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MEMORANDUM

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This memo updates the occupational post-application risk calculations already examined in past HED documents [D296595, D355152, D333957, D262366, D268141, D277160] using recently updated hazard information for phosmet. Non-occupational exposures to harvesting ("pick-your-own") are also assessed in this document with the updated hazard information for phosmet. While there is potential for non-occupational (i.e., residential) exposure to phosmet via entry into commercially treated orchards/fields, there are no currently registered residential uses of phosmet, *per se*.

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1. Executive Summary

Phosmet, an organophosphate insecticide first registered in 1966, is currently used on a variety of orchard fruits, berries, nuts, and other crops. In connection with the Federal Insecticide, Fungicide and Rodenticide Act (FIFRA) reregistration requirements and the Federal Food, Drug, and Cosmetic Act (FFDCA) tolerance reassessment processes, EPA issued an Interim Reregistration Eligbility Decision (IRED) for phosmet in October 2001. The Agency has reviewed additional toxicological information submitted by the registrant and incorporated that information into evaluating occupational and non-occupational post-application exposure after application of phosmet to nine "time-limited" registrations identified in the Special Review and Registration document "Reregistration Decision on Nine Phosmet Time-Limited Uses."

The toxicology database is adequate to assess risk for phosmet, although it is not complete. The outstanding components include: 1) the gestational component of the comparative cholinesterase study and 2) an immunotoxicity study. Phosmet is acutely toxic *via* the oral and inhalation routes of exposure, and is in category III for acute dermal toxicity. It is non-irritating to the skin, and is not an eye irritant in the rabbit. The predominant effects seen in various toxicity studies on phosmet are those associated with cholinesterase inhibition [plasma, red blood cell, and brain] that occurs following all routes and durations of exposure. No effects were detected in a functional observational battery or motor activity assessment in the acute and subchronic neurotoxicity studies in rats. Based on a weight-of evidence evaluation of the mutagenicity and carcinogenicity data for phosmet, there is suggestive evidence of carcinogenicity but not sufficient to assess human carcinogenic potential.

Three acute points of departure (PoDs) were selected for the non-occupational (i.e., residential) exposure assessment to address separate population subgroups potentially exposed to phosmet through "pick your own" activities in tree fruit orchards and blueberry fields: 1) females 13-49; 2) infants and children; and 3) the general population. For females 13-49 and the general population, the PoD was selected based on adult RBC cholinesterase inhibition observed in an acute oral Comparative Cholinesterase Assay (CCA). For infants and children, the PoD was selected, based on pup brain cholinesterase inhibition observed in the same study. The 10X FQPA safety factor was retained as a database uncertainty factor for females 13-49 because of lack of the gestational component of the CCA study. The factor was removed for the other two population subgroups. Since the dermal endpoints are based on an oral study, a 10% dermal absorption factor and a 4.5X in vitro dermal correction factor were applied to correct for relative dermal to oral absorption, and relative rat and human skin penetration, respectively.

For the occupational dermal exposure assessments (short- and intermediate-term), the 7-day repeat dose comparative cholinesterase assay was selected based on adult RBC cholinesterase inhibition. Since the dermal endpoints are based on an oral study, both the 10% dermal absorption factor and a 4.5X in vitro dermal correction factor were applied.

A refined non-occupational post-application exposure assessment was conducted for the "pick your own" scenarios for the nine crop groups addressed in this risk assessment. The exposure assessment addresses adult and youth exposure. HED identified risks of concern for females 13-49 for all of the "pick your own" scenarios assessed; MOEs were all above 100, but below the target of MOE of 1000 (FQPA safety factor retained). No risk concerns were identified for other two population subgroups (i.e., all MOEs exceed the level of concern).

A refined occupational post-application exposure assessment was conducted to address the nine phosmet "time-limited" uses identified in the SRRD decision document. The risk estimates are of concern (i.e., MOEs are below the LOC of 100) in all of the "very high" activity grouping at the current[1] re-entry intervals (REIs). Typical activities for the "very high" activity grouping include workers thinning fruit trees and cane turning/girdling grapes. REIs must be lengthened significantly to achieve the target MOE of 100.

The risk estimates are of concern at the current REIs for every post-application activity scenario in the "high" activity grouping for both exposure durations, except for apples east of the Rocky Mountains and blueberries. Typical activities for the "high" activity pattern include workers harvesting deciduous tree fruits. REIs must generally be lengthened significantly to achieve the target MOE of 100. When harvesting activities are considered at the pre-harvest interval (PHI), the risk estimates are of concern (i.e., MOEs are below the LOC of 100) for apples/pears west of the Rocky Mountains and apples east of the Rocky Mountains.

For the "low" exposure activity grouping risks are of concern only for apples (everywhere) and for pears (West of the Rockies only). Typical activities in this activity grouping include irrigation and scouting.

There are no risks of concern in the "very low" exposure activity grouping.

Potential areas of environmental justice concerns, to the extent possible, were considered in this human health risk assessment, in accordance with U.S. Executive Order 12898, "Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations," http://www.eh.doe.gov/oepa/guidance/justice/eo12898.pdf).

This assessment relies in part on data from studies in which adult human subjects were intentionally exposed to a pesticide. These studies have received the appropriate ethical review for use in risk assessment.

[1] As specified in the final regulatory decision and mitigation of the January, 2007 SRRD document, "Reregistration Decisions on Nine Phosmet "Time-Limited" Uses.

2. Hazard Characterization/Assessment

2.1. Database Summary

The toxicology database is adequate to assess risk for phosmet although two studies remain outstanding. Toxicological studies evaluated for use in this risk assessment include subchronic oral toxicity studies (rat, mouse and dog), subchronic dermal toxicity studies (rat), acute and subchronic neurotoxicity studies (rat), a two-generation reproduction study (rat), prenatal developmental toxicity studies (rats and rabbits), an acute time of peak cholinesterase depression study in neonatal postnatal day (PND 11) rats, an acute dose relative sensitivity study in neonatal and young adult rats, an oral repeat dose relative sensitivity study in neonatal and young adult rats, a chronic dog study, combined chronic/carcinogenicity studies in rats and mice, a battery of mutagenicity studies, a dermal absorption study in rats, an *in vitro* rat and human skin absorption study, and a metabolism study in rats.

All submitted toxicity data on phosmet have been reviewed by the Agency and incorporated as appropriate into the most recent decisions regarding regulatory endpoints. However, the toxicology database for phosmet is not complete. The gestational component of the Comparative Cholinesterase (CCA) study remains outstanding. Additionally, as specified in the revised 40 CFR Part 158 data requirements, an immunotoxicity study on phosmet is a data requirement (see phosmet Registration Review document for additional information; D364685). There were sufficient studies to select endpoints for post-application worker risks and non-occupational harvester "pick-your-own" assessments.

2.2. Toxicological Effects and Metabolism

Toxicological Effects

Phosmet is acutely toxic *via* the oral and inhalation routes of exposure (Toxicity Category II and I, respectively), and is in category III for acute dermal toxicity. It is non-irritating to the skin, and is not an eye irritant in the rabbit.

Phosmet is an organophosphate insecticide. The predominant effects seen in various toxicity studies on phosmet are those associated with cholinesterase inhibition [plasma, red blood cell (RBC), and brain] that occurs following all routes and durations of exposure. Phosmet produces the associated clinical signs, including tremors, shaking, unsteady gait, subdued mood, decreased activity, salivation, muscle weakness, convulsions in rats and rabbits (2-generation reproduction study in rats and developmental toxicity studies in rats and rabbits), and decreased cholinesterase activity in rats, mice, and dogs following acute, subchronic, and chronic exposures. In the acute and subchronic neurotoxicity studies, significant cholinesterase inhibition is observed in the absence of clinical signs of cholinesterase inhibition.

Phosmet does not cause neurological changes indicative of delayed neurotoxicity in the hen, and there is no evidence of neuropathology in any of the subchronic or chronic studies. No treatment-related effects are observed in the functional observational battery (FOB) parameters or on motor activity in the acute and subchronic neurotoxicity studies

in rats, and neuropathology is not observed in either study, although effects were observed in other studies. Phosmet did not produce developmental or reproductive toxicity in the guideline studies, and there was no indication of an increased sensitivity of offspring in rats or rabbits in guideline studies following prenatal and/or postnatal exposure to phosmet. In all of these guideline studies, maternal or parental NOAELs are lower or equivalent to the offspring NOAELs. The earlier guideline studies do not measure cholinesterase activity, and the Agency required comparative cholinesterase assays to be performed. In those recently submitted direct-dosing, acute oral and repeat oral comparative cholinesterase studies, a 4-fold sensitivity (based on NOAELs) was observed in the postnatal day 11 (PND 11) rat pups compared to the young adult rats.

Metabolism
Following oral administration, phosmet is rapidly absorbed in the gastrointestinal tract, metabolized, and eliminated in the urine and feces; most of the radioactivity was eliminated in the urine within 24 hours of dosing. Very low levels of radioactivity (corresponding to less than 1% of the administered dose) were found in all tissues; radioactivity was higher in liver and whole blood, and lowest in fat and bone. Phosmet does not bioaccumulate. Metabolites identified in the urine consisted of phthalamic acid conjugates; there was unidentified radioactivity in both the urine and the feces, but there was no attempt to determine if phosmet *per se* was present.

Phosmet requires metabolic activation to the oxon. The oxon is the active cholinesterase inhibiting metabolite of most organophosphate compounds that require metabolic activation. The phosmet oxon is included in the tolerance expression, but oxon residues, when detected, are generally an order of magnitude lower than parent residues. There are no toxicological data available on this phosmet metabolite.

2.3. Dermal Absorption

An acceptable dermal absorption study (MRID 40122201) conducted in rats indicates a dermal absorption factor of 10% for phosmet. The *in vitro* dermal penetration study (MRID 47262501) provides a comparison of permeability between rat and human skin, and showed rat skin to be 4.5X more permeable to phosmet than human skin. To account for differences in permeability between rat and human skin, the data from the *in vitro* dermal penetration study on phosmet and the rat *in vivo* dermal absorption study on phosmet were applied to the oral point of departure (PoD) to obtain the human equivalent dermal dose for the short- and intermediate-term dermal risk assessments.

2.4. Carcinogenic Potential

In the mouse carcinogenicity study, phosmet causes increases in liver carcinomas/ adenomas in males and increased mammary gland tumors in females. Phosmet is not carcinogenic in rats. Phosmet is considered to cause direct effects on DNA *in vitro*, inducing mutations in bacteria and mammalian cells in the absence of exogenous metabolic activation. In the *in vivo* systems, there is no evidence of a mutagenic effect. Overall, the data indicate that phosmet has intrinsic mutagenic potential that is not expressed in whole animals. Based on a weight-of evidence evaluation of the mutagenicity and carcinogenicity data for phosmet, there is suggestive evidence of carcinogenicity but not sufficient to assess human carcinogenic potential.

2.5. FQPA Considerations

The decision to remove the 10X factor relative to hazard considerations in the initial phosmet assessment (D262365; 2/9/00) was made based on having a complete toxicity database, which was thought to allow reasonable understanding in predicting possible effects on infants and children, and the lack of increased susceptibility in the fetuses and/or pups in the developmental and reproduction studies. This decision has since been modified given a reassessment of the available toxicological information, as discussed below.

A requirement for a developmental neurotoxicity study (DNT) was issued for all organophosphate pesticides (OPs) in August, 1999. In response to a request for a waiver of the DNT, the Agency agreed that the submission of comparative cholinesterase assay (CCA) data to evaluate comparative sensitivity in juvenile and adult rats would be considered, and the requirement for the DNT was reserved. Typically for the OPs, the CCA includes the following components: (1) Repeat-dose, gestational dosing of pregnant dams followed by sacrifice at gestational day 20. Brain and blood cholinesterase activity is measured in dams and fetuses. (2) Acute, single-dose direct dosing to postnatal day (PND) 11 and young adult rats. Brain and blood cholinesterase activity is measured in PND 11 pups and adult rats. (3) Repeated, direct dosing to juvenile rats (PND11-21) and young adult rats. Brain and blood cholinesterase activity is measured in PND 21 pups and adult rats.

In both of the comparative cholinesterase studies (acute and repeat) submitted on phosmet to date, a 4-fold sensitivity (based on NOAELs) was observed in the postnatal day 11 (PND 11) rat pups compared to the young adult rats. The CCA study for phosmet did not include the gestational component.

For females 13-49, the 10X FQPA safety factor is retained for the lack of the gestational component of the comparative cholinesterase assay. For the population subgroups infants and children and general population (excluding females 13-49), the FQPA safety factor is removed because the database for these subpopulations is complete and the point of departure for each is based on the acute CCA study for the respective age groups.

2.6. Toxicity Endpoint Selection and Levels of Concern

A summary of the toxicological endpoints and PoDs selected for this phosmet risk assessment may be found in Table 1. Benchmark dose (BMD) modeling was used to select point of departures for occupational and non-occupational risk assessment. The $BMDL_{10}$, which is the lower 95% confidence limit on the estimated mean brain ChE inhibition 10% effect level, was used to evaluate risk.

Prior to submission of the repeat dose comparative cholinesterase study, HED made revisions to the occupational post-application exposure and risk calculations for phosmet (2/17/09). At that time, new dermal endpoints and points of departure were selected for the short- and intermediate-term dermal exposure scenarios using the subchronic oral neurotoxicity (SCN) study in rats (MRID 44811801) as the primary study, supported by

the MPI 21-day dermal study in rats (MRID 44795801) as co-critical. The new 21-day dermal toxicity study (MRID 47262502) in rats and an *in vitro* comparative dermal penetration study (MRID 47262501) in rat and human skin, and the acute dose comparative cholinesterase assay on phosmet, were considered in the 2/17/09 assessment.

Following the submission of the repeat dose comparative cholinesterase study, new dermal and inhalation endpoints and new points of departure (PoD) were again revised for the occupational dermal and inhalation exposure scenarios. Additionally, dermal and inhalation endpoints and points of departure have been selected for non-occupational/ non-dietary uses (pick-your-own). The pick-your-own assessment addresses three separate population subgroups (females 13-49; infants and children; and general population).

2.6.1. Non-Occupational (Acute) Dermal and Inhalation

Dermal and Inhalation Exposure (acute) (Females 13-49 years old):
Study Selected: acute oral comparative cholinesterase assay – rat
MRID No.: 47087401
Executive Summary: See Appendix B
Dose and Endpoint for Risk Assessment: $BMDL_{10}$ = 3.56 mg/kg/day based on adult RBC cholinesterase inhibition with an estimated BMD_{10} of 7.092 mg/kg/day. The $BMDL_{10}$ is the lower 95% confidence limit on the estimated mean 10% brain ChE inhibition.
Uncertainty Factor(s): 1000X (10 interspecies; 10X intraspecies; 10X FQPA safety factor retained for females 13-49 for the lack of the gestational component of the comparative cholinesterase assay).

Dermal and Inhalation Exposure (acute) (general population, excluding infants and children and females 13-49):
Study Selected: acute oral comparative cholinesterase assay – rat
MRID No.: 47087401
Executive Summary: See Appendix B
Dose and Endpoint for Risk Assessment: $BMDL_{10}$ = 3.56 mg/kg/day, based on adult RBC cholinesterase inhibition with an estimated BMD_{10} of 7.092 mg/kg/day. The $BMDL_{10}$ is the lower 95% confidence limit on the estimated mean 10% brain ChE inhibition.
Uncertainty Factor(s): 100X (10 interspecies; 10X intraspecies; 1X FQPA).

Dermal and Inhalation Exposure (acute) (infants and children):
Study Selected: acute oral comparative cholinesterase assay – rat
MRID No.: 47087401
Executive Summary: See Appendix B
Dose and Endpoint for Risk Assessment: $BMDL_{10}$ = 1.2 mg/kg/day (infants and children), based on female PND 11 pup brain cholinesterase inhibition with an estimated BMD_{10} of 1.9 mg/kg/day. The $BMDL_{10}$ is the lower 95% confidence limit on the estimated mean 10% brain ChE inhibition.
Uncertainty Factor(s): 100X (10 interspecies; 10X intraspecies; 1X FQPA).

Comments about Study/Endpoint/Uncertainty Factors: The study provides the age group specific NOAEL for the endpoint of concern (cholinesterase inhibition). The acute oral CCA study was considered appropriate for these assessments since the "pick your own" scenario is considered to be an acute exposure scenario. The executive summary of the acute oral comparative cholinesterase assay may be found in Appendix B of this document. Since the dermal exposure endpoints are based on an oral study, both a 10% dermal absorption factor and a 4.5X *in vitro* dermal correction factor were applied (see section 2.3).

For females 13-49 and the general population (excluding infants and children), the PoD $BMDL_{10}$ of 3.56 mg/kg/day was selected, based on adult RBC cholinesterase inhibition with an estimated BMD_{10} of 7.092 mg/kg/day. The FQPA safety factor of 10X is retained for females 13+ for the lack of the gestational component of the comparative cholinesterase assay. The FQPA factor protects women of child-bearing age and/or the developing fetus. For infants and children, the PoD $BMDL_{10}$ of 1.2 mg/kg/day was selected, based on female PND 11 pup brain cholinesterase inhibition with an estimated BMD_{10} of 1.9 mg/kg/day. The FQPA safety factor was removed because the outstanding study, which is the basis for retaining the factor for other subpopulations, is not pertinent for this subpopulation; i.e., the database for this subpopulation is complete. Since the dermal exposure scenarios are based on an oral study, for the dermal assessments, both a 10% dermal absorption factor and a 4.5X *in vitro* dermal correction factor are applicable.

2.6.2. Occupational Exposure (Short-and Intermediate-term) Dermal and Inhalation

Study Selected: 7-day repeat oral comparative cholinesterase assay – rat
MRID No.: 47695401
Executive Summary: See Appendix B
Dose and Endpoint for Risk Assessment: $BMDL_{10}$ = 0.6 mg/kg/day, based on adult RBC cholinesterase inhibition with an estimated BMD_{10} of 1.19 mg/kg/day. The $BMDL_{10}$ is the lower 95% confidence limit on the estimated mean 10% brain ChE inhibition.
Uncertainty Factor(s): 100X (10 interspecies; 10X intraspecies; FQPA not applicable).

Comments about Study/Endpoint/Uncertainty Factors: The study provides the NOAEL for the endpoint of concern (cholinesterase inhibition). The 7-day repeat oral dose CCA study was considered appropriate to use for the short- and intermediate-term occupational exposure scenarios without any additional uncertainty factor for extrapolating from short- to intermediate-term exposures. A comparison of the BMD_{10}/$BMDL_{10}$'s across all studies/durations (subchronic neurotoxicity studies (3- and 13-weeks), chronic toxicity study (6 months), and repeat 7-day CCA studies) showed that the BMD_{10} and $BMDL_{10}$ for RBC and brain cholinesterase data, were similar within a 2-fold range (i.e., there is no significant increase in cholinesterase (ChE) inhibition with increasing duration). The executive summary of the 7-day repeat oral dose comparative cholinesterase assay may be found in Appendix B of this document. Since the dermal exposure scenarios are based on an oral study, for the dermal assessments, both a 10% dermal absorption factor and a 4.5X *in vitro* dermal correction factor were applied (see section 2.3).

For the occupational dermal and inhalation risk assessments (short- and intermediate-term), the PoD selected was the $BMDL_{10}$ of 0.6 mg/kg/day, based on adult RBC cholinesterase inhibition with an estimated BMD_{10} of 1.19 mg/kg/day. Since the dermal endpoints are based on an oral study, both a 10% dermal absorption factor and a 4.5X in vitro dermal correction factor were applied.

Table 1. Summary of Toxicological Doses and Endpoints for Phosmet for Use in Human Health Risk Assessments

Endpoint Scenario	PoD (mg/kg/day)	UF	LOC (mg/kg/day)	Study and Endpoint
Non-Occupational, Non-Dietary				
Dermal & Inhalation (females 13+) (Acute) *[only dermal endpoint is relevant in this assessment]*	$BMDL_{10}$ = 3.56 - 10% dermal absorption - 4.5X *in vitro* dermal correction factor - inhalation hazard assumed to be equivalent to oral hazard	UF_A 10x UF_H 10x UF_{DB}/FQPA SF = 10x	Non-occupational LOC for MOE ≤ 1000	Acute oral CCA – rat MRID 47087401 BMD_{10} = 7.092 mg/kg (RBC ChEI)
Dermal & Inhalation (infants and children) (Acute) *[only dermal endpoint is relevant in this assessment]*	$BMDL_{10}$ = 1.2 - 10% dermal absorption - 4.5X *in vitro* dermal correction factor - inhalation hazard assumed to be equivalent to oral hazard	UF_A 10x UF_H 10x	Non-occupational LOC for MOE ≤ 100	Acute oral CCA – rat MRID 47087401 BMD_{10} = 1.9 mg/kg (female PND 11 brain ChEI)

Table 1. Summary of Toxicological Doses and Endpoints for Phosmet for Use in Human Health Risk Assessments				
Endpoint Scenario	**PoD (mg/kg/day)**	**UF**	**LOC (mg/kg/day)**	**Study and Endpoint**
Dermal & Inhalation (general pop, **excluding** infants and children and females 13+) (Acute) *[only dermal endpoint is relevant in this assessment]*	$BMDL_{10}$ = 3.56 - 10% dermal absorption - 4.5X *in vitro* dermal correction factor - inhalation hazard assumed to be equivalent to oral hazard	UF_A 10x UF_H 10x	Non-occupational LOC for MOE ≤ 100	Acute oral CCA – rat MRID 47087401 BMD_{10} = 7.092 mg/kg (RBC ChEI)
Occupational				
Dermal & Inhalation (Short- and Intermediate-Term) *[only dermal endpoint is relevant in this assessment]*	Oral $BMDL_{10}$ = 0.6 - 10% dermal absorption - 4.5X *in vitro* dermal correction factor - inhalation hazard assumed to be equivalent to oral hazard	UF_A 10x UF_H 10x	Occupational LOC for MOE ≤ 100	7-day repeat CCA – rat MRID 47695401 BMD_{10} = 1.19 mg/kg/day (adult RBC ChEI; grouped)

CCA is Comparative Cholinesterase Assay.
BMD is Bench Mark Dose Analysis

2.7. Endocrine Disruption

EPA is required under the FFDCA, as amended by FQPA, to develop a screening program to determine whether certain substances (including all pesticide active and other ingredients) *"may have an effect in humans that is similar to an effect produced by a naturally occurring estrogen, or other such endocrine effects as the Administrator may designate."* Following the recommendations of its Endocrine Disruptor Screening and Testing Advisory Committee (EDSTAC), EPA determined that there were scientific bases for including, as part of the program, androgen and thyroid hormone systems, in addition to the estrogen hormone system. EPA also adopted EDSTAC's recommendation that the Program include evaluations of potential effects in wildlife. When the appropriate screening and/or testing protocols being considered under the Agency's Endocrine Disrupter Screening Program (EDSP) have been developed and vetted, phosmet may be subjected to additional screening and/or testing to better characterize effects related to endocrine disruption.

3. Dietary Exposure/Risk Characterization

The scope of this document is to examine occupational and non-occupational post-application exposure to the nine "time-limited" uses identified in the SRRD document, "Reregistration Decision on Nine Phosmet "Time-Limited" Uses". Therefore, no dietary

risk assessment is required in this document. An update on the most recent phosmet dietary risk assessment can be found in:

- Phosmet Human Health Assessment Scoping Document in Support of Registration Review. May 19, 2009. D364685.

4. Non-occupational Post-application Exposure Scenarios: "Pick Your Own"

4.1. Non-occupational Post-application Exposure and Risk

A refined non-occupational post-application exposure assessment was conducted for the "pick your own" scenarios to address risk for the general public entering commercial orchards or blueberry fields to picks fruits that have been previously treated with phosmet. This assessment (and the residential exposure SOPs on which the assumptions are based) assumes that "pick your own" facilities are commercial farming operations that allow public access for fruit harvesting in large-scale fields treated with commercially labeled pesticides. In this document, the Agency is calculating the number of days after application at which risks to adults and youths would be not of concern (i.e.- MOEs≥LOC) when harvesting fruit in phosmet treated commercial orchards and fields. "Pick-your-own" scenarios are expected to be episodic in nature for the general public and are assessed using an acute point of departure. Eight of the nine crops given "time-limited" registrations in the October 2001 phosmet IRED are included here; the Office of Pesticide Program's Biological and Economic Analysis Division (BEAD) provided information that grapes generally do not have "pick-your-own" operations and are not included in this assessment.

The "pick your own" scenarios address post-application dermal exposure to the general public entering into "pick your own" commercial orchards. Inhalation exposures are not typically calculated for residential post-application scenarios because inhalation exposures generally account for a negligible percentage of the overall body burden for most pesticide chemicals. Additionally, phosmet has a relatively low vapor pressure of 3.72×10^{-7} mm Hg at 25°C and inhalation exposure from revolatilization is not expected to be a significant contributor for non-occupational post-application risk.

4.2. Non-occupational Post-application Exposure Scenarios and Calculation Methods

4.2.1. Data Used for Non-Occupational Post-application Exposure Scenarios

For the "pick your own" post-application exposure scenarios, chemical-specific transfer coefficients generated in a residential dermal exposure study (MRID 40122301) were used; an adjustment was made for the differences in body surface areas for youth and adults, based on information found in the *Draft SOPs for Residential Exposure Assessment*. The transfer coefficients were calculated in accordance with the draft *Series 875-Occupational and Residential Exposure Test Guidelines, Group B-Post-application Exposure Monitoring Test Guidelines.*

4.2.2. Exposure Assumptions, Factors and Transfer Coefficients

The following assumptions, factors and transfer coefficients were used for calculating non-occupational risk estimates:

- Three separate points of departure (PoDs) for three population subgroups have been identified for the "pick your own" exposure scenarios:
  - Females 13-49 - $BMDL_{10}$ of 3.56 mg/kg/day (LOC = 1000)
  - Infants and children – $BMDL_{10}$ = 1.2 mg/kg/day (LOC = 100)
  - General population (excluding infants and children and females 13-49) – $BMDL_{10}$ = 3.56 mg/kg/day (LOC = 100)
- A 10% dermal absorption factor was used to account for the relative oral vs. dermal absorption since the PoD was selected from an oral study.
- A 4.5X factor was used to correct for the differences in permeability between the rat and human skin.
- Body weights for adults and youths were 70 kg and 39.1 kg, respectively per HED's Standard Operating Procedures for Residential Exposure Assessment.
- The residential "pick your own" SOP dictates 4 hours of exposure for adults and 2 hours of exposure for youth (age 10-12 years) based on the 50th percentile values for time spent outdoors at a farm (U.S. EPA, 1996) specified in HED's Residential SOPs.
- Maximum application rates were used to calculate "pick your own" post-application risk estimates for adults and youths.
- All deciduous tree crop data is extrapolated from the pear dislodgeable foliar residue (DFR) data (MRID 40425301) and vine trellis (highbush blueberry) crops are extrapolated from grape DFR data (MRID 404253-01) and used in the Phosmet IRED.
- Deciduous tree crop transfer coefficients are derived from a residential dermal exposure study (MRID 40122301) used in the Phosmet IRED and vine/trellis (highbush blueberry) crops reflect exposure estimates using the modified ARTF blueberry harvesting transfer coefficient in order to reflect residential clothing.
- It is assumed that clothing used by adults and youths during "pick your own" activities includes shorts, and a tee-shirt, as opposed to the long pants and long-sleeved shirt assumed in the occupational post-application assessment.

4.2.3. Non-occupational Post-application Exposure and Risk Estimates

An MOE summary is presented below for each application scenario considered. MOE values are presented in the summary for the day of application and the day where the risks do not exceed the Agency's level of concern at the exposure durations specified in the *Draft Residential SOPs*. These calculated risk estimates for episodic "pick your own" activities by the general public summarized below in Section 3.2.5. Additional details of the risk calculations are presented in Appendix C.

The hazard identification section identifies three points of departure for assessing "pick your own" exposure and risk estimates: 1) 3.56 mg/kg/day for assessing females 13-49, 2) 1.2 mg/kg/day for assessing infants and children, and 3) 3.56 mg/kg/day used to assess

the hazard to the general population. The "pick your own" exposure scenario assesses risk estimates to adults and youths, and the following table summarizes the risk assessment conducted for the "pick your own" exposure scenarios and the level of concern (LOC) for each assessment conducted. Table 2 (below) provides a summary connecting the relevant endpoints and levels of concern for that assessment. Section 2 of this document provides additional information about the endpoints, points of departure, and levels of concern associated with the phosmet risk assessment.

Table 2 – Non-Occupational Post-application Exposure Scenarios			
Subpopulation	**Adult Exposure Scenario**	**Youth Exposure Scenario**	**Level of Concern (LOC) in Risk Assessment**
Females 13-49 Endpoint	Yes	N/A	1000
General Population (excluding females 13+ & infants and children) Endpoint	Yes	N/A	100
Infants/Children Endpoint	N/A	Yes	100

4.2.4. Summary of Non-occupational Post-application Risk Concerns and Data Gaps

Table 3 (below) provides a summary of the risk estimates for non-occupational "pick your own" exposure assessment. Complete non-occupational "pick your own" risk estimates are available in Appendix C.

Three acute points of departure (PoDs) were selected for the non-occupational (residential) exposure assessment to address separate population subgroups [potentially exposed to phosmet through "pick-your-own" activities in tree fruit orchards and blueberry fields]: 1) females 13-49; 2) infants and children; and 3) the general population (except females 13-49). HED identified risks of concern for females 13-49 for all of the "pick your own" scenarios assessed; MOEs for those scenarios were all above 100, but below the LOC of 1000. The level of concern includes a 10X FQPA safety factor in addition to the standard 10X factors for inter-and intra-species sensitivities. No risk concerns were identified for other population groups (i.e., all MOEs exceed the level of concern).

Table 3 – Acute Exposure Duration Risk Estimates for PYO Activities			
Information Summary	Endpoint for Females 13+	Endpoint for General Population	Endpoint for Infants and Children
	Adults Harvesting PYO Pears (at 4 lb ai/acre):		**Youth-Aged Children Harvesting PYO Pears (at 4 lb ai/acre):**
Day 0 MOE	**120**	140	100
MOE @ PHI (7 days)	**190**	220	170

Table 3 – Acute Exposure Duration Risk Estimates for PYO Activities			
MOE @ restriction in January, 2007 Decision document (14 days)	**300**	350	260
Days after application until MOE>LOC	From Day 0: 33 From PHI: 26 From 1/07 restriction: 19	MOE ≥ LOC on Day 0	MOE ≥ LOC on Day 0
	Adults Harvesting Apples On The West Coast (at 4 lb ai/acre):		**Youth-Aged Children Harvesting Apples On The West Coast (at 4 lb ai/acre):**
Day 0 MOE	**120**	140	100
MOE @ PHI (7 days)	**190**	220	170
MOE @ restriction in January, 2007 Decision document (14 days)	**300**	350	260
Days after application until MOE>LOC	From Day 0: 33 From PHI: 26 From 1/07 restriction: 19	MOE ≥ LOC on Day 0	MOE ≥ LOC on Day 0
	Adults Harvesting Apples (Eastern) (at 1.5 lb ai/acre):		**Youths Harvesting Apples (Eastern) (at 1.5 lb ai/acre):**
Day 0 MOE	**320**	370	280
MOE @ PHI (7 days)	**500**	590	440
MOE @ restriction in January, 2007 Decision document (14 days)	**800**	940	710
Days after application until MOE>LOC	From Day 0: 18 From PHI: 11 From 1/07 restriction: 4	MOE ≥ LOC on Day 0	MOE ≥ LOC on Day 0
	Adults Harvesting Peaches & Nectarines (at 3 lb ai/acre):		**Youth-Aged Children Harvesting Peaches & Nectarines (at 3 lb ai/acre):**
Day 0 MOE	**160**	190	140
MOE @ PHI (14 days)	**400**	470	350
MOE @ restriction in January, 2007 Decision document (14 days)	**400**	470	350
Days after application until MOE>LOC	From Day 0: 28 From PHI / 1/07 restriction: 14	MOE ≥ LOC on Day 0	MOE ≥ LOC on Day 0
	Adults Harvesting Apricots (at 3 lb ai/acre):		**Youth-Aged Children Harvesting Apricots (at 3 lb ai/acre):**
Day 0 MOE	**160**	190	140
MOE @ PHI (14 days)	**400**	470	350

Table 3 – Acute Exposure Duration Risk Estimates for PYO Activities			
MOE @ restriction in January, 2007 Decision document (14 days)	**400**	470	350
Days after application until MOE>LOC	From Day 0: 28 From PHI: 14 From 1/07 restriction: 14	MOE ≥ LOC on Day 0	MOE ≥ LOC on Day 0
	Adults Harvesting Plums/Prunes (at 3 lb ai/acre):		**Youth-Aged Children Harvesting Plums/Prunes (at 3 lb ai/acre):**
Day 0 MOE	**160**	190	140
MOE @ PHI (7 days)	**250**	290	220
MOE @ restriction in January, 2007 Decision document (14 days)	**400**	470	350
Days after application until MOE>LOC	From Day 0: 28 From PHI: 21 From 1/07 Decision document: 14	MOE ≥ LOC on Day 0	MOE ≥ LOC on Day 0
	Adults Harvesting Highbush Blueberries (at 1 lb ai/acre):		**Youth-Aged Children Harvesting Highbush Blueberries (at 1 lb ai/acre):**
Day 0 MOE	**710**	820	620
MOE @ PHI (3 days)	**870**	1000	760
MOE @ restriction in January, 2007 Decision document (N/A)	N/A	N/A	N/A
Days after application until MOE>LOC	From Day 0 : 6 From PHI: 4 From 1/07 restriction: N/A	MOE ≥ LOC on Day 0	MOE ≥ LOC on Day 0

+ Bolded MOEs are of concern (i.e., MOEs<100 or 1000, depending on endpoint selected). See Table 2 for relevant LOCs.

4.2.5. Non-Occupational Post-application Risk Characterization

The "pick-your-own" scenario was originally developed to assess exposure and risk estimates for the general public entering commercial strawberry fields during "pick your own" fruit harvesting. The approach used in this SOP was used to calculate risks for "pick-your-own" operations for tree fruit and highbush blueberry crops using transfer coefficients appropriate for those activities. The amount of time assessed for "pick your own" operations has not been scaled for fruit size (i.e.- the same amount of time has been assessed for picking relatively large fruits like apples and smaller fruits like blueberries). It is a reasonable assumption that during "pick your own" operations, more time is spent picking blueberries and similar small fruits than larger fruits like apples.

Non-occupational post-application exposures were calculated based on the crop type (i.e.- pear, grape, and blueberry) and the harvesting activity. Chemical-specific post-application exposure and concurrent dislodgeable foliar residue data were generated for "pick your own" scenarios. The activities simulated in this study included pear harvest and tree maintenance. These data were used to develop dermal transfer coefficients for adults and children engaged in fruit tree maintenance activities. The pear exposure study was conducted in a manner that represents a person wearing no clothing (i.e., dosimeters were worn on the exterior of clothing). Therefore, it is likely that the post-application exposures calculated using these transfer coefficients probably represent higher levels of exposure because normal attire anticipated by the Agency would offer a level of protection and reduce exposures. Adult test subjects were utilized in this study and the resulting adult transfer coefficients were scaled down using a surface area and weight relationship to obtain transfer coefficients for children (the "scaling" methodology has also been used in the Agency's SOPs For Residential Exposure Assessment).

The exposure factors derived from the SOPs For Residential Exposure Assessment and used to assess exposure and risk estimates for members of the general public to "pick your own" operations are generally considered to be conservative. The chemical-specific transfer coefficient was based on calculating the mean of the transfer coefficients for several days of monitoring in the study (i.e., the value is not a conservative representation of the available data).

5. Occupational Post-application Exposure

5.1. Occupational Post-application Exposures and Risks

The Agency uses the term "post-application" to describe exposures to individuals that occur as a result of working in an environment that has been previously treated with a pesticide (also referred to as reentry exposure). The Agency believes that there are distinct job functions or tasks related to the kinds of activities that occur in previously treated areas such as harvesting vegetables in a treated field. Job requirements (e.g., the kinds of jobs to cultivate a crop), the nature of the crop or target that was treated (e.g., crop height, foliage density), and how chemical residues degrade in the environment can cause exposure levels to differ over time. Each factor has been considered in this assessment.

With a few exceptions, inhalation exposures are not typically calculated for occupational post-application scenarios because inhalation exposures generally account for a negligible percentage of the overall body burden for most pesticide chemicals. Additionally, phosmet has a relatively low vapor pressure of 3.72×10^{-7} mm Hg at 25°C and inhalation exposure from revolatilization is not expected to be a significant contributor for occupational post-application risk.

5.2. Occupational Post-application Exposure Scenarios and Calculation Methods

Exposure Scenarios

The current post-application occupational exposure assessment is conducted for the nine crops specified in the *Reregistration Decisions on Nine Phosmet "Time Limited" Uses*, dated January 18, 2007. The calculations for post-application exposure in this document focus on dermal exposures alone because inhalation exposures are thought to be a negligible contribution to post-application exposure. Applications are typically around two times per year, although phosmet can be used more frequently.

The Agency uses a concept known as the transfer coefficient to numerically represent the post-application exposures one would receive (i.e., generally presented as cm^2/hour). These transfer coefficients are listed in Policy 3.1 Science Advisory Council for *Exposure Policy Regarding Agricultural Transfer Coefficients*. In this policy, transfer coefficients were selected to represent the activities associated with 18 distinct crop/agronomic groupings based on different types of vegetables, trees, berries, vine/trellis crops, turf, field crops, and bunch/bundle crops (e.g., tobacco). The transfer coefficients for highbush blueberries were taken from a study submitted by the ARTF (ARF-020, MRID 451382-01) on blackberries.

The relevant crop groups associated with the nine "time-limited" uses of phosmet include:

- Tree/fruit, deciduous (e.g., apples, pears, peaches, nectarines, plums, prunes, apricots);
- Vine/trellis (e.g., grapes)
- Vine/trellis (highbush blueberries)

Within each agronomic group, a variety of cultural practices are required to maintain the included crops. These practices are varied and typically involve light contact with immature plants and heavy contact with more mature plants.

For phosmet, the Agency has completed short- and intermediate-term post-application assessments because of concerns over extended periods of exposure for a segment of the user population. The selected endpoint for occupational post-application dermal exposure is identical for short- and intermediate-term risk assessment. The Agency believes that phosmet exposures can occur over a single day or up to several weeks at a time for post-application workers, even though many crops are likely treated only a couple of times per season. This is supported by the length of time residues take to decline in the phosmet dislodgeable foliar residue studies used in past HED phosmet risk assessment documents (D262365), and the concept that several areas within a work environment may be treated at different times leading to worker exposures in different locations and at different times as workers move from treated field to treated field. For example, parts of agricultural fields or different farms in a localized area might be treated over several weeks because of an infestation, with a concurrent need for hand labor activities. Individuals working in

those fields might be exposed from contact with treated foliage over an extended period of time as they move from field to field that could be categorized as an intermediate-term.

Calculation Methods

Post-application exposures are calculated by considering transferable residue levels in areas where people work and the kinds of jobs or tasks that are required to produce agricultural commodities. These factors are represented by dislodgeable foliar residue (DFR) concentrations and by activity-based transfer coefficients. Exposures are calculated by multiplying these factors by a time component (i.e., an 8 hour work day assumed for seasonal reentry work). Exposures are then normalized by body weight and adjusted for dermal absorption (if necessary) to calculate absorbed doses. Risk estimates are then calculated. Post-application risks diminish over time because phosmet residues dissipate in the environment.

Estimation of Residue Levels Using Dissipation Kinetics

The first step in the post-application risk assessment was to complete an analysis of the available DFR data. Best fit DFR levels were calculated based on empirical data using the equation D2-16 from Series 875-Occupational and Residential Test Guidelines: Group B-Post-application Exposure Monitoring Test Guidelines. Half-lives were calculated using the algorithm ($T_{1/2}$ = -Ln 2/slope). The results of those statistical analyses were used to calculate best fit concentrations over time using the following pseudo-first order equation:

$$C_{envir(t)} = C_{envir(0)} e^{(PAI_{(t)} * M)}$$

Where:

$C_{envir(t)}$ = dislodgeable foliar residue ($\mu g/cm^2$) that represents the amount of residue on the surface of a contacted leaf surface that is available for dermal exposure at time (t);

$C_{envir(0)}$ = same as above at time (0);

e =natural logarithms base function;

$PAI_{(t)}$ = post-application interval or dissipation time (e.g., days after treatment or DAT); and

M = slope of line generated during linear regression of data [$\ln(C_{envir})$ versus PAI].

The data were not corrected for recovery in any calculation by the Agency and it appears that the data also were not corrected by the investigators (i.e., overall field recoveries are around 90%). The same data points were used by the Agency in the development of this risk assessment as were used in various risk assessments by the Gowan Corporation in previous submission to the Agency. Analysis of the data are summarized by Table 4 (below):

Table 4 – "Best Fit" Dissipation Kinetics Data for Phosmet Post-application Risk Calculations

Crop	Application Rate (lb ai/A)	Correlation Coefficient	Slope	C_0 ($\mu g/cm^2$)	Half-Life (days)
Pears	5	0.97905	-0.06621	5.04	10.5
Grapes	1	0.94075	-0.06810	1.70	10.2

Note: *This analysis is based on cumulative residues of phosmet and phosmet oxon.*

In cases where no chemical-specific residue dissipation data are available, the Agency typically uses a generic dissipation model to complete risk calculations. In this case, the Agency has determined that it is more appropriate; however, to extrapolate using phosmet-specific dissipation data in the risk assessment for other currently labeled crops than it is to use the generic dissipation model. This approach is consistent with current Agency policies for generating transferable/dislodgeable residue data. The existing residue data were extrapolated to the currently labeled crops as follows:

- **Pear Data:** These data have been used to complete all occupational assessments that were based on exposures worker reentry activities around tree fruit crops. This extrapolation is scientifically supported because of similarities in the application method, the crop canopy, and application rates (i.e., between the study and current labels). These data were extrapolated to various application rates including 4.0 lb ai/acre for pears and apples, 3.0 lbs ai/acre for peaches, nectarines, plums, and apricots, and 2.0 lb ai/acre for apples in the northeast (tank mixed with methomyl [lannate]). Therefore, four different calculations were completed for these post-application assessments to account for differences between crops due to application rates in order to provide for a more informed risk management decision.

- **Grape Data:** These data have been used to complete the remaining occupational assessments (i.e., post-application scenarios for highbush blueberries and grapes). This extrapolation is scientifically supported because of similarities in the application method, the crop canopy, and application rates (i.e., between the study and current labels). These data were extrapolated to various application rates including 1.5 lbs ai/acre for grapes (to reflect the most recent proposed label rates). No extrapolation was necessary for highbush blueberries because the study was conducted at 1 lb ai/acre and the current label rate is 1 lb ai/A. These calculations for the different label rates were completed for these post-application activities to account for differences between crops due to application rates in order to provide for a more informed risk management decision.

Daily Exposure: The next step in the risk assessment process was to calculate dermal exposure values on each post-application day after application using the following equation (see equation D2-20 from *Series 875-Occupational and Residential Test Guidelines: Group B-Post-application Exposure Monitoring Test Guidelines*).

$$\mathbf{DE_{(t)}\ (mg/day) = (DFR_{(t)}\ (\mu g/cm^2)\ x\ TC\ (cm^2/hr)\ x\ Hr/Day)/1000\ (\mu g/mg)}$$

Where:

DE(t)	=	Daily exposure or amount deposited on the surface of the skin at time (t) attributable for activity in a previously treated area, also referred to as potential dose (mg ai/day);
DFR(t)	=	Dislodgeable foliar residue at time (t) ($\mu g/cm^2$);
TC	=	Transfer Coefficient (cm^2/hour); and
Hr/day	=	Exposure duration meant to represent a workday (8 hours).

Margins of Exposure: Finally, the calculations of daily dermal dose received by post-application workers were then compared to the appropriate PoD (e.g., NOAEL or $BMDL_{10}$) to assess the total risk to post-application workers for dermal exposure. All risk estimate (MOE) values were calculated for dermal exposure levels using the formula below:

$$MOEroute = \frac{PoDroute\ (mg/kg/day)}{Average\ Daily\ Dose\ (mg/kg/day)}$$

Where:

MOE	= Margin of exposure for a given exposure route, value used by HED to represent risk or how close a chemical exposure is to being a concern (unitless);
ADD	= (Average Daily Dose) or the amount as absorbed dose received from exposure to a pesticide in a given scenario (mg pesticide active ingredient/kg body weight/day); and
PoD	= Dose level in a toxicity study, where no observed adverse effects occurred (e.g., NOAEL or $BMDL_{10}$) in the study (mg/kg/day).

A body weight of 70 kg was used to estimate occupational exposures for the post-application assessment. The Agency's level of concern (LOC) for phosmet post-application risk assessment is 100 (i.e, a margin of exposure less than 100 is considered a risk of concern). The LOC is based on a factor of 100 to account for inter-species extrapolation to humans from the animal test species (10X) and to account for the intra-species sensitivity (10X).

5.2.1. Data Used for Occupational Post-application Exposure Scenarios

Chemical-Specific Data: The post-application risk assessment for phosmet has been developed using chemical-specific dislodgeable foliar residue data on pears and grapes. In the previous assessments for phosmet, these data were used to calculate risk

estimates for the risk manager to set Restricted Entry Intervals (REIs) for occupational exposures.

In order to present a transparent post-application exposure assessment, it is necessary to present the data upon which it is based. The studies used to determine the dislodgeable foliar residue levels and human exposure levels for risk assessment purposes can be identified below:

- ***Dislodgeable Residue Dissipation and Reentry Interval Calculations For Crops Treated With Products Containing Phosmet:*** Submitted by Stauffer (now Zeneca) Chemical Company; Study Completion Date: 10/22/86; Report Date: 1/16/87; Authors: Dick Knarr, Yutaka Iwata, and Kay Curry; EPA MRID 404253-01.

This study was reviewed by the Agency in 1991. The review indicated that this study was considered acceptable to the Agency based on the review criteria appropriate for that era. The review can be identified by the following information:

- ***Review of Post-application/Reentry Data Submitted to Support the Reregistration of Phosmet and Revision of Data Required by the 8/30/91 DCI for Phosmet (HED Project # 9-0839):*** A memo from Peg Perreault of the former Occupational and Residential Exposure Branch of HED to Lois Rossi, Special Review and Reregistration Division.

This document is a review of the data included in MRIDs 401223-01 and 404253-01. Release of this review memo from the Agency to the registrants prompted two additional chemical-specific submissions including:

- ***Phosmet Dermal Passive Dosimetry Exposure Addendum to MRID 404253-01:*** Submitted by the Gowan Company, Yuma Arizona; Completion Date: 12/8/92; Author: E. Codrea; EPA MRID 425958-01 (submitted with 12/14/92 letter described below).

- ***Letter from Gowan Company, Yuma Arizona to Ms. Brigid Lowery of EPA/OPP/SRRD (Phosmet CRM) Dated December 14, 1992:*** Author: Elizabeth Codrea, Regulatory Product Manager; EPA MRID 425958-00.

MRID 404253-01: Dislodgeable foliar residue levels were quantified from two crops (pears and Zinfandel variety grapes) that were selected to represent the crops for which phosmet is registered. Phosmet, formulated as Imidan 50-WP, was used to make all applications. All study sites were located in California. Pears, representing the remaining tree fruits and nut crops, were treated at an application rate of 5 lbs ai/acre which is the current label maximum for pears. Grapes, representing the remaining crops, were treated at an application rate of 1 lb ai/acre which is the current maximum application rate for blueberries, and near the maximum application rate of 1.5 lbs ai/acre for grapes. The Iwata leaf punch/aqueous surfactant method was used to collect all samples. A 1 inch diameter punch was used in all cases and 48 punches were collected in each sample for a

total double-sided surface area per sample of 480 cm^2. Based on sample surface area and the available recovery data (i.e., a low fortification level of 1 µg/sample), the limit of quantification was defined as 0.002 $\mu g/cm^2$ (i.e., this applies to both phosmet and phosmet oxon residue levels that were both screened for). All field samples collected in this study were above the limit of quantification.

Pears: Imidan 50-WP was applied to a commercial, established planting of Bartlett pears located near Walnut Grove, California. Imidan 50-WP was applied once using an airblast sprayer at a rate of 5 lb ai/acre. Samples were collected on days 0, 1, 2, 3, 4, 5, 7, 10, 14, 21, and 28 days post-application Weather conditions were typical, and no rainfall was reported during the study. Based on the labeling information for pears and other tree crops at the time of the study, the high application rate is 5.0 lb ai/acre, the preharvest interval is 7 days, and phosmet can be applied as needed. The dissipation data for pears are presented in Table 2 of Appendix C of "The Revised Occupational and Residential Exposure Aspects of the HED Chapter of the Reregistration Eligibility Decision Document (RED) for Phosmet" (DP262366) [***Available:*** Special Docket EPA-HQ-OPP-2007-0151, at www.regulations.gov].

Field and laboratory recovery data were generated in this aspect of the study. Field recovery for phosmet was 82.5 percent (CV 9.3, n = 8) while field recovery for phosmet oxon was 93.2 percent (CV 6.9, n=10). Laboratory recovery for phosmet was 89.4 percent (CV 6.7, n = 7) while laboratory recovery for phosmet oxon was 95.1 percent (CV 5.0, n=7). The residue levels presented in Table 2 were not apparently corrected for recovery by the investigators.

Grapes: Imidan 50-WP was applied to a commercial, established planting of Zinfandel grapes located near Lodi, California. Imidan 50-WP was applied by an airblast sprayer at a rate of 1 lb ai/acre. One application was made. Samples were collected on days 0, 1, 3, 4, 6, 9, 13, 20, and 27 days post-application Weather conditions were typical during the study (i.e., no unusual events). Based on the labeling information for grapes and other crops, the high application rate is 1.5 lb ai/acre, the preharvest interval is 7 days, and phosmet can be applied as needed between egg hatch and pupation for leaffolder, leafroller, and western grape skeletonizer. The dissipation data for grapes are presented in Table 3 of Appendix C of "The Revised Occupational and Residential Exposure Aspects of the HED Chapter of the Reregistration Eligibility Decision Document (RED) for Phosmet" (DP262366) [*Available:* Special Docket EPA-HQ-OPP-2007-0151, at www.regulations.gov]. Field and laboratory recovery data were generated in this aspect of the study. Field recovery for phosmet was 96.9 percent (CV 6.4, n = 7) while field recovery for phosmet oxon was 98.0 percent (CV 5.2, n=9). Laboratory recovery for phosmet was 90.2 percent (CV 7.9, n = 5) while laboratory recovery for phosmet oxon was 93.8 percent (CV 10.6, n=5). The residue levels presented in Table 4 were not apparently corrected for recovery by the investigators.

These studies are of sufficient quality to be used for exposure and risk assessment purposes and have been used in a number of past occupational and residential exposure risk assessment documents and in the July, 2006 IRED.

5.2.2. Application of the Relevant Study Data to the Exposure Scenarios

This assessment pertains to the nine crops specified in the *Reregistration Decisions on Nine Phosmet Restricted Entry Intervals* of January, 2007. Dislodgeable foliar residue studies were submitted for only two crop groups (deciduous tree crops and vine/trellis crops). It is relevant to note for risk characterization that the DFR studies took place at California-based sites, in dry conditions. Generalizing the DFR dissipation to other locations, any ambient conditions with additional precipitation would generally mean less residue is available for transfer to the skin of field workers; therefore, this assumption leads to a protective estimate of risks for all climate conditions in which these crops may be grown. Based upon similarity in crop form and cultural practices, the data were extrapolated from these DFR studies to other similar labeled crops.

5.2.3. Exposure Assumptions, Factors and Transfer Coefficients

The following assumptions, factors and transfer coefficients were used for calculating the occupational post-application risk estimates:

- Short- and intermediate-term exposures were assessed for post-application scenarios where the post-application worker activities are appropriate for the exposure duration (i.e., not all agricultural activity patterns are relevant for both exposure durations).

- The relevant toxicological information used for occupational post-application short- and intermediate-term assessment (i.e., same PoD for assessing both exposure durations) is addressed above in section 2.6.2.

- Maximum application rates were used to calculate risk estimates for the post-application scenarios.

- When the Agency extrapolated the available DFR data to other crops, the data were adjusted for differences in application rate using a simple proportional approach. This approach seems to be the most appropriate given the data available. This approach is commonly used by the Agency to conduct post-application risk assessments.

- A limited number of transfer coefficients were used, each representing multiple activities which would be expected to result in similar dermal contact. The exposure durations for short- and intermediate-term and transfer coefficients reflect current Agency policy.

- A listing of the transfer coefficients used in this assessment is given in Table 5, below. Most of these transfer coefficients were taken from the Agency's revised Policy 3.1 Science Advisory Council for Exposure Policy Regarding Agricultural Transfer Coefficients (August 7, 2000). The transfer coefficients for highbush

blueberries were taken from a study recently submitted by the ARTF (MRID 45138201) on blackberries.

- Blackberry ARTF data (ARF-020) is used as a surrogate for the blueberry transfer coefficient. This study has a primary review by Versar and a secondary review from PMRA (MacMillan, PMRA).

- Discussion and risk characterization around the risk estimates for both short- and intermediate-term risks are based upon the restricted entry intervals identified in *Reregistration Decisions on Nine Phosmet "Time-Limited" Uses*, January, 2007.

- The use of personal protective equipment or other types of equipment to reduce exposures for post-application workers is not considered a viable alternative for the regulatory process except in specialized situations (e.g., a rice scout will wear rubber boots in flooded paddies). This is described in some detail in the Agency's Worker Protection Standard (40 CFR 170). All occupational post-application risk estimates assessed in this document assume the reentry workers are wearing standard agricultural clothing: long pants, a long-sleeve shirt, socks, and shoes.

Table 5 – Post-application Exposure Scenarios and Transfer Coefficients

Crop Type (Specific Crops)	Post-application Exposure Scenarios	Transfer Coefficient (cm^2/hr)
Tree, Fruit, Deciduous (pears, apples, apricots, peaches, nectarines, plums, prunes,)	Very Low - propping Low - Irrigation, scouting, weeding High – Pruning, training, tying, harvesting Very High – Thinning	100 1,000 1,500 3,000
Vine/Trellis (Grape)	Low - Hedging, irrigation, scouting, hand weeding Medium - Scouting, training, tying High – Leaf pulling, thinning, pruning, training/tying Very High – Cane Turning and Tabling Grapes	500 1,000 5,000 10,000[1]
Vine/Trellis (Highbush Blueberries)	High Exposure	1,100[2]

1 – TC for short-term exposures only; BEAD has provided HED with information that this activity pattern does not occur for the intermediate-term exposure duration
2 - ARTF surrogate Transfer Coefficient (MRID 451382-01)

5.2.4. Occupational Post-application Exposure and Risk Estimates

Phosmet Risk Summary:

The post-application risks for phosmet are summarized in Table 6 and additional details are presented in Appendix D. Both the short- and intermediate term post-application risk estimates are based on a toxicological PoD (oral BMD_{10} – 0.6 mg/kg/day) selected from a

7 day repeat CCA studies in rats (MRID 47695401). The LOC for short- and intermediate-term post-application exposures is an MOE of 100. Within each crop group, differing transfer coefficients were used to represent different types of cultural practices which were applicable to each crop group. All of the risk estimates for "very high" exposure activities (i.e., thinning) and most of the "high exposure" activities (i.e., harvesting) for phosmet are of concern (i.e., MOEs are less than 100) at the REIs specified in the Agency decision document, *Reregistration Decisions on Nine Phosmet "Time Limited" Uses*, dated January 18, 2007. The time needed to achieve MOEs of 100 for short-term risks for the "very high" exposure category ranges from 8 to 31 days, with the longest time needed for cane turning and girdling grapes (Applicable on to grapes grown east of the Rocky Mountains).

Since the endpoint and PoD are identical for short- and intermediate-term post-application risk assessment, the risk estimate calculations are identical for both exposure durations. However, there are some noteworthy activity-based differences in the potential exposure patterns. For instance, OPP's Biological and Economic Analysis Division (BEAD) provided information that cane turning and girdling of grapes is an exposure activity that occurs for the short-term exposure duration, but not the intermediate-term exposure duration.

Table 6 - Phosmet Post-application Short- & Intermediate-Term Risk Estimates (Reflecting Label Maximum Application Rates)					
Crop Group	Current Product Labels MOE; (days till MOE>100)				Reregistration Decisions on Nine Phosmet "Time-Limited" Uses, January 18, 2007 MOE; (days till MOE>100)
	Very Low	**Low**	**High** (Harvesting)	**Very High** (Thinning)	**High** (Harvesting)
	MOE on REI [Day 7]* (Days when MOE > 100)				**MOE on PHI [Day 7]* (Days when MOE > 100)**
Tree, Fruit, Deciduous *Pears/Apples (West of Rockies)* Application Rate: 4 lbs ai/A	930	**93** (8)	**62** (15)	**31** (25)	**62** (15)
	MOE on REI [Day 4]* (Days when MOE > 100)				**MOE on PHI [Day 7]* (Days when MOE > 100)**
Tree, Fruit, Deciduous *Apples (East of Rockies)* Application Rate: 4 lbs ai/A	760	**76** (8)	**51**(15)[1]	**25** (25)	**62** (15)
	MOE on REI [Day 7]* (Days when MOE > 100)				**MOE on PHI [Day 14]* (Days when MOE > 100)**
Tree, Fruit, Deciduous *Peaches, nectarines (West of the Rockies)* Application Rate: 3 lbs ai/A	1240	124	**83**(10)[2]	N/A[3]	130
	MOE on REI [Day 4]* (Days when MOE > 100)				**MOE on PHI [Day 14]* (Days when MOE > 100)**
Tree, Fruit, Deciduous *Peaches, nectarines (East of the Rockies)* Application Rate: 3 lbs ai/A	1020	100	**68**(10)[4]	**34** (21)	130

	MOE on REI [Day 7]* (Days when MOE > 100)				**MOE on PHI [Day 14]* (Days when MOE > 100)**
Tree, Fruit, Deciduous *Plums, prunes (West of the Rockies)* Application Rate: 3 lbs ai/A	1240	120	**83**(10)[5]	N/A[6]	130
	MOE on REI [Day 7]* (Days when MOE > 100)				**MOE on PHI [Day 14]* (Days when MOE > 100)**
Tree, Fruit, Deciduous *Plums, prunes (East of the Rockies)* Application Rate: 3 lbs ai/A	1240	124	**83**(10)[7]	**41** (21)	130
	MOE on REI [Day 7]* (Days when MOE > 100)				**MOE on PHI [Day 14]* (Days when MOE > 100)**
Tree, Fruit, Deciduous *Apricots (West of the Rockies)* Application Rate: 3 lbs ai/A	1240	120	**83**(10)[8]	N/A [9]	130
	MOE on REI [Day 7]* (Days when MOE > 100)				**MOE on PHI [Day 14]* (Days when MOE > 100)**
Tree, Fruit, Deciduous *Apricots (East of the Rockies)* Application Rate: 3 lbs ai/A	1240	120	**83**(10)[10]	**41** (21)	130
	MOE on REI [Day 4]* (Days when MOE > 100)				**MOE on PHI [Day 7]* (Days when MOE > 100)**
Tree, Fruit, Deciduous *North east Apples (tank mix with methomyl [lannate], only)* Application Rate: 2 lbs ai/A	1530	150	102[11]	**51** (15)	124
	MOE on REI [Day 14]* (Days when MOE > 100)				***
Vine/trellis *Grapes (West of the Rockies)* Application Rate: 1.5 lbs ai/A	N/A	310[12]	N/A[13]	N/A[13]	N/A[13]

	MOE on REI [Day 14]* (Days when MOE > 100)				MOE on PHI [Day 14]* (Days when MOE > 100)
Vine/trellis *Grapes (East of the Rockies)* Application Rate: 1.5 lbs ai/A	N/A	310[12]	**62**(21)	**31**(31)[14]	**62** (21)
	MOE on REI [Day 1]* (Days when MOE > 100)				**MOE on PHI [Day 3]* (Days when MOE > 100)**
Vine/trellis *Blueberries* Application Rate: 1 lbs ai/A	N/A	N/A[15]	135[16]	N/A	160

+ Bolded MOEs exceed HED's level of concern (i.e., MOEs<100)

* - Reregistration Decisions on Nine Phosmet "Time-Limited" Uses, January 18, 2007

1 - The PHI for apples is 7 days, so no hand harvesting would take place at 4 days. The MOE at 7 days is **62**.

2- The PHI for peaches is 14 days, so no hand harvesting would take place at 7 days. The MOE at 14 days is 130.

3 - In the January 18, 2007 decision document for phosmet, thinning is prohibited as a post-application exposure activity after phosmet applications to peaches West of the Rockies. The MOE for thinning on Day 7 is **41**.

4 - The PHI for peaches is 14 days, so no hand harvesting would take place at 7 days. The MOE on Day 14 is 130.

5 - In the January 18, 2007 decision document for phosmet, hand harvesting of plums and prunes is prohibited for 14 days after application, so no hand harvesting would take place at 7 days. The MOE on day 14 is 130.

6 - In the January 18, 2007 decision document for phosmet, thinning is prohibited as a post-application exposure activity after phosmet applications to plums and prunes West of the Rocky Mountains.

7 - In the January 18, 2007 decision document for phosmet, hand harvesting of plums and prunes is prohibited for 14 days after application. The MOE on day 14 is 130.

8 - The PHI for apricots is 14 days, so no hand harvesting would take place at 7 days. The MOE for harvesting on Day 14 is 130.

9 – In the January 18, 2007 decision document for phosmet, thinning is prohibited as a post-application exposure activity after phosmet applications to apricots West of the Rockies. The MOE on Day 7 for thinning is **41**.

10 – The PHI for apricots is 14 days, so no hand harvesting would take place at 7 days. The MOE for harvesting on Day 14 days is 130.

11 – The PHI for northeast apples (tank mix with methomyl, only) is 7 days, so no hand harvesting would take place at 4 days. The MOE for harvesting on Day 7 is 120.

12 – The MOE of 310 relates to medium exposure activities for grapes. (See Table 5 for additional information).

13 – In the January 18, 2007 decision document for phosmet, all hand labor activities EXCEPT for scouting, hand weeding, and irrigating, are prohibited after phosmet application to grapes West of the Rockies. The MOE for harvesting grapes on Day 14 is **62**.

14 – According to information provided by BEAD, cane turning and girdling of grapes occurs only as a short-term exposure activity, not an intermediate-term exposure activity

15 – ARTF ARF-020 data used for surrogate TC; HED expects other blueberry post-application work to result in lower exposures than the "high" exposure activity shown.

16 – The PHI for blueberries is 3 days, so no hand harvesting would take place on the first day after application. The MOE at 3 days is 160.

Risk estimates for workers tending blueberries are represented for both short- and intermediate-term exposure durations using data extrapolated from the Agricultural Rentry Task Force's ARF-020 [MRID 45138201]. The ARTF transfer coefficient (TC) studies do not present TC data that are directly comparable to the HED's default TC values on a exposure category basis. The TC value used to estimate phosmet risk most closely approximates the "high" exposure potential used in the default TC studies, and are presented in that category in the risk estimate summary table. Reentry workers conducting activities with a lower exposure potential (e.g., scouting and irrigation) than harvesting and pruning would have a lower exposure estimate than risk estimates presented in this document (On the day of application [Day 0], the short- and intermediate-term MOE is 130 for harvesting and pruning activities). The calculated risk estimates for reentry workers for irrigation and scouting using the default TC value of 500 would be approximately 2X lower (i.e., a 2X higher MOE) than the risk estimates presented for workers harvesting highbush blueberries in this document.

5.2.5. Summary of Occupational Post-application Risk Concerns and Data Gaps

A summary of all the occupational post-application risks of concern for phosmet is included in Table 7, below.

The risk estimates are of concern (i.e., MOEs are below the LOC of 100) for all of the "very high" activity grouping at the current re-entry intervals (REIs). REIs must be lengthened significantly to achieve the target MOE of 100. Typical activities for the "very high" activity grouping include thinning fruit trees and cane turning/girdling grapes.

The risk estimates are of concern at the current REIs for every post-application activity scenario in the "high" activity grouping for both exposure durations, except for apples east of the Rocky Mountains and blueberries. The former activity pattern represents workers harvesting deciduous tree fruits. REIs must generally be lengthened significantly to achieve the target MOE of 100. When harvesting activities are considered at the pre-harvest interval (PHI), the risk estimates are of concern (i.e., MOEs are below the LOC of 100) for apples/pears west of the Rocky Mountains and apples east of the Rocky Mountains.

For the "low" exposure activity grouping risks are of concern only for apples (everywhere) and for pears (West of the Rockies only). Typical activities in this activity grouping include irrigation and scouting.

There are no risks of concern in the "very low" exposure activity grouping.

Table 7 - Summary of Phosmet Post-application Risks of Concern per Crop and Activity Groups						
Crop Group	**Exposure Duration**	**Risk of Concern Identified Exposure per Activity Grouping**				
		Very Low	**Low**	**Medium**	**High**	**Very High**
Deciduous Fruit Trees (Pears)	ST/IT	No	**Yes**	N/A	REI: **Yes** PHI: **Yes**	**Yes**
Deciduous Fruit Trees (Apples – west of Rockies)	ST/IT	No	**Yes**	N/A	REI: **Yes** PHI: **Yes**	**Yes**
Deciduous Fruit Trees (Apples – east of Rockies)	ST/IT	No	**Yes**	N/A	REI: **Yes** PHI: **Yes**	**Yes**
Deciduous Fruit Trees (Apples – northeast) [for tank mix]	ST/IT	No	No	N/A	REI: No PHI: No	**Yes**
Deciduous Fruit Trees (Peaches, nectarines – west of Rockies)	ST/IT	No	No	N/A	REI: **Yes** PHI: No	N/A
Deciduous Fruit Trees (Peaches, nectarines – east of Rockies)	ST/IT	No	No	N/A	REI: **Yes** PHI: No	**Yes**
Deciduous Fruit Trees (Apricots – west of Rockies)	ST/IT	No	No	N/A	REI: **Yes** PHI: No	N/A
Deciduous Fruit Trees (Apricots –east of Rockies)	ST/IT	No	No	N/A	REI: **Yes** PHI: No	**Yes**
Deciduous Fruit Trees (plums/prunes – west of Rockies)	ST/IT	No	No	N/A	REI: **Yes** PHI: No	N/A
Deciduous Fruit Trees (plums/prunes - east of Rockies)	ST/IT	No	No	N/A	REI: **Yes** PHI: No	**Yes**

Table 7 - Summary of Phosmet Post-application Risks of Concern per Crop and Activity Groups						
Crop Group	**Exposure Duration**	**Risk of Concern Identified Exposure per Activity Grouping**				
		Very Low	**Low**	**Medium**	**High**	**Very High**
Vine/trellis (blueberries)	ST/IT	N/A	N/A	N/A	REI: No PHI: No	N/A
Vine/trellis[1] (grapes – west of Rockies)	ST	No	No	No	N/A	N/A
	IT	N/A	N/A	No	N/A	N/A
Vine/trellis[1] (grapes – east of Rockies)	ST	No	No	No	REI: **Yes** PHI: **Yes**	**Yes**
	IT	N/A	N/A	No	REI: **Yes** PHI: **Yes**	N/A
Representative Exposure Activities per Activity Grouping		**Propping**	**Irrigation, Scouting**	**Grape Scouting, training grapes[2]**	**Harvesting**	**Thinning, cane turning/girdling [grapes only][3]**

1 – Vine/trellis risk summary has been broken into two line items to reflect the difference in activity patterns based on exposure duration.
2 - The "medium" exposure activity grouping is relevant to scouting and training of grapes only.
3 – Cane turn/girdling is an activity relevant to grapes only [short-term exposure duration only]. Thinning activities are relevant to all crop groups.

5.2.6. Occupational Post-application Risk Characterization

The Agency has completed a risk assessment for both short- and intermediate-term exposures; the PoD is the same for both exposure durations. The two assessments for short- and intermediate-term exposure durations represents a worker conducting post-application activities every day of the exposure duration from crops treated with the maximum phosmet application rate It should be noted that even though the Agency has completed this assessment, it is unlikely that many individuals will be exposed in this manner given the way that phosmet is likely used and based on the recent use and usage data provided that indicate (in agriculture) that phosmet is generally used up to about a maximum of 5 times per year. Even with a relative few number of applications per growing season, post-application exposure activities like harvesting and thinning can take place over a course of several weeks. HED does not expect post-application workers to be exposed to maximum residues at any given REI every day over the course of the short-term exposure duration (up to 30 days). Since the endpoint and the PoD are identical for the short- and intermediate-term exposure duration, the risk estimate calculations are identical for both exposure durations. However, risk estimates for the intermediate-term exposure duration are likely a conservative estimate of risk (i.e., intermediate-term risk calculations likely overestimate exposure and risk) because it is not likely that reentry work will take place in fields treated with the maximum application rate every day of the exposure duration.

The chemical-specific exposure and dislodgeable foliar residue studies submitted by the registrant were reviewed by the Agency and determined to be acceptable for risk

assessment purposes. The surrogate transfer coefficients used to calculate occupational post-application exposures are based on published empirical data and are generally considered to represent reasonable estimates of dermal exposure. These transfer coefficient values are based on the use of long pants, boots and long-sleeved work clothing.

6. Environmental Justice and Human Studies

Potential areas of environmental justice concerns, to the extent possible, were considered in this human health risk assessment, in accordance with U.S. Executive Order 12898, "Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations," http://www.eh.doe.gov/oepa/guidance/justice/eo12898.pdf

As a part of every pesticide risk assessment, OPP considers a large variety of consumer subgroups according to well-established procedures. In line with OPP policy, HED risk assessments typically estimate risks to population subgroups from pesticide exposures that are based on patterns of that subgroup's food and water consumption, and activities in and around the home that involve pesticide use in a residential setting. This document deals exclusively with occupational post-application risk estimates for the nine crops specified in the *Reregistration Decisions on Nine Phosmet "Time Limited" Uses*, dated January 18, 2007. Further considerations are currently in development as OPP has committed resources and expertise to the development of specialized software and models that consider exposure to bystanders and farm workers as well as lifestyle and traditional dietary patterns among specific subgroups.

Human Studies:
This assessment relies in part on data from studies in which adult human subjects were intentionally exposed to a pesticide. These studies, listed below, have received the appropriate ethical review for use in risk assessment.

- The PHED Task Force, 1998. The Pesticide Handler Exposure Database (PHED), Version 1.1. Task Force members: Health Canada, U.S. Environmental Protection Agency, the California Department of Pesticide Regulation, and the American Crop Protection Association; released August 1998.
- Knarr, R.D. and Iwata, Y. (1986) Homeowner Exposure to Phosmet While Performing Typical Activities with Imidan Insecticide-Treated Fruit Trees, 71 pp. (MRID 40122301).

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U.S. Environmental Protection Agency. (January 18th, 2007) Reregistration Decisions on Nine "Time-Limited" Uses.

The Revised Occupational and Residential Exposure Aspects of the HED Chapter of the Reregistration Eligibility Decision Document (RED) For Phosmet, Case 818976, PC Code 059201, DP Barcode 262366, Author: Jeff Dawson, Issued: January 27, 2000.

U.S. Environmental Protection Agency. (October 30, 2001). Interim Reregistration Eligibility Decision for Phosmet Case No. 0242

U.S. Environmental Protection Agency. Phosmet Human Health Assessment Scoping Document in Support of Registration Review. May 19, 2009. D364685.

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Barnett Jr. J. F. (2005). Oral (Gavage) Acute Time of Peak Cholinesterase Depression Study of Phosmet Technical in Neonatal Rats. Charles River Laboratories Preclinical Services, Horsham PA Protocol No. WJ100010. March 9, 2007. MRID 47083001. Unpublished.

Barnett, J. F., Jr. (2007). Cholinesterase Response of Crl:CD(SD) Rats Following Repeated Dermal Applications of Imidan™ 70-W at Multiple Dose Levels. Charles River Laboratories, Preclinical Services, Horsham, PA. Laboratory Project ID WJI00021, October 18, 2007. MRID 47262502. Unpublished.

Cappon, G. D. (1998). An Acute Neurotoxicity Study of Phosmet in Rats. WIL Research Laboratories, Inc. Ashland, OH. Laboratory Study No. WIL-331004, October 8, 1998. MRID 44673301. Unpublished.

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Fasano, W.J., Sr. (2007) Imidan® 70 WP *In* Vitro Absorption in Rat and Human Skin. E. I. duPont de Nemours and Company, DuPont Haskell SM Global Center for Health and Environmental Sciences, Delaware. Laboratory Project ID 22742, September 5, 2007 (revision October 8, 2007). MRID 47262501. Unpublished.

Letter from Gowan Company, Yuma Arizona to Ms. Margaret Rice of EPA/OPP/SRRD (Phosmet CRM) Dated December 10, 2007: Author: Elizabeth Codrea, Director of Regulatory Science.

Letter from Gowan Company, Yuma Arizona to Ms. Margaret Rice of EPA/OPP/SRRD (Phosmet CRM) Dated February 13, 2008: Author: Elizabeth Codrea, Director of Regulatory Science.

Letter from Gowan Company, Yuma Arizona to Ms. Margaret Rice of EPA/OPP/SRRD (Phosmet CRM) Dated March 23, 2008: Author: Elizabeth Codrea, Director of Regulatory Science.

Letter from Gowan Company, Yuma Arizona to Ms. Margaret Rice of EPA/OPP/SRRD (Phosmet CRM) Dated May 5, 2008: Author: Elizabeth Codrea, Director of Regulatory Science.

Letter from Gowan Company, Yuma Arizona to Ms. Margaret Rice of EPA/OPP/SRRD (Phosmet CRM) Dated , January 14, 2009: Author: Elizabeth Codrea, Director of Regulatory Science.

Letter from Sielken & Associates Consulting, Inc. to Gowan Company, Dated April 24, 2008: Author: Robert L. Sielken, Jr. Biostatistician.

Letter from Sielken & Associates Consulting, Inc. to Gowan Company, Dated April 25, 2008: Author: Robert L. Sielken, Jr. Biostatistician.

ToxSacMeetingNotes, dated February 21, 2008. 059201TS.001. Phosmet: Joint Meeting between ToxSAC and HASPOC to Discuss the Use of *in vitro* and *in vivo* Dermal Absorption Data.

ToxSacMeetingNotes, meeting date: January 22, 2009. 059201TS.001. Phosmet: Meeting of ToxSAC to Discuss Weight-of-the-Evidence Determination of the Short- and Intermediate-Term Dermal Endpoints for the Post-Application Worker Risk Assessment for Phosmet.

Postapplication Exposures

Dislodgeable Residue Dissipation and Reentry Interval Calculations For Crops Treated With Products Containing Phosmet: Submitted by Stauffer (now Zeneca) Chemical Company; Study Completion Date: 10/22/86; Report Date: 1/16/87; Authors: Dick Knarr, Yutaka Iwata, and Kay Curry; EPA MRID 404253-01.

Homeowner Exposure to Phosmet While Performing Typical Activities With Imidan Insecticide-Treated Fruit Trees. Study Completion Date: 10/22/86; Report Date: 12/19/86; Authors: Dick Knarr, and Yutaka Iwata. EPA MRID 401223-01.

Phosmet Dermal Passive Dosimetry Exposure Addendum to MRID 404253-01: Submitted by the Gowan Company, Yuma Arizona; Completion Date: 12/8/92; Author: E. Codrea; EPA MRID 425958-01.

MacMillan, Linda. *Secondary Review of ARF-020: Blackberry Harvesting*
ARTF Blackberry transfer Coefficient Study (ARF-020); MRID 451382-01

APPENDIX A1 – Toxicity Data

Acute Toxicity of Phosmet

Guideline No.	Study Type	MRIDs #	Results	Toxicity Category
81-1	Acute Oral – rat	00046189	LD_{50} = 113 mg/kg	II
81-2	Acute Dermal – rabbit	00046190	LD_{50} >5000 mg/kg	III
81-3	Acute Inhalation – rat	00063197	LC_{50} >0.152 mg/L	I
81-4	Primary Eye Irritation	00046192	moderate eye irritant	III
81-5	Primary Skin Irritation	00046191	not a skin irritant	IV
81-6	Dermal Sensitization	?		N/A
81-7	Delayed Neurotoxicity	44587601	unsteadiness, subdued behavior, recumbency, salivation; no ataxia; no decreases in brain or spinal cord NTE; brain ChE decreased 63%; no neuropathology.	N/A
81-8	Acute Neurotoxicity	44673301	NOAEL 4.5 mg/kg LOAEL 22.5 mg/kg, based on cholinesterase inhibition [plasma, RBC, brain] and decreased motor activity in both sexes.	N/A

Table : Toxicology Profile of Phosmet		
Guideline No./ Study Type	**MRID No. (year)/ Classification /Doses**	**Results**
Acute comparative cholinesterase assay	MRID 47087401 (2007) 0, 2.5, 5, 10 mg/kg young adult and PND 11 pups gavage	Adult NOAEL = 5 mg/kg Adult LOAEL = 10 mg/kg, based on RBC, brain, plasma cholinesterase inhibition PND 11 NOAEL <2.5 mg/kg PND 11 LOAEL = 2.5 mg/kg, based on brain cholinesterase inhibition
Repeat dose comparative cholinesterase assay	MRID 47695401 (2007) 0, 1.25, 2.5, or 5 mg/kg/day young adult and PND 11 pups 7 consecutive doses gavage	Adult LOAEL for brain cholinesterase inhibition = 5 mg/kg/day; Adult NOAEL for brain cholinesterase inhibition = 2.5 mg/kg/day. Adult LOAEL for RBC cholinesterase inhibition = 1.25 mg/kg/day. Adult NOAEL for RBC cholinesterase inhibition < 1.25 mg/kg/day Adult LOAEL for plasma cholinesterase inhibition = 5 mg/kg/day. Adult NOAEL for plasma cholinesterase inhibition = 2.5 mg/kg/day. Pup LOAEL for brain cholinesterase inhibition = 1.25 mg/kg/day; Pup NOAEL for brain cholinesterase inhibition <1.25 mg/kg/day. Pup LOAEL for RBC cholinesterase inhibition = 1.25 mg/kg/day. Pup NOAEL for RBC cholinesterase inhibition < 1.25 mg/kg/day Pup LOAEL for plasma cholinesterase inhibition = 1.25 mg/kg/day (females), 2.5 mg/kg/day (males). Pup NOAEL for plasma cholinesterase inhibition <1.25 mg/kg/day (females), 1.25 mg/kg/day (males).

Table : Toxicology Profile of Phosmet

Guideline No./ Study Type	MRID No. (year)/ Classification /Doses	Results
870.3100 90-day/4-week oral toxicity rats	MRID 00081426 ( ) 0, 20, 100, 500 ppm 0, mg/kg/day Acceptable/guideline	Systemic NOAEL = 100 ppm (10 mg/kg/day) Systemic LOAEL = 500 ppm (50 mg/kg/day), based on decreased body weight NOAEL (cholinesterase) = 20 ppm (2 mg/kg/day) LOAEL (cholinesterase) = 100 ppm (10 mg/kg/day) RBC compartment (@ week 3: ♂ 56%/♀ 61%;@ 11 weeks: ♂ 62%/♀ 54% @ 500 ppm: @ 500 ppm, males displayed 100% and 97% RBC inhibition at 3 and 11 weeks; females displayed 100% RBC inhibition at both time points.
870.3200 21-day dermal toxicity rats	MRID 47262502 (2007) 0, 30, 40, 50, 60, 90, or 120 mg/kg bw/day, 6 hours/day for 5 days/week during a 3-week period	NOAEL <30 mg/kg/day LOAEL = 30 mg/kg/day, based on female RBC cholinesterase inhibition
870.3200 21-day dermal toxicity rats	MRID 44795801 (1999) 0, 15, 22.5, 60 mg/kg/day	NOAEL = 15 mg/kg/day LOAEL = 22.5 mg/kg/day, based on decreased brain cholinesterase in females
870.6100 Subchronic neurotoxicity Rats	MRID 44811801 (1999) 0, 25, 50, 150 ppm 0, 1.5/1.6, 2.7/3.1, 9.4/11 mg/kg/day	NOAEL = not determined LOAEL = 22 ppm (1.5 males/1.6 females mg/kg/day), based on dose-related decreases in plasma, whole blood, RBC, and brain cholinesterase activity levels BMD analysis performed
870.3700a Prenatal developmental (rats)	MRID 41962902 (1991) 0, 5, 10, 15 mg/kg/day GD 6-15 (gavage) Acceptable/guideline	Maternal NOAEL = 10 mg/kg/day Maternal LOAEL = 15 mg/kg/day, based on clinical signs (tremors/shaking in 4 dams on days 12-16), salivation, piloerection, subdued mood (2 dams on days 16-19), and decreased body weight gain/food consumption. Developmental toxicity NOAEL = 15 mg/kg/day, HDT
870.3700b Prenatal developmental (rabbits)	MRID 41962901 (1991) 0, 5, 10, 15 mg/kg/day GD 6-15 (gavage) Acceptable/guideline	Maternal NOAEL = 5 mg/kg/day Maternal LOAEL = 15 mg/kg/day, based on clinical signs (2 does on days 16 and 18 showed unsteady gait, shaking, salivation, irregular breathing), decreased body weight Developmental toxicity NOAEL = 5 mg/kg/day Developmental toxicity LOAEL = 15 mg/kg/day, based on an increased incidence of skeletal variations

Table : Toxicology Profile of Phosmet

Guideline No./ Study Type	MRID No. (year)/ Classification /Doses	Results
870.3800 Reproduction and fertility effects rats	MRID 41520001 (1990) 0, 20, 80, 300 ppm (diet) males F0 (1.3, 5.0, 19)/ F1 (1.4, 5.9, 23) mg/kg/day females F0 (1.5, 6.0, 24)/ F1 (1.5, 6.1, 26) mg/kg/day 10 weeks prior to mating Acceptable/guideline	Maternal toxicity NOAEL <20 ppm (1.5 mg/kg/day) Maternal toxicity LOAEL = 20 ppm (1.5 mg/kg/day), based on decreased RBC cholinesterase (F0 ♂ 8%*/♀ 12%**; F1 ♂ 6%/♀ 16%**). @ 80 ppm: F0 ♂ 38%/♀ 48%; F1 ♂ 48%/♀ 59% @ 300 ppm: F0 ♂ 74%/♀ 82%; F1 ♂ 85%/♀ 80% Reproductive/offspring NOAEL = 20 ppm (1.5 mg/kg/day) Reproductive/offspring LOAEL =80 ppm (6.1 mg/kg/day), based on decreased fertility and lactation indices, decreased number of live pups/litter, decreased pup weight. At 300 ppm (19/24 mg/kg/day), 3 F0 females (day 28) showed tremors; one F1 dam displayed convulsions and hypothermia and decreased activity (day 173), one F1 female displayed muscle weakness and 2 F1 females displayed tremors on day 109.
870.4100 Chronic toxicity Rat (Crl:CD(SD) BR)	MRID 41916401 (1991) 0, 20, 40, 200, 400 ppm males 0, 1.1, 1.8, 9.4, 23 mg/kg/day females 0, 1.1, 2.1, 10.9, 27 mg/kg/day	NOAEL < 20 ppm (1.1 mg/kg/day) LOAEL = 20 ppm (1.1 mg/kg/day), based on RBC cholinesterase inhibition in males (16%*) Both sexes showed 19% inhibition at 40 mg/kg/day Males showed 20% and 34% brain inhibition at 200 ppm and 400 ppm, respectively at 6 months Females showed 27% and 43% brain inhibition at 200 ppm and 400 ppm, respectively at 6 months
870.4100 Chronic toxicity Dog (beagle)	MRID 00076436 (1967) diet (104 weeks) 0, 20, 40, 400 ppm 0, 0.5, 1, 10 mg/kg/day	NOAEL = 40 ppm (1 mg/kg/day) LOAEL = 400 ppm (10 mg/kg/day), based on RBC (>70%) and brain (>40%) cholinesterase inhibition in both sexes Systemic NOAEL = 400 ppm (10 mg/kg/day) HDT
870.4200 Carcinogenicity Mouse (B6C3F1)	MRIDs 00141659, 00160114, 40595501 (1984) 0, 5, 25, 100 ppm (diet) Acceptable/guideline	NOAEL < 5 ppm LOAEL = 5 ppm, based on brain cholinesterase inhibition (both sexes; 29%/28%) Systemic NOAEL = 5 ppm Systemic LOAEL = 25 ppm, based on convulsions (males), hepatocellular carcinoma/adenocarcinoma combined in males
870.7600 Dermal penetration Rat	MRID 40122201 (1987)	Poorly absorbed when applied to shaved skin; 10% absorption

Table : Toxicology Profile of Phosmet		
Guideline No./ Study Type	**MRID No. (year)/ Classification /Doses**	**Results**
In vitro dermal absorption	Epidermal membranes (rat and human); phosmet applied as (1) an undiluted concentrate at 700 g phosmet/kg (7000 $\mu g/cm^2$), which represents worker mixer/loader exposure, or as (2) a 7 g phosmet/L aqueous dilution (70 $\mu g/cm^2$), which represents worker applicator and re-entry exposure.	Rat: The mean percentage of absorbed radioactivity in the receptor fluid was 0.19% for the undiluted concentrate and 11.7% for the aqueous dilution. Mean amount of applied dose remaining in the rat epidermis was 0.01% for the undiluted concentrate and 0.5% for the aqueous dilution. Human: The mean percentage of absorbed radioactivity in the receptor fluid was 0.07% for the undiluted concentrate and 1.69% for the aqueous dilution. Mean amount of applied dose remaining in the human epidermis was <0.01% for the undiluted concentrate and 0.15% for the aqueous dilution.
870.7485 Metabolism Rat (Crl:CD(SD) BRVAF/Plus)	MRID 41296001 (1989) MRID 41425701 (1990) 1 and 25 mg/kg	Phosmet is rapidly absorbed, distributed, metabolized, and eliminated in rats after a single low and high and repeat low dose. Most of radiolabel was recovered within 24 hours in urine (69-83%) and feces (4.5-9.9%) for all groups. Highest levels in liver and whole blood; peak blood levels occurred 0.5 hour following low and high dose.
Bacterial reverse mutation test 870.5100	MRID 00164884 (1986) Salmonella typhimurium TA100, TA1535	Positive w/ & w/out S9
Mammalian micronucleus test mouse bone marrow 870. 5395	MRID 40199401 (1987)	No clastogenic effect at 17 mg/kg in bone marrow cells 24, 48, or 72 hr after dosing;
In vitro mammalian cytogenetics assay in mammalian cells (mouse lymphoma multiple endpoint test) 870.5375	MRID 00164886 (1987)	Positive for structural chromosomal aberrations w/out S9 Positive for SCE w/ & w/out S9
Mouse lymphoma forward mutation	MRID 00164885 (1987)	Positive w/ & w/out S9
DNA damage assay in human fibroblast	MRID 00164887 (1987)	Negative w/ & w/out S9
Morphological transformation of BALB/3T3 cells	MRID 00164888 (1986)	Positive

Appendix A2 – Bench Mark Dose Analysis

1) BMD Summary

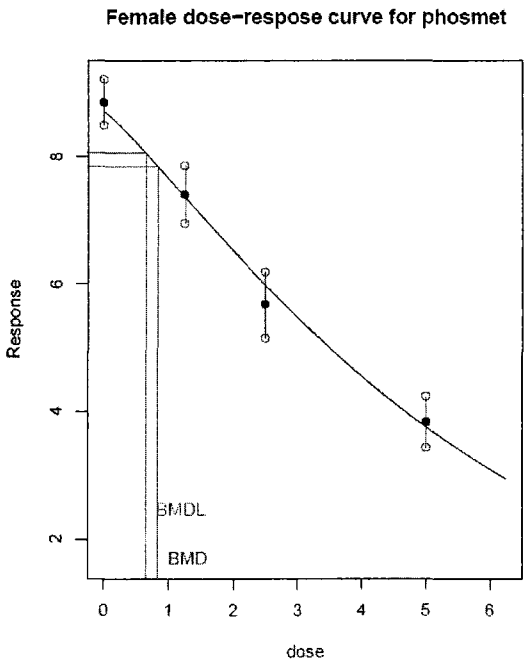
Date: March 2009
Chemical: Phosmet
Study: Comparative ChE Repeat study in the Rat

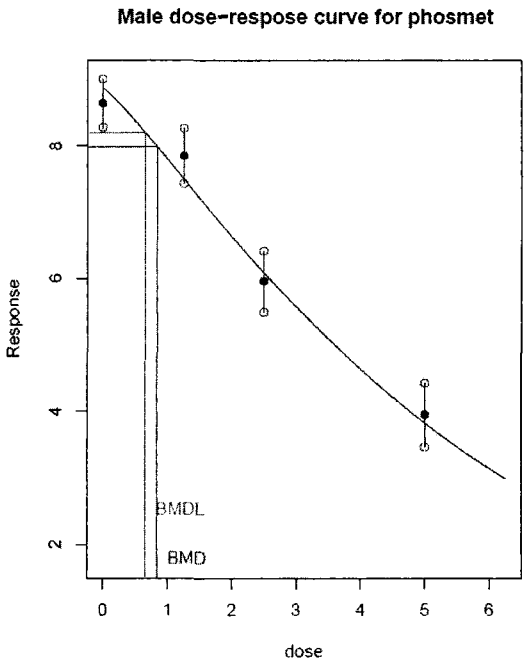
PHOSMET: BMD/BMDL VALUES – R Program

Subset data	Sex	BMD_{10} (95% CI)	$BMDL_{10}$	Model
Pup Brain	Male – Female (BMD grouped)	0.8222	0.6398	Power
Adult Brain	Male – Female (BMD grouped)	3.8568	2.8400	Power
Pup RBC	Male – Female (BMD grouped)	0.3609	0.1633	Power
Adult RBC	Male – Female (BMD grouped)	1.1935	0.6012	Power

2) Pup Brain

Date: March 23,2009
Chemical: Phosmet
Dataset: Comparative ChE repeat (Linda Taylor)
Data: pup brain
Sexes: Both
Model: R combined sexes
Power
10% bmr





Mon Mar 23 14:28:02 2009
Redundancy Analysis

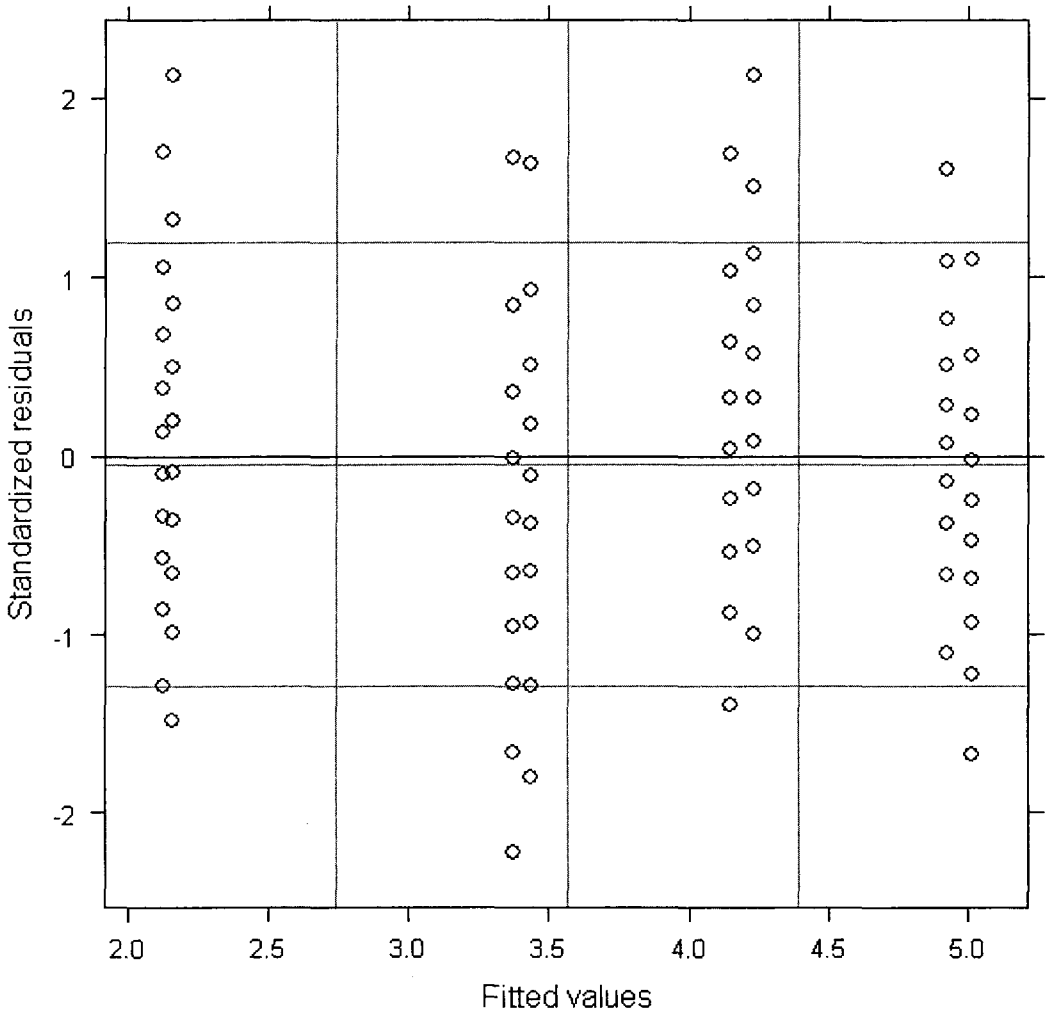
	1	2	3	4	5
CondIndex	10.556	3.732	2.264	1.582	1.000
mu	0.164	0.463	0.763	1.092	1.728
lA.sexF	0.287	0.199	0.263	0.243	0.008
lA.sexM	0.155	0.302	0.419	0.101	0.023
lD.(Intercept)	0.981	0.010	0.003	0.001	0.005
lD.sexM	0.051	0.883	0.007	0.035	0.024
lg	0.936	0.038	0.019	0.002	0.006

Parameter Values and Relative Standard Errors (sigma == 1)

	Parms	Relative SE
lA.sexF	1.600	0.059
lA.sexM	1.600	0.058
lD.(Intercept)	-0.242	0.396
lD.sexM	0.078	0.218
lg	0.136	0.217

Mean Absolute Value of Gradient

	Val
lA.sexF	1.7806419
lA.sexM	1.8762078
lD.(Intercept)	1.0902249
lD.sexM	0.5395807
lg	1.4446399



***** UNWEIGHTED *****

BMD Grouped.

AIC: 86.27491

Female intercept estimate (standard error): 4.918198(0.1082552)
Male intercept estimate (standard error): 5.01209(0.1087194)
Grouped BMD10 estimate (standard error): 0.8221816(0.1437889)
Power parameter estimate (standard error): 1.149898(0.1086796)

The confidence intervals for the variables are given by
lower est. upper

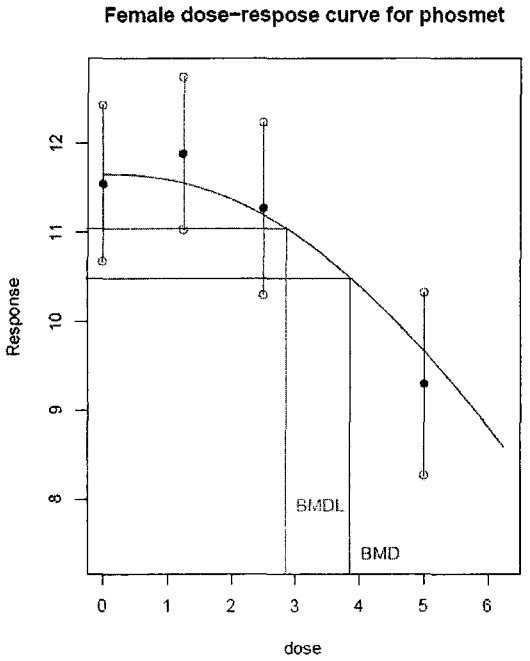
Female Intercept 4.7108168 4.9181977 5.134708
Male Intercept 4.8036925 5.0120904 5.229529
BMD10 0.6091254 **0.8221816** 1.109759
Power Parameter 0.9670937 1.1498983 1.367257
attr(,"label")
[1] "Coefficients:"

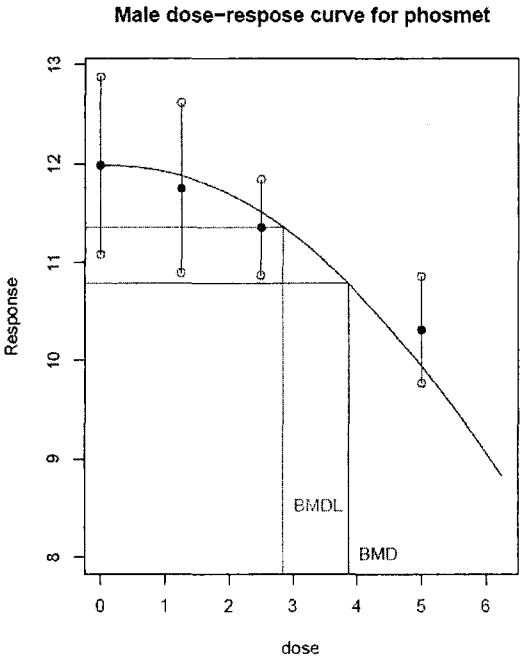
The one-sided confidence intervals (the lower bound) is given by

Female Intercept	Male Intercept	BMDL10	Power Parameter
4.7442149	4.8372631	**0.6398345**	0.9949444

3) Adult Brain

Date: March 24, 2009
Chemical: Phosmet
Dataset: Comparative ChE repeat (Linda Taylor)
Data: adult brain
Sexes: Both
Model: R combined sexes
Power
10% bmr





Tue Mar 24 08:43:45 2009
Redundancy Analysis

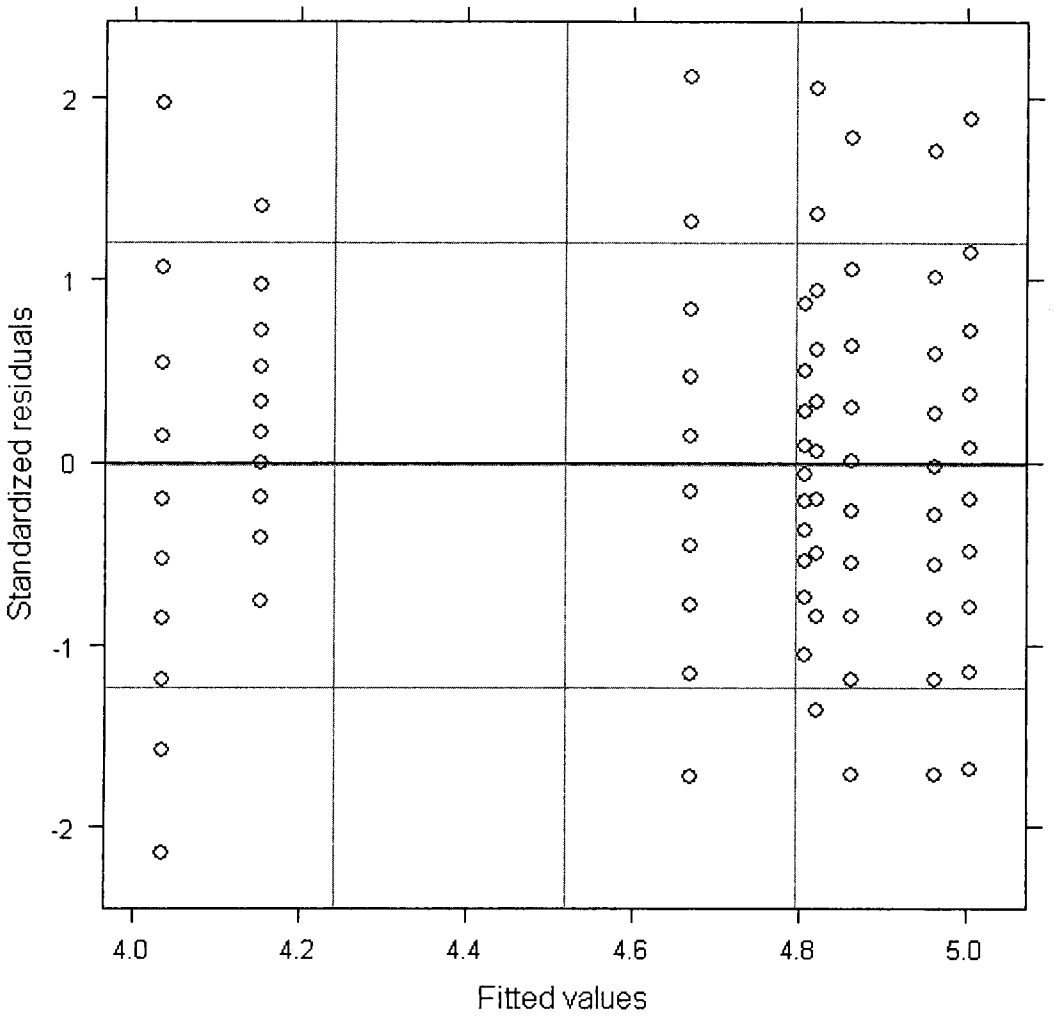
	1	2	3	4	5
CondIndex	6.924	2.470	1.672	1.296	1.000
mu	0.221	0.619	0.914	1.180	1.529
lA.sexF	0.563	0.011	0.357	0.055	0.015
lA.sexM	0.157	0.625	0.040	0.153	0.025
lD.(Intercept)	0.983	0.000	0.001	0.002	0.014
lD.sexM	0.503	0.411	0.003	0.054	0.029
lg	0.889	0.030	0.047	0.020	0.014

Parameter Values and Relative Standard Errors (sigma == 1)

	Parms	Relative SE
lA.sexF	1.590	0.052
lA.sexM	1.600	0.045
lD.(Intercept)	1.270	0.404
lD.sexM	0.213	0.370
lg	0.870	0.984

Mean Absolute Value of Gradient

	Val
lA.sexF	2.2902331
lA.sexM	2.3744936
lD.(Intercept)	0.5785363
lD.sexM	0.2293183
lg	0.1832306



***** UNWEIGHTED *****

BMD Grouped.

AIC: 138.9437

Female intercept estimate (standard error): 4.862507(0.1287690)
Male intercept estimate (standard error): 5.005503(0.1304668)
Grouped BMD10 estimate (standard error): 3.856859(0.8524483)
Power parameter estimate (standard error): 2.212544(2.142782)

The confidence intervals for the variables are given by

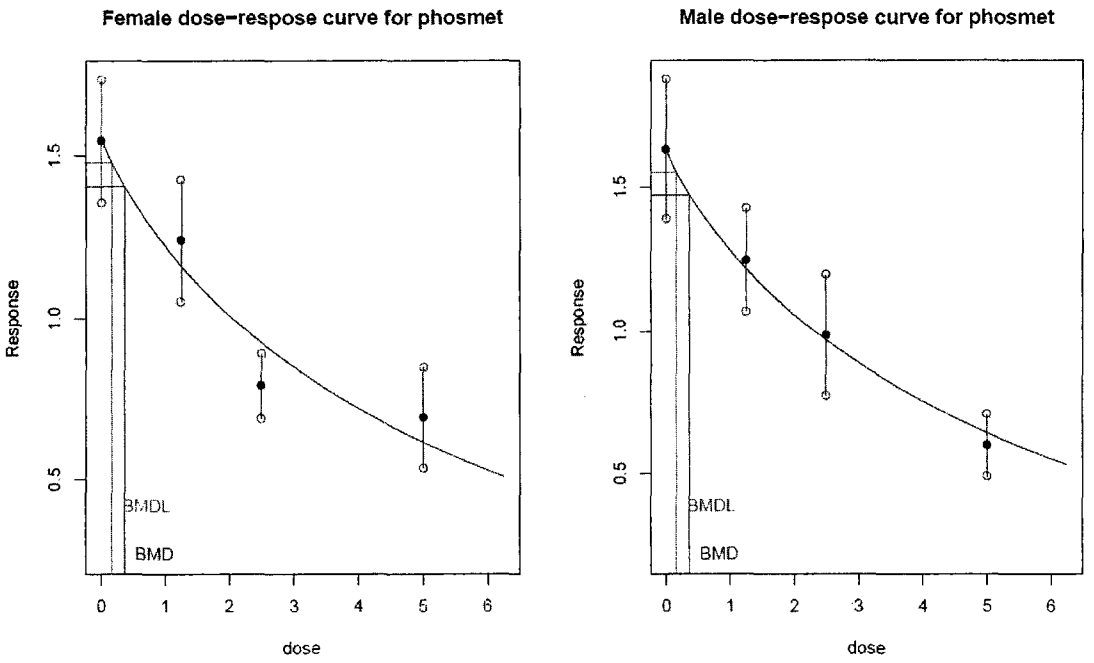
	lower	est.	upper
Female Intercept	4.6179233	4.862507	5.120045
Male Intercept	4.7574980	5.005503	5.266437

BMD10 2.6745803 **3.856859** 5.561756
Power Parameter 0.7533503 2.212544 6.498107
attr(,"label")
[1] "Coefficients:"

The one-sided confidence intervals (the lower bound) is given by
Female Intercept Male Intercept BMDL10 Power Parameter
4.6571611 4.7972981 **2.8400046** 0.8988871

4) Pup RBC

Date: March 23,2009
Chemical: Phosmet
Dataset: Comparative ChE repeat (Linda Taylor)
Data: pup RBC
Sexes: Both
Model: R combined sexes
Power
10% bmr



Mon Mar 23 13:33:52 2009
Redundancy Analysis

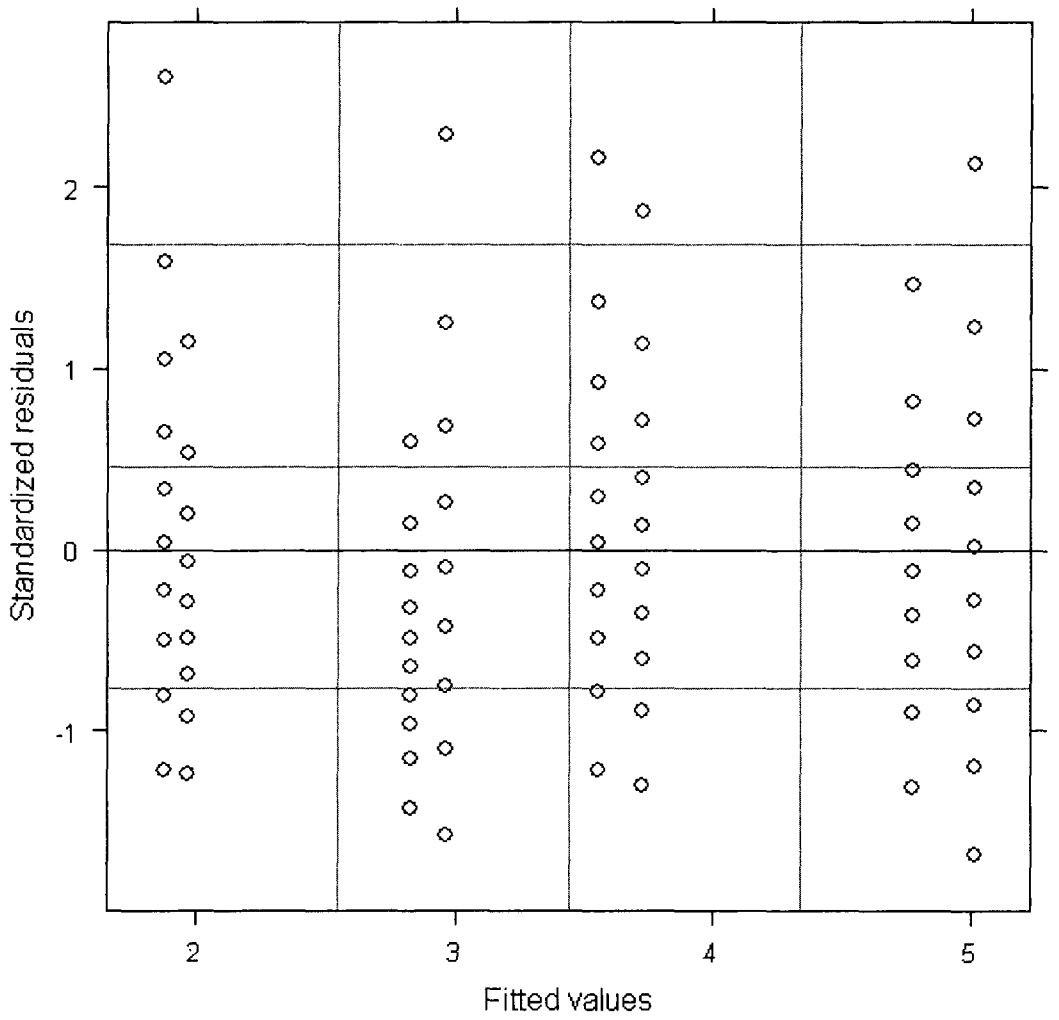
	1	2	3	4	5
CondIndex	11.806	4.081	2.388	1.612	1.000
mu	0.148	0.430	0.734	1.087	1.753
lA.sexF	0.212	0.302	0.225	0.253	0.008
lA.sexM	0.091	0.214	0.567	0.103	0.024
lD.(Intercept)	0.979	0.014	0.003	0.001	0.004
lD.sexM	0.031	0.899	0.019	0.030	0.021
lg	0.943	0.040	0.011	0.001	0.005

Parameter Values and Relative Standard Errors (sigma == 1)

	Parms	Relative SE
lA.sexF	1.550	0.067
lA.sexM	1.620	0.060
lD.(Intercept)	-0.900	0.528
lD.sexM	-0.054	0.271
lg	-0.145	0.218

Mean Absolute Value of Gradient

	Val
lA.sexF	1.6257967
lA.sexM	1.7182397
lD.(Intercept)	0.9379854
lD.sexM	0.4709352
lg	1.8309531



***** USING WEIGHTED *****

BMD Grouped.

AIC: 200.1885

Female intercept estimate (standard error): 4.775538(0.2901817)
Male intercept estimate (standard error): 5.014522(0.2907885)
Grouped BMD10 estimate (standard error): 0.3609339(0.2856233)
Power parameter estimate (standard error): 0.8303164(0.1854109)

The confidence intervals for the variables are given by

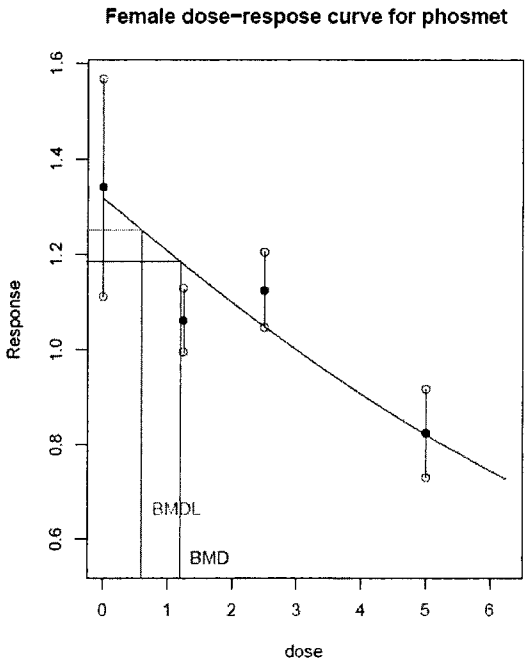
	lower	est.	upper
Female Intercept	4.2580623	4.7755376	5.3559010
Male Intercept	4.4933859	5.0145223	5.5960993

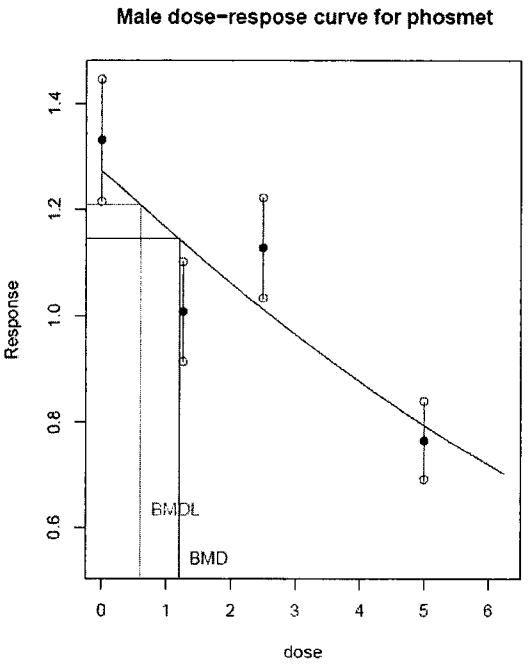
BMD10 0.1397511 **0.3609339** 0.9321804
Power Parameter 0.5739767 0.8303164 1.2011383
attr(,"label")
[1] "Coefficients:"

The one-sided confidence intervals (the lower bound) is given by
Female Intercept Male Intercept BMDL10 Power Parameter
4.3389498 4.5750185 **0.1632925** 0.6098227

5) Adult RBC

Date: March 24,2009
Chemical: Phosmet
Dataset: Comparative ChE repeat (Linda Taylor)
Data: adult RBC
Sexes: Both
Model: R combined sexes
Power
10% bmr





Tue Mar 24 09:34:56 2009

Redundancy Analysis

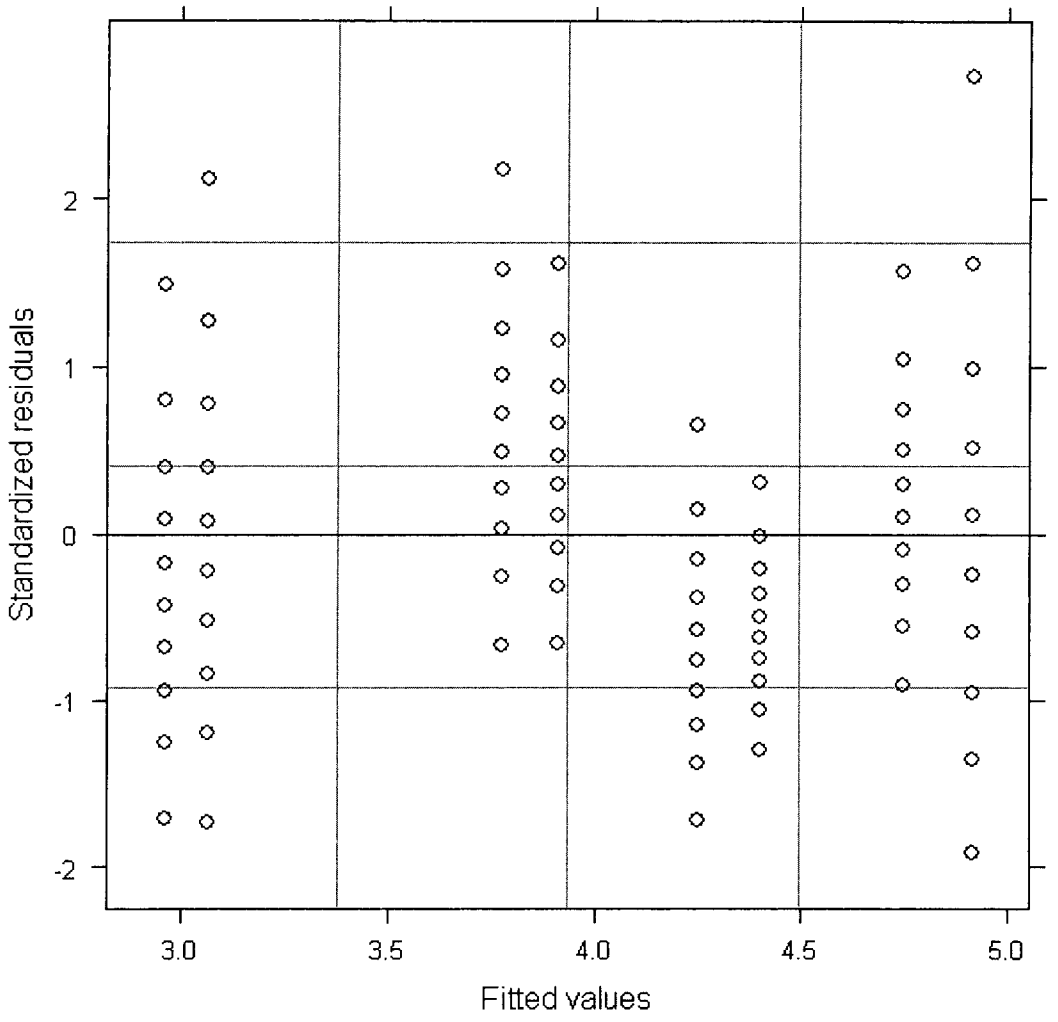
	1	2	3	4	5
CondIndex	10.347	4.686	2.669	1.623	1.000
mu	0.172	0.380	0.668	1.098	1.782
lA.sexF	0.306	0.268	0.213	0.206	0.006
lA.sexM	0.111	0.307	0.491	0.070	0.021
lD.(Intercept)	0.974	0.016	0.004	0.002	0.004
lD.sexM	0.024	0.925	0.011	0.024	0.016
lg	0.893	0.070	0.030	0.001	0.006

Parameter Values and Relative Standard Errors (sigma == 1)

	Parms	Relative SE
lA.sexF	1.600	0.060
lA.sexM	1.590	0.061
lD.(Intercept)	-0.293	0.720
lD.sexM	-0.129	0.468
lg	-0.292	0.360

Mean Absolute Value of Gradient

	Val
lA.sexF	2.0272940
lA.sexM	1.9696170
lD.(Intercept)	0.5843594
lD.sexM	0.3001007
lg	0.8418136



***** USING WEIGHTED *****

BMD Grouped.

AIC: 177.6946

Female intercept estimate (standard error): 4.914701(0.2418758)
Male intercept estimate (standard error): 4.745838(0.2321720)
Grouped BMD10 estimate (standard error): 1.193572(0.7584752)
Power parameter estimate (standard error): 1.046178(0.3448541)

The confidence intervals for the variables are given by

	lower	est.	upper
Female Intercept	4.4742980	4.914701	5.398452
Male Intercept	4.3228771	4.745838	5.210182

BMD10 0.5255868 **1.193572** 2.710523
Power Parameter 0.6305068 1.046178 1.735886
attr(,"label")
[1] "Coefficients:"

The one-sided confidence intervals (the lower bound) is given by

Female Intercept	Male Intercept	BMDL10	Power Parameter
4.5436956	4.3895414	**0.6012316**	0.6850834

APPENDIX B – Executive Summaries

EXECUTIVE SUMMARY: In a comparative cholinesterase (dose-response) study (MRID 47087401), phosmet (93.4% a.i.; Lot #4312)] was administered to 10 adult Crl:CD (SD) rats/sex/dose and 10 Crl:CD (SD) postnatal day (PND) 11 pups/sex/dose *via* gavage at dose levels of 0 (0.5% aqueous carboxymethylcellulose), 2.5, 5, or 10 mg/kg bw. At four hours post dose, red blood cell (RBC), plasma, and brain acetylcholinesterase levels were determined.

All adult rats and PND 11 pups survived to scheduled sacrifice, and there were no treatment-related clinical signs.

In the adult rat, acetylcholinesterase activity was reduced only at the 10 mg/kg dose level. Both sexes of adult rats displayed a comparable response with respect to RBC cholinesterase inhibition (males 39%**/females 37%), but plasma cholinesterase inhibition was observed only in the female (31%*). Brain cholinesterase inhibition was observed in both sexes, with the female displaying the greater response (males 18%**/females 27%**).

In the PND 11 pups, a dose-related increase in cholinesterase inhibition was observed in all compartments in both sexes. The magnitude of the inhibition in each compartment at a given dose was comparable between the sexes; *e.g.*, 49%** *vs* 45%**; 55%** *vs* 53%**; and 53%** *vs* 51%** inhibition (males *vs* females) in the RBC, plasma, and brain compartments, respectively, at 10 mg/kg, and the magnitude of the response was similar regardless of the compartment. At the low dose (2.5 mg/kg), the PND 11 pups displayed a statistically (female)/biologically-significant (both sexes) inhibition in brain cholinesterase activity (males 11%; females 17%*).

The NOAEL for adult rats (both sexes) is 5 mg/kg, based on RBC, plasma, and brain cholinesterase inhibition following an acute oral dose of 10 mg/kg (LOAEL). This adult rat NOAEL is consistent with the NOAEL from the guideline acute neurotoxicity study (4.5 mg/kg) in adult rats. **The NOAEL for PND 11 pups could not be determined, based on brain cholinesterase inhibition at all dose levels following acute oral exposure. The LOAEL for PND 11 pups is 2.5 mg/kg.** The PND 11 pup is more sensitive to phosmet with respect to cholinesterase inhibition in all three compartments than the adult rat. A comparison of the LOAEL for PND 11 pups (2.5 mg/kg) with the LOAEL for adult rats (10 mg/kg) indicates a 4-fold difference in response between these two age groups.

This study of RBC, plasma, and brain cholinesterase activities following acute oral treatment with phosmet in adult and neonatal rats is classified **Acceptable/Nonguideline.** It does not satisfy any guideline requirement; however, it does satisfy the data requirement for phosmet for comparative cholinesterase activity between adult and young rats.

EXECUTIVE SUMMARY: In a comparative cholinesterase (dose-response) study (MRID 47695401), phosmet (93.4% a.i.; Lot #4312) was administered to 10 adult Crl:CD (SD) rats/sex/dose and 10 Crl:CD (SD) postnatal day (PND) 11 pups/sex/dose via gavage at dose levels of 0 (0.5% aqueous carboxymethylcellulose), 1.25, 2.5, or 5 mg/kg/day for 7 consecutive days. On the last day of dosing, red blood cell (RBC), plasma, and brain samples were collected from each animal at approximately four hours post dose, and cholinesterase activity was determined for each compartment.

All adult rats and neonatal pups survived to scheduled sacrifice, and there were no treatment-related clinical signs. Body weights and body-weight gains were comparable among the groups for both age groups.

In the adult rats, both sexes displayed statistically-significant RBC cholinesterase inhibition four hours after the last of seven oral doses of 1.25 mg/kg/day (males 25%; females 21%), 2.5 mg/kg/day (males 15%; females 16%), and 5 mg/kg/day (males 43%; females 38%). However, a dose-response effect was not evident: the magnitude of the inhibition in both sexes at the mid-dose level was lower than that observed at the low-dose level. Both sexes displayed a statistically-significant inhibition of brain cholinesterase activity at 5 mg/kg/day (males 14%; females 20%) compared to the control values, with the female displaying the a slightly greater response. There was a dose-related reduction in plasma cholinesterase activity in both sexes, although statistical significance was attained only in the high-dose male group (30%)/female group (25%). No plasma cholinesterase inhibition was observed in either sex at the low-dose level.

In the PND 17 pups, there was a dose-related, statistically-significant, reduction in RBC cholinesterase activity in both sexes four hours after the last of seven oral doses of 1.25 mg/kg/day (males 24%; females 20%), 2.5 mg/kg/day (males 40%; females 49%), and 5 mg/kg/day (males 64%; females 56%). Inhibition was comparable between the sexes at all dose levels. Brain cholinesterase activity was reduced significantly in the PND 17 pups (both sexes) at doses of 1.25 mg/kg/day (males 10%; females 16%), 2.5 mg/kg/day (males 32%/females 36%), and 5.0 mg/kg/day (males 54%; females 57%). There was a dose-related, statistically-significant, reduction in plasma cholinesterase activity at doses of 1.25 mg/kg/day (females 20%), 2.5 mg/kg/day (males 32%; females 41%), and 5.0 mg/kg/day (males 56%; females 55%). At 1.25 mg/kg, male pups displayed a 10% inhibition of plasma cholinesterase activity, which was not statistically significant, and the magnitude of the male pup response is not considered biologically significant.

For repeat exposures (7 days' duration),

The adult LOAEL for brain cholinesterase inhibition is 5 mg/kg/day;
The adult NOAEL for brain cholinesterase inhibition is 2.5 mg/kg/day.

The adult LOAEL for RBC cholinesterase inhibition is 1.25 mg/kg/day.
The adult NOAEL for RBC cholinesterase inhibition is < 1.25 mg/kg/day

The adult LOAEL for plasma cholinesterase inhibition is 5 mg/kg/day.
The adult NOAEL for plasma cholinesterase inhibition is 2.5 mg/kg/day.

The pup LOAEL for brain cholinesterase inhibition is 1.25 mg/kg/day;
The pup NOAEL for brain cholinesterase inhibition is <1.25 mg/kg/day.

The pup LOAEL for RBC cholinesterase inhibition is 1.25 mg/kg/day.
The pup NOAEL for RBC cholinesterase inhibition is < 1.25 mg/kg/day

The pup LOAEL for plasma cholinesterase inhibition is 1.25 mg/kg/day (females), 2.5 mg/kg/day (males).
The pup NOAEL for plasma cholinesterase inhibition is <1.25 mg/kg/day (females), 1.25 mg/kg/day (males).

The overall adult LOAEL for cholinesterase inhibition is 1.25 mg/kg/day for red blood cells; the adult NOAEL was not determined (<1.25 mg/kg/day).

The overall pup LOAEL for cholinesterase inhibition is 1.25 mg/kg/day for brain, RBC, and plasma; the pup NOAEL was not determined (<1.25 mg/kg/day).

This study of brain, RBC, and plasma cholinesterase activities following repeat oral treatment with phosmet in adult and neonatal rats is classified Acceptable/Nonguideline. It does not satisfy any guideline requirement; however, it does satisfy the data requirement for phosmet for a comparative cholinesterase activity assay between adult and young rats following repeat exposure.

Appendix C – Non-Occupational (Residential) Exposure

PYO Risk Estimate Summary Table

		PYO MOEs (acute)					
	Population:	Females 13+		Infants/Children		General Populations (excluding females 13+ & infants and children	
Application Rate (lbs/A)	DAT	Adults - 4 hours	Youth - 2 hours	Adults - 4 hours	Youth - 2 hours	Adults - 4 hours	Youth - 2 hours
4	0	120	N/A	N/A	100	140	N/A
4	1	130	N/A	N/A	110	150	N/A
4	2	140	N/A	N/A	120	160	N/A
4	3	150	N/A	N/A	130	170	N/A
4	4	160	N/A	N/A	140	180	N/A
4	5	170	N/A	N/A	150	190	N/A
4	6	180	N/A	N/A	160	210	N/A
4	7	190	N/A	N/A	170	220	N/A
4	8	200	N/A	N/A	180	240	N/A
4	9	220	N/A	N/A	190	250	N/A
4	10	230	N/A	N/A	200	270	N/A
4	11	250	N/A	N/A	220	290	N/A
4	12	260	N/A	N/A	230	310	N/A
4	13	280	N/A	N/A	250	330	N/A
4	14	300	N/A	N/A	260	350	N/A
4	15	320	N/A	N/A	280	380	N/A
4	16	340	N/A	N/A	300	400	N/A
4	17	370	N/A	N/A	320	430	N/A
4	18	390	N/A	N/A	340	460	N/A
4	19	420	N/A	N/A	370	490	N/A
4	20	450	N/A	N/A	390	520	N/A
4	21	480	N/A	N/A	420	560	N/A
4	22	510	N/A	N/A	450	600	N/A
4	23	550	N/A	N/A	480	640	N/A
4	24	580	N/A	N/A	510	680	N/A
4	25	620	N/A	N/A	550	730	N/A
4	26	670	N/A	N/A	590	780	N/A
4	27	710	N/A	N/A	630	830	N/A
4	28	760	N/A	N/A	670	890	N/A
4	29	810	N/A	N/A	710	950	N/A
4	30	870	N/A	N/A	760	1000	N/A

Population: Females 13+	
PoD:	3.56
Human Equivalent Dose Used to Quantify Risk (in mg/kg/day):	160
Source (ST/IT):	acute oral CCA - rat (MRID 47087401)
LOC:	1000

Population: Infants and Children	
PoD:	1.2
Human Equivalent Dose Used to Quantify Risk (in mg/kg/day):	54
Source (ST/IT):	acute oral CCA - rat (MRID 47087401)
LOC:	100

Population: General Population	
Human Equivalent Dose Used to Quantify Risk (in mg/kg/day):	3.56
Source (ST/IT):	acute oral CCA - rat (MRID 47087401)
LOC:	100

PYO MOEs (acute)

Application Rate (in lbs/A)	Population: DAT	Females 13+ Adults - 4 hours	Females 13+ Youth - 2 hours	Infants/Children Adults - 4 hours	Infants/Children Youth - 2 hours	General Populations (excluding females 13+ & infants and Adults - 4 hours	General Populations (excluding females 13+ & infants and Youth - 2 hours
3	0	160	N/A	N/A	140	190	N/A
3	1	170	N/A	N/A	150	200	N/A
3	2	180	N/A	N/A	160	210	N/A
3	3	190	N/A	N/A	170	230	N/A
3	4	210	N/A	N/A	180	240	N/A
3	5	220	N/A	N/A	190	260	N/A
3	6	240	N/A	N/A	210	280	N/A
3	7	250	N/A	N/A	220	290	N/A
3	8	270	N/A	N/A	240	310	N/A
3	9	290	N/A	N/A	250	340	N/A
3	10	310	N/A	N/A	270	360	N/A
3	11	330	N/A	N/A	290	380	N/A
3	12	350	N/A	N/A	310	410	N/A
3	13	380	N/A	N/A	330	440	N/A
3	14	400	N/A	N/A	350	470	N/A
3	15	430	N/A	N/A	380	500	N/A
3	16	460	N/A	N/A	400	530	N/A
3	17	490	N/A	N/A	430	570	N/A
3	18	520	N/A	N/A	460	610	N/A
3	19	560	N/A	N/A	490	650	N/A
3	20	600	N/A	N/A	520	700	N/A
3	21	640	N/A	N/A	560	740	N/A
3	22	680	N/A	N/A	600	790	N/A
3	23	730	N/A	N/A	640	850	N/A
3	24	780	N/A	N/A	680	910	N/A
3	25	830	N/A	N/A	730	970	N/A
3	26	890	N/A	N/A	780	1000	N/A
3	27	950	N/A	N/A	830	1100	N/A
3	28	1000	N/A	N/A	890	1200	N/A
3	29	1100	N/A	N/A	950	1300	N/A
3	30	1200	N/A	N/A	1000	1300	N/A

PYO MOEs (acute)

Application Rate (in lbs/A)	Population: DAT	Females 13+ Adults - 4 hours	Females 13+ Youth - 2 hours	Infants/Children Adults - 4 hours	Infants/Children Youth - 2 hours	General Populations (excluding females 13+ & infants and Adults - 4 hours	General Populations (excluding females 13+ & infants and Youth - 2 hours
1.5	0	320	N/A	N/A	280	370	N/A
1.5	1	340	N/A	N/A	300	400	N/A
1.5	2	360	N/A	N/A	320	420	N/A
1.5	3	390	N/A	N/A	340	450	N/A
1.5	4	410	N/A	N/A	360	480	N/A
1.5	5	440	N/A	N/A	390	520	N/A
1.5	6	470	N/A	N/A	420	550	N/A
1.5	7	500	N/A	N/A	440	590	N/A
1.5	8	540	N/A	N/A	470	630	N/A
1.5	9	580	N/A	N/A	510	670	N/A
1.5	10	620	N/A	N/A	540	720	N/A
1.5	11	660	N/A	N/A	580	770	N/A
1.5	12	700	N/A	N/A	620	820	N/A
1.5	13	750	N/A	N/A	660	880	N/A
1.5	14	800	N/A	N/A	710	940	N/A
1.5	15	860	N/A	N/A	750	1000	N/A
1.5	16	920	N/A	N/A	810	1100	N/A
1.5	17	980	N/A	N/A	860	1100	N/A
1.5	18	1000	N/A	N/A	920	1200	N/A
1.5	19	1100	N/A	N/A	980	1300	N/A
1.5	20	1200	N/A	N/A	1000	1400	N/A
1.5	21	1300	N/A	N/A	1100	1500	N/A
1.5	22	1400	N/A	N/A	1200	1600	N/A
1.5	23	1500	N/A	N/A	1300	1700	N/A
1.5	24	1600	N/A	N/A	1400	1800	N/A
1.5	25	1700	N/A	N/A	1500	1900	N/A
1.5	26	1800	N/A	N/A	1600	2100	N/A
1.5	27	1900	N/A	N/A	1700	2200	N/A
1.5	28	2000	N/A	N/A	1800	2400	N/A
1.5	29	2200	N/A	N/A	1900	2500	N/A
1.5	30	2300	N/A	N/A	2000	2700	N/A

PYO MOEs (acute)

Application Rate (in lbs/A)	Population: DAT	Females 13+ Adults - 4 hours	Females 13+ Youth - 2 hours	Infants/Children Adults - 4 hours	Infants/Children Youth - 2 hours	General Populations (excluding females 13+ & infants and Adults - 4 hours	General Populations (excluding females 13+ & infants and Youth - 2 hours
1	0	**710**	N/A	N/A	620	820	N/A
1	1	**760**	N/A	N/A	660	880	N/A
1	2	**810**	N/A	N/A	710	940	N/A
1	3	**870**	N/A	N/A	760	1000	N/A
1	4	**930**	N/A	N/A	820	1100	N/A
1	5	**990**	N/A	N/A	870	1200	N/A
1	6	1100	N/A	N/A	930	1200	N/A
1	7	1100	N/A	N/A	1000	1300	N/A
1	8	1200	N/A	N/A	1100	1400	N/A
1	9	1300	N/A	N/A	1100	1500	N/A
1	10	1400	N/A	N/A	1200	1600	N/A
1	11	1500	N/A	N/A	1300	1700	N/A
1	12	1600	N/A	N/A	1400	1900	N/A
1	13	1700	N/A	N/A	1500	2000	N/A
1	14	1800	N/A	N/A	1600	2100	N/A
1	15	2000	N/A	N/A	1700	2300	N/A
1	16	2100	N/A	N/A	1800	2400	N/A
1	17	2200	N/A	N/A	2000	2600	N/A
1	18	2400	N/A	N/A	2100	2800	N/A
1	19	2600	N/A	N/A	2300	3000	N/A
1	20	2800	N/A	N/A	2400	3200	N/A
1	21	2900	N/A	N/A	2600	3400	N/A
1	22	3200	N/A	N/A	2800	3700	N/A
1	23	3400	N/A	N/A	3000	3900	N/A
1	24	3600	N/A	N/A	3200	4200	N/A
1	25	3900	N/A	N/A	3400	4500	N/A
1	26	4100	N/A	N/A	3600	4800	N/A
1	27	4400	N/A	N/A	3900	5200	N/A
1	28	4800	N/A	N/A	4200	5500	N/A
1	29	5100	N/A	N/A	4500	5900	N/A
1	30	5400	N/A	N/A	4800	6400	N/A

Appendix D – Occupational Post-application Exposure

Agricultural Crop Post-Application Summary Table

PoD:	3.56
Human Equivalent Dose Used to Quantify Risk (in mg/kg/day):	160
Source (ST/IT):	7 day repeat CCA - rat (MRID 47695401)
LOC:	100

		Short-term MOEs					Intermediate-term MOEs				ST/IT ROUNDED-term MOEs			
Application Rate (in lbs/A)	DAT	Very Low Exposure	Low Exposure	High Exposure	Very High Exposure	DAT	Very Low Exposure	Low Exposure	High Exposure	Very High Exposure	Very Low Exposure	Low Exposure	High Exposure	Very High Exposure
4	0	586	59	39	20	0	586	59	39	20	590	59	39	20
4	1	626	63	42	21	1	626	63	42	21	630	63	42	21
4	2	669	67	45	22	2	669	67	45	22	670	67	45	22
4	3	715	71	48	24	3	715	71	48	24	710	71	48	24
4	4	764	76	51	25	4	764	76	51	25	760	76	51	25
4	5	816	82	54	27	5	816	82	54	27	820	82	54	27
4	6	872	87	58	29	6	872	87	58	29	870	87	58	29
4	7	931	93	62	31	7	931	93	62	31	930	93	62	31
4	8	995	100	66	33	8	995	100	66	33	1000	100	66	33
4	9	1063	106	71	35	9	1063	106	71	35	1100	110	71	35
4	10	1136	114	76	38	10	1136	114	76	38	1100	110	76	38
4	11	1214	121	81	40	11	1214	121	81	40	1200	120	81	40
4	12	1297	130	86	43	12	1297	130	86	43	1300	130	86	43
4	13	1386	139	92	46	13	1386	139	92	46	1400	140	92	46
4	14	1481	148	99	49	14	1481	148	99	49	1500	150	99	49
4	15	1582	158	105	53	15	1582	158	105	53	1600	160	110	53
4	16	1690	169	113	56	16	1690	169	113	56	1700	170	110	56
4	17	1806	181	120	60	17	1806	181	120	60	1800	180	120	60
4	18	1929	193	129	64	18	1929	193	129	64	1900	190	130	64
4	19	2062	206	137	69	19	2062	206	137	69	2100	210	140	69
4	20	2203	220	147	73	20	2203	220	147	73	2200	220	150	73
4	21	2353	235	157	78	21	2353	235	157	78	2400	240	160	78
4	22	2515	251	168	84	22	2515	251	168	84	2500	250	170	84
4	23	2687	269	179	90	23	2687	269	179	90	2700	270	180	90
4	24	2871	287	191	96	24	2871	287	191	96	2900	290	190	96
4	25	3067	307	204	102	25	3067	307	204	102	3100	310	200	100
4	26	3277	328	218	109	26	3277	328	218	109	3300	330	220	110
4	27	3501	350	233	117	27	3501	350	233	117	3500	350	230	120
4	28	3741	374	249	125	28	3741	374	249	125	3700	370	250	120
4	29	3997	400	266	133	29	3997	400	266	133	4000	400	270	130
4	30	4271	427	285	142	30	4271	427	285	142	4300	430	280	140
		Days till VH Exposure Reaches LOC (ST) =		25			Days till VH Exposure Reaches LOC (IT) =		25					

		Short-term MOEs					Intermediate-term MOEs			
Application Rate (in lbs/A)	DAT	Very Low Exposure	Low Exposure	High Exposure	Very High Exposure	DAT	Very Low Exposure	Low Exposure	High Exposure	Very High Exposure
3	0	781	78	52	26	0	781	78	52	26
3	1	835	83	56	28	1	835	83	56	28
3	2	892	89	59	30	2	892	89	59	30
3	3	953	95	64	32	3	953	95	64	32
3	4	1018	102	68	34	4	1018	102	68	34
3	5	1088	109	73	36	5	1088	109	73	36
3	6	1162	116	77	39	6	1162	116	77	39
3	7	1242	124	83	41	7	1242	124	83	41
3	8	1327	133	88	44	8	1327	133	88	44
3	9	1418	142	95	47	9	1418	142	95	47
3	10	1515	151	101	50	10	1515	151	101	50
3	11	1618	162	108	54	11	1618	162	108	54
3	12	1729	173	115	58	12	1729	173	115	58
3	13	1848	185	123	62	13	1848	185	123	62
3	14	1974	197	132	66	14	1974	197	132	66
3	15	2109	211	141	70	15	2109	211	141	70
3	16	2254	225	150	75	16	2254	225	150	75
3	17	2408	241	161	80	17	2408	241	161	80
3	18	2573	257	172	86	18	2573	257	172	86
3	19	2749	275	183	92	19	2749	275	183	92
3	20	2937	294	196	98	20	2937	294	196	98
3	21	3138	314	209	105	21	3138	314	209	105
3	22	3353	335	224	112	22	3353	335	224	112
3	23	3582	358	239	119	23	3582	358	239	119
3	24	3827	383	255	128	24	3827	383	255	128
3	25	4089	409	273	136	25	4089	409	273	136
3	26	4369	437	291	146	26	4369	437	291	146
3	27	4668	467	311	156	27	4668	467	311	156
3	28	4988	499	333	166	28	4988	499	333	166
3	29	5329	533	355	178	29	5329	533	355	178
3	30	5694	569	380	190	30	5694	569	380	190
		Days till VH Exposure Reaches LOC (ST) =		21			Days till VH Exposure Reaches LOC (IT) =		21	

		Short-term MOEs					Intermediate-term MOEs			
Application Rate (in lbs/A)	DAT	Very Low Exposure	Low Exposure	High Exposure	Very High Exposure	DAT	Very Low Exposure	Low Exposure	High Exposure	Very High Exposure
2	0	1172	117	78	39	0	1172	117	78	39
2	1	1252	125	83	42	1	1252	125	83	42
2	2	1338	134	89	45	2	1338	134	89	45
2	3	1429	143	95	48	3	1429	143	95	48
2	4	1527	153	102	51	4	1527	153	102	51
2	5	1632	163	109	54	5	1632	163	109	54
2	6	1743	174	116	58	6	1743	174	116	58
2	7	1863	186	124	62	7	1863	186	124	62
2	8	1990	199	133	66	8	1990	199	133	66
2	9	2127	213	142	71	9	2127	213	142	71
2	10	2272	227	151	76	10	2272	227	151	76
2	11	2428	243	162	81	11	2428	243	162	81
2	12	2594	259	173	86	12	2594	259	173	86
2	13	2771	277	185	92	13	2771	277	185	92
2	14	2961	296	197	99	14	2961	296	197	99
2	15	3164	316	211	105	15	3164	316	211	105
2	16	3380	338	225	113	16	3380	338	225	113
2	17	3612	361	241	120	17	3612	361	241	120
2	18	3859	386	257	129	18	3859	386	257	129
2	19	4123	412	275	137	19	4123	412	275	137
2	20	4405	441	294	147	20	4405	441	294	147
2	21	4707	471	314	157	21	4707	471	314	157
2	22	5029	503	335	168	22	5029	503	335	168
2	23	5373	537	358	179	23	5373	537	358	179
2	24	5741	574	383	191	24	5741	574	383	191
2	25	6134	613	409	204	25	6134	613	409	204
2	26	6554	655	437	218	26	6554	655	437	218
2	27	7003	700	467	233	27	7003	700	467	233
2	28	7482	748	499	249	28	7482	748	499	249
2	29	7994	799	533	266	29	7994	799	533	266
2	30	8541	854	569	285	30	8541	854	569	285
		Days till VH Exposure Reaches LOC (ST) =		15			Days till VH Exposure Reaches LOC (IT) =		15	

Application Rate (in lbs/A)	DAT	Short-term MOEs Low Exposure	Medium Exposure	High Exposure	Very High Exposure	DAT	Intermediate-term MOEs Low Exposure	Medium Exposure	High Exposure	Very High Exposure
1.5	0	235	117	23	12	0	N/A	117	23	N/A
1.5	1	251	126	25	13	1	N/A	126	25	N/A
1.5	2	269	135	27	13	2	N/A	135	27	N/A
1.5	3	289	144	29	14	3	N/A	144	29	N/A
1.5	4	309	155	31	15	4	N/A	155	31	N/A
1.5	5	331	166	33	17	5	N/A	166	33	N/A
1.5	6	355	178	36	18	6	N/A	178	36	N/A
1.5	7	381	190	38	19	7	N/A	190	38	N/A
1.5	8	408	204	41	20	8	N/A	204	41	N/A
1.5	9	437	219	44	22	9	N/A	219	44	N/A
1.5	10	468	234	47	23	10	N/A	234	47	N/A
1.5	11	502	251	50	25	11	N/A	251	50	N/A
1.5	12	538	269	54	27	12	N/A	269	54	N/A
1.5	13	577	288	58	29	13	N/A	288	58	N/A
1.5	14	618	309	62	31	14	N/A	309	62	N/A
1.5	15	662	331	66	33	15	N/A	331	66	N/A
1.5	16	710	355	71	35	16	N/A	355	71	N/A
1.5	17	760	380	76	38	17	N/A	380	76	N/A
1.5	18	815	407	81	41	18	N/A	407	81	N/A
1.5	19	873	437	87	44	19	N/A	437	87	N/A
1.5	20	936	468	94	47	20	N/A	468	94	N/A
1.5	21	1003	501	100	50	21	N/A	501	100	N/A
1.5	22	1075	537	107	54	22	N/A	537	107	N/A
1.5	23	1152	576	115	58	23	N/A	576	115	N/A
1.5	24	1234	617	123	62	24	N/A	617	123	N/A
1.5	25	1323	661	132	66	25	N/A	661	132	N/A
1.5	26	1418	709	142	71	26	N/A	709	142	N/A
1.5	27	1519	760	152	76	27	N/A	760	152	N/A
1.5	28	1628	814	163	81	28	N/A	814	163	N/A
1.5	29	1745	872	174	87	29	N/A	872	174	N/A
1.5	30	1870	935	187	93	30	N/A	935	187	N/A
1.5	31	2004	1002	200	100	31	N/A	1002	200	N/A
		Days till VH Exposure Reaches LOC (ST) =		31			Days till H Exposure Reaches LOC (IT) =		21	

		Short-term MOEs					Intermediate-term MOEs			
Application Rate (in lbs/A)	DAT	Very Low Exposure	Low Exposure	High Exposure	Very High Exposure	DAT	Very Low Exposure	Low Exposure	High Exposure	Very High Exposure
1	0	N/A	N/A	126	N/A	0	N/A	N/A	126	N/A
1	1	N/A	N/A	135	N/A	1	N/A	N/A	135	N/A
1	2	N/A	N/A	145	N/A	2	N/A	N/A	145	N/A
1	3	N/A	N/A	155	N/A	3	N/A	N/A	155	N/A
1	4	N/A	N/A	166	N/A	4	N/A	N/A	166	N/A
1	5	N/A	N/A	178	N/A	5	N/A	N/A	178	N/A
1	6	N/A	N/A	190	N/A	6	N/A	N/A	190	N/A
1	7	N/A	N/A	203	N/A	7	N/A	N/A	203	N/A
1	8	N/A	N/A	218	N/A	8	N/A	N/A	218	N/A
1	9	N/A	N/A	233	N/A	9	N/A	N/A	233	N/A
1	10	N/A	N/A	250	N/A	10	N/A	N/A	250	N/A
1	11	N/A	N/A	267	N/A	11	N/A	N/A	267	N/A
1	12	N/A	N/A	286	N/A	12	N/A	N/A	286	N/A
1	13	N/A	N/A	306	N/A	13	N/A	N/A	306	N/A
1	14	N/A	N/A	328	N/A	14	N/A	N/A	328	N/A
1	15	N/A	N/A	351	N/A	15	N/A	N/A	351	N/A
1	16	N/A	N/A	376	N/A	16	N/A	N/A	376	N/A
1	17	N/A	N/A	402	N/A	17	N/A	N/A	402	N/A
1	18	N/A	N/A	430	N/A	18	N/A	N/A	430	N/A
1	19	N/A	N/A	461	N/A	19	N/A	N/A	461	N/A
1	20	N/A	N/A	493	N/A	20	N/A	N/A	493	N/A
1	21	N/A	N/A	528	N/A	21	N/A	N/A	528	N/A
1	22	N/A	N/A	565	N/A	22	N/A	N/A	565	N/A
1	23	N/A	N/A	605	N/A	23	N/A	N/A	605	N/A
1	24	N/A	N/A	648	N/A	24	N/A	N/A	648	N/A
1	25	N/A	N/A	693	N/A	25	N/A	N/A	693	N/A
1	26	N/A	N/A	742	N/A	26	N/A	N/A	742	N/A
1	27	N/A	N/A	794	N/A	27	N/A	N/A	794	N/A
1	28	N/A	N/A	850	N/A	28	N/A	N/A	850	N/A
1	29	N/A	N/A	910	N/A	29	N/A	N/A	910	N/A
1	30	N/A	N/A	975	N/A	30	N/A	N/A	975	N/A
		Days till H Exposure Reaches LOC (ST) =		0			Days till H Exposure Reaches LOC (IT) =		0	

13544

R174612

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