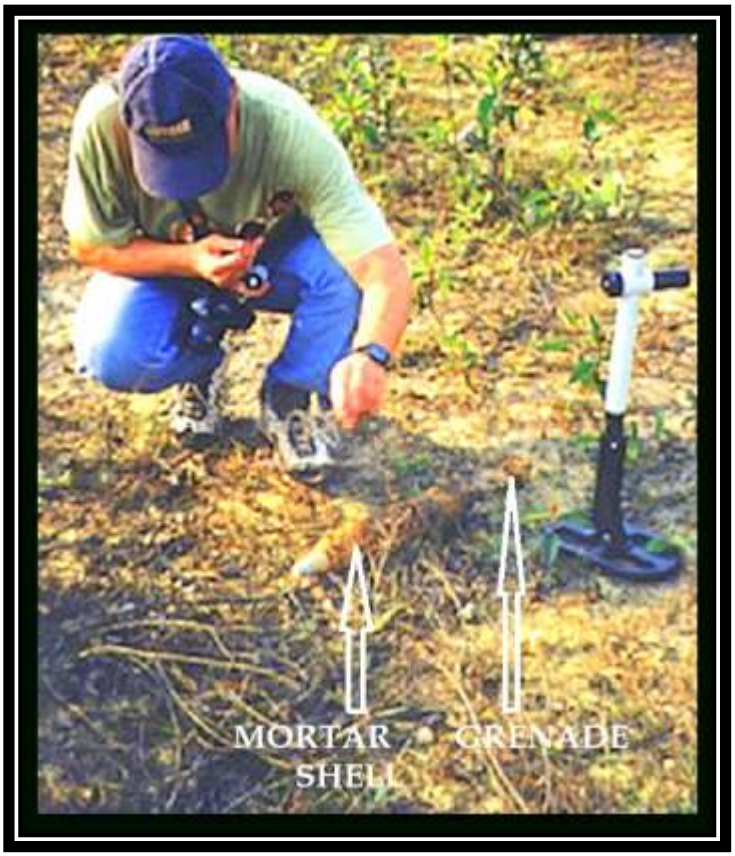
HUMAN BLOOD AND BREAST MILK SAMPLING FROM LOCAL HILL TRIBES PEOPLE BY THE HATFIELD CREW IN THE A LUOI VALLEY, SOUTHERN VIETNAM

SOIL CORE AND FISH SAMPLING IN THE A LUOI VALLEY, SOUTHERN VIETNAM. THROUGH LABORATORY ANALYSES IN CANADA, OF SAMPLES COLLECTED IN THE A LOUI VALLY, HATFIELD CONSULTANTS DETERMINED ELEVATED LEVELS OF DIOXIN IN HUMAN BLOOD, HUMAN BREAST MILK, SOIL CORES, AND FOODS (e.g., FISH AND DUCKS).

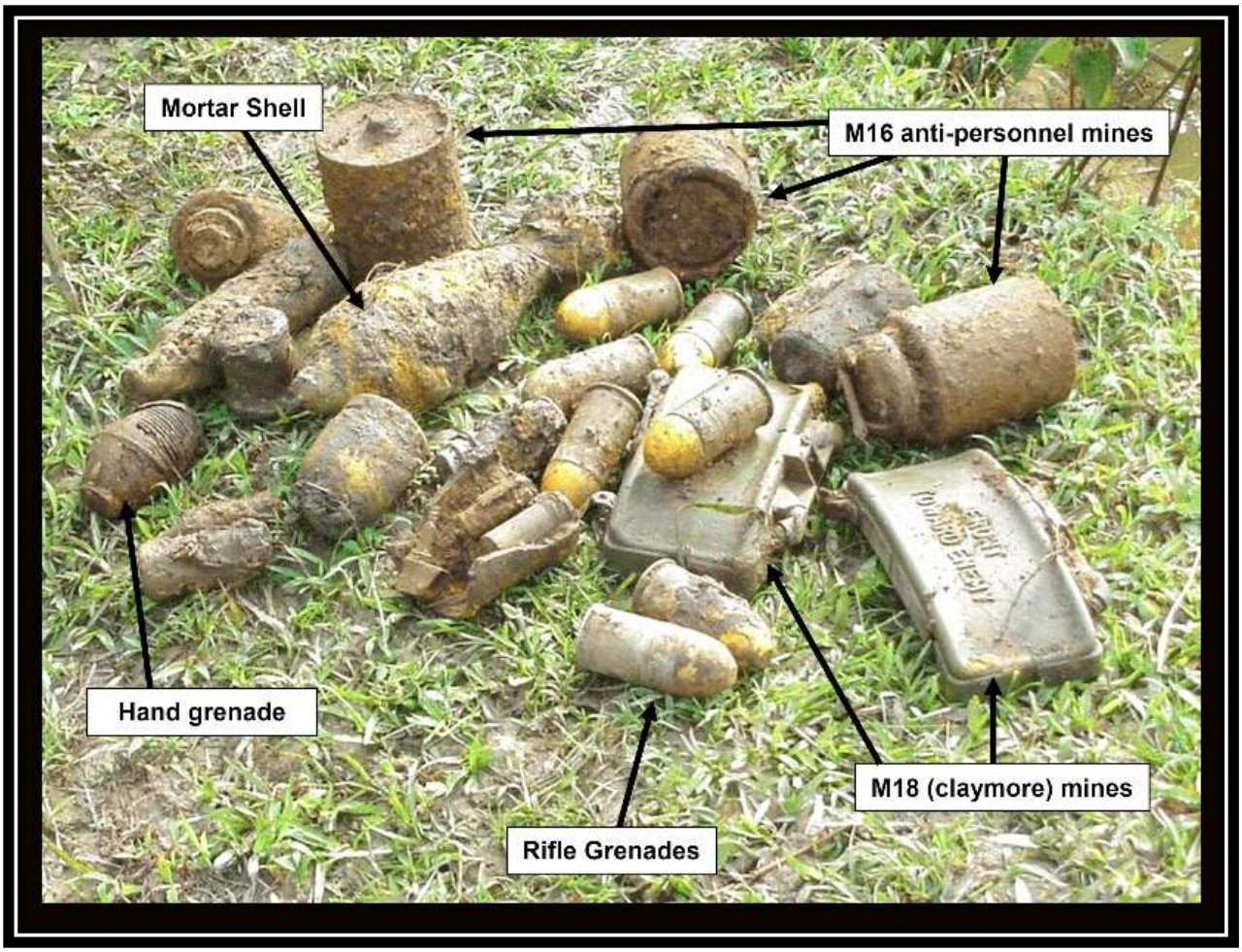
THIS IS THE A LUOI VALLEY WHERE HATFIELD CONSULTENTS PERFORMED AGENT ORANGE RESEARCH. NOTE THE AMOUNT OF ORDNACE DROPPED ON THE VALLEY. IT WAS NECESSARY FOR US TO RETAIN A DEMINING CREW TO CLEAR AREAS FOR SOIL CORING TO AVOID TRIGGERING UNEXPLOSED SUB-SURFACE BOMBS, GRENADES, AND/OR` MORTAR SHELLS.



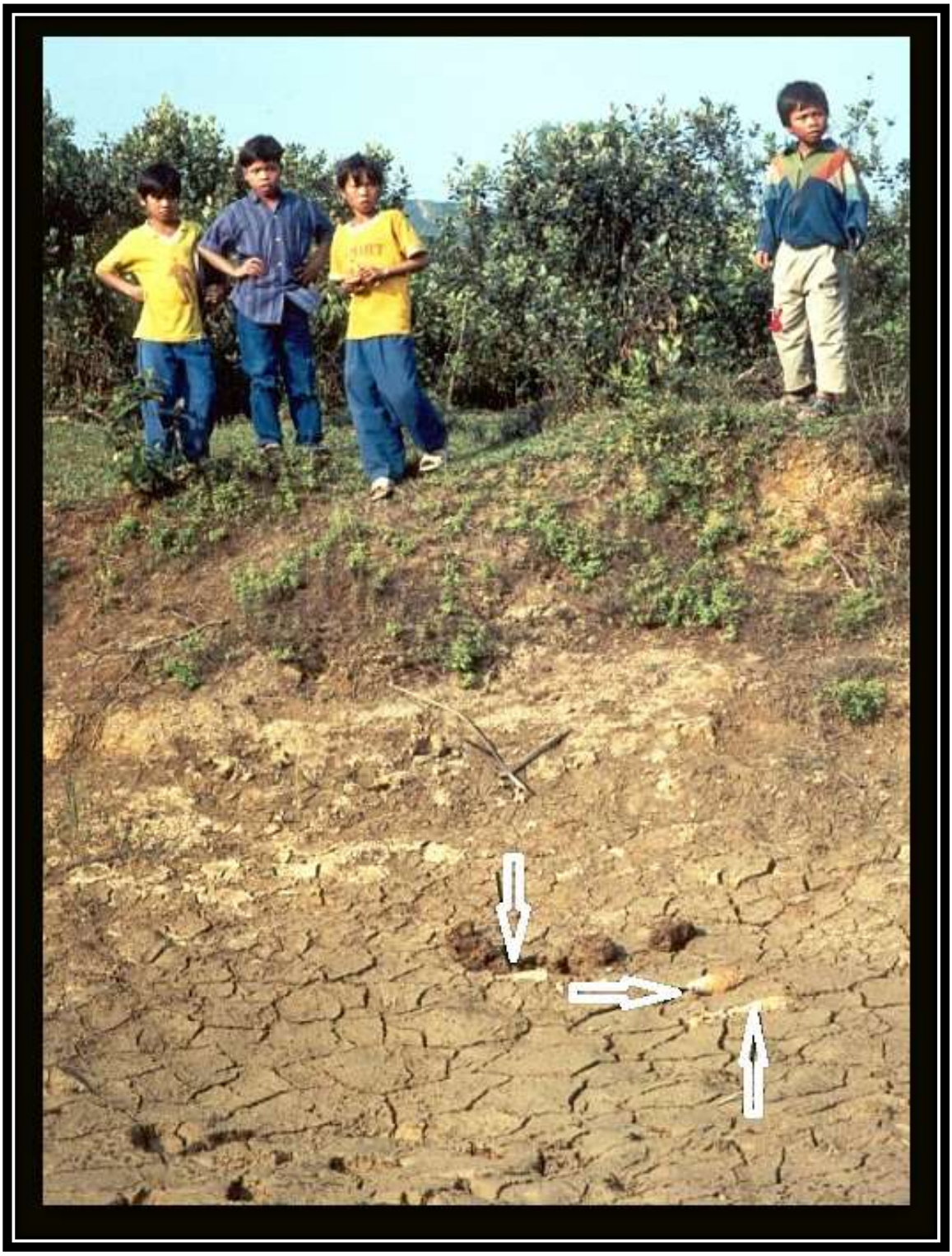
GERMAN GERBERA DEMINER EXAMINING 'LIVE' UNEXPLODED ORDNANCE ON HATFIELD CONSULTANTS STUDY AREA. GRENADES AND MORTAR SHELLS OFTEN LITTERED OUR SAMPLING SITES. IN HIGH RISK ZONES (NEAR HAMBURGER HILL) THE DEMINER WOULD CLEAR A WALKING TRAIL BEFORE WE COULD SAMPLE. ULTRA-SENSITIVE METAL DETECTOR TO THE RIGHT IN PHOTO.



EXAMPLES OF 'LIVE' UNEXPLODED ORDNANCE (UXO) COLLECTED BY THE DEMINING CREW FROM THE HATFIELD CONSULTANTS STUDY AREAS IN THE A LUOI VALLEY BEING PREPARED FOR DETONATION



CHILDREN FROM A NEARBY VILLAGE PLAYING ON THE EDGE OF A BOMB CRATER. NOTE THE THREE LIVE MORTAR SHELLS IN THE CRATER.



A 21-YEAR OLD VICTIM OF UNEXPLODED ORDNANCE BEING DETONATED WHILE DIGGING FOR AND COLLECTING SCRAP IRON NEAR ONE OF HATFIELD CONSULTANTS SAMPLING LOCATIONS IN THE A LUOI VALLEY. LOCAL VILLAGERS ASSIST THIS YOUNG MAN WITH FOOD AND LODGING.

SINCE 1975, THERE HAVE BEEN ~39,000 FATALITIES AND ~66,000 INJURIES BY EXPLODING UXO IN SOUTHERN VIETNAM. IN EXCESS OF 400,000 ITEMS OF EXPLOSIVE ORDNANCE HAVE BEEN CLEARED AND DESTROYED BY NON-GOVERNMENTAL ORGANIZATIONS IN THE LAST DECADE. THERE ARE NO DATA ON THE NEUTRALIZING OF UXO BY VIETNAM'S MILITARY.