Karen Morrison
Director

Department of Pesticide Regulation

M E M O R A N D U M

Gavin Newsom
Governor

Yana Garcia
Secretary for Environmental Protection

To: Karen Morrison
Director

From: Sam Raburn
Economist

Cc: Sapna Thottathil
Deputy Director, Sustainable Pest Management

Madison Le
Deputy Director, Monitoring and Mitigation

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Subject: **Economic and Pest Management Evaluation of Fipronil Spot-On Pet Products in California**

The California Department of Pesticide Regulation (DPR) is actively evaluating the environmental and human health impacts related to pet products containing the active ingredient fipronil. This work supports the larger effort at DPR to evaluate fipronil mitigation options by specifically analyzing the economic impact of fipronil spot-on pet products becoming unavailable to consumers, should it be determined that no other mitigation is feasible.

DPR identified and analyzed the costs of 143 products for cats and dogs: 54 fipronil-containing spot-on pet products and 89 alternative spot-on pet products. Using DPR sales data from 2023-2025, costs were calculated by comparing currently available spot-on products containing fipronil and currently available alternative spot-on products that do not contain fipronil.

If fipronil spot-on products become unavailable to Californians, statewide pest management costs are estimated to increase by an average of $326,611 per year (Table ES-1). This number corresponds to an average increase in monthly cost of $3.64 per cat and $0.56 per dog for pet owners currently using fipronil spot-on products. These impacts are exclusive to users of spot-on products and do not capture impacts to other formulations or professional services. Additionally,

many non-chemical controls for fleas and ticks exist, but have been omitted from this economic analysis due to challenges in estimating user costs.

Table ES-1. Change in statewide pest management costs if fipronil spot-on products were unavailable (estimates based on 2023-25 sales data)

Year	Cat Products ($)	Dog Products ($)	Total ($)
2023	453,088	-3,216	449,872
2024	263,009	88,926	351,935
2025	89,489	88,536	178,025
Average	*268,529*	*58,082*	*326,611*

The remainder of the report is organized as follows. Prior to the economic analysis, background information on fipronil and pest pressures are presented for additional context. We then discuss the data and methodology used. Finally, we present the economic analyses and results.

FIPRONIL BACKGROUND

Fipronil (5-amino-1-[2,6-dichloro-4-(trifluoromethyl)phenyl]-4-[(trifluoromethyl)sulfinyl]-1H -pyrazole-3-carbonitrile), first registered in California in 1997, is a phenylpyrazole broad-spectrum insecticide used in a variety of structural pest control, bait, and spot-on pet products (Gunasekara et al., 2007). Spot-on products are a category of pesticide-containing liquids that are used to treat ectoparasites such as fleas and ticks. These products often come in the form of gels, creams, or liquid solutions, and are typically applied to the pet's skin between the shoulder blades or down the pet's back (National Pesticide Information Center, 2016). Spot-on products are both species- and weight-specific. Other formulations of flea and tick pesticide products include shampoos, sprays, and collars. Oral medications (i.e., chewables) can also manage fleas and ticks, but these are not regulated by DPR.

Fipronil controls a broad spectrum of pests including, but not limited to, mosquitoes, cockroaches, and ticks and fleas at both their larval and adult stages. Fipronil works by disrupting the gamma-aminobutyric acid gated channels leading to convulsion, paralysis, and death of insects (Gant et al., 1998).

Although fipronil is an effective pesticide, fipronil spot-on products have been found to be a surface water contaminant caused, in part, by bathing dogs (Teerlink et al., 2017). DPR has identified that pet products containing fipronil pose environmental impact and human health concerns and has listed it as an active ingredient (AI) on DPR's Continuous Evaluation and Mitigation list (DPR, 2026a). As part of the reevaluation process, DPR has published other

materials on the risks associated with the use of fipronil including the memo *Fipronil Pet Products: Potential Risks to Aquatic Life* (DPR, 2026b).

OVERVIEW OF PEST PRESSURES

Fleas

Fleas are among the most common ectoparasites on cats and dogs and are a significant cause of irritation and disease (Verne, 2017; Trembley & Bishopp, 1940). The cat flea (*Ctenocephalides felis*), which can be found on cats and dogs, is the most common species of flea encountered in California (Gin et al., 2026). The dog flea (*Ctenocephalides canis*) and human flea (*Pulex irritans*) also occur in California and may occasionally infest pets and companion animals (Lawrence et al., 2019).

Flea populations rapidly reproduce under favorable conditions, including moderate temperatures, high relative humidity, and the presence of suitable hosts (Silverman et al., 1981). Fleas are active year-round in southern California and during spring, summer, and fall in most of the state (Krueger et al., 2022).

Fipronil is commonly used as a topical spot-on treatment for the prevention and control of fleas on cats and dogs. Fipronil's widespread use reflects both its effectiveness against adult fleas and its availability as an over-the counter product (Dryden et al., 2000). Preventative products for fleas include fipronil and non-fipronil containing topical spot-on treatments, flea collars, chewables, and other veterinarian-recommended products for the control of adult fleas (Rosenkrantz, 2016).

Ticks

Ticks are parasitic arachnids commonly encountered by both humans and domestic animals. There are several species of concern in California including, but not limited to, the western blacklegged tick (*Ixodes pacificus*), the Pacific Coast tick (*Dermacentor occidentalis*), the western American dog tick (*Dermacentor similis*), the Rocky Mountain wood tick (*Dermacentor andersoni*), the brown dog tick (*Rhipicephalus sanguineus*), and rodent ticks (*Ixodes spinipalpis* and *Ixodes angustus*) (Galletti et al., 2024; Xu et al., 2019; Gurfield et al., 2017; Wikswo et al., 2007; Clover & Lane, 1995; Oliver et al., 1972).

The main tick species of public health and veterinary concern belong to the family *Ixodidae*, also known as hard ticks (Sarwar, 2017; Oliver, 1989). Hard ticks are the most common ticks in California and are typically associated with grasslands, forests, and other vegetated areas, where they seek out passing hosts (MacDonald, 2018). Their seasonal activity and behavior differ by species, life stage, and geographic region. In central and southern California, nymphs tend to seek

hosts from February to June, while adult ticks seek hosts from late fall to spring. In the north coast and Sierra Nevada foothills, adults may remain active throughout the winter when temperatures allow (UC IPM, 2016).

Fipronil is commonly used as a topical spot-on treatment for the prevention and control of hard ticks on cats and dogs (Šíma et al., 2024; Bonneau et al., 2010). Fipronil's widespread use reflects its efficacy against multiple hard tick species, simultaneous control of fleas, and its availability over the counter.

Alternatives to Spot-On Fipronil Products

Alternative spot-on products that control adult fleas on dogs or cats contain AIs such as neonicotinoids (e.g., imidacloprid and dinotefuran), spinosyns (e.g., spinetoram), and pyrethroids (e.g., permethrin, etofenprox, and cyphenothrin) (Rust, 2020; U.S. Environmental Protection Agency [EPA], 2018; Dryden et al., 2011). Some products also contain growth regulators (e.g., s-methoprene and pyriproxyfen), or synergists (e.g., n-octyl bicycloheptene dicarboximide and piperonyl butoxide) (Anadón et al., 2025; Horak et al., 2012).

Alternative spot-on products that control adult ticks on dogs or cats contain AIs such as isoxazolines, pyrethrins, and pyrethroids (e.g., flumethrin, permethrin, etofenprox, and cyphenothrin). Some products also contain synergists (e.g., piperonyl butoxide) (Anadón et al., 2025; Zhou et al., 2022; Horak et al., 2012). Depending on the AI, these products are available in various formulations including topical treatments, collars, sprays, shampoos, and wipes.

The use of these AIs can depend on target pest, animal species, veterinary recommendations, and owner preferences. Nonchemical practices may be used alone or in combination with chemical products depending on the pet's exposure risk. Nonchemical practices can also support population control when used as part of an integrated control plan (Rust, 2017). Example mechanical controls for fleas include vacuuming, trapping, laundering, and using flea combs. Example cultural controls for ticks include walking in the center of trails, inspecting pets after outdoor activities, creating hardscape barriers, and maintaining outdoor spaces. Additionally, the removal of flea and tick habitats such as vegetation in outdoor pet resting areas can reduce pet exposure. While many non-chemical controls for fleas and ticks exist, they have been omitted from this economic analysis due to challenges in estimating user costs.

DATA

Pet Products of Interest

DPR reviewed the labels of 367 registered pet products to identify fipronil-containing and non-fipronil spot-on products. Active products were queried using DPR site codes that were applicable

to pet products.[1] DPR identified 143 products for analysis: 54 fipronil-containing spot-on pet products and 89 alternative spot-on pet products.[2]

To identify products that would be alternatives to fipronil spot-on products, DPR first linked the full 367-product list to an internal label review table. This table has several characteristics including the product's formulation (e.g., spot-on, collar), whether the product is used for pets, and whether the product is used for agricultural livestock. In this analysis, we considered a product to be an alternative to fipronil spot-on pet products if it exhibits three characteristics: 1) use on pets; 2) no use on livestock; and 3) spot-on formulation. Using this characterization, 89 alternative spot-on products were identified. Products that did not meet all three requirements may be used as alternatives but are not considered in this analysis.

Sales

Using DPR's Mill Assessment database, we obtained annual sales values for the 54 fipronil and 89 alternative spot-on products between 2023-2025. Sales data do not provide details as to why products are used, but the identified pet products are inherently species- and weight-specific (e.g., for dogs weighing 22-44 lbs). To account for these details, we expanded the data by adding two characteristic variables to indicate species and weight specifications. Weight specifications were pulled from online sources. Due to differences between species and applicable products, we analyzed cats and dogs separately.

Representative Product Prices

Product prices were identified using prices from online retailers and reflect the full price of products, excluding discounts. Prices may vary across stores, but we assumed full, non-discounted prices reflect manufacturers' suggested retail prices (i.e., MSRP) and are representative of consumer costs. For consistency, all prices were standardized to the cost per one-month dose. Since product prices also vary based on the quantity purchased, with buying in bulk leading to lower per-unit costs, we selected prices for 3-month packages when available or the next-closest option when unavailable. Comprehensive product lists are available in the Appendix and include whether a product is a target (i.e., contains fipronil) or an alternative (i.e., alt), online prices, and calculated price per dose. Cat and dog products are presented in Tables A.1. and A.2., respectively.

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[1] These site codes are: 54000, PETS (ALL OR UNSPEC); 54001, CATS (KITTENS) (PET); 54002, CATS (ALL OR UNSPEC) (PET); 54003, DOGS (ALL OR UNSPEC) (PET); 54004, DOGS (PUPPIES) (PET); 54005, CANINES (PET); 54007, DOGS (ADULT) (PET); 54008, CATS (ADULT) (PET); 54501, MAMMALS (ALL OR UNSPEC) (PET); 56011, DOGS (LAB); 56028, CATS (LAB); and 92501, PETS AND DOMESTIC ANIMALS (COMBINED SITE).

[2] Of the 143 products analyzed in this report, 57 are cat spot-on products and 86 are dog spot-on products.

METHODOLOGY

Data

Sales and use data by individual products are confidential to DPR and are not presented in this analysis. We estimated the number of product boxes and doses sold using DPR sales values and representative product prices. To calculate the number of boxes for each product sold, we divided the DPR annual sales values by the representative product prices per box. Then, to calculate the number of one-month doses sold, we further divided the calculated number of boxes sold by the number of monthly doses within each box.

Doses are defined as the specified quantity of a pesticide product intended to be applied to a pet at one time, as per the instructions on the product's label. Dose count is distinct from pounds of product sold and, for recurring treatments such as spot-on products, directly captures the number of applications for each product. While AIs range in the required mass to effectively control pests, one dose of a product is assumed to be as efficacious as one dose of a similar product within the same species-weight specification because all products registered by DPR must show sufficient efficacy before being approved.

Pet Weights

Weight specifications complicate the analysis because products define applicable weight ranges (i.e., weight specifications) differently. For instance, fipronil-containing Product X may define 'medium' dogs as 22-44 pounds while alternative Product Y may define 'medium' dogs as 20-40 pounds. For the hypothetical owner of a 43-pound dog, Product Y would not be an adequate alternative to Product X.

To address the potential for incongruency, we split a product's total sales into one-pound bins across their respective weight specifications. For example, a product with applicable weights of 22-44 pounds would have total sales be divided into 23 one-pound bins (i.e., sales for 22-pound dogs, sales for 23-pound dogs, ..., sales for 44-pound dogs). While sales could be distributed evenly across bins, pet weights are not distributed uniformly. To better approximate sales per bin, we distribute sales according to modeled normal distributions based on two non-DPR pet weight surveys. For cats, we used a normal distribution with mean 15 and standard deviation 4 (Broad, 2012) and for dogs we used a normal distribution with mean 35 and standard deviation 10 (Rafalko, 2023). This approach assigns more weight, and sales, to bins closer to the distribution means. We acknowledge these distributions may not capture the true distribution of pet weights or sales in California but believe this approach to be more complete than ignoring pet weights or uniformly distributing sales.

Economic Analysis

To estimate the cost of fipronil spot-on products becoming unavailable, we compared the direct cost of managing target pests with and without fipronil. Under the hypothetical scenario, we assumed all spot-on products that contain fipronil are no longer available, and consumers will choose to apply alternative spot-on products. This analysis assumes consumers do not switch to chewables or a different formulation (e.g., collars), switch to using professional services (e.g., pet groomers), or switch to other non-chemical alternatives and preventative measures.

Following a similar approach to Stegall et al. (2018), we constructed composite alternatives of what consumers may apply if spot-on fipronil products are unavailable. Composite alternatives are weighted averages of alternative product uses between 2023-2025, where weights are the shares of total doses. The methodology of this analysis deviates from Stegall et al. (2018) in two major ways. First, this report analyzed non-agricultural products, unlike Stegall et al. (2018), which look at AIs used in agriculture. Second, since we analyzed products by one-pound bins, we calculated and used bin-specific composite alternatives before aggregating economic impacts. Occasionally, composite alternatives consisted only of a single product, though this did not change the methodology. Individual composite alternatives were not presented in this analysis but averages for composite alternatives are presented.

To estimate costs, we used a partial budget analysis, meaning we only considered changes to consumer costs due to using alternatives to fipronil spot-on products. For each product, we used the identified product price to calculate cost per dose. For composite alternatives, we used weighted averages of alternative product prices per one-pound bin. To estimate the economic impact of spot-on fipronil products being unavailable, we compared costs under two scenarios: The first scenario included fipronil products, while the second, alternative, scenario excluded fipronil products. The annual cost of fipronil spot-on products unavailability was calculated as the difference between these two scenarios.

Caveats

There are several caveats which can be grouped into four categories: scope, methodology, data, and external factors. First, we limited the scope of this analysis to spot-on products. Multiple formulations are available to consumers including, but not limited to, spot-on products, sprays, and collars. While some users of fipronil spot-on products may switch formulations, this analysis assumed all users of spot-on products containing fipronil will switch to spot-on products without fipronil. The scope of this analysis was determined by two primary factors. The first factor was the lack of elasticity data. To estimate the share of consumers that might switch formulations, cross-price elasticities of demand are needed or need to be assumed. At the time of this analysis, no information on elasticities were available in the literature. The second factor was the perceived

level of risk. DPR has evaluated the potential acute and chronic risk to non-target aquatic organisms and determined that spot-on products for dogs pose particular risks. For these reasons, the scope of this analysis was limited to spot-on products.

Methodologically, we used the most recent historical sales data. If pesticide uses significantly shifted since 2025, cost estimates may be different than presented. Moreover, while the approach of this analysis takes inspiration from Stegall et al. (2018), it is methodologically distinct and features unique caveats.

An additional set of caveats regards the data we used. Calculating the quantities of products sold through DPR sales values and representative product prices may underestimate the quantity of products sold and, thus, the economic impact. However, reported sales values are more consistent than reported pounds of products sold, so we opted to use these as the basis for our analysis. Additionally, the online retail prices used in this analysis are historic and may not reflect the exact prices consumers pay for pet products.

External factors can also influence the results. In addition to switching formulations, consumers could also switch to professional services (e.g., veterinarians) for pest control. Changes in product prices could lead to changes in product use patterns. The cyclicality of pest populations could also impact the results. For instance, if a pest outbreak occurs, the economic impact of fipronil spot-on products being unavailable may increase. Lastly, technological advances and the release of novel products or formulations could impact the results.

ECONOMIC ANALYSIS

This section presents the estimated changes in statewide pest management costs for cats and dogs due to the unavailability of fipronil spot-on products. Together, the 143 identified fipronil and alternative products had annual sales values between $2.2 and $2.6 million. We estimated this corresponds to the annual sale of approximately 390,000 doses of spot-on pet products. In the sections that follow, we present the analyses for two categories of products: cat products and dog products. Note that numbers presented in tables may not sum exactly due to rounding and averaging.

Cat Products

From 2023-2025, 57 cat spot-on products were registered and had a combined sales value between $1.1 and $1.6 million annually. This corresponds to between 129,157 and 201,792 doses per year, with fipronil products composing between 22 and 66 percent of doses. Table 1 on the following page presents the number of doses per year for fipronil and alternative products.

Table 1. Number of doses of fipronil and alternative products 2023-25

Year	Fipronil Products	Alternative Products
2023	85,150	44,007
2024	91,318	96,600
2025	44,465	157,327
Average	*73,644*	*99,311*

Spot-on cat products range in price from $2.06 to $16.80 per dose. Although we used the same price per product for all three years, average costs for fipronil products and the composite alternatives shift year-to-year due to changes in individual product use shares. Fipronil products cost an average of $5.44 to $6.67 per dose, and the composite alternatives cost an average of $8.32 to $12.00 per dose. This represents a change in user costs between 31.4 and 80 percent. Table 2 presents these costs.

Table 2. Costs per dose for fipronil products and composite alternatives

Year	Fipronil Products ($)	Composite Alternatives ($)	Change (%)
2023	6.67	12.00	80.0
2024	5.44	8.32	53.0
2025	6.41	8.42	31.4
Average	*6.17*	*9.58*	*55.3*

Table 3 summarizes the annual change in pest management cost resulting from the unavailability of cat fipronil spot-on products. The total change in annual costs to fipronil spot-on users ranges from $89,489 to $453,088. In terms of per treated cat, this corresponds to an average increase of $3.64 in monthly costs. These costs do not include impacts to other formulations or professional services.

Table 3. Change in management costs if fipronil spot-on products were unavailable (2023-25)

Year	Fipronil Available ($)	Fipronil Unavailable ($)	Change in Cost ($)
2023	567,943	1,021,031	453,088
2024	496,632	759,641	263,009
2025	284,960	374,449	89,489
Average	*449,845*	*718,374*	*268,529*

Dog Products

From 2023-2025, 86 dog spot-on products were registered and had a combined sales value between $1.0 and $1.2 million annually. This corresponds to between 196,107 and 241,618 doses per year, with fipronil products composing between 43 and 50 percent of doses. Table 4 presents the number of doses per year for fipronil and alternative products.

Table 4. Number of doses of fipronil and alternative products 2023-25

Year	Fipronil Products	Alternative Products
2023	106,341	106,005
2024	119,516	122,102
2025	84,072	112,035
Average	*103,310*	*113,381*

Table 5 presents the average costs per year for fipronil products and composite alternatives. Spot-on dog products range in price from $1.50 to $20.33 per dose. Although we used the same price per product for all three years, average costs for fipronil products and the composite alternatives shift year-to-year due to changes in individual product use shares. Fipronil products cost an average of $4.61 to $5.36 per dose, and the composite alternatives costs an average of $5.33 to $5.66 per dose. This represents a change in user costs between -0.6 and 22.8 percent.

Table 5. Average cost per dose for fipronil products and composite alternative

Year	Fipronil Products ($)	Composite Alternatives ($)	Change (%)
2023	5.36	5.33	-0.6
2024	4.72	5.46	15.7
2025	4.61	5.66	22.8
Average	*4.90*	*5.48*	*12.0*

Table 6 on the following page summarizes the annual change in pest management cost resulting from the unavailability of dog fipronil spot-on products. The total change in annual costs to spot-on fipronil users ranges from -$3,216 to $88,926. In terms of per treated dog, this corresponds to an average increase of $0.56 in monthly costs. These costs do not include impacts to other formulations or professional services.

Table 6. Change in management costs if fipronil spot-on products were unavailable (2023-25)

Year	Fipronil Available ($)	Fipronil Unavailable ($)	Change in Cost ($)
2023	570,014	566,798	-3,216
2024	563,631	652,557	88,926
2025	387,312	475,848	88,536
Average	*506,986*	*565,068*	*58,082*

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APPENDIX

Table A.1. Individual Product Costs for Cat Products

Product	Target	AIs	Doses per Box	Cost per Box	Cost per Dose
ADAMS PLUS FLEA & TICK SPOT ON FOR CATS	Alt	Etofenprox, (S)-Methoprene	3	19.56	6.52
ADVANTAGE FOR LARGE CATS	Alt	Imidacloprid	2	14.99	7.50
ADVANTAGE FOR SMALL CATS	Alt	Imidacloprid	2	14.99	7.50
ADVANTAGE II KITTEN	Alt	Imidacloprid, Pyriproxyfen	2	33.59	16.80
ADVANTAGE II LARGE CAT	Alt	Imidacloprid, Pyriproxyfen	2	33.59	16.80
ADVANTAGE II SMALL CAT	Alt	Imidacloprid, Pyriproxyfen	2	33.59	16.80
ADVANTAGE XD LARGE CAT	Alt	Imidacloprid, Pyriproxyfen	4	59.99	15.00
ADVANTAGE XD SMALL CAT	Alt	Imidacloprid, Pyriproxyfen	4	59.99	15.00
ADVECTA PLUS FOR CATS	Alt	Imidacloprid, Pyriproxyfen	4	24.99	6.25
ADVENTURE PLUS FOR CATS	Alt	Imidacloprid, Pyriproxyfen	4	31.91	7.98
AMAZON BASICS FLEA & TICK TOPICAL FOR CATS	Target	Fipronil, Methoprene	6	21.59	3.60
AMAZON BASICS FLEA TOPICAL FOR CATS	Alt	Imidacloprid, Pyriproxyfen	6	38	6.33

APEX PLUS FOR CATS	Target	Fipronil, (S)-methoprene	6	23.49	3.92
CATEGO FOR CATS	Target	Fipronil, Dinotefuran, Pyriproxyfen	3	34.99	11.66
CHERISTIN FOR CATS	Alt	Spinetoram	3	46.49	15.5
COVETRUS PARAMONTHLY PLUS FOR CATS	Target	Fipronil, (S)-methoprene	6	45.99	7.67
CROSSBLOCK II FOR CATS	Alt	Imidacloprid, Pyriproxyfen	3	20.99	7.00
EFFIPRO PLUS TOPICAL SOLUTION FOR CATS	Target	Fipronil, Pyriproxyfen	3	37.99	12.66
FLEA 5X PLUS FOR CATS	Target	Fipronil, (S)-methoprene	6	44.98	7.50
FROM THE MAKERS OF CAPSTAR (NITENPYRAM) NEXTSTAR FLEA & TICK TOPICAL FOR CATS	Target	Fipronil, Etofenprox, (S)-methoprene	3	38.99	13.00
FRONTLINE GOLD FOR CATS	Target	Fipronil, (S)-methoprene, Pyriproxyfen	6	94.99	15.83
FRONTLINE PLUS FOR CATS	Target	Fipronil, (S)-methoprene	6	88.99	14.83
HARTZ ULTRAGUARD PLUS TOPICAL FLEA & TICK PREVENTION FOR CATS & KITTENS 12 WEEKS AND OLDER	Alt	Etofenprox, (S)-methoprene	3	13.44	4.48
HARTZ ULTRAGUARD PRO TOPICAL FLEA & TICK PREVENTION FOR CATS & KITTENS 12 WEEKS AND OLDER	Alt	Etofenprox, (S)-methoprene	3	16.12	5.37
HARTZ ULTRAGUARD TOPICAL FLEA & TICK PREVENTION FOR CATS & KITTENS	Alt	Etofenprox	3	6.17	2.06
ITCH. FLEA FOR CATS	Target	Fipronil, (S)-methoprene	3	21.62	7.21
LUVSOME FLEA & TICK FOR CATS ADVANCED	Target	Fipronil, (S)-methoprene	3	18.99	6.33
LUVSOME FLEA FOR CATS ADVANCED	Alt	Imidacloprid, Pyriproxyfen	4	24.99	6.25
LUVSOME PLUS FLEA & TICK FOR CATS	Target	Fipronil, (S)-methoprene	3	18.99	6.33
NUTRI-VET DEFENSE + FOR CATS	Alt	Etofenprox, Pyriproxyfen	3	26.99	9.00
NUTRI-VET GUARD+ FOR CATS	Target	Fipronil, (S)-methoprene	3	26.99	9.00
ONGUARD PLUS FOR CATS FLEA & TICK	Target	Fipronil, (S)-methoprene	6	35.17	5.86
PARA|DEFENSE II FOR CATS	Alt	Imidacloprid, Pyriproxyfen	4	24.99	6.25

PAWS PLUS FOR CATS	Target	Fipronil, (S)-methoprene	3	27	9.00
PET DEFENDER PLUS FOR CATS	Target	Fipronil, (S)-methoprene	3	25.69	8.56
PETACTION PRO FOR CATS	Target	Fipronil, (S)-methoprene	3	15.42	5.14
PETARMOR ADVANCED 2 FOR CATS	Alt	Imidacloprid, Pyriproxyfen	6	100	16.67
PETARMOR FOR CATS	Target	Fipronil	3	16.99	5.66
PETARMOR PLUS FOR CATS	Target	Fipronil, (S)-methoprene	3	26.12	8.71
PETLOCK DUO FOR CATS	Alt	Imidacloprid, Pyriproxyfen	4	30.42	7.61
PETPREVEA II FOR CATS	Alt	Imidacloprid, Pyriproxyfen	4	24.47	6.12
PETPREVEA PLUS FOR CATS	Target	Fipronil, (S)-methoprene	3	19.97	6.66
PROMIKA ZOGUARD PLUS FOR CATS	Target	Fipronil, (S)-methoprene	3	23.99	8.00
PROVECTA II FOR CATS	Alt	Imidacloprid, Pyriproxyfen	4	24.88	6.22
PURRS ADVANCE FOR CATS	Alt	Imidacloprid, Pyriproxyfen	3	27	9.00
SENTRY FIPROGUARD FOR CATS	Target	Fipronil	3	13.47	4.49
SENTRY FIPROGUARD PLUS FOR CATS	Target	Fipronil, (S)-methoprene	3	33.99	11.33
SENTRY PURRSCRIPTIONS PLUS SQUEEZE-ON FOR CATS AND KITTENS	Alt	Etofenprox, Pyriproxyfen	3	17.49	5.83
SERGEANT'S BANSECT SQUEEZE-ON FLEA & TICK CONTROL FOR CATS	Alt	Etofenprox	3	14.99	5.00
SERGEANT'S GUARDIAN PRO TOPICAL FOR CATS	Alt	Etofenprox, Pyriproxyfen	3	14.99	5.00
SERGEANT'S GUARDIAN TOPICAL FOR CATS	Alt	Etofenprox	3	9.99	3.33
SERGEANT'S SILVER SQUEEZE-ON FOR CATS AND KITTENS	Alt	Etofenprox	3	10.99	3.66
SHIELDTEC FOR CATS	Target	Fipronil	3	17.08	5.69
SIMPLEGUARD FOR CATS & KITTENS 2 TO 9 LBS, OVER 8 WEEKS OF AGE	Alt	Dinotefuran, Pyriproxyfen	3	10	3.33
SIMPLEGUARD FOR CATS 9 LBS AND OVER, OVER 8 WEEKS OF AGE	Alt	Dinotefuran, Pyriproxyfen	3	10	3.33
SIMPLEGUARD FOR CATS OVER 9LB., OVER 8 WEEKS OF AGE	Alt	Dinotefuran, Pyriproxyfen	3	10	3.33
STEELCOAT PLUS FOR CATS	Target	Fipronil, (S)-methoprene	3	14.75	4.92

TEVRAPET ACTISPOT II FOR CATS	Alt	Imidacloprid, Pyriproxyfen	6	29.99	5.00
TEVRAPET FIRSTACT PLUS FOR CATS	Target	Fipronil, (S)-methoprene	3	26.63	8.88
VECTRA FOR CATS & KITTENS 2 TO 9 LBS AND OVER 8 WEEKS OF AGE	Alt	Dinotefuran, Pyriproxyfen	3	46.99	15.66
VECTRA FOR CATS 9 LBS AND OVER	Alt	Dinotefuran, Pyriproxyfen	3	46.99	15.66
VECTRA FOR CATS OVER 9 LBS	Alt	Dinotefuran, Pyriproxyfen	3	46.99	15.66
VETALITY ADVOTECT II FOR CATS	Alt	Imidacloprid, Pyriproxyfen	6	29.97	5.00
VETALITY FIRSTECT PLUS FOR CATS	Target	Fipronil, (S)-methoprene	3	29.99	10.00
ZODIAC SPOT ON FLEA CONTROL FOR CATS & KITTENS	Alt	(S)-methoprene	4	16.99	4.25
ZODIAC SPOT ON PLUS FLEA & TICK CONTROL FOR CATS 5 LBS. AND OVER	Alt	Etofenprox, (S)-methoprene	4	16.99	4.25

Table A.2. Individual Product Costs for Dog Products

Product	Target	AIs	Doses per Box	Cost per Box	Cost per Dose
ADAMS PLUS FLEA & TICK PREVENTION SPOT ON FOR DOGS	Alt	Etofenprox, Piperonyl Butoxide, N-octyl Bicycloheptene Dicarboximide, Pyriproxyfen	3	19.99	6.66
ADVANTAGE II EXTRA LARGE DOG	Alt	Imidacloprid, Pyriproxyfen	4	50.99	12.75
ADVANTAGE II LARGE DOG	Alt	Imidacloprid, Pyriproxyfen	4	50.99	12.75
ADVANTAGE II MEDIUM DOG	Alt	Imidacloprid, Pyriproxyfen	4	50.99	12.75
ADVANTAGE II SMALL DOG	Alt	Imidacloprid, Pyriproxyfen	4	50.99	12.75
ADVECTA ULTRA FOR DOGS	Alt	Imidacloprid, Permethrin, Pyriproxyfen	4	27.99	7.00
ADVENTURE PLUS FOR DOGS	Alt	Imidacloprid, Pyriproxyfen	4	39.95	9.99
AMAZON BASICS FLEA & TICK TOPICAL FOR DOGS	Target	Fipronil, Methoprene	3	10.85	3.62
AMAZON BASICS FLEA, TICK & MOSQUITO TOPICAL FOR DOGS	Alt	Imidacloprid, Permethrin, Pyriproxyfen	4	26.55	6.64
APEX PLUS FOR DOGS	Target	Fipronil, (S)-methoprene	6	34.99	5.83
COVETRUS PARAMONTHLY PLUS FOR DOGS	Target	Fipronil, (S)-methoprene	6	49.67	8.28
CROSSBLOCK II FOR DOGS AND PUPPIES	Alt	Imidacloprid, Pyriproxyfen	3	22.99	7.66
EFFIPRO PLUS TOPICAL SOLUTION FOR DOGS	Target	Fipronil, Pyriproxyfen	3	44.16	14.72
EFFITIX PLUS TOPICAL SOLUTION FOR DOGS	Target	Fipronil, Permethrin, Pyriproxyfen	3	42.55	14.18
FIRST SHIELD TRIO	Alt	Dinotefuran, Pyriproxyfen, Permethrin	4	71.99	18.00
FLEA 5X PLUS FOR DOGS	Target	Fipronil, (S)-methoprene	3	18.99	6.33
FREEDOM 45 SPOT-ON FOR DOGS	Alt	Permethrin	6	19.99	3.33

FROM THE MAKERS OF CAPSTAR (NITENPYRAM) NEXTSTAR FLEA & TICK TOPICAL FOR DOGS	Target	Fipronil, Cyphenothrin, (S)-methoprene	3	38.99	13.00
FRONTLINE GOLD FOR DOGS	Target	Fipronil, (S)-methoprene, Pyriproxyfen	3	60.99	20.33
FRONTLINE PLUS FOR DOGS	Target	Fipronil, (S)-methoprene	3	52.99	17.66
FRONTLINE SHIELD FOR DOGS	Target	Fipronil, Permethrin, Pyriproxyfen	3	59.99	20.00
HARTZ ULTRAGUARD DUAL ACTION TOPICAL FOR DOGS & PUPPIES	Alt	Etofenprox, Piperonyl Butoxide, N-octyl Bicycloheptene Dicarboximide, Pyriproxyfen	3	6.52	2.17
HARTZ ULTRAGUARD PLUS TOPICAL FLEA & TICK PREVENTION FOR DOGS & PUPPIES	Alt	Etofenprox, Piperonyl Butoxide, N-octyl Bicycloheptene Dicarboximide, Pyriproxyfen	3	13.08	4.36
HARTZ ULTRAGUARD PRO FLEA & TICK TREATMENT FOR DOGS AND PUPPIES	Alt	Methoprene, Etofenprox	3	13.56	4.52
HARTZ ULTRAGUARD PRO TRIPLE ACTION FLEA & TICK DROPS FOR DOGS & PUPPIES	Alt	Etofenprox, Piperonyl Butoxide, N-octyl Bicycloheptene Dicarboximide, Pyriproxyfen, (S)-methoprene	3	15.17	5.06
K9 ADVANTIX EXTRA LARGE DOG	Alt	Imidacloprid, Permethrin, Pyriproxyfen		2	
K9 ADVANTIX II EXTRA LARGE DOG	Alt	Imidacloprid, Permethrin	2	14.99	7.50
K9 ADVANTIX II LARGE DOG	Alt	Imidacloprid, Permethrin, Pyriproxyfen	2	35.69	17.85
K9 ADVANTIX II MEDIUM DOG	Alt	Imidacloprid, Permethrin, Pyriproxyfen	2	35.69	17.85

K9 ADVANTIX II SMALL DOG	Alt	Imidacloprid, Permethrin, Pyriproxyfen	2	35.69	17.85
K9 ADVANTIX LARGE DOG	Alt	Imidacloprid, Permethrin, Pyriproxyfen	2	35.69	17.85
K9 ADVANTIX MEDIUM DOG	Alt	Imidacloprid, Permethrin, Pyriproxyfen	2	14.99	7.50
K9 ADVANTIX SMALL DOG	Alt	Imidacloprid, Permethrin, Pyriproxyfen	2	14.99	7.50
LUVSOME FLEA & TICK FOR DOGS ADVANCED	Target	Fipronil, (S)-methoprene	4	14.99	7.50
LUVSOME FLEA & TICK FOR DOGS ADVANCED & REPEL	Alt	Imidacloprid, Permethrin, Pyriproxyfen	4	24.99	6.25
LUVSOME PLUS FLEA & TICK FOR DOGS	Target	Fipronil, (S)-methoprene	3	24.99	6.25
NUTRI-VET DEFENSE FOR DOGS	Alt	Permethrin	4	18.99	6.33
NUTRI-VET DEFENSE+ FOR DOGS	Alt	Permethrin, Pyriproxyfen	4	19.99	5.00
NUTRI-VET GUARD+ FOR DOGS	Target	Fipronil, (S)-methoprene	3	19.99	5.00
ONGUARD PLUS FOR DOGS FLEA & TICK	Target	Fipronil, (S)-methoprene	3	26.99	9.00
PARA|DEFENSE ADVANCED FOR DOGS	Alt	Imidacloprid, Permethrin, Pyriproxyfen	4	14.17	4.72
PET DEFENDER PLUS FOR DOGS	Target	Fipronil, (S)-methoprene	1	34.95	8.74
PETACTION PRO FOR DOGS	Target	Fipronil, (S)-methoprene	3	6.4	6.40
PETARMOR FOR DOGS	Target	Fipronil	4	14.99	5.00
PETARMOR MAX FOR DOGS	Alt	Imidacloprid, Permethrin, Pyriproxyfen	6	26.99	6.75
PETARMOR PLUS FOR DOGS	Target	Fipronil, (S)-methoprene	3	19.99	3.33
PETLOCK ULTRA FOR DOGS	Alt	Imidacloprid, Permethrin, Pyriproxyfen	4	29.99	10.00
PETPREVEA ADVANCED FOR DOGS	Alt	Imidacloprid, Permethrin, Pyriproxyfen	4	38.99	9.75
PETPREVEA PLUS FOR DOGS	Target	Fipronil, (S)-methoprene	3	29.97	7.49

PROMIKA ZOGUARD PLUS FOR DOGS	Target	Fipronil, (S)-methoprene	3	19.97	6.66
PROVECTA ADVANCED FOR DOGS	Alt	Imidacloprid, Permethrin, Pyriproxyfen	4	26.99	9.00
SENTRY FIPROGUARD FOR DOGS	Target	Fipronil	3	31.79	7.95
SENTRY FIPROGUARD PLUS FOR DOGS	Target	Fipronil, (S)-methoprene	3	25.99	8.66
SERGEANT'S BANSECT SQUEEZE-ON FLEA & TICK CONTROL FOR DOGS	Alt	Permethrin	1	33.99	11.33
SERGEANT'S GUARDIAN PRO TOPICAL FOR DOGS	Alt	Permethrin, Pyriproxyfen	3	1.5	1.50
SERGEANT'S GUARDIAN TOPICAL FOR DOGS	Alt	Permethrin, (S)-methoprene	3	14.99	5.00
SERGEANT'S GUARDIAN TOPICAL FOR DOGS & PUPPIES	Alt	Permethrin, Pyriproxyfen	3	5.99	2.00
SHIELDTEC PLUS FOR DOGS	Alt	Permethrin, Pyriproxyfen	3	5.99	2.00
SIMPLEGUARD 3 FOR DOGS	Alt	Dinotefuran, Pyriproxyfen, Permethrin	6	17.08	5.69
SIMPLEGUARD 3 FOR DOGS AND PUPPIES	Alt	Dinotefuran, Pyriproxyfen, Permethrin	6	47.84	7.97
STEELCOAT PLUS FOR DOGS	Target	Fipronil, (S)-methoprene	3	47.84	7.97
TEVRAPET ACTIVATE II	Alt	Imidacloprid, Permethrin, Pyriproxyfen	4	14.75	4.92
TEVRAPET FIRSTACT PLUS FOR DOGS	Target	Fipronil, (S)-methoprene	3	29.99	7.50
VECTRA 3D	Alt	Dinotefuran, Pyriproxyfen, Permethrin	3	26.63	8.88
VECTRA FOR DOGS & PUPPIES	Alt	Dinotefuran, Pyriproxyfen, Permethrin	3	57.99	19.33
VETALITY AVANTECT II	Alt	Imidacloprid, Permethrin, Pyriproxyfen	4	46.99	15.66
VETALITY FIRSTECT PLUS FOR DOGS	Target	Fipronil, (S)-methoprene	3	44.99	11.25
VETALITY PROTECT FOR DOGS	Alt	Permethrin, (S)-methoprene	3	26.49	8.83
WAGS ADVANCE FOR DOGS	Alt	Imidacloprid, Permethrin, Pyriproxyfen	3	17.14	5.71

ZODIAC SPOT ON FLEA & TICK CONTROL FOR LARGE DOGS OVER 60 LBS	Alt	Permethrin, (S)-methoprene	4	27	9.00
ZODIAC SPOT ON FLEA & TICK CONTROL FOR MEDIUM DOGS 31-60 LBS	Alt	Permethrin, (S)-methoprene	4	14.99	3.75
ZODIAC SPOT ON FLEA & TICK CONTROL FOR PUPPIES, TOYS & MINIATURE DOGS 7-15 LBS	Alt	Permethrin, (S)-methoprene	4	14.99	3.75
ZODIAC SPOT ON FLEA & TICK CONTROL FOR SMALL DOGS 16-30 LBS	Alt	Permethrin, (S)-methoprene	4	14.99	3.75