POST-HEARING SUPPLEMENT TO INFORMATION *and* REPORT *concerning*

HEXAZINONE

submitted to the

PESTICIDE REGISTRATION EVALUATION COMMITTEE

pursuant to the

PESTICIDE CONTAMINATION PREVENTION ACT

by

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INTRODUCTION

The following information is submitted by E. I. du Pont de Nemours and Company ("DuPont"), in response to questions and requests for additional information from the PREC Subcommittee during a hearing held on May 9, 2011 pursuant to the Pesticide Contamination and Prevention Act ("PCPA"), Cal. Food & Agric. Code § 13149.

RESPONSES *to* QUESTIONS *from the* PREC SUBCOMMITTEE

1. What was the percentage of wells with hexazinone detections in areas where the product is known to be used? (Transcript at p. 35.)

As part of the Department's groundwater monitoring program, DPR analyzed 3,866 samples from 2344 wells for hexazinone, and detected hexazinone in concentrations ranging from 0.05 (the reporting limit) to 0.27 μg/l (ppb) in 27 wells (Quagliaroli, 2011). The May 9, 2011 memorandum from WEI provided maps of well locations, hexazinone use and a grand summary showing that the detections were limited to 1.2% of sampled wells. Additional details on detection frequency were requested at the May 9th, 2011 hearing. Following the hearing, WEI prepared a supplementary memorandum addressing questions from the Subcommittee. The supplementary memorandum appears at Attachment 1.

Three use history ranges were selected, and an analysis was conducted to determine the percentage of wells in which hexazinone was detected in areas where the product is known to be used. Monitoring and use were analyzed by intersecting the sampling location and section use for three time periods. The results follow:

Sections with sampling before and during 1995. A total of 2274 samples were collected from 1330 wells. Use was reported in the sections that included 300 samples (13%) from 200 (15%) of the wells. Hexazinone was detected in 5 wells sampled during this time period, including four detections attributed to point sources. Excluding the four detections that were attributed to point sources, the detection frequency was 0.5% in wells located in sections with documented use.

Sections with sampling in 1996 through 2000. A total of 1936 samples were collected from 737 wells. Use was reported in the sections that included 305 samples (16%) from 207 (28%) of the wells. Hexazinone was detected in 6 wells sampled during this time period. Excluding the two detections attributed to leakage from ponds and 2 detections in sections with no documented use, the detection frequency was 1% for hexazinone in wells located in sections with documented use.

Sections with sampling beginning in 2001. A total of 2170 samples were collected from 982 wells. Use was reported in the sections that included 471 samples (22%) from 365 (37%) of the wells. Hexazinone was detected in 16 wells sampled during this time period. Excluding the five detections in sections with no reported use, the detection frequency was 3.0% for hexazinone in wells located in sections with documented use.

Finally, sampling and use data were reviewed in the larger township area (36 sections) with use summarized for the entire period. Of the 3866 samples from 2344 wells, 2599 (67%) samples from 1621 (69%) wells were in townships with use during the period of 1990 to 2009.

2. *Do the soil restrictions on the label apply to all uses, all alfalfa uses, or just seed alfalfa? (Transcript at p. 13.)*

The labels for all products containing hexazinone contain use instructions that include requirements for use rates that are dependent on soil texture and organic matter content. Specific instructions prohibiting application of the products to gravelly and rocky soils appear on labels in sections on all applications to alfalfa (*e.g.* Velpar ® DF) or in use directions for seed alfalfa (*e.g.* Velpar ® Alfamax™ Gold). Instructions for application of the products to seed alfalfa in California include additional restrictions by soil type and organic matter.

The label for VELPAR® DF herbicide[1] contains the following instructions for all alfalfa applications:

- "Do not exceed 2 pounds per acre per application."
- "Do not exceed 2 pounds (1.5 pounds active ingredient hexazinone) per year."

The appropriate use rate is shown in the table below, and depends on the soil texture and organic matter content.

VELPAR® DF (LB/AC)

	PERCENT ORGANIC MATTER		
SOILS	**<1%**	**1-5%**	**>5%**
Coarse Texture Loamy sand, sandy loam	2/3-1 (0.5-0.75 lbs ai/ac)	2/3-2 (0.5-1.5 lbs ai/ac)	1 1/3-2 (1.0-1.5 lbs ai/ac)
Medium texture Loam, silt loam, silt, clay loam, sandy clay loam	2/3-1 (0.5-0.75 lbs ai/ac)	1-2 (0.75-1.5 lbs ai/ac)	1 1/3-2 (1.0-1.5 lbs ai/ac)

[1] A copy of the label for VELPAR® DF herbicide appears at Attachment 2.

	PERCENT ORGANIC MATTER		
SOILS	**<1%**	**1-5%**	**>5%**
Fine Texture Silty clay loam, sandy clay, silty clay, clay	1-2 (0.75-1.5 lbs ai/ac)	1-2 (0.75-1.5 lbs ai/ac)	1 1/3-2 (1.0-1.5 lbs ai/ac)

Additional guidance and restrictions regarding alfalfa applications appear as follows:

In the section of the label entitled "Use Precautions and Restrictions – Alfalfa":

- "Best results are obtained with ½-1 inches of rainfall or sprinkler irrigation occurs within two weeks after application, when soil is moist at time of application, and when weeks have not germinated or are less than 2 inches in height or diameter. Heavy rainfall or excessive irrigation after application may result in crop injury or poor performance of the herbicide."

In the section of the label entitled "Alfalfa," regarding "Weeds Controlled":

- "In California, fall planted alfalfa may be treated in the following winter months with VELPAR® DF at 1/3 to 2/3 pounds per acre (use higher rate for fine textured soils)…"
- "Do not use VELPAR® DF on gravelly or rocky soils, exposed subsoils, hardpan, sand, poorly drained soil or alkali soils."

In the section of the label entitled "Seed Alfalfa (CA, ID, MT, NV, OR, UT, WA)":

- "Do not use VELPAR® DF on fields with sandy loam or loamy soils having less than 1% organic matter."
- "Do not exceed 2/3 pound per acre on fields with sandy loam or loamy sand soils having 1-2% organic matter."
- "Do not exceed 2/3 pound per acre on seed alfalfa that has been established for only one growing season."

VELPAR® ALFAMAX™ HERBICIDE

The label for VELPAR® Alfamax™ herbicide[2] contains similar statements and use rate instructions that apply to all applications. The recommended use rates for the product, which contains 35.3% hexazinone, are shown in the following table.

VELPAR® ALFAMAX™
HEXAZINONE APPLICATION RATES

	PERCENT ORGANIC MATTER	
SOILS	**1-5%**	**>5%**
Coarse Texture Loamy sand, Sandy loam	1.5-2 (0.5-0.75 lbs ai/ac)	3-4.3 (1.0-1.5 lbs ai/ac)
Medium Texture Loam, silt loam, silt, clay loam, sandy clay loam	2-4.3 (0.75-1.5 lbs ai/ac)	3-4.3 (1.0-1.5 lbs ai/ac)
Fine Texture Silty clay loam, sandy clay, silty clay, clay	2-4.3 (0.75-1.5 lbs ai/ac)	3-4.3 (1.0-1.5 lbs ai/ac)

Additional guidance and restrictions regarding alfalfa applications appear as follows:

In the section of the label entitled "USE PRECAUTIONS":

- "Best results are obtained with ½-1 inch of rainfall or sprinkler irrigation occurs within two weeks after application, when soil is moist at time of application, and when weeds have not germinated or are less than 2 inches in height or diameter. Heavy rainfall or excessive irrigation after application may result in crop injury or poor performance of the herbicide."
- "Do not use VELPAR® ALFAMAX™ on gravelly or rocky soils, exposed subsoils, hardpan, sand, poorly drained soil or alkali soils."

In the section entitled "SEED ALFALFA (California Only)," subtitled "ADDITIONAL USE DIRECTIONS"

- "Do not use VELPAR® ALFAMAX™ on fields that have less than 1% organic matter."

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[2] A copy of the label for VELPAR® ALFAMAX™ herbicide appears at Attachment 3.

- "Do not apply more than 1.5 pounds of product per acre on fields with sandy loam or loamy sand soils having 1-2% organic matter."
- "Do not apply more than 1.5 pounds of product per acre on seed alfalfa that has been established for only one growing season."

VELPAR® *ALFAMAX*™ GOLD HERBICIDE

The label for VELPAR® ALFAMAX™ herbicide[3] contains similar statements and use rate instructions that apply to all applications. The recommended use rates for the product, which contains 23.1% hexazinone, are shown in the following table.

VELPAR® ALFAMAX™ GOLD
HEXAZINONE APPLICATION RATES

	PERCENT ORGANIC MATTER	
SOILS	**1-5%**	**>5%**
Coarse Texture Loamy sand, Sandy loam	2.2-3.2 (0.5-0.75 lbs ai/ac)	4.3 (1.5 lbs ai/ac)
Medium Texture Loam, silt loam, silt, clay loam, sandy clay loam	3.2-4.3 (0.75-1.5 lbs ai/ac)	4.3 (1.5 lbs ai/ac)
Fine Texture Silty clay loam, sandy clay, silty clay, clay	3.2-4.3 (0.75-1.5 lbs ai/ac)	3-4.3 (1.0-1.5 lbs ai/ac)

Additional guidance and restrictions regarding alfalfa applications appear as follows:

In the section of the label entitled "ADDITIONAL USE DIRECTIONS":

- "Best results are obtained with ½-1 inch of rainfall or sprinkler irrigation occurs within two weeks after application, when soil is moist at time of application, and when weeds have not germinated or are less than 2 inches in height or diameter. Heavy rainfall or excessive irrigation after application may result in crop injury or poor performance of the herbicide."

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[3] A copy of the label for VELPAR® Alfamax™ Gold herbicide appears at Attachment 4.

In the section entitled "ALFALFA GROWN FOR SEED," subtitled "ADDITIONAL USE DIRECTIONS SEED ALFALFA:"

- "Do not use VELPAR® ALFAMAX™ Gold on gravelly or rocky soils, exposed subsoils, hardpan, sand, poorly drained soil or alkali soils."
- "Do not use VELPAR® ALFAMAX™ Gold on fields that have less than 1% organic matter."
- "Do not apply more than 2.2 pounds of product per acre on fields with sandy loam or loamy sand soils having 1-2% organic matter."
- "Do not apply more than 2.2 pounds of product per acre on seed alfalfa that has been established for only one growing season."

3. What is the relevance of the detections of hexazinone in groundwater in Maine and North Carolina and the reason for the difference between monitoring in California? (Transcript at p. 25.)

In 1994, the Maine Board of Pesticides began a groundwater monitoring program for pesticides with a high potential for leaching. Hexazinone was detected in 15 of 20 wells located in blueberry growing areas. Follow-up sampling in wells located within 0.25 mile of blueberry fields confirmed the initial findings, with 35 of 48 wells having detectable concentrations of hexazinone.

In 1996, the Board adopted a State Management Plan requiring monitoring every 4 years. Reports of the monitoring program are available on the Maine Board of Pesticide Control website (www.maine.gov/agriculture/pesticides/water/index.htm).

Of the wells in the 1994 program, 53 were selected for monitoring in 1998, 2002 and 2006 (2006 Ground Water Monitoring of Hexazinone, Board of Pesticides Control). The criteria for selecting the wells were:

- The site contains a private domestic well, currently used for drinking water;
- The site is within ¼ mile of an active blueberry field; and
- The site is down gradient or of equal elevation with the blueberry field.

The summary of results published in 2006 shows that hexazinone was detected in 42-75% of the wells with a median concentration of 0.43 ppb or less. The maximum concentration in each year ranged from 2.15 to 11.4 ppb. The well depths ranged from 5 ft to 500 ft, and wells were located at distances of 0-1000 ft. In general, the deeper wells had low or non-detectable concentrations of hexazinone, but incomplete information on the wells makes any generalizations very uncertain. For instance, the depth of the well with the maximum concentration reported in 2002 (11.4 ppb) is unknown, while the depth of the well with the next highest concentration is reported as 132 ft. In contrast, the highest concentration reported in 2006 (8.4 ppb) was found in a well with a 5 ft depth.

Differences in local recharge, hexazinone use, soil characteristics and well construction affect the concentrations detected. All concentrations reported were less than the US EPA Health Advisory Level (400 μg/l) and the Maine Maximum Exposure Guideline (230 μg/l).

A study by Perkins (2002) reported the results of monitoring in an area of intensive blueberry production in Maine. Perkins reported that most hexazinone use occurs in the coastal area where soils are gravelly and sandy and groundwater is shallow and may surface close to blueberry fields. Perkins monitored seven wells over a period of 9 years. Three of the wells were located within blueberry fields where the depth to groundwater ranged from 23-35 ft. The maximum concentration of hexazinone reported by Perkins in these wells was 29 μg/l. The remaining four wells were drinking water wells located near blueberry fields. Hexazinone was detected in all the wells with several concentration spikes that were attributed to point sources. In general, the concentrations showed a declining trend over the 9-year monitoring period.

In a second phase of the study, Perkins monitored randomly selected drinking water wells in blueberry production areas. Hexazinone was detected in 81 of 133 samples. Concentrations ranged from 0.1 to 5.97 μg/l with the 95th and 90th percentile values of 4.29 μg/l and 3.7 μg/l - far below the HAL of 400 μg/l.

The principal use of hexazinone in Maine is for weed control in established blueberry crops. Applications must be made in the spring before the lower leaves have expanded, and the applicator must avoid spraying foliage. The use rate is dependent on soil type and organic matter as shown in the following table.

Application Rates for Hexazinone (VELPAR®)*		
High-Bush Blueberries	**Percent Organic Matter**	
Soil Texture	**Less Than *or* Equal To 3%**	**Greater Than 3%**
Coarse Loamy sand, sandy loam (50-85% sand)	1.3 (1 lbs ai/ac)	1.6 (1.2 lbs ai/ac)
Medium Loam, silt loam, silt, clay loam, sandy clay loam	1.3 (1 lbs ai/ac)	2.6 (2 lbs ai/ac)
Fine texture Silty clay loam, sandy clay, silty clay, clay	1.3-2 (1-1.5 lbs ai/ac)	2.6 (2 lbs ai/ac)
Low-Bush Blueberries		
Coarse Loamy sand, sandy loam (50-85% sand)	1.2 (0.9 lbs ai/ac)	1.6 (1.2 lbs ai/ac)

Application Rates for Hexazinone (VELPAR®)*		
High-Bush Blueberries	**Percent Organic Matter**	
Soil Texture	**Less Than *or* Equal To 3%**	**Greater Than 3%**
Medium Loam, silt loam, silt, clay loam, sandy clay loam	1.2 (0.9 lbs ai/ac)	2.0 (1.5 lbs ai/ac)
Fine texture Silty clay loam, sandy clay, silty clay, clay	1.2-2.4 (0.9-1.8 lbs ai/ac)	2.4-3.6 (1.8-2.7 lbs ai/ac)

Use precautions include specific statements prohibiting applications to flooded fields, and, for applications to low bush blueberries, a requirement to maintain a 50 ft buffer from well heads or water reservoirs.

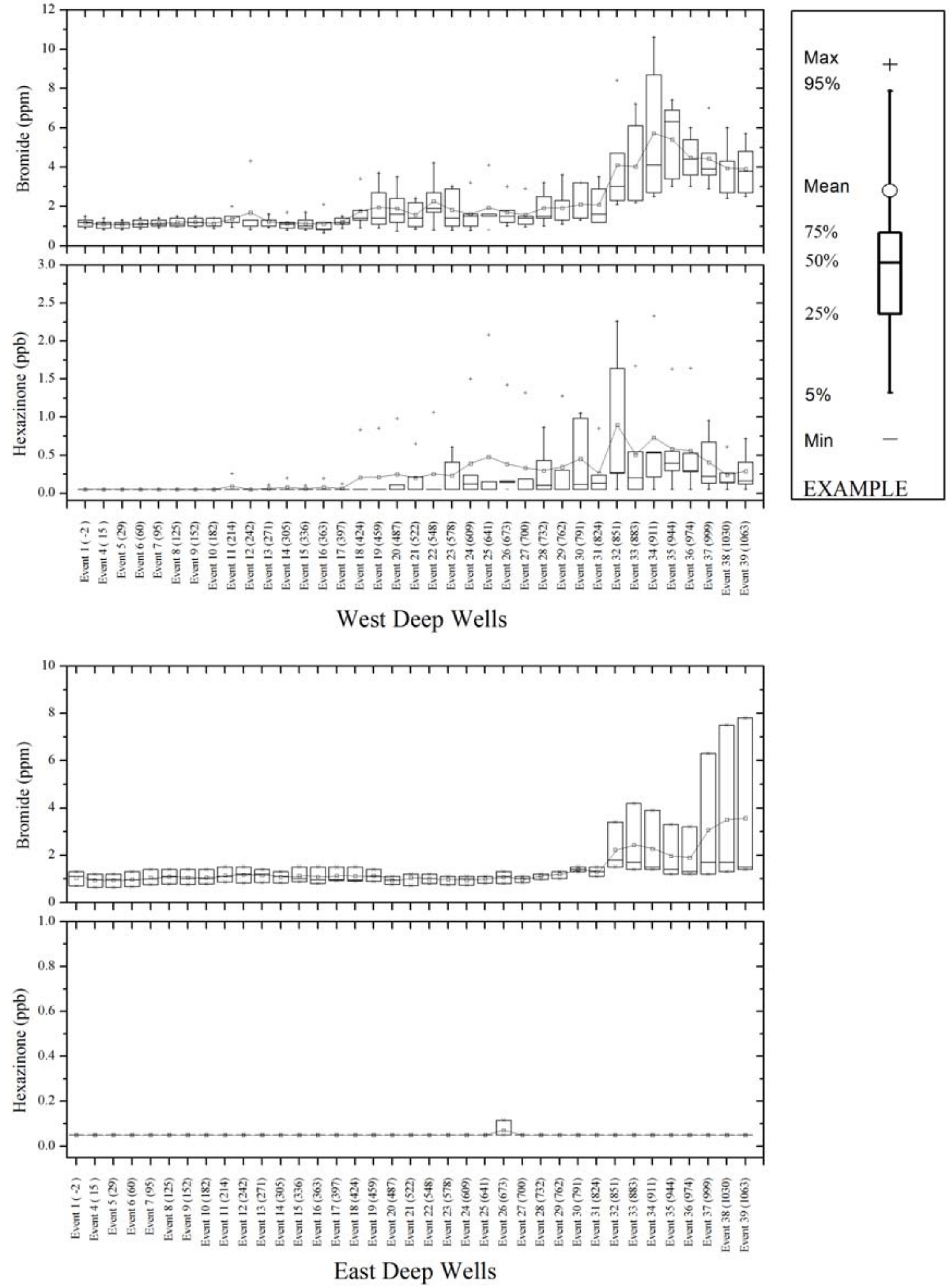
A study in North Carolina (Wade *et al*. J. Environ. Qual. 27, 1018, 1998) reported the results of a monitoring program designed in two phases. The first phase sampled existing wells in aquifers that provide domestic and municipal supplies of drinking water. In this phase, hexazinone was detected at a concentration of 1.5 μg/l in a well located within 25ft of a forest application site that received 2 lbs ai/a hexazinone. Follow up sampling showed that the concentration ranged from a non-detectable level to 5.2 μg/l (H. F. Wade, NC Dept of Agriculture and Consumer Services, personal communication). The depth to groundwater was 30.3-32.3 ft, and the soil was a Lakeland sandy soil. Phase II was designed to sample shallow surficial aquifers in areas of known pesticide use where risk of leaching was high as shown by the EPA DRASTIC model. Wells were installed in compliance with North Carolina well construction regulations with screens placed at or above the seasonal high water table.

Hexazinone was detected in one of the 97 wells in the program. The well was located within 300 ft of a forest use site. Repeated sampling of the well over a two year time period gave a range of concentration of 0.74-34 μg/l. The well was screened at a depth of 4.4-5.9 m and was located in an area with a DRASTIC score of 222 (indicating a highly vulnerable condition for leaching) and a soil leaching potential index of 85 (high leaching potential). Although the authors concluded that the indices were not effective tools for predicting the occurrence of pesticides in shallow aquifers, it is clear that the well with the detectable concentration of hexazinone was in an area with high potential for pesticide leaching. Hexazinone was also detected at 2.6 μg/l in one of seven wells located within a forest treatment site that received an application of 2.5 lbs ai/ac. As in the Phase II study, the wells sampled shallow surficial aquifiers in a vulnerable setting with a Candor sandy soil found on the coastal plain of the eastern US.

4. What was the pattern of the concentration profile of hexazinone in the Prospective Groundwater Study? Was it retained relative to the bromide tracer? (Transcript at p. 37.)

A groundwater study was conducted for hexazinone as a requirement of USEPA registration in Merced County, CA. (Hanson *et al.*, 2000)). Eight well clusters were installed with 2 wells in an alfalfa field and 4 suction lysimeters in each well. The surface soil types were loamy sands and sands with 0.8% organic matter. Subsoils were characterized as sand with discontinuous layers of loam, silt loam and silty clay loam. An application of 0.75 pounds ai/ac was made in January of 1996 to alfalfa. Irrigation and rainfall combined to exceed evapotranspiration. The site was irrigated with the existing flood irrigation system. In the western part of the plot where 5 of the well clusters were located, hexazinone moved through the soil profile at a rate similar to the rate of movement of the bromide tracer (Figure 1). In the eastern part of the plot, characterized by slightly heavier soils, the bromide tracer movement was retarded relative to the profile in the western area, and hexazinone was detected in only two samples indicating that it was retained relative to the tracer. A maximum concentration of 9.2 ppb was observed in one well in the western area at a time when the water table was approximately 12 feet below the land surface. Wells in areas of the field with heavier soils saw lower concentrations, with maximums below 1 ppb.

FIGURE 1 CONCENTRATION PROFILES *from*
***the* HEXAZINONE PROSPECTIVE GROUNDWATER STUDY**



5. *What are the acreage trends for alfalfa and what is the potential for increased use of hexazinone? (Transcript at p. 37.)*

The previous WEI memorandum highlighted hexazinone use trends in California and highlighted the relatively stable use patterns in California. Additional details follow.

Total alfalfa production in California has been in the range 900,000-1,000,000 acres over the past twenty four years. (USDA-NASS, 2011). The table below shows a 25% increase in total acreage in 2002 compared to 1997, followed by a 15% decline in 2007 compared to 2002.

YEAR	ALFALFA HAY *(Harvested Acres)*
1987	948,719
1992	939,097
1997	944,056
2002	1,176,021
2007	986,982

6. *What is the potential for increased detections of hexazinone in areas of current alfalfa use?*

In a previous memorandum, WEI reported the use of a recently developed PRZM based tool to evaluate the spatial distribution of potential hexazinone leaching associated with actual applications. All applications for the period of 2000 to 2008 in the Bay-Delta Estuary, Sacramento and San Joaquin Watersheds (the primary use area) were evaluated using spatially assigned soils data, weather files, and the WinPRZM Pesticide Root Zone Model (PRZM-4.51) to simulate the pesticide leaching. WEI added soils, use, and weather files in the Tulare Basin to cover a wider range of alfalfa use areas in California (Attachment 1). The simulations are deterministic and were conducted with a conservative set of inputs using the maximum field dissipation half-life (154 days) in the soil and the minimum sorption parameter (Koc = 38 mL/g), and a set of simulations was conducted using mean parameters (field dissipation half-life of 139 days and Koc of 57.5 mL/g). Errors in the soils database resulting from missing soil parameters were corrected. The results are shown in the following table and confirm that the probability of detecting hexazinone in higher concentrations or in a wider geographical range is negligible.

PRZM Spatial Modeling Assessment				
Environmental Fate (Most Vulnerable): K_{OC} = 38, Half-life = 154d				
Aging Time *(Years)*	Longest Half-Life *(Days)*	Cumulative Percentile (µg/L) *of all* Simulations		
		50th	90th	95th
13	154	0.0000	0.0000	0.0000
10	154	0.0000	0.0000	0.0000
5	154	0.0000	0.0000	0.0008
4	154	0.0000	0.0001	0.0043
3	154	0.0000	0.0003	0.0223
Environmental Fate (Mean): K_{OC} = 57.5, Half-life = 139d				
Aging Time *(Years)*	Longest Half-Life *(Days)*	Cumulative Percentile (µg/L) *of all* Simulations		
		50th	90th	95th
13	154	0.0000	0.0000	0.0000
10	154	0.0000	0.0000	0.0000
5	154	0.0000	0.0000	0.0000
4	154	0.0000	0.0000	0.0002
3	154	0.0000	0.0000	0.0008

7. *DuPont was asked to comment about a possible adverse effect noted in the DPR Medical Toxicology Branch Summary of Toxicological Data on Hexazinone. (Transcript at pp. 81-82.)*

As background, this question relates to a DPR review entitled *DPR Medical Toxicology Branch Summary of Toxicological Data on Hexazinone* (Chemical Code # 001871, Tolerance # 00396, SB 950 # 086, Revised 9/6/02). The DATA GAP STATUS includes the following notation: "Chromosome effects: No data gap, possible adverse effect."

The statement above was based on a positive *in vitro* chromosome aberration test cited in DPR's assessment of hexazinone (**035035182, Haskell Laboratory Report 768-82 of 1982). DuPont indicated in the report that hexazinone is negative for mutagenicity, using a weight of evidence approach. Because this study had some guideline deficiencies, DuPont was asked to conduct another study for the endpoint of *in vitro* chromosome aberrations that conforms to current guideline requirements. This guideline-compliant *in vitro* chromosome aberration test was negative, and has been submitted separately to DPR, as requested by the PREC Subcommittee. (A May 23, 2011 letter from DuPont, transmitting the study DPR, appears at Attachment 5.)

8. ***Does DuPont have any information to suggest that hexazinone should be considered chemically similar to other triazine herbicides that are regulated in California? If these other triazines caused liver toxicity, could hexazinone any risk of liver toxicity from hexazinone be additive? (Transcript at pp. 49-50.)***

At the hearing, DuPont mentioned that there are several chemical differences between hexazinone and other triazines such as atrazine and simizine. For example, hexazinone does not contain a chloro substitution on the triazine ring, but rather has two oxo groups on the ring. Furthermore, hexazinone is not fully aromatic as the other chloro-s-triazines. (A paper detailing these chemical and toxicological differences (O'Neal, 2002) appears at Attachment 6.)

In addition, US EPA did not include hexazinone in its grouping with chloro-s-triazines. (US EPA, 2002). Nor is hexazinone structurally similar to prometon. Prometon has a completely aromatic triazine ring like atrazine and simazine, whereas hexazinone is only partially aromatic. Hexazinone does not have an oxy-methyl group attached to the ring; instead it has the oxo group. Like atrazine and simazine, none of the ringed nitrogens are substituted in prometon, whereas two of the three nitrogens in hexazinone are substituted. These structural differences are reflected in the toxicological differences. (A copy of US EPA (2002) appears at Attachment 7.)

DuPont has compared the toxicity profile of the three regulated triazines (atrazine, simazine and prometon) has found that none of them has human health risk assessment endpoints based on liver toxicity.

According to US EPA, the acute effects relevant to risk assessment for atrazine are from the developmental toxicity studies in rats and rabbits (weight of evidence from four studies) where delayed ossification of cranial bones in fetuses and decreased body weight gain in adults were observed (US EPA, 2006a). The relevant chronic endpoints are the attenuation of the pre-ovulatory luteinizing hormone surge and histopathological lesions in the kidneys of rats. The endpoints relevant to risk assessment for simazine are based on an increased incidence of various unossified skeletal structures in the developmental toxicity study in rats. The endpoints used for the longer term risk are based on atrazine studies where effects on the luteinizing hormone surge in female rats and delayed preputial separation in male rats were observed (US EPA, 2006b).

The US EPA RED for prometon mentioned that US EPA did not consider this compound to be structurally similar to the chloro-s-triazines (atrazine and simazine) or to have a similar toxicity profile. Therefore, EPA did not include them in its cumulative risk assessment for triazines (US EPA, 2008). The endpoints relevant for the prometon risk assessment are based on decreased body weight and food consumption in female rabbits and emesis and body weight effects in chronic dog studies. This review of regulated triazines does not rule out that there could be liver-related effects in their comprehensive toxicology database for the other compounds. Nevertheless, it is clear that if there are liver-related effects, US EPA did not consider them relevant for its human health risk assessment for these compounds.

9. ***What was the basis for the calculation of the former Health Advisory Life-time at 200 ppm in the 1994 US EPA RED? How was the Health Advisory for children established in the 1994 RED? (Transcript at p. 81.)***

The US EPA RED (1994) for hexazinone states at page 6:

> EPA's Office of Drinking Water issued a drinking water Health Advisory (HA) for hexazinone in August 1988. A lifetime HA was established at 200 ppb for an adult consuming 2 liters of water per day. For a 10 kg child, a one- and ten-day HA was determined to be 2 mg/L.

These values are presented below. The basis for the calculation of the Health Advisory Lifetime is available from a draft document from US EPA's Office of Drinking Water (US EPA, 1987). That document shows calculations for One-day and Ten-day Health Advisories. Because they do not appear to be reflected in the 1994 US EPA RED, a later document is presented which more clearly articulates the One-day and Ten-day Health Advisories (US EPA, 1996).

This later document also explains the reason for the change in the Health Advisory Lifetime to 400 ppb. The basis for the ***former*** Health Advisory Lifetime of 200 ppb was the use of a different study for the Chronic Reference Dose (cRfD) and the application of different uncertainty factors. Previously, the cRfD was based on the 2-year rat study with a NOEL of 10 mg/kg bw/day. An additional uncertainty factor of 3x was applied to the usual 100x uncertainty factor due to the absence of a chronic non-rodent study in the database.

The previous cRfD was calculated as follows:

cRfD	=	NOEL/UF
cRfD	=	10 mg/kg bw/day / 300
	=	0.033 mg/kg bw/day

The previous Drinking Water Equivalent Level and Health Advisory Lifetime were calculated as follows:

DWEL	=	(Chronic RfD) (mass of a reference person) / water consumed per day
DWEL	=	(0.03 mg/kg/day) (70 kg person) / 2 L
	=	1.05 mg/L (1050 ppb)

The previous Health Advisory Lifetime, which allots 20% of the exposure to drinking water followed as:

Health Advisory Life-time	=	(DWEL) (0.2)
	=	(1.05 mg/L) (0.2)
	=	~0.2 mg/L (*i.e.* 200 ppb).

The One-day and Ten-day Health Advisories previously were based on the same NOAEL of 50 mg/kg bw/day from a 1980 rabbit developmental toxicity study because there were no data to indicate the need for a different One-day Health Advisory. As above, an additional uncertainty factor of 3x was applied to the usual 100x to account for uncertainty in the database (US EPA, 1996). The Ten-day Health Advisory was calculated as:

Ten-day Health Advisory	=	NOAEL) (weight of reference child) / (UF) (1 L/day)
	=	(50 mg/kg/day) (10 kg) / (300) (1 L/day)
	=	1.67 mg/L, rounded to 2.0 mg/L (2000 ppm)

The change to a Health Advisory Lifetime of 400 ppb is also explained in the 1996 document on hexazinone from US EPA's Office of Water (US EPA, 1996). The basis for the change was a 1991 chronic dog study by DuPont, which changed the chronic RfD from 0.03 mg/kg/day to 0.05 mg/kg/day and removed the extra 3x uncertainty factor.

10. Are there any monitoring data for hexazinone in food (Transcript at p. 42.)

The following three U.S. government web sites address the issues of hexazinone residues in commodities. The first website includes a list of current US EPA tolerances in various commodities (crops, animal residues and milk). The second includes the USDA Pesticide Data Program 18th Annual Summary, which includes monitoring data from the calendar year 2008. Hexazinone was included in the program and no detections were reported. The third website provides FDA pesticide monitoring data for various years. Hexazinone was not found in the FDA monitoring samples from 2003 to 2008.

- www.ecfr.gpoaccess.gov/cgi/t/text/text-idx?type=simple;c=ecfr;cc=ecfr;sid=b90c07349d7847f6a449480ec3f4d2fb;region=DIV1;q1=hexazinone;rgn=div8;view=text;idno=40;node=40%3A23.0.1.1.28.3.19.156
- www.ams.usda.gov/AMSv1.0/getfile?dDocName=STELPRDC5081750
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