5-23-88

Shaughnessy Number: 103301

Date out of EAB: MAY 23 1988

TO: Wlliam Miller
Product Manager #16
Registration Division (TS-767C)

FROM: Michael P. Firestone, Chief
Special Review Section #2
Exposure Assessment Branch/HED (TS-769C)

THRU: Paul F. Shuda, Chief
Exposure Assessment Branch/HED (TS-769C)

Attached, please find the EAB review of:

Reg./File#: 239-2471

Chemical Name: Acephate

Type product: Insecticide

Company Name: Chevron Chemical Company

Purpose: Mixer/loader and applicator exposure assessments for golf course use.

Date Received: 3/17/88 Action Code: 660

Date Completed: EAB#(s): 80538

Monitoring study requested: Total reviewing time: 15 days

Monitoring study volunteered:

Deferrals: _____ Ecological Effects Branch

_____ Residue Chemistry Branch

_____ Toxicology Branch

(1)

## 1.0 INTRODUCTION

Agrisearch Incorporated has submitted a worker exposure study on behalf of Chevron Chemical Company in response to the data call-in requirements of the acephate registration standard.

## 2.0 MATERIALS AND METHODS

Worker exposure to Orthene (O,S dimethyl phosphoramido thioate) during application to golf courses was measured at three sites in Boca Raton, Florida during July, 1987. The test material, Orthene 75S Soluble Powder (75% a.i.), was applied by different spray equipment at each site so that three spray rigs were tested in the study using either fan tip or cone nozzles.

Four mixer/loaders and four applicators were tested at each golf course. Each mixer/loader prepared one 100 gallon tank load; at site 1, 12 lbs of Orthene 75 S were used while at sites 2 and 3,six lbs were used involving the opening and transfer of the required number of one pound cans of formulation. Orthene was applied at 5.2 lbs of formulation per acre (43.5 gal/acre were applied at site 1 and 100 gallons to 1.15 acres at sites 2 and 3). Mixer/loader exposure times ranged from 5 to 26 minutes (See Table 1) and applicator exposure times ranged from 16 to 52 minutes (See Table 2). During testing each worker wore Tyvek coveralls, baseball cap, and latex gloves worn under white cotton sample gloves.

The 5.2 lb/acre application rate for the control of mole crickets is the maximum rate recommended on commercial turfgrass, lawns and other turfgrass areas.

A weather station was located between the mixing/loading area and the spray areas to measure wind direction and velocity, temperature and relative humidity hourly and during sample collection (See Table 3).

Dermal exposure was monitored for each mixer/loader and applicator using duplicate patches. The outside patches, representing exposure to outside clothing, are made of alpha-cellulose pads (10cm x 10cm) backed with aluminum foil,and attached to a plastic conference badge. Patches representing exposure inside clothing were made by taking an outside patch and loosely attaching one layer of protective clothing material to the upper collection face of the patch. For upper body patches, shirt material was used and for the lower body patches, blue jean material was used as the protective clothing. The inside patch allowed for monitoring ofthe protection afforded by clothing without contamination and dislodgement of patches placed inside of clothing.

The hands were monitored with white cotton gloves worn over latex gloves. The white cotton gloves were the sampling media,and the latex golves protected the cotton gloves from contamination from the workers' hands as well as protecting the workers. Protected patches were placed on the shoulders, chest, back,forearms, upper arms, thighs and ankles. Unprotected patches were placed on the shoulders, chest, back, head, forearms, upperarms, thighs and ankles.

Inhalation exposure was measured with personal air-montioring pumps worn throughout the exposure period. They were fitted with two polyurethane foam plugs functioning as acephate filters. The pumps were calibrated for use to draw 2.0 liters of air per minute through the two filters. Foam filters placed between the air monitoring pumps and the fortified filters showed no acephate breakthrough.

## 3.0 ANALYTICAL METHODS AND QUALITY ASSURANCE PROCEDURES

After the exposure period, all samples were removed by forceps by laboratory personnel. Duplicate patches (e.g. left and right shoulder) were combined with exposed surfaces face to face. All samples were placed in prelabeled bags and immediately frozen on dry ice. The polyurethane plugs were combined and placed in prelabeled vials and frozen.

Alpha-cellulose patch samples and white cotton glove samples were extracted by shaking with 100 ml of acetone in a 200 ml jar for 30 minutes. Fifty ml of extract were aliquoted and evaporated to dryness. The residue was taken up in 4.0 ml of acetone and subjected to gas chromatographic analysis for acephate quantification. The polyurethane foam filters were extracted in 20 ml of a 20% v/v hexane in acetone solution by sonication. Ten ml of each extract were then passed through a silica-gel Sep-pak column. Additional hexane/acetone was passed through the Sep-pak; all solvent was combined and evaporated to dryness. The residue was taken up in 2 ml of acetone and quantitated by gas chromatographic analysis using a thermionic detector. To verify method performance, each set of samples was run with fresh laboratory fortified control samples at suitable concentration ranges.

A blank sample of each matrix was opened to the experiment staging area prior to initiating the exposure period (negative controls). Two replicates of each type of sampling media were spiked in the field at 10, 100, and 1000 micrograms (See Table 4).

In addition, a sample of the formulation used and triplicate samples of each batch of spray solution used were taken, frozen and analyzed (See Table 5).

A storage stability study was initiated prior to the exposure period using each type of sample matrix (See Table 6).

## 4.0 CALCULATIONS OF EXPOSURES

All exposure determined to be below the limits of detection was considered as positive at half the detection limit for calcultion purposes.

Dermal exposure values were calculated by multiplying the reported values of patch residues (ug/$cm^2$ corrected for recovery) by the surface area ($cm^2$) of the body region represented by each patch as defined by Subdivision U of the Pesticide Assessment Guidelines. This result was converted to mg/body region. In the case of exposure to hands, a surface area factor was not used. The total residue on the sample gloves (corrected for recovery) was taken as the exposure to this part of the body (See Tables 13-24).

Dermal exposure for unprotected subjects was taken as the total exposure as calculated from data on the nonprotected patches and gloves, and assumes that no area of the body was protected by clothing.

Dermal exposure for protected subjects was taken as exposure to the unprotected face, back of neck, front of neck and hands with protection to the rest of the body. This assumes that a long sleeved shirt, long-legged pants and a hat were worn.

Dermal exposure was divided by the number of lbs a.i. handled by the the mixer/loader or applied by the applicator to give mg/lb a.i. At site 1, nine pounds of active ingredient were applied and at site 2, 4.5 pounds of active ingredient were applied.

Inhalation exposure values were calculated by multiplying the residue found on the polyurethane foam filters (See Table 12) (adjusted for recovery), which was collected in the field at a flow rate of 2 L/min, by 14.5 for male workers and 8.0 for female workers. The ventilation rates for light work are condsidered to be 29 L/min for males and 16 L/min for females. This result was then divided by the lb a.i. handled and reported as mg/lb a.i. Exposure to applicators was corrected for actual tank-mix concentrations as reported in Table 5.

## 5.0 RESULTS

The mean exposure for mixer/loaders wearing long pants, long sleeve shirt and hat is indicated below:

| | Dermal (mg/lb ai) | Inhalation (mg/lb ai) |
|---|---|---|
| Site 1 | 1.05 | .002 |
| Site 2 | 10.1 | .003 |
| Site 3 | 1.33 | .003 |

Mean of all sites: Dermal------ 4.16
(mg/lb ai) Inhalation-- .003

The mean total exposure potential for nonprotected mixer/loaders is indicated below:

| | Dermal (mg/lb ai) | Inhalation (mg/lb ai) |
|---|---|---|
| Site 1 | 1.17 | .002 |
| Site 2 | 10.3 | .003 |
| Site 3 | 1.40 | .003 |

Mean of all sites: Dermal------ 4.29
(mg/lb ai) Inhalation-- .003

The mean exposure for applicators wearing long pants, long sleeve shirt and hat is indicated below:

| | Dermal (mg/lb ai) | Inhalation (mg/lb ai) |
|---|---|---|
| Site 1 | .29 | .0007 |
| Site 2 | .21 | .003 |
| Site 3 | .50 | .003 |

Mean of all sites: Dermal------ .34
(mg/lb ai) Inhalation-- .002

The mean total exposure potential for nonprotected applicators is indicated below:

| | Dermal (mg/lb ai) | Inhalation (mg/lb ai) |
|---|---|---|
| Site 1 | .38 | .0007 |
| Site 2 | .38 | .003 |
| Site 3 | .55 | .003 |

Mean of all sites: Dermal------ .44
(mg/lb ai) Inhalation-- .002

DISCUSSION

The approximate 10x difference in dermal exposure at site 2 compared to sites 1 and 3 is noted. This variation is due mostly to much higher hand exposure at site 2. Variable exposure to the hands can occur when the powder formulation dusts into the air when the one pound cans are opened for loading the spray tank.

Exposure to the hands for mixer/loaders wearing long pants, sleeved shirt and hat ranged from 93 to almost 100% of total exposure with a mean of 98%.

Exposure to the hands of applicators wearing long pants, long sleeved shirt and hat ranged from 14 to 97% of total exposure with a mean of 68%.

6.0 CONCLUSIONS

Dermal and inhalation exposures to mixer/loaders and applicators involved in the application of Orthene 75S (acephate) to golf courses (assuming a 70 kg body weight and subjects wearing long-sleeved shirt, long-legged trousers, hat and shoes) is estimated to be:

| | |
|---|---|
| Dermal exposure | |
| Mixer/loader (mean of all sites) | $5.9 \times 10^{-2}$ mg/kg/lb ai |
| Applicator (mean of all sites) | $4.9 \times 10^{-3}$ mg/kg/lb ai |
| Inhalation exposure | |
| Mixer/loader (mean of all sites) | $4 \times 10^{-5}$ mg/kg/lb ai |
| Applicator (mean of all sites) | $3 \times 10^{-5}$ mg/kg/lb ai |

If the same person performs both mixer/loader and applicator tasks the following exposures are estimated:

| | |
|---|---|
| Dermal exposure | $6.4 \times 10^{-2}$ mg/kg/lb ai |
| Inhalation exposure | $7 \times 10^{-5}$ mg/kg/lb ai |
| Total exposure (dermal and inhalation) | $6.4 \times 10^{-2}$ mg/kg/lb ai |

The distribution of the exposure and the magnitude of the hand exposure support the Agency's concern that mixer/loaders and applicators must wear long pants, long-sleeved shirts, and protective gloves. Because hands accounted for an average of 98% of the total exposure to mixer/loaders and 68% of the total exposure to applicators, the wearing of protective gloves would reduce total exposure substantially. The guidance document for acephate reregistration requires product labels to state that users must wear long pants, long-sleeved shirt, and protective gloves. This study demonstrates that this label change could

have substantial potential impact on mixer/loader and applicator exposure.

Arthur O. Schlosser 5/23/88

Arthur O. Schlosser
Special Review Section
Exposure Assessment Branch
Hazard Evaluation Divison (TS-769C)

Acephate

PIN 3279-96

Page_____ is not included in this copy.

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_____ Description of quality control procedures.

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_____ The product confidential statement of formula.

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Table 13: MIXER/LOADER[a]

Site 1 Broken Sound Golf Course - East Boca Raton, Florida

Equipment: 15' ground boom

Total lb ai handled: 9.0

| Body Area | Body Surface Area ($cm^2$) | Corrected Exposure (mg)[b] M/L-1[c] | M/L-2[c] | M/L-3 | M/L-4 |
|---|---|---|---|---|---|
| Head | 1300 | --- | --- | --- | --- |
| Face | 650 | .033 | .004 | .008 | .004 |
| Back of neck | 110 | .003 | .001 | .0007 | .0007 |
| Front of neck | 150 | .004 | .002 | .013 | .008 |
| Chest/stomach | 3550 | .022 | .022 | .022 | .022 |
| Back | 3550 | .022 | .022 | .022 | .022 |
| Upper arm | 2910 | .018 | .018 | .018 | .018 |
| Forearm | 1210 | .031 | .008 | .092 | .031 |
| Hand | 820 | 4.98 | 12.07 | 15.4 | 4.63 |
| Thigh | 3820 | .024 | .024 | .024 | .024 |
| Lower leg | 2380 | .015 | .015 | .060 | .015 |
| Feet | 1310 | --- | --- | --- | --- |
| Total dermal exposure | | 5.15 | 12.19 | 15.66 | 4.77 |
| Inhalation exposure | | .014 | .004 | .034 | .021 |
| Total exposure (mg) | | 5.17 | 12.19 | 15.69 | 4.80 |
| Dermal exposure(mg/lb ai) | | .57 | 1.35 | 1.74 | .53 |
| Inhalation exposure (mg/lb ai) | | .002 | .0004 | .004 | .002 |

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(a) Clothing worn: Long-sleeved shirt, long pants, hat and shoes.

(b) Data corrected for recovery.

(c) Female mixer/loader

Table 14: MIXER/LOADER[a]

Site 2 Broken Sound Golf Course - West Boca Raton, Florida

Equipment: 16' ground boom

Total lb ai handled: 4.5

| Body Area | Body Surface Area ($cm^2$) | Corrected Exposure (mg)[b] M/L-5 | M/L-6 | M/L-7 | M/L-8 |
|---|---|---|---|---|---|
| Head | 1300 | --- | --- | --- | -- |
| Face | 650 | .020 | .003 | .007 | .007 |
| Back of neck | 110 | .002 | .001 | .002 | .002 |
| Front of neck | 150 | .003 | .0008 | .0008 | .002 |
| Chest/stomach | 3550 | .018 | .018 | .018 | .018 |
| Back | 3550 | .018 | .018 | .018 | .018 |
| Upper arm | 2910 | .015 | .015 | .015 | .015 |
| Forearm | 1210 | .025 | .006 | .006 | .037 |
| Hand | 820 | 95.33 | 3.68 | 36.60 | 46.14 |
| Thigh | 3820 | .019 | .019 | .019 | .019 |
| Lower leg | 2380 | .012 | .012 | .012 | .012 |
| Feet | 1310 | --- | --- | --- | --- |
| Total dermal exposure | | 95.46 | 3.77 | 36.70 | 46.27 |
| Inhalation exposure | | .032 | .008 | .008 | .008 |
| Total exposure (mg) | | 95.49 | 3.78 | 36.71 | 46.28 |
| Dermal exposure(mg/lb ai) | | 21.2 | .84 | 8.16 | 10.3 |
| Inhalation exposure (mg/lb ai) | | .007 | .002 | .002 | .002 |

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(a) Clothing worn: Long-sleeved shirt, long pants, hat and shoes.

(b) Data corrected for recovery.

Table 15: MIXER/LOADER[a]

Site 3 Boco Lago Golf Course Boca Raton, Florida

Equipment: 16' ground boom

Total lb ai handled: 4.5

| Body Area | Body Surface Area ($cm^2$) | Corrected Exposure (mg)[b] M/L-9 | M/L-10 | M/L-11 | M/L-12 |
|---|---|---|---|---|---|
| Head | 1300 | --- | --- | --- | --- |
| Face | 650 | .008 | .004 | .004 | .004 |
| Back of neck | 110 | .0007 | .0007 | .0007 | .0007 |
| Front of neck | 150 | .004 | .004 | .001 | .006 |
| Chest/stomach | 3550 | .022 | .022 | .022 | .022 |
| Back | 3550 | .022 | .022 | .022 | .022 |
| Upper arm | 2910 | .018 | .018 | .018 | .018 |
| Forearm | 1210 | .008 | .008 | .008 | .008 |
| Hand | 820 | 9.49 | 5.29 | 1.52 | 7.24 |
| Thigh | 3820 | .024 | .024 | .024 | .024 |
| Lower leg | 2380 | .015 | .030 | .015 | .015 |
| Feet | 1310 | --- | --- | --- | --- |
| Total dermal exposure | | 9.61 | 5.42 | 1.63 | 7.36 |
| Inhalation exposure | | .009 | .019 | .009 | .009 |
| Total exposure (mg) | | 9.62 | 5.44 | 1.64 | 7.37 |
| Dermal exposure(mg/lb ai) | | 2.14 | 1.21 | .36 | 1.64 |
| Inhalation exposure (mg/lb ai) | | .002 | .004 | .002 | .002 |

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(a) Clothing worn: Long-sleeved shirt, long pants, hat and shoes.

(b) Data corrected for recovery.

Table 16: APPLICATOR[a]

Site 1 Broken Sound Golf Course - East Boca Raton, Florida

Equipment: 15' ground boom

Total lb ai applied: 9.0

| Body Area | Body Surface Area ($cm^2$) | Corrected Exposure (mg)[b] APP-1 | APP-2 | APP-3[c] | APP-4[c] |
|---|---|---|---|---|---|
| Head | 1300 | --- | --- | --- | --- |
| Face | 650 | .025 | .041 | .025 | .033 |
| Back of neck | 110 | .0007 | .003 | .004 | .039 |
| Front of neck | 150 | .006 | .009 | .0009 | .004 |
| Chest/stomach | 3550 | .022 | .022 | .022 | .022 |
| Back | 3550 | .022 | .022 | .022 | .022 |
| Upper arm | 2910 | .018 | .018 | .018 | .018 |
| Forearm | 1210 | .008 | 1.58 | .015 | .008 |
| Hand | 820 | 4.49 | 1.54 | .60 | .98 |
| Thigh | 3820 | .024 | .024 | .024 | .024 |
| Lower leg | 2380 | .015 | .015 | .015 | .015 |
| Feet | 1310 | --- | --- | --- | --- |
| Total dermal exposure | | 4.63 | 3.27 | .75 | 1.17 |
| Inhalation exposure | | .007 | .007 | .004 | .004 |
| Total exposure | | 4.64 | 3.28 | .75 | 1.17 |
| Dermal exposure (mg/lb ai) (with tank mix correction) | | .54 | .39 | .09 | .15 |
| Inhalation exp. (mg/lb ai) (with tank mix correction) | | .0008 | .0008 | .0005 | .0005 |

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(a) Clothing worn: Long-sleeved shirt, long pants, hat and shoes.

(b) Data corrected for recovery.

(c) Female applicator

Table 17: APPLICATOR[a]

Site 2 Broken Sound Golf Course - West Boca Raton, Florida

Equipment: 16' ground boom

Total lb ai applied: 4.5

| Body Area | Body Surface Area ($cm^2$) | Corrected Exposure (mg)[b] APP-5 | APP-6 | APP-7 | APP-8 |
|---|---|---|---|---|---|
| Head | 1300 | --- | --- | --- | --- |
| Face | 650 | .003 | .003 | .013 | .027 |
| Back of neck | 110 | .0006 | .0006 | .0006 | .003 |
| Front of neck | 150 | .0008 | .006 | .002 | .003 |
| Chest/stomach | 3550 | .018 | .018 | .018 | .018 |
| Back | 3550 | .018 | .018 | .018 | .036 |
| Upper arm | 2910 | .015 | .267 | .015 | .015 |
| Forearm | 1210 | .006 | .321 | .006 | .006 |
| Hand | 820 | .017 | .479 | .310 | .581 |
| Thigh | 3820 | .019 | .019 | .019 | .019 |
| Lower leg | 2380 | .012 | .12[c] | .291 | .073 |
| Feet | 1310 | --- | --- | --- | --- |
| Total dermal exposure | | .11 | 1.25 | .69 | .78 |
| Inhalation exposure | | .008 | .008 | .008 | .008 |
| Total exposure | | .12 | 1.26 | .70 | .79 |
| Dermal exposure (mg/lb ai) (with tank mix correction) | | .038 | .42 | .15 | .24 |
| Inhalation exp. (mg/lb ai) (with tank mix correction) | | .003 | .003 | .002 | .002 |

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(a) Clothing worn: Long-sleeved shirt, long pants, hat and shoes.

(b) Data corrected for recovery.

(c) The reported value was considered to be an outlier. The average value for this body area and site was used.

Table 18: APPLICATOR[a]

Site 3 Boco Lago Golf Course Boca Raton, Florida

Equipment: 16' ground boom

Total lb ai applied: 4.5

| Body Area | Body Surface Area ($cm^2$) | Corrected Exposure (mg)[b] APP-9 | APP-10 | APP-11 | APP-12 |
|---|---|---|---|---|---|
| Head | 1300 | --- | --- | --- | --- |
| Face | 650 | .004 | .008 | .008 | .008 |
| Back of neck | 110 | .0007 | .003 | .004 | .0007 |
| Front of neck | 150 | .0009 | .004 | .0009 | .0009 |
| Chest/stomach | 3550 | .022 | .022 | .022 | .022 |
| Back | 3550 | .022 | .022 | .022 | .022 |
| Upper arm | 2910 | .018 | .018 | .018 | .018 |
| Forearm | 1210 | .151 | .121 | .008 | .015 |
| Hand | 820 | 1.49 | 1.15 | .381 | 1.80 |
| Thigh | 3820 | .024 | .024 | .024 | .024 |
| Lower leg | 2380 | .015 | .015 | .015 | .015 |
| Feet | 1310 | --- | --- | --- | --- |
| Total dermal exposure | | 1.75 | 1.39 | .50 | 1.93 |
| Inhalation exposure | | .009 | .009 | .009 | .009 |
| Total exposure | | 1.76 | 1.40 | .51 | 1.93 |
| Dermal exposure (mg/lb ai) (with tank mix correction) | | .45 | .35 | .14 | 1.07 |
| Inhalation exp. (mg/lb ai) (with tank mix correction) | | .002 | .002 | .002 | .005 |

(a) Clothing worn: Long-sleeved shirt, long pants, hat and shoes.

(b) Data corrected for recovery.

Table 19: MIXER/LOADER Total Potential Exposure[a]

Site 1 Broken Sound Golf Course - East Boca Raton, Florida

Equipment: 15' ground boom

Total lb ai handled: 9.0

| Body Area | Body Surface Area ($cm^2$) | Corrected Exposure (mg)[b] M/L-1[c] | M/L-2[c] | M/L-3 | M/L-4 |
|---|---|---|---|---|---|
| Head[d] | 1300 | .066 | .008 | .016 | .008 |
| Face | 650 | --- | --- | --- | --- |
| Back of neck | 110 | .003 | .001 | .0007 | .0007 |
| Front of neck | 150 | .004 | .002 | .013 | .008 |
| Chest/stomach | 3550 | .090 | .045 | .31 | .18 |
| Back | 3550 | .090 | .045 | .022 | .022 |
| Upper arm | 2910 | .44 | .074 | .074 | .11 |
| Forearm | 1210 | .17 | .20 | .44 | .47 |
| Hand | 820 | 4.98 | 12.07 | 15.4 | 4.63 |
| Thigh | 3820 | .19 | .024 | .15 | .097 |
| Lower leg | 2380 | .060 | .015 | .90 | .015 |
| Feet | 1310 | .033 | .008 | .50 | .008 |
| Total dermal exposure | | 6.13 | 12.49 | 17.83 | 5.55 |
| Inhalation exposure | | .014 | .004 | .034 | .021 |
| Total exposure (mg) | | 6.14 | 12.5 | 17.9 | 5.57 |
| Dermal exposure(mg/lb ai) | | .68 | 1.39 | 1.98 | .62 |
| Inhalation exposure (mg/lb ai) | | .002 | .0004 | .004 | .002 |

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(a) Totally unprotected.

(b) Corrected for recovery.

(c) Female mixer/loader.

(d) Includes face area.

Table 20: MIXER/LOADER Tota Potential Exposure[a]

Site 2 Broken Sound Golf Course - West Boca Raton, Florida

Equipment: 16' ground boom

Total lb ai handled: 4.5

| Body Area | Body Surface Area ($cm^2$) | Corrected Exposure (mg)[b] M/L-5 | M/L-6 | M/L-7 | M/L-8 |
|---|---|---|---|---|---|
| Head[c] | 1300 | .040 | .007 | .013 | .013 |
| Face | 650 | --- | --- | --- | --- |
| Back of neck | 110 | .002 | .001 | .002 | .002 |
| Front of neck | 150 | .003 | .0008 | .0008 | .0008 |
| Chest/stomach | 3550 | .072 | .018 | .018 | .036 |
| Back | 3550 | .072 | .036 | .072 | .072 |
| Upper arm | 2910 | .151 | .015 | .089 | .059 |
| Forearm | 1210 | .30 | .074 | .16 | .11 |
| Hand | 820 | 95.33 | 3.68 | 36.60 | 46.14 |
| Thigh | 3820 | .31 | .039 | .62 | .62 |
| Lower leg | 2380 | .049 | .024 | .012 | .012 |
| Feet | 1310 | .027 | .013 | .007 | .007 |
| Total dermal exposure | | 96.36 | 3.91 | 37.59 | 47.07 |
| Inhalation exposure | | .032 | .008 | .008 | .008 |
| Total exposure (mg) | | 96.47 | 3.92 | 37.69 | 47.1 |
| Dermal exposure(mg/lb ai) | | 21.4 | .87 | 8.35 | 10.5 |
| Inhalation exposure (mg/lb ai) | | .007 | .002 | .002 | .002 |

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(a) Totally unprotected.

(b) Corrected for recovery.

(c) Includes face area.

Table 21: MIXER/LOADER Total Potential Exposure[a]

Site 3 Boca Lago Golf Course Boca Raton, Florida

Equipment: 16' ground boom

Total lb ai handled: 4.5

| Body Area | Body Surface Area ($cm^2$) | Corrected Exposure (mg)[b] M/L-9 | M/L-10 | M/L-11 | M/L-12 |
|---|---|---|---|---|---|
| Head[c] | 1300 | .016 | .008 | .008 | .008 |
| Face | 650 | --- | --- | --- | --- |
| Back of neck | 110 | .0007 | .0007 | .0007 | .0007 |
| Front of neck | 150 | .004 | .004 | .001 | .006 |
| Chest/stomach | 3550 | .089 | .089 | .022 | .013 |
| Back | 3550 | .022 | .022 | .022 | .022 |
| Upper arm | 2910 | .11 | .073 | .018 | .073 |
| Forearm | 1210 | .091 | .076 | .061 | .076 |
| Hand | 820 | 9.49 | 5.29 | 1.52 | 7.24 |
| Thigh | 3820 | .096 | .096 | .024 | .19 |
| Lower leg | 2380 | .015 | .18 | .015 | .030 |
| Feet | 1310 | .008 | .098 | .008 | .016 |
| Total dermal exposure | | 9.94 | 5.94 | 1.70 | 7.68 |
| Inhalation exposure | | .009 | .019 | .009 | .009 |
| Total exposure (mg) | | 9.95 | 5.96 | 1.71 | 7.68 |
| Dermal exposure(mg/lb ai) | | 2.21 | 1.32 | .38 | 1.71 |
| Inhalation exposure (mg/lb ai) | | .002 | .004 | .002 | .002 |

(a) Totally unprotected.

(b) Corrected for recovery.

(c) Includes face area.

Table 22: APPLICATOR Total Potential Exposure[a]

Site 1 Broken Sound Golf Course - East Boca Raton, Florida

Equipment: 15' ground boom

Total lb ai applied: 9.0

| Body Area | Body Surface Area ($cm^2$) | Corrected Exposure (mg)[b] APP-1 | APP-2 | APP-3[c] | APP-4[c] |
|---|---|---|---|---|---|
| Head[d] | 1300 | .050 | .082 | .050 | .066 |
| Face | 650 | --- | --- | --- | --- |
| Back of neck | 110 | .0007 | .003 | .004 | .039 |
| Front of neck | 150 | .006 | .009 | .0009 | .004 |
| Chest/stomach | 3550 | .13 | .22 | .022 | .090 |
| Back | 3550 | .022 | .090 | .13 | 1.26 |
| Upper arm | 2910 | .22 | .15 | .074 | .15 |
| Forearm | 1210 | .061 | .12 | .031 | .061 |
| Hand | 820 | 4.49 | 1.54 | .60 | .98 |
| Thigh | 3820 | .39 | .44 | .097 | .24 |
| Lower leg | 2380 | .03 | .15 | .03 | .21 |
| Feet | 1310 | .017 | .083 | .017 | .12 |
| Total dermal exposure | | 5.42 | 2.89 | 1.06 | 3.22 |
| Inhalation exposure | | .007 | .007 | .004 | .004 |
| Total exposure | | 5.42 | 2.89 | 1.06 | 3.22 |
| Dermal exposure (mg/lb ai) (with tank mix correction) | | .64 | .35 | .13 | .41 |
| Inhalation exp. (mg/lb ai) (with tank mix correction) | | .0008 | .0008 | .0005 | .0005 |

(a) Totally unprotected.

(b) Corrected for recovery.

(c) Female applicator.

(d) Includes face area.

Table 23: APPLICATOR Total Potential Exposure[a]

Site 2 Broken Sound Golf Course - West Boca Raton, Florida

Equipment: 16' ground boom

Total lb ai applied: 4.5

| Body Area | Body Surface Area ($cm^2$) | Corrected Exposure (mg)[b] APP-5 | APP-6 | APP-7 | APP-8 |
|---|---|---|---|---|---|
| Head[c] | 1300 | .007 | .007 | .027 | .053 |
| Face | 650 | --- | --- | --- | --- |
| Back of neck | 110 | .0006 | .0006 | .0006 | .003 |
| Front of neck | 150 | .0008 | .006 | .002 | .003 |
| Chest/stomach | 3550 | .018 | .14 | .036 | .072 |
| Back | 3550 | .018 | .018 | .018 | .11 |
| Upper arm | 2910 | .015 | .015 | .18 | .33 |
| Forearm | 1210 | .025 | .074[d] | .062 | .14 |
| Hand | 820 | .017 | .479 | .31 | .581 |
| Thigh | 3820 | .019 | .18[d] | .43 | .078 |
| Lower leg | 2380 | .19 | .27[d] | .41 | .22 |
| Feet | 1310 | .11 | .15[d] | .23 | .12 |
| Total dermal exposure | | .42 | 1.34 | 1.71 | 1.71 |
| Inhalation exposure | | .008 | .008 | .008 | .008 |
| Total exposure | | .43 | 1.35 | 1.71 | 1.72 |
| Dermal exposure (mg/lb ai) (with tank mix correction) | | .15 | .45 | .37 | .53 |
| Inhalation exp. (mg/lb ai) (with tank mix correction) | | .003 | .003 | .002 | .002 |

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(a) Totally unprotected.

(b) Corrected for recovery.

(c) Includes face area.

(d) The reported value was considered to be an outlier. The average value for this body area and site was used.