Shaughnessy Number: 029001

Date Out of EFGWB: OCT 08 1991

TO: Jay Ellenberger
Product Manager 50
Registration Division (H7505C)

FROM: Elizabeth Behl, Acting Section Head
Ground-Water Technology Section
Environmental Fate & Ground-Water Branch/EFED (H7507C)

THRU: Henry Jacoby, Chief
Environmental Fate & Ground-Water Branch/EFED (H7507C)

Attached, please find the EFGWB review of:

Reg./File #: _____

Chemical Name: Dichloropropene (1,3-D; Telone II)

Type Product: Soil Fumigant, Nematicide

Company Name: DowElanco

Purpose: Review progress report on small-scale retrospective ground-water monitoring study.

Date Received: 8/19/91 ACTION CODE: 627

Date Completed: 9/24/91 EFGWB #(s): 91-0876

Monitoring study requested: X Total Review Time: 6 days

Monitoring study voluntarily: ___

Deferrals To: _____ Biological Effects Branch

_____ Science Integration & Policy Staff, EFED

_____ Non-Dietary Exposure Branch, HED

_____ Dietary Exposure Branch, HED

_____ Toxicology Branch, HED

DP BARCODE: D167714 REREG CASE #

CASE: 818694 DATA PACKAGE RECORD DATE: 08/16/91
SUBMISSION: S401095 BEAN SHEET Page 1 of 1

* * * CASE/SUBMISSION INFORMATION * * *

CASE TYPE: REREGISTRATION ACTION: 627 GENERIC DATA SUBMISSION
CHEMICALS: 029001 1,3-Dichloropropene

ID#: 029001
COMPANY:
PRODUCT MANAGER: 50 JAY ELLENBERGER 703-308-8085 ROOM: CS1 4J1
PM TEAM REVIEWER: JAY ELLENBERGER 703-308-8085 ROOM: CS1 4J1
RECEIVED DATE: 08/01/91 DUE OUT DATE: 11/29/91

* * * DATA PACKAGE INFORMATION * * *

DP BARCODE: 167714 EXPEDITE: N DATE SENT: 08/16/91 DATE RET.: / /
CHEMICAL: 029001 1,3-Dichloropropene
DP TYPE: 100 Phase II Review
ADMIN DUE DATE: 12/14/91 CSF: N LABEL: N

ASSIGNED TO	DATE IN	DATE OUT
DIV : EFED	08/19/91 TV	10/08/91
BRAN: EFGB	/ /	/ /
SECT:	/ /	/ /
REVR :	/ /	/ /
CONTR:	/ /	/ /

* * * DATA REVIEW INSTRUCTIONS * * *

For the attached reregistration case, please identify all applicable data requirements and note those for which adaquate data have not been submitted to the Agency.

ATTN: BETSY BEHL/EFGWB/EFED: REPORT ON THE NEBRASKA SITE, SMALL SCALE RETROSPECTIVE GRDWTR MONITOR STUDY

RETURN TO: H.TOMA(RB/SRRD)(H7508W) 308-8055

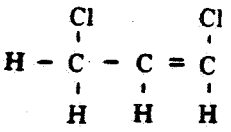
* * * ADDITIONAL DATA PACKAGES FOR THIS SUBMISSION * * *

DP BC	BRANCH/SECTION	DATE OUT	DUE BACK	INS	CSF	LABEL

2

1. CHEMICAL: Dichloropropene (Telone II)

Chemical name: 1,3-Dichloropropene
Common name: Telone II; 1,3-D
Structure:



2. TEST MATERIAL:

Not Applicable.

3. STUDY/ACTION TYPE:
Review progress report on small-scale retrospective ground-water monitoring study.

4. STUDY IDENTIFICATION:

Title: Small-Scale Retrospective Ground-Water Monitoring Study for Telone Brand Soil Fumigants; Progress Report on Study Site in Scotts Bluff County, Nebraska

Submitted for:
DowElanco
N.A. Environmental Chemistry Laboratory
P. O. Box 1706
9001 Building
Midland, MI 48641-1706

Identifying No.: 029001
DP Barcode: 167714
Date Sent to EFED: 8/19/91

5. REVIEWED BY:

Estella Waldman
Hydrologist
OPP/HED/EFED/Ground-Water Section

Signature: Estella Waldman
Date: 9/24/91

6. APPROVED BY:

Elizabeth Behl
Acting Section Head
OPP/HED/EFED/Ground-Water Section

Signature: Eliz Behl
Date: 10/7/91

7. CONCLUSIONS:

1,3-D has been detected in ground water in three states in the U.S. (New York, Hawaii, and California), and in The Netherlands. In the United States, detections ranged from 0.09 - 270 ppb. In The Netherlands, detections of 1,3-D in ground water under ranged from less than 0.1 ppb to 2.5 ppb.

The submitted report indicates that the detections in ground water on the study site in Nebraska (well B-3) are due to the normal field use of Telone. However, the study is not adequate to fully assess the amounts of the chemical that may enter ground water. Factors which lead to this conclusion are:

- A perched system is present in the vicinity of well A-2. This means that there was a restriction on vertical flow in the vicinity of this well, and probably little movement to the main aquifer in this area.

- All of the wells on the study site were located downgradient (relative to ground water flow direction) of a different field on which Telone was applied. Also, there is an irrigation ditch to the north of the site and an irrigation well in the vicinity of the study site. No analyses of the irrigation water were done. This combination of potential point and line sources of Telone adds many unknowns to the study.

- No analyses were done for 1,3-D or 1,2-D in September or October 1990 because of equipment failure. Detections of 1,3-D were found from January through August 1990, and then again in January 1991. Because of the equipment failure, an incomplete picture is obtained of 1,3-D persistence.

8. RECOMMENDATIONS:

1) The registrant is required to conduct several small-scale ground-water monitoring studies for 1,3-D (Telone) and its degradates. The submitted study shows that the normal field use of 1,3-D does contaminate ground water. However, the study is not adequate for a small-scale prospective ground-water monitoring study. Therefore, the true levels of contamination for 1,3-D and its degradates are unknown.

2) The Ground Water Section believes that several small-scale prospective ground-water monitoring studies are needed to clearly establish the potential for 1,3-D to migrate to ground water as a result of normal field use. A protocol for the small-scale ground-water monitoring studies for 1,3-D should be submitted to the EPA for approval as soon as possible.

9. BACKGROUND:

Telone II is a broad-spectrum soil fumigant and nematicide, mainly used as a preplant fumigant by chisel injection for nematode control. According to the 1986 Guidance document for reregistration of this product, the predominant use of Telone II is on vegetables, field crops, citrus, and fruit and nut trees. Application rates are generally high and range from 38.3 lb ai/acre (field crops and vegetables) to 1000 lb ai/acre (citrus, fruit, and nut trees) (EFGWB #90774, 12/21/89).

1,2-Dichloropropane (1,2-D) is present in current Telone formulations in trace quantities of less than 0.1% by weight. 1,2-D is similar to 1,3-D in structure but there are differences in their environmental properties. 1,2-D possesses a higher affinity for the vapor phase over either soil organic matter or water than does 1,3-D, and 1,2-D is less prone to degradation in soil than 1,3-D (Peterson, 1989).

The EPA has categorized the active ingredient (1,3-D) as a B1 oncogen and a B2 carcinogen. The impurity, 1,2-D, has been classified as a Group B2 carcinogen. 1,2-D does not have an MCL or HAL; 1,2-D has an MCL of 5 ppb. There are two degradates, 3-chloroallyl alcohol and 3-chloroacryllic acid.

Telone II is composed of 94 percent by weight 1,3-D. 1,3-D exists in two isomeric forms : cis-1,3-D and trans-1,3-D which are present in a 50:50 ratio for these formulations. In the environment, the dissipation of 1,3-D occurs by three mechanisms which include gaseous diffusion through the soil, hydrolysis in aqueous solution, and biological metabolism by soil microorganisms (Peterson, 1989).

1,3-D is a very mobile compound with K_d's ranging from 0.23 (loamy sand) to 1.09 (clay). Laboratory half-lives for 1,3-D range from 3 - 37 days (aerobic soil metabolism), 2.4 - 9.1 (anaerobic soil metabolism), and 2 - 100 days (pH dependent, hydrolysis half-life). The compound (1,3-D) is very soluble in water with a solubility of 2500 ppm. The Henry's constant is 1.8×10^{-3}.

1,3-D has been detected in ground water in three states in the U.S. (New York, Hawaii, and California), and in The Netherlands. Detections from a confirmed New York study ranged from 37 - 270 ppb. Two other reports from New York, both unconfirmed, reported detections of 72 - 130 ppb. Concentrations of 0.09 ppb of Telone were reported from an unconfirmed study in Hawaii. In Riverside, California, illegal use of Telone in 1986 and 1987 resulted in six detections in one irrigation well ranging from 6.8 - 31 ppb. In The Netherlands, detections of 1,3-D were found in ground water under potato and flower bulb fields. Detections ranged from less than 0.1 ppb to 2.5 ppb. 1,2-D has been detected in the ground water in California, Connecticut, Hawaii, Massachusetts, Maryland, and New York (Williams et al., 1988).

The EPA determined that the registrant must evaluate the impact on ground water occurring from registered 1,3-D use by conducting retrospective ground water monitoring studies at several different locations (EAB #6572; 6/23/86). Six monitoring sites were tentatively approved by the EPA (EFGWB #90565; 6/6/89). The sites were located in Jackson County, Florida; Grant County, Washington; Merced County, California; Monterey County, California; Wayne County, North Carolina; and Scotts Bluff County, Nebraska (EFGWB #90774, 12/21/89). Monitoring complications caused the site in Florida to be put on hold. Additional monitoring in Hawaii was also put on hold pending the results of monitoring at the other sites (EFGWB #90778, 12/27/89).

10. DISCUSSION:

The EPA requested that DowElanco conduct five small-scale retrospective monitoring studies for Telone brand soil fumigants (Telone II and Telone C-17) in varied environments with different use patterns. The Nebraska study (reviewed in this document) was begun in October 1989, and is still continuing because of detections in one well. The concentrations of 1,3-D (both isomers) ranged from 0.23 to 3.86 ppb in the ground water from one well.

SITE DESCRIPTION

The site is located in Scotts Bluff County, Nebraska and was cropped with sugar beets in 1986, 1989, and 1990. Telone II was applied during these years at 11 - 13 gallons per acre (105 - 125 lbs A.I./acre). The 1990 crop was treated with Telone at 12.1 gallons per acre on November 17, 1989. The site was irrigated with approximately 1.5 inches of water every six to seven days from June 24, 1990 to the end of September 1990.

Topography and Soils. The soils on the site belong to the Tripp-Alice-Dunday association which the SCS describes as deep, loamy and sandy soils. According to the SCS, the site contains Tripp soils but the report states that the soils are more similar to the Dunday soils. Both of these soils are well-drained and have low runoff potential. Surface slopes on the site are from 0 to 3 percent.

Hydrogeology. The study site is underlain by a Quaternary alluvium aquifer which produces as much as 1,000 gallons per minute of water. The hydraulic conductivity of the aquifer near the site is estimated to be $3x10^{-3}$ ft/sec which is representative of a clean sand (Freeze and Cherry, 1979).

Rainfall and Irrigation. A Rainwise, Inc. tipping bucket weather station was installed on the site. Problems with the data logger resulted in unreliable on-site precipitation information until January 1, 1991. Data from the nearest weather station (Scottsbluff WSO) were submitted instead.

Approximately 23 inches of irrigation were applied to the field from June 1990 through September 1990, using an estimate of 1.5 inches every 6-7 days.

Ground Water. Three well clusters were installed on July 11-13, 1989. Each cluster consisted of two wells, one shallow and one deep, located 10 feet apart. Each well had five-foot screens placed at 14-19 and 19-24 feet. Depth to ground water varied between 11.5 and 16.7 feet during the study.

Ground-water samples were taken on October 3 and November 7, 1989, before the Telone application on November 17, 1989. The next round of ground-water sampling was on December 6, 1989, almost three weeks after application. Sampling continued at (approximately) monthly intervals until the present.

Nine piezometers were installed on April 24, 1991 at the request of EFGWB following Telone detections in one of the wells. The initial water table levels were taken on July 22, 1991.

RESULTS:

Ground Water

Ground-water samples were analyzed for both isomers of 1,3-D, the degradates 3-chloroallyl alcohol and 3-chloroacryllic acid, and the impurity 1,2-D. An equipment failure occurred in September and October 1990 and no 1,3-D analyses were made for the volatiles (1,2-D and 1,3-D) during these months. No analyses were made for 3-chloroallyl alcohol in March 1990. Because of method development, analysis of the acid did not occur until May 1990. No analyses were done for the acid in August 1990 or after March 1991. No analyses were performed for 1,2-D in March, September or October 1990.

Detections of 1,3-D were seen in well B-3 in January 1990, two months after the Telone application. At this time, only the cis- isomer was found at 0.23 ppb. Both of the 1,3-D isomers were found from February through August 1990 with total 1,3-D residues ranging from 0.23 to 3.86 ppb. The highest value (3.86 ppb) was detected in July 1990, eight months after application. An equipment failure made sample analysis impossible in September and October 1990. The cis-isomer was again detected in January 1991, fourteen months after the Telone application. No detections have been noted since that time. Analyses for 3-chloroacryllic acid began in May 1990 because of method development.

STUDY DETAILS:

1. Ground-Water Problems

A. Well Locations. Three well clusters were installed near the northeast perimeter of the study site. Telone was also applied to the field north of the site on October 1989. Using the piezometer water level readings from the July 21, 1991 sampling round, the ground-water flow direction is shown to be towards the southwest. All of the well clusters, therefore, are basically located downgradient (in terms of topography and ground-water flow) to the field in the north. All ground-water samples taken from these wells were, therefore, not representative of the field on which the application was made. A reversal in ground-water flow direction was noted in March, April, and May 1991. However, the difference in gradient is less than 0.5 inches across the site which does not indicate a major reversal. Since residues may have originated from the other field, verification of this possibility needs to be determined.

B. Precipitation and Irrigation. Precipitation data for the Scottsbluff WSO show that no significant rainfall occurred during the three weeks prior to application. Ground-water samples were not taken until almost three weeks after Telone was applied to the field. During this time, only 0.03 inches of rain fell at the Scottsbluff WSO. The first rainfall event following application occurred on 11/25/89 when 0.02 inches fell. No significant precipitation occurred until approximately four weeks after application when 0.41 inches fell over a two-day period. The first major rainfall event occurred on 3/6/90 (approximately 3.5 months after application) when 1.36 inches fell. Because the standard agricultural practice is to irrigate the crop in the summer, no irrigation was provided until June 24, 1990. From the time of application to the onset of irrigation (7 months), a total of 10.3 inches of rainfall fell at the Scottsbluff WSO. Even with a minimal amount of rainfall, and no irrigation until seven months after application, Telone residues were still detected in ground water.

According to the submitted progress report, rainfall is not the most significant source of recharge to ground water in Scotts Bluff County. However, irrigation and seepage from the canals that transport irrigation water to the fields do provide this recharge. A standard agricultural practice in Nebraska is to irrigate with surface water that is brought by canal to the fields. An irrigation canal is located approximately 1500 feet north of the study site (upgradient), and an irrigation well is located at the southwestern edge of the study site. (The irrigation well is only used only during extremely dry periods and supplied approximately five percent of the total irrigation water to the site in 1990.) No analyses were made of the irrigation water from the canal or from the irrigation well. This combination of potential point and line sources of contamination adds

many unknowns to the study, and does not allow a true understanding of the movement of contaminants in the system.

An inspection of the site was done in July 1991. At this time, a pump test of well B-3 was done, and estimates made of the flow velocities in the irrigation canals. These data were not included in the submitted report. However, using the estimated hydraulic conductivity of the aquifer near the site of $3x10^{-3}$ ft/sec (clean sand) water movement from the canal to the field would take approximately six days.

C. Water Levels and Sampling. Several problems in measuring water levels and taking ground-water samples were noted. These include that:

- the well design does not allow easy lowering of the water level indicator which means that erroneous readings could have been measured,
- condensation on the tubing in the well could have caused false water level readings,
- well B-4 was hit by a truck in May 1991, and any water level readings taken after this date from this well are probably incorrect,
- although piezometers were installed in April 1991, no readings were taken until July 1991, and
- a substantial number of samples were not taken because the water table dropped below the bladder pump.

D. Pan Evaporation. No pan evaporation information was provided. These data are important in assessing the total input of water into the system.

2. Soil Characterization Problems

A. Missing Intervals. According to the draft guidelines for ground-water monitoring studies, one complete set of soil samples is required at the beginning of a study to fully characterize the soil profile in the unsaturated zone. It is recommended that six-inch depth increments be taken in the first five feet, and then foot-long increments to the water table, unless distinctly different soil horizons necessitate a change in sampling intervals. Soil cores were taken from three locations on July 11-13, 1989. Table 4 and the accompanying A & L Mid West Laboratories, Inc. soil characterization profiles show that there is a substantial gap in the reported data. These missing intervals are:

soil core A2: 1-2', 3-4', 5-9', 10-14'
soil core B4: 1-2', 3-5', 6-9', 10-14'
soil core C6: 1-2', 3-4', 5-9', 10-13', 14-19'

A comparison of the soil characterization results from the site and the DBAPE soil description does indicate, as suggested in the report, that the soils are more similar to the Dunday than to the Tripp soil. No evidence was seen of the carbonate layer which is distinctive of the Tripp soil. However, the soil characterization logs are incomplete, and for all of the three soil cores, the interval below the subsoil where the carbonate layer might be located is not described.

Two other soil cores were obtained on November 14, 1989, prior to the Telone application, and used for residue analysis. At each location, 18-inch samples were composited into three intervals (0-6', 6-12', and 12-15'). No 1,3-D or 1,2-D residues were found in these samples. The analyses were done on an extremely large interval which does not give a good indication of the possible residues in the soil.

B. Restrictive Zones in Soil Profile. The draft guidelines state that the site should not contain any restrictive layers between the surface and the water table. In the driller's logs for wells A-1 and A-2, a "hard drilling" layer was encountered from approximately 5 - 10 feet. It was noted that a "wet to saturated" zone was found immediately above this "hard" layer, and that the hard layer was dry. It appears that a perched system above a restrictive layer is present in this portion of the field. This is not unlikely considering that the SCS indicates that carbonate is present in the area, and often occurs in the Tripp soil. Blow counts indicate that this restrictive layer is not present in well C-6 and is probably not present in well B-4.

C. Soil Composition. Bulk densities for the soils were not provided. It would also have been useful to have a particle size and composition analysis done on the coarse fragments of the soil cores. Although the driller's log shows gravel in several of the cores, the laboratory soil characterization does not mention gravel in their report.

3. Environmental Fate Problems

According to laboratory studies, Telone is not a persistent chemical. Laboratory half-lives for 1,3-D range from 3 - 37 days (aerobic soil metabolism), 2.4 - 9.1 (anaerobic soil metabolism), and 2 - 100 days (pH dependent, hydrolysis half-life). However, residues on the site were first detected in January 1990, and the compound was applied in November of the previous year. Residues were still detected in January 1991, 14 months after application. Therefore, it seems that 1,3-D may not be persistent under laboratory conditions but it is very persistent in the environment. A true determination of the environmental fate of 1,3-D in the environment cannot be gained from this study.

4. Other Problems

No information is provided about the method of Telone application used on the site. Only the general method is provided.

Information about the method of ground-water sample collection, storage, and shipment to the laboratory is not provided.

REFERENCES

Barrett, Michael. 1989. Review of submission of information on degradation products of 1,3-D in soils. EFGWB #90774. 12/21/89.

Freeze, R.A., Cherry, J.A. 1979. Ground Water. Prentice-Hall, Inc., Englewood Cliffs, N.J. 07632.

Peterson, J.R. 1989. The Environmental Fate of 1,3-Dichloropropene. Dow Chemical U.S.A. North American Agricultural Products Department. Midland, Michigan. January 20, 1989.

Williams, W. Martin, Holden, P.W., Parsons, D.W., and Lorber, M.N. 1988. Pesticides in Ground Water Data Base - 1988 Interim Report. U.S. EPA, Office of Pesticides Programs. December 1988.