Province of
British Columbia

Ministry of
Environment

ENVIRONMENTAL APPEAL BOARD
Victoria
British Columbia
V8V 1X5

APPEAL NO. 82-16 (1) PES

JUDGEMENT

PERMIT NO. 194-4-82/83, issued to Weldwood of Canada Limited in the name of Mr. J. Rodney, Divisional Forester, for the use of 2,4-D Amine 80 in TFL 10, Toba Inlet (47.8 hectares)

This permit is for the use of 2,4-D Amine 80 for treatment of Red Alder and Cottonwood by individual tree injection for conifer release purposes using the hack and squirt method.

APPEAL:

The principal issue of this appeal was whether the Administrator of the Pesticide Control Act was correct in deciding that under Section 6 of the Pesticide Control Act, the pesticide application authorized under this permit will not cause an unreasonable adverse effect which will result in damage to man or the environment in the area involved. The specific areas of appeal were as follows:

1. The action will have an unreasonable effect on the environment in general, and specifically on -

   a) the watershed and water source in the affected and adjacent areas;

   b) human habitat, health, residences and livestock;

   c) plant and animal life in the affected and adjacent areas;

2. The action was not reasonable in the particular instance, and given the nature of the action and the effect sought, will be more harmful than beneficial to the environment;

3. The effect sought can be accomplished by more efficient and less harmful methods;

4. The action, if implemented, will contravene guidelines established by the Pesticide Control Branch, relating to the

application of the subject pesticide and without limitation to such application in the vicinity of human habitation and watersheds.

5. The conditions of the permit were alleged to be incomplete;

6. The lack of baseline studies on fauna and water quality.

HEARING INFORMATION:

The hearing was held on July 28th, 1982, at the Beach Gardens Resort, 7074 Westminster Street, Powell River, B. C. before a Panel of the Environmental Appeal Board.

The Panel members in attendance were:

Mr. Andrew J. Lynch, B.Sc., M.P.H. -	Panel Chairman
Dr. B. Morrison, Ph. D.	Member
Dr. C. Walden, Ph. D.	Member
Hon. E. C. Hughes, Q.C.	Legal Advisor to the
Ms. Anne Dyke	Official Recorder.

The hearing was held concurrently with the hearing into Permit No. 113-5*RES-82/83 (Appeal No. 82-16 (2) PES)

REGISTERED APPELLANTS:

1. Powell River Regional Board

   Mr. J. Ross McClellan - Legal Counsel
   Mr. William Ireland - Witness

2. Ms. Louise Hajsky
   Lund, B. C.

LIST OF EXHIBITS:

A. Map of TFL 10

B. Presentation of Mr. Ireland

C. Submission to the Consultative Committee on I.B.T. - by Michael Conway-Brown.

D. "Why We Are Losing The Battle Against Cancer" by John J. Moelaert.

E. Presentation by Mr. R. Beaumont.

F. Letter of July 9, 1982, from Mr. J.R. McClellan to Timberland Development Co. Ltd.

G. Permit No, 113-4-82/82

SUMMARY OF THE POWELL RIVER REGIONAL BOARD'S PRESENTATION (In Part)

Mr. Ireland - Some of Mr. Ireland's comments were as follows:

a) He attended the Ministry of Forests's office in Powell River to view the permits and maps. From the posted maps, he could not identify the location of the spray area. It took approximately two hours with the assistance of staff of the Ministry of Forests to identify the spray location and its relationship to his property. During cross-examination, Mr. Ireland indicated that this, although inconvenient, did not prejudice his position in this appeal.

b) Mr. Ireland, who stated that he has owned property in the Toba area, gave a detailed physical description of Toba Inlet, the valley, the Big and Little Toba Rivers and the fisheries and wildlife habitat.

c) Up to the present time, the Toba valley has had very few ecological problems because it is a natural wilderness, which is self-sustaining due to the lack of human involvement. He expressed concern regarding the effect of the spray program on this ecological balance.

Prior to summation, Mr. McClellan requested that the appeal be allowed because:

1. The permit holder had failed to comply with a mandatory condition precedent contained in each of the Permits under appeal. He had reference to the condition which provides that "a copy of this permit and maps of the treatment area be posted continuously in a public access area of the Lund

District Office of the Ministry of Forests at Powell River and the Toba Inlet logging camp between May 6, 1982 and October 1, 1983".

2. There existed a breach of an accepted principle of the laws of equity and natural justice to the effect that a person whose interest is or may be affected by the decision of a judicial or quasi-judicial tribunal must be given adequate notice of the case to be made against it.

The decision of the Board's Panel with respect to these two matters was reserved in order to allow Counsel to present written argument. This he did in a submission dated the 9th day of August, 1982.

In his summation, Mr. McClellan stated that there is an absence of data on the effects of the program on fish, bears, human population and river quality.

SUMMARY OF MS. H.L. HAJSKY'S PRESENTATION (In Part)

1. Ms. Hajsky stated that until the morning of the hearing and viewing of the map supplied by the permit holder, she did not know where her land fitted into the scheme of the two permits under the appeal.

2. She expressed concern regarding her bees and stated that they fly approximately one mile.

3. She said that a program that worked for her in Toba was to pull the trees, including roots. In the second season, there was less than one-half to do, and it decreased thereafter.

4. She questioned why other less dangerous herbicides have not been developed.

5. Ms. Hajsky stated that there is a lot of energy centered around this issue in this community. It is an intensity that covers a frustration verging on violence. Given the freedom of this energy, they could have made axes and chopped down the young alders which seem to be the major culprit.

6. In cross-examination, Ms. Hajsky indicated that there are 13 land-owners in the Toba area, of which 3 were permanent residents. She also stated that although she was unable to identify the relationship of the site to her property, it did not prejudice her position.

SUMMARY OF THE PERMIT HOLDER'S PRESENTATION (In Part)

The following people appeared as representatives or witnesses for the permit holder:

Mr. R. Beaumont, R.P.F.	-	Staff Forester Weldwood of Canada Limited
Mr. R. Rodney	-	Project Supervisor Weldwood of Canada Limited

Mr. Beaumont acted as the spokesman for the permit holder and Mr. Rodney acted as his technical assistant.

Mr. Beaumont: Some of Mr. Beaumont's comments were as follows:

1. Weldwood is the Licensee and Manager of Tree Farm Licence 10, and has a contractural commitment to grow commercially valuable timber on that land in perpetuity.

2. It is imperative that logged areas are brought into production as soon as practicable and the young stands tended until they are old enough to compete with the faster growing brush and weed species, including alder and maple.

3. Control of those presently low-value deciduous species is critical to the survival of many young coniferous stands, and is essential to maintain the long-term timber productivity and economic viability of the T.F.L.

4. Chemical removal of the alder and competing cottonwood on the area was chosen above other treatment methods because it will release the plantation with minimal adverse effects upon the young trees.

5. Cutting the alder with power saws will result in a mat of slash up to a meter thick, which will crush some trees, deform and slow the growth of others, and will also produce a significant fire hazard.

6. Workers run a higher risk of physical injury while using power saws than while undertaking the individual tree injection with hatchets and small squirt bottles.

7. The hack and squirt method of application was chosen over the cheaper aerial spray application to eliminate the risk of spray drift.

8. The hack and squirt method of application is a labour-intensive and very target-specific treatment.

9. The 2,4-D will be applied as a 50% solution in water (1 ml. per notch) with a maximum of 239 liters used.

10. No stems will be treated or herbicides allowed within 10 meters of rivers, streams or swamps.

11. The careful and responsible use of the herbicides approved in the target-specific manner described ensures a minimal risk to applicators, Toba Valley residents, flora, fauna and the environment.

In cross-examination, some of Mr. Beaumont's comments were as follows:

1. He received but did not respond to a letter of July 9, 1982, to Timberland Development Co. Ltd. from Mr. J.R. McClellan (Exhibit F).

2. Timberland do not perform water monitoring after an application of herbicide.

3. The B.C. Forest Service will pay the direct costs of the application, estimated at $700/hectare contractual costs, and $200/hectare for herbicide. Manual release would destroy the conifer stand as the trees are 10 - 12 meters high.

DECISION:

The Panel of the Environmental Appeal Board has considered all of the evidence submitted to it in the Appeal Hearing on Pesticide Control Permit No. 194-4-82/83, issued by the Administrator of the Pesticide Control Act to Weldwood of Canada Ltd., and has decided that:

1. Warning signs shall be posted in prominant places when the pesticide application commences.

2. The application will not cause an unreasonable adverse effect to man and/or the environment.

On this basis, the appeals are hereby dismissed.

In coming to this decision, the Panel takes note of the following:

The Panel accepts the evidence that 2,4-D, like most other chemicals, is potentially a toxic substance and when misused may have acute and chronic adverse effects; therefore, human exposure to the chemical should be minimized and every effort should be made to apply it as sparingly and discriminately as possible. With this in mind, the Panel does consider the hack and squirt method of application, as proposed for these projects, one of the most site-specific methods of chemical usage which, at the same time, should keep contamination of the environment to an absolute minimum.

With this method of application and the stipulation in the permit of 10-meter buffer zones for the protection of water bodies, the possibility of significant contamination of streams would appear to be virtually non-existent.

Included in this Judgement is the latest update on 2,4-D from the Health Protection Branch of Health and Welfare Canada (Appendix A).

In regard to the two procedural points raised by Powell River Regional Board, the Panel's response is as follows:

1. It is not suggested that there was no compliance with the stated mandatory condition precedent. Rather, the submission is, as we understand it, that there was not an adequate compliance so as to acquaint interested parties with the precise location of the permit areas. This, the appellant sought to show through the evidence of two witnesses. Neither witness, according to his evidence, was in any way prejudiced in presenting his objections to the Panel. They made this quite clear. That is to say, they both appreciated at the time of appeal the areas involved. Indeed, the evidence is that Ministry of Forests's officials at the Ministry's posting locations were most helpful in precisely identifying the particular areas on the posted maps. To suggest on the evidence that there was an inadequate compliance with what Counsel calls a condition precedent amounting to non-compliance, is speculative at best. The evidence allows no conclusion other than that there was the compliance called for by the permit.

2. The soundness of the principle cited by counsel, requiring

adequate notification, has been made clear. The Panel acknowledges the requirements of the law as stated in the cases furnished. Counsel has applied that law to the facts of this case by saying ...."where material evidence (in this instance the location of the application areas) is denied an appellant, or a party to a quasi-judicial hearing, the hearing itself is invalid". On the evidence presented, it is the Panel's opinion that the denial relied on by Counsel does not exist. There is no suggestion of a breach of a statutory requirement and the evidence discloses no prejudice to anyone on the basis of the alleged absence of adequate notification. Counsel refers to the necessity of affording the opportunity to make a meaningful appeal and to make the hearing process a meaningful one. In the Panel's opinion, the indicated opportunity was present and the hearing process from the standpoint of all participants, including those who gave evidence, was clearly a meaningful one although, as in the case of all contentious hearings, appeals included, the result may not be pleasing to all. That part, however, does not detract from the hearing process being a meaningful one.

Accordingly, for the reasons given, the Panel does not assent to the position of the Appellant on the two matters just reviewed.

A. J. Lynch

A. J. Lynch,
Panel Chairman
Environmental Appeal Board

October 20th, 1982

A P P E N D I X

A Review of the Toxicology

of the Herbicide 2,4-D

by: Dr. D. Riedel, Ph.D.,
Toxicologist
Pesticide Division
Health & Welfare Canada
March, 1982

Comments on the Toxicity and Safety of the Herbicide 2,4-D

The Pesticides Division of the Environmental Health Directorate frequently receives inquiries concerning the toxicity and safety of the herbicides 2,4-D, particularly in respect to possible effects on applicators and persons indirectly exposed during herbicide use ("bystanders"). The following comments reflect the state of knowledge up to early 1982, and may be useful in assessing whether or not 2,4-D may be considered a "safe" herbicide.

1. Toxicity as a dose-effect relationship

Like other pesticides registered in Canada, 2,4-D has been extensively tested in animals to determine what biologic effects it might have at various dose levels. It is important to realize that in such tests increasingly higher doses must be given until a toxic effect is obtained, and that under such conditions any chemical, including table salt, will have some toxic effects. In deciding whether a chemical is "safe", one therefore has to determine whether the normal use of a given chemical might result in users or "bystanders" absorbing enough of the chemical to produce a toxic effect.

The difference between the amount absorbed by humans and the amount which causes no apparent toxic effects can be referred to as the "Margin of Safety". Different people and different test species differ in size and weight, and therefore the absorbed amount of the chemical is usually expressed as a comparable unit or dose, as grammes (g), milligrammes (1/1000 g) (mg), or microgrammes (1/1,000,000 g) (µg) per kilogramme (kg) body weight (b.w.).

With this in mind one can attempt to assess whether toxic effects of 2,4-D are likely to occur in humans exposed as a result of the use of this herbicide. The hazards most frequently mentioned in this respect are immediate poisoning (acute toxicity), heritable defects (mutagenicity), and long-term effects including cancer (chronic toxicity and carcinogenicity).

2. Acute toxicity of 2,4-D

2,4-D is not a highly toxic chemical. The doses of 2,4-D which produce no acute toxic effects, slight symptoms of poisoning, and severe or fatal poisoning in human beings are well known as a result of the ingestion of small doses of 2,4-D by volunteers, of the brief use of 2,4-D as an experimental drug against fatal infections or cancer, and of suicide attempts with 2,4-D herbicides. Doses of about 100-300 mg 2,4-D/person (about 2-5 mg/kg BW/day) given by mouth or by injection have been found to have no acute toxic effects on adults or children (Apffel, 1959, Presse medicale 67:207; Kohli et al., 1977, Xenobiotica 4:94; Sauerhoff et al., 1977, Toxicology 8:3; Seabury, 1963, Arch. environ. Health 7:202).

By comparison, recent studies on farmers and herbicide applicator teams have shown that even the most heavily exposed applicators absorb at most only 10% and most absorb only 1-5% of this safe dose. "Bystanders" such as supervisors or members of the public exposed only indirectly to spray drift or vapours, or to treated vegetation or water, absorb only a small fraction of the amount absorbed by the applicators. Generally, at least a 10-fold Margin of Safety is desired for acute toxic effects. Disregarding the warnings on the labels of the herbicide containers, and allowing for instance large amounts of herbicide concentrate to spill and dry on the skin or clothing has occasionally led to mild 2,4-D poisoning. However, such cases appear to be rare, considering the wide use of 2,4-D during the last 35 years.

More than 90% of the total amount of herbicide absorbed by applicators is taken up through the skin; inhalation of vapour or spray droplets accounts for only a few percent of the absorbed dose (Kolmodin-Hedman and Erne, 1980, Arch. Toxicol., Suppl., 4:318; Nash et al., 1981, unpublished). Consequently, exposure by inhalation alone would not lead to absorption of a significant amount of 2,4-D.

Moreover, 2,4-D absorbed through ingestion, inhalation, or skin contact is rapidly excreted in the urine (Kohli et al., 1977; Sauerhoff et al., 1977; Kolmodin-Hedman and Erne, 1980; Nash et al., 1981), and thus would not tend to accumulate in the body.

3. Mutagenicity

The ability of 2,4-D to produce heritable changes in genetic material has been tested numerous times in such diverse organisms as bacteria, viruses, yeasts, plants, fruit flies, mice, and rats, and in human and animal cells grown in the laboratory. Some of these tests were positive, others were negative or doubtful. On the whole, they showed 2,4-D to be a weak mutagen. In 3 studies on workers manufacturing or applying 2,4-D herbicides, no evidence was produced that 2,4-D had a mutagenic effect (Crossen et al., 1978, New Zealand Medical Journal, 88:192; Johnson, 1971, BioScience 21:899; Yoder et al., 1973, Mutation Research 21:335); however 2 of these showed some chromosome abnormalities possibly related to heavy exposure to a variety of herbicides.

4. Reproductive effects including teratogenicity

High doses of various chemicals may injure the male or female reproductive organs, or the developing embryo or fetus, and may thus cause sterility, stillbirths or miscarriages, or birth defects. Perhaps because of its association with "Agent Orange", 2,4-D has been suspected of having such effects on human beings. Scientific studies on various animals treated with 2,4-D and on human populations exposed to 2,4-D herbicides have been conducted to examine these possibilities.

a) Studies on humans

Populations living in areas in which 2,4-D or other phenoxy herbicides were heavily used, and groups of farmers, forest workers and herbicide applicators have been recently studied in Australia, Canada, Hungary, New Zealand, and the U.S.A. to determine whether exposure to these chemicals caused decreased fertility, miscarriages, stillbirths, birth defects, or other reproductive effects. No scientifically verifiable evidence has been found that this is the case (Bower and Stanley, 1980, Lancet 1:1247; Brogan et al., 1980, Lancet 1:597; Carmelli et al., 1981, SRI International Final Report; Field and Kerr, 1979, Lancet 1:1341; Hanify et al., 1980, New Zealand Medical Journal 92:245; and 1981, Science 212:349; Ministry of Health, Victoria, Australia, 1978; New Zealand Department of Health 1977; Smith et al., New Zealand Medical Journal No. 680:177; Thomas, 1980, Lancet 2:214, Wigle and Yao, Health and Welfare Canada 1981). A poorly documented study in the U.S.A. implied that exposure to 2,4-D, 2,4,5-T, or other agricultural chemicals might cause adverse reproductive effects in humans (U.S. Environmental Protection Agency "Alsea Studies"). However this could not be confirmed when the raw data were closely examined by Health & Welfare Canada specialists. Additional epidemiological studies are in progress in Canada and the U.S.A.

b) Studies on animals

To determine what reproductive effects 2,4-D herbicides might have in animals, male, and pregnant female rats and mice, or hamsters have been heavily dosed with "Agent Orange" like 2,4-D/2,4,5-T mixtures containing 2,3,7,8-TCDD ("dioxin"), or with various 2,4-D products. The dose levels ranged up to more than 300 mg/kg BW/day. (Bage et al., 1973, Acta phamacol. 32:408; Bionetics Research Labs, Inc., 1968, U.S. NTIS Report PB-223-160; Bjorklund and Erne, 1966, Acta Vet. Scandinavia 7;364; Buslovich et al., 1976, Zdravookhr. Belorussii No. 10:83, Collins et al., 1971, Bull. Envir. Contam. Toxicol. 6:559; Courtney, 1977, Arch. Envir. Contam. Toxicol. 6:33; Hansen et al., 1971, Toxicol. Applied Pharamcol. 20:122; Khera and McKinley, 1972, Toxicol. Applied Pharmacol. 22:14; Konstantinova et al., 1976, Gigiena i Sanitarya No. 11:102; Lamb et al., 1980, U.S. National Toxicol. Program Report NTP-80-44; Schwetz et al., 1971, Food Cosmet. Toxicol. 9:801; Schillinger, 1960, J. Hyg. Epidemiol. Microbiol. Immunol. 4:243; Shtabsky, 1976, Gigiena i Sanitanya No. 1:82).

In the best documented reproduction tests, the fertility of treated male animals mated to untreated females was not affected, and their offspring were normal.

The teratogenic potential of various 2,4-D products was determined by treating pregnant female rats mice, or hamsters with high doses of 2,4-D. Doses of more than about 50-100 mg 2,4-D/kg BW/day led to some stillbirths, birth defects, or other adverse effects in offspring. In one study carried out in the Soviet Union (Konstantinova et al., 1976), much lower doses were said to have had adverse effects. However, some of the data cited by these authors are inconsistent with their statements, and thus their conclusions are questionable. Moreover, all of the tests

carried out elsewhere indicate that much higher doses are needed to produce birth defects.

While it is thus true that 2,4-D may produce birth defects or other adverse reproductive effects in rodents, it is also true that the doses required for this are so large that comparable doses of commonly used drugs such as aspirin will begin to produce similar effects in animals (Wollam and Morriss, 1974, Experimental Embryology and Teratology, vol. 1, p. 25; Elek Science Publishing Co., London).

Moreover, as already pointed out earlier, there is no definite evidence to indicate that 2,4-D has had any adverse reproductive effects in either herbicide applicators or other population groups exposed to 2,4-D herbicides or related compounds. Moreover, the amounts of 2,4-D absorbed by herbicide applicators or bystanders have been measured and found to be many times less than the amounts known to produce adverse effects in human beings or animals, and thus no adverse effects would be expected to result from the use of 2,4-D herbicides.

5. Chronic Toxic Effects

a) Studies with animals

The long-term effects of 2,4-D have been tested in mice, rats, and dogs given the chemical for most of their life span, or for a large part of it (Arkhipov and Kozlova, 1974, Voprosy Pitaniya No. 5:83; Bionetics Research Labs, 1968, Report No. PB-223 159; Hansen et al., 1971, Toxicol. Applied Phamacol. 20:122-129; Innes et al., 1969, J. National Cancer Inst. 42:1101). The most recent and best documented of these studies indicated that up to about 12.5 mg 2.4-D/kg BW/day caused no toxic effects, and that 2,4-D was not considered to be carcinogenic. However, all of these studies suffered from deficiencies, and in one of them (Innes et al., 1969) mice given 2,4-D were housed together with others given known carcinogens, thus possibly leading to cross-contamination, and casting the validity of the study into doubt.

New chronic tests with 2,4-D-treated rodents are therefore planned in the USA, in order to provide a definite answer as to whether 2,4-D can cause tumours in animals.

b) Studies on human beings

During the last few years a number of studies have been conducted in Germany, New Zealand, Scandinavia, and the U.S.A., to determine whether occupational exposure to 2,4-D, other herbicides, or pesticides in general might cause cancer in human beings, and additional studies are underway (Axelson and Sundell, 1974, Work Environ. Health 11:24; Barthel, 1981, J. Toxicol. Environ. Health, 8:1027; Eriksson et al., 1981, Brit. J. Industr. Med. 38:27; Hardell, 1981, Scand. J. Work Environ. Health 7:119; Hardell and Sandstrom, 1979, Brit. J. Cancer, 39:711; Hardell et al., 1981, Brit J. Cancer 43:169; Morgan et al., 1980, Arch. Environ. Contam. Toxicol. 9:349; Ott et al., 1980, J. Occup. Med. 22:47; Zack

and Suskind, 1980, J. Occup. Med. 22:11).

These suggest that occupational exposure to pesticides in general may lead to a higher incidence of cancers, but exposure to 2,4-D alone has so far not been identified as leading to an increased risk of cancer. Moreover, two as yet incomplete studies in Finland and New Zealand suggest that long-term occupational exposure to 2,4-D, 2,4,5-T or other herbicides may not lead to an increased risk of cancer. The final results of these, and of other studies being planned or conducted in the USA and elsewhere will have to be awaited before a final conclusion can be drawn.

In the meantime it would be appropriate to treat 2,4-D herbicides more carefully than in the past, until the question of their possible carcinogenicity has been settled. However, it should be stressed that it would be surprising if 2,4-D were found to be a strong carcinogen, as the most trustworthy of the available safety studies with animals do not suggest that 2,4-D is carcinogenic, and the low amounts of 2,4-D absorbed by exposed workers and bystanders should not lead to serious health risks.

6. 2,4-D and "dioxins"

In 1980, scientists of the Laboratory Services Division of Agriculture Canada identified several kinds of "dioxins" in various 2,4-D herbicide products, but these did not include the most toxic type, namely 2,3,7,8-TCDD (Cochrane et al., 1981, J. Chromatography, 217:289). The amounts found were below the levels of "dioxin" generally reported in "Agent Orange", or in 2,4,5-T herbicides used during the 1960's and early 1970's.

Although the presence of these toxic byproducts had not been recognized when the various 2,4-D safety studies with animals were carried out, they were presumably present also in the test products used at that time, and would thus have contributed to the overall effect of 2,4-D on the test animals. However, additional safety studies with 2,4-D containing known low amounts of these dioxins will be carried out in the USA to verify this.

7. Summary

The available safety studies with animals, and the majority of the studies on human beings occupationally or otherwise exposed to 2,4-D suggest that 2,4-D herbicides are not a threat to the health of the general population or to users observing the precautions on the product labels.

However, additional studies will be carried out to determine conclusively whether or not 2,4-D may cause tumors in animals or occupationally exposed human beings.

Until the results of these studies are available, the precautions stated on the product labels should be carefully followed to avoid unnecessary exposure.

March 1982

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