State of Oregon
DEQ Department of Environmental Quality

Memorandum

To: the file (ECSI 6590)

From: Kaley Major, DEQ Western Region Risk Assessor/Toxicologist

Date: June 27, 2024

Subject: Assessment of ecological risk and human health risk at the proposed Stratus Village development, 2450 SE Stratus Ave, McMinnville, Oregon

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Background

Reynolds Engineering, LLC (RE), in collaboration with Coles+Betts Environmental Consulting, LLC (C+BEC), performed and summarized a Phase II Environmental Site Assessment (ESA) conducted for the proposed Stratus Village development project at 2540 SE Stratus Ave in McMinnville, Oregon. The Phase II ESA provided data to characterize soil contamination for a variety of metals, pesticides, and petroleum hydrocarbons that were suspected to be present at the 6.89 acre site, which has historically been used for agriculture. Details of the site, including supporting documents and environmental assessment can be found at https://ordeq.org/ECSI-6590.

Purpose

The purpose of this memo is to characterize the soil measurement data provided in the Phase II ESA to assess the ecological risk and human health risk associated with the soil at the site proposed for the Stratus Village development. Based on available site information, DEQ has determined that a baseline human health risk assessment and Tier I ecological risk assessment are the most appropriate for assessing risk at this site. Both of these risk assessments have been carried out by comparing composite sample soil data with Oregon's applicable Risk Based Concentration (RBC) values for human health (DEQ, 2023) (or in some cases, EPA's Regional Screening Level Values (EPA, 2023)) and ecological receptors (DEQ, 2020c).

Risk Determination

Neither unacceptable ecological risk nor unacceptable human health risk is present from soils at the site for the pathways evaluated (see risk assessments below for full details). The chemicals of interest were either 1) below the naturally-occurring environmental background levels for the region, and/or 2) found at concentrations below DEQ's risk based thresholds for individual and cumulative risk. Although several data gaps and uncertainties exist (i.e. some chemicals do not have risk-based concentrations or toxicological information for comparison with composite sample data), the levels of those contaminants were low, most often at or below the level of laboratory method detection. The full details of each risk assessment can be found below.

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1 Ecological Risk Assessment (ERA)

1.1 Ecological Scoping:

Coles+Betts Environmental Consulting, LLC completed the DEQ-recommended Appendices 1 and 2 of DEQ's guidance for *Conducting Ecological Risk Assessments* (DEQ, 2020b, 2020a) *Appendix A1: Basic Site Information Checklist* (and corresponding attached documentation) indicated that it is not likely that any federal or state threatened & endangered species are present at the site. Further, Appendix A1 documented that the site is ~0.20-0.25 miles from the South Yamhill River and associated riparian area. Chinook Salmon and Steelhead are threatened species in the South Yamhill River. *Appendix A2: Exposure Pathway Assessment* (and corresponding attachments) described the contaminants of interest (pesticides, metals and petroleum hydrocarbons) for the site, as well as the status of vegetation at the site (primarily grasses and shrubs; some invertebrates noted). The site included no obvious wetlands or site connection between groundwater (no groundwater wells available to sample) or the South Yamhill River or sediments. Appendix 2 also documented the possibility of hazardous substances to be in the soil and incidentally ingested or dermally contacted by ecological soil receptors, the potential for hazardous substances to be present in food or prey items located at the site, and the potential for hazardous substances in the soil to move into burrows via fugitive dust.

Appendices 1 and 2 revealed that it is possible that a connection between the site and the river and sediment exists, but given surrounding developed area, river distance from the site (nearly ¼ mile), and low concentrations of hazardous substances in the soil, DEQ did not think that there was likely to be sufficient overland runoff of site soil in into the South Yamhill River to be considered a significant complete pathway for the ecological risk assessment.

1.2 Ecological Risk Assessment:

1.2.1 Problem Formulation: Assessment Endpoints and Conceptual Site Model

DEQ selected default assessment endpoints representative of four guilds of terrestrial wildlife that get a significant portion of their diet or physiological needs from soil. Given that no threatened or endangered species were likely to be present the site, DEQ focused on endpoints for general populations of these guilds only**.**

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Ecological Risk– Evaluated Pathways			
Contaminated Media	**Exposure Route**	**Receptor**	**Assessment Endpoint**
Soil	Direct exposure	Plants	Survival, growth and reproduction of local populations of plants exposed to soil.
Soil	Direct exposure	Invertebrates	Survival, growth and reproduction of local populations of soil invertebrates exposed to soil.
Soil	Incidental Soil and Prey Ingestion	Ground Feeding Birds (non-T&E)	Survival, growth and reproduction of local populations of avian ground insectivores, herbivores, and carnivores exposed via ingestion of prey and incidental ingestion of soil.
Soil	Incidental Soil and Prey Ingestion	Ground Feeding Mammals (non-T&E)	Survival, growth and reproduction of local populations of mammalian ground insectivores, herbivores, and carnivores exposed via ingestion of prey and incidental ingestion of soil.
Soil	Incidental Soil and Prey Ingestion	Top Consumer Birds (non-T&E)	Survival, growth and reproduction of local populations of avian ground insectivores, herbivores, and carnivores exposed via ingestion of prey and incidental ingestion of soil.
Soil	Incidental Soil and Prey Ingestion	Top Consumer Mammals (non-T&E)	Survival, growth and reproduction of local populations of mammalian ground insectivores, herbivores, and carnivores exposed via ingestion of prey and incidental ingestion of soil

1.2.2 Exposure Analysis

Contaminants of interest (COI) at the site included pesticides, metals, and petroleum hydrocarbons as described in the Phase II ESA(Reynolds Engineering, LLC, 2024) .

1.2.2.1 Background Evaluation

An evaluation and consideration of background concentrations for hazardous substances is only appropriate for naturally-occurring chemicals like metals. To distinguish between soil metal concentrations that are naturally occurring at the site and those that are the result of anthropogenic activities, DEQ compared the maximum detected concentration to DEQ's upper prediction limits (UPLs) by region provided in *Development of Oregon Background Metals*

Concentrations in Soil (DEQ, 2013) or the 95% UPL calculated using USGS data for Oregon (Smith et al., 2013).

Given that all environmental point source concentrations for composite samples in the field, grass, and mound area were below naturally-occurring background as defined above and indicated in Appendix A, none of the 16 metals were carried forward as contaminants of potential concern (COPCs) for risk analysis.

1.2.3 Data Requirements

Upon review, DEQ concluded that data presented in the Phase II ESA met minimum data requirements for site characterization including:

- Include all site COIs known or suspected to be present.
- Have method detection limits below DEQ RBC, or be the lowest reasonably achievable detection limit.
- Adequately characterize decision units including the crop field, grass field, and mound (see Phase II ESA for more details).

1.2.4 Soil Depth and Spatial Scale

Sample measurements were reported as composites using RSM at four different depths (0-0.5 ft below ground surface(bgs), 0.5-1 ft bgs, 1-1.3 ft bgs, and 1.3-1.7 bgs) in three decision units for the crop field and for one decision unit in the grass field. Two composite samples were taken from the last decision unit area: the mound. Each composite sample from a given depth was treated as an exposure point concentration (EPC) for screening purposes with the exception of the mound, where both composite samples were considered as a single sample. For more detail see the Phase II Site Assessment.

1.2.5 Ecological Risk Calculations

Soil measurements of the remaining COIs (excluding metals below background) were compared with Oregon's ecological risk-based concentrations for soils (Appendix A). DEQ followed the guidance for *Conducting Ecological Risk Assessment* (DEQ, 2020b) to screen for COPCs in each composite sample the crop field, grass field, and mound areas of the site. DEQ considered both individual chemical risk as well as cumulative risk for each sample. See Appendices A and B for applied RBCs and ecological risk assessment hazard quotient (HQ) and hazard index (HI) results.

1.2.6 Ecological Risk Characterization

For all COIs at the site that were not screened out because of naturally-occurring background concentrations (i.e. all non-metals), both the individual chemical HQs and cumulative sample HIs were less than 1. These results indicate that there is no unacceptable ecological risk to local populations of soil dwelling plants and invertebrates, ground feeding birds and mammals, and top consumer birds and mammals. See Appendices A and B for supporting tables.

1.2.6.1 *Ecological Risk Uncertainties*

In the Phase II ESA, over 100 pesticides were tested in soil from the site (in all areas except for the mound). Most pesticides were not detected above the laboratory method detection limits and were therefore not included in this risk analysis. DEQ found that the detection limits were at or below the lowest reasonably achievable detection limits. However, several pesticides were detected in site soil samples including 4,4'DDE, Carbendazim, DCPMU, and Diuron. DEQ has ecological RBCs for 4,4'DDE and was therefore able to characterize the risk associated with those detections. DEQ does not have ecological RBCs for carbendazim, DCPMU, or Diuron. Further, no readily available soil toxicity data for ecological receptors was available in EPA's ECOTOX database (https://cfpub.epa.gov/ecotox/). Pesticide registration ecological risk assessments for diuron (and breakdown product DCPMU) (EPA, 2020a) and carbendazim (EPA, 2020b) provided some limited additional data. Carbendazim had avian and mammalian no observed adverse effect levels (NOAELs) several orders of magnitude above site detections. For diuron, avian, insect (bee), and mammalian NOAELs were also several orders of magnitude above site detections. While no terrestrial data was available for the diuron breakdown product DCPMU, the pesticide registration ecological risk assessment noted that generally DCMPU and diuron displayed similar levels of toxicity in aquatic environments (EPA, 2020a).

In the Phase II ESA, pesticides were not measured in the mound area composite sample. However, organochlorine pesticide data for another mound composite sample were provided later to fill the pesticide data-gap in this area. Although performing the risk analysis for the mound by combining the data from the two separate monitoring events is a source of uncertainty, the combined mound measurement data were consistent with the data collected from other areas on the property.

Another uncertainty in this ecological risk assessment is whether there is likely to be a connection between the site and the river, sediment, and riparian area associated with the South Yamhill River that is roughly ¼ mile away from the site. DEQ did not think that there was likely to be sufficient overland runoff of site soil in into the South Yamhill River to be considered a significant complete pathway for the ecological risk assessment. To mitigate any potential risk caused by runoff during the construction phase, the Cleanup program is documenting the requirement of a 1200-C permit, which will control offsite migration of contaminated soils and any associated hazardous substances into the local aquatic environment.

1.2.7 Ecological Risk Determination

DEQ finds no evidence of unacceptable ecological soil risk at the Stratus Village site, based on data and information provided in the Phase II ESA and the Ecological Risk Assessment contained within this memo.

2 Human Health Risk Assessment (HHRA)

2.1 HHRA Problem Formulation

A full site description and history for the proposed Stratus Village development can be found in the Phase II ESA (Reynolds Engineering, LLC, 2024). In this case, residential receptor scenarios will likely provide the most appropriate characterization of risk based on the past and proposed future development of the Stratus Village site. Residential risk assumptions are also protective of occupational, excavation worker, and construction worker receptor scenarios, which have RBCs that are higher than residential RBCs.

Human Health Risk -Evaluated Pathways		
Contaminated Media	**Exposure Route**	**Receptor Scenario**
Soil	Soil Ingestion, Dermal Contact, and Inhalation	Residential
Soil	Leaching to Groundwater	Residential
Soil	Volatilization to Outdoor Air	Residential

2.2 Chemical Screening Procedures

COIs at the site were initially evaluated and handled for the Human Health Risk Assessment in the same way as the Ecological Risk Assessment (See **Section 1.2.2** above for full details). After evaluating data quality and screening out metals as previously described, remaining COIs were evaluated for inclusion as COPCs following the methods described in *DEQ's Human Health Risk Assessment Guidance* (DEQ, 2010). The RBCs used to assess human health risk can be found in Appendix A. They preferentially include DEQ's *Risk-Based Concentrations for Individual Chemicals* (DEQ, 2023) followed by EPA Regional Screening Level values (EPA, 2023) when DEQ values were not available for a specific chemical.

Hazard quotients (HQs) and cumulative hazard index (HI) were calculated for COIs for both cancer and non-cancer endpoints in each composite sample to determine whether any COPCs existed.

2.3 Risk Characterization

No COIs were detected at levels that would categorize them as COPCs. See Appendices A and C for full details.

2.4 Human Health Uncertainty Analysis

In the Phase II ESA, over 100 pesticides were tested in soil from the site (in all areas except for the mound). Most pesticides were not detected above the laboratory method detection limit and were therefore not included in this risk analysis. DEQ found that the detection limits were at or

below the lowest reasonably achievable detection limits. However, several pesticides were detected in site soil samples including 4,4'DDE, Carbendazim, DCPMU, and Diuron. DEQ has RBCs for 4,4'DDE and EPA had some regional screening level data available for diuron, and was therefore able to characterize the risk associated with those detections. DEQ does not have RBCs for carbendazim or DCPMU, nor does EPA have regional screening levels. No chemical entries were available for either chemical in EPA's IRIS database (https://cfpub.epa.gov/ncea/iris/search/), leaving the risk associated with these low-level detections uncertain.

In the Phase II ESA, pesticides were not measured in the mound area composite sample. However, organochlorine pesticide data for another mound composite sample were provided later to fill the pesticide data-gap in this area. Although performing the risk analysis for the mound by combining the data from the two separate monitoring events is a source of uncertainty, the combined mound measurement data were consistent with the data collected from other areas on the property.

2.5 Acceptable Risk Level Determination

All hazard quotients for cancer and non-cancer effects of individual chemicals as well as cumulative non-cancer hazard index for each sample were below a value of 1 based on RBC (or RSL) screening, indicating no unacceptable risk for residential, occupational, construction worker, or excavation worker receptor scenarios at the Stratus Village site.

3 References

DEQ. (2010). *Human Health Risk Assessment Guidance*.

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EPA. (2020a). *Draft Ecological Risk Assessment for the Registration Review of Diuron* (p. 90).

EPA. (2020b). *Draft Ecological Risk Assessment for the Registration Review of Thiophanate-methyl and MBC (Carbendazim)* (p. 178).

EPA. (2023). *Regional Screening Levels (RSLs)—Generic Tables* [dataset]. https://www.epa.gov/risk/regional-screening-levels-rsls-generic-tables

HAI Hahn and Associates, Inc. (2020). *A Phase I Environmental Site Assessment, 6.89-Acre Undeveloped Property, 235 SE Norton Lane, McMinnville, Yamhill County, Oregon*.

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Smith, D. B., Cannon, W. F., Woodruff, L. G., Solano, F., Kilburn, J. E., & Fey, D. L. (2013). *Geochemical and mineralogical data for soils of the conterminous United States: U.S. Geological Survey Data Series 801* (p. 19). http://pubs.usgs.gov/ds/801/

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Appendix A: Values Used in Risk Assessments and Overall COI Screening Summary Results

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Background values for naturally occurring metals

Metal	Background Value, South Willamette Valley (mg/kg)
Antimony	0.39 [a]
Arsenic	18 [a]
Barium	730 [a]
Beryllium	2.6 [a]
Cadmium	1.6 [a]
Chromium	100 [a]
Cobalt	43 [b]
Copper	140 [a]
Lead	28 [a]
Mercury	0.07 [a]
Molybdenum	2.1 [b]
Nickel	50 [a]
Selenium	0.68 [a]
Silver	2.6 [a]
Thallium	5.7 [a]
Vanadium	370 [a]
Zinc	200 [a]

Source:
[a] (DEQ, 2013)
[b] (Smith et al., 2013)

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	DEQ's Ecological RBCs[a,] Soil (mg/kg)					
Site COIs with Detections	Plants	Inverts	Ground Feeding Birds (non T&E)	Ground Feeding Mammals (non T&E)	Top Consumer Birds (Non-T&E)	Top Consumer Mammals (non-T&E)
4,4'-DDE	4.1		0.41	0.24	1.2	0.099
Carbendazim						
DCPMU						
Dieldrin	10		0.64	0.009	3	0.013
Diuron						
Gasoline-Range Organics	120	120	5,000	5,000	5,000	5,000
Diesel-Range Organics	260	260	6,000	6,000	6,000	6,000
Oil-Range Organics	260	260	6,000	6,000	6,000	6,000

Blank spaces indicate no available RBCs.

[a] (DEQ, 2020c)

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Total Ecological Risk Hazard Indices (HI) By Sample Location							
Exposure Area Composite Samples	Depth Below Ground Surface (bgs, ft)	Assessment Endpoint					
		Plants	Inverts	Ground Feeding Birds (non T&E)	Ground Feeding Mammals (non T&E)	Top Consumer Birds (Non-T&E)	Top Consumer Mammals (non-T&E)
CFComp1	0-0.5	*HI <1*	*HI <1*	*HI <1*	*HI <1*	*HI <1*	*HI <1*
	0.5-1	*HI <1*	*HI <1*	*HI <1*	*HI <1*	*HI <1*	*HI <1*
	1-1.3	*HI <1*	*HI <1*	*HI <1*	*HI <1*	*HI <1*	*HI <1*
	1.3-1.7	*HI <1*	*HI <1*	*HI <1*	*HI <1*	*HI <1*	*HI <1*
CFComp2	0-0.5	*HI <1*	*HI <1*	*HI <1*	*HI <1*	*HI <1*	*HI <1*
	0.5-1	*HI <1*	*HI <1*	*HI <1*	*HI <1*	*HI <1*	*HI <1*
	1-1.3	*HI <1*	*HI <1*	*HI <1*	*HI <1*	*HI <1*	*HI <1*
	1.3-1.7	*HI <1*	*HI <1*	*HI <1*	*HI <1*	*HI <1*	*HI <1*
CFComp3	0-0.5	*HI <1*	*HI <1*	*HI <1*	*HI <1*	*HI <1*	*HI <1*
	0.5-1	*HI <1*	*HI <1*	*HI <1*	*HI <1*	*HI <1*	*HI <1*
	1-1.3	*HI <1*	*HI <1*	*HI <1*	*HI <1*	*HI <1*	*HI <1*
	1.3-1.7	*HI <1*	*HI <1*	*HI <1*	*HI <1*	*HI <1*	*HI <1*
GFComp1	0-0.5	*HI <1*	*HI <1*	*HI <1*	*HI <1*	*HI <1*	*HI <1*
	0.5-1	*HI <1*	*HI <1*	*HI <1*	*HI <1*	*HI <1*	*HI <1*
	1-1.3	*HI <1*	*HI <1*	*HI <1*	*HI <1*	*HI <1*	*HI <1*
	1.3-1.7	*HI <1*	*HI <1*	*HI <1*	*HI <1*	*HI <1*	*HI <1*
MComp1		*HI <1*	*HI <1*	*HI <1*	*HI <1*	*HI <1*	*HI <1*

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	DEQ's Residential Human Health RBCs for Soil (mg/kg)		
Site COIs with Detections	Soil Ingestion, Dermal Contact and Inhalation [a]	Volatilization to Outdoor Air [a]	Leaching to Groundwater [a]
4,4'-DDE	1.8 [a]	3,800 [a]	1.6 [a]
Carbendazim			
DCPMU			
Dieldrin	0.034 [a]		0.017 [a]
Diuron	130 [b]		0.9 [c]
Gasoline-Range Organics	1,200 [a]	5,900 [a]	31 [a]
Diesel-Range Organics	1,100 [a]	> Max [a]	9,500 [a]
Oil-Range Organics	1,100 [a]	> Max [a]	9,500 [a]

Blank spaces indicate no available RBCs (or EPA regional screening levels).

[a] (DEQ, 2023)

[b] EPA residential regional screening level (EPA, 2023) when DEQ RBCs (DEQ, 2023) were not available.

[c] EPA soil to groundwater regional screening level (EPA, 2023) multiplied by 60 to be consistent with DEQ assumptions (in this case, dilution attenuation factor).

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Cumulative Hazard Index (HI) for Cancer and Non-Cancer Effects by Sample Location			
Exposure Area composite Samples	Depth Below Ground Surface (bgs, ft)	Residential Pathways	
		Cancer	Non-Cancer
CFComp1	0-0.5	*HI <1*	*HI <1*
	0.5-1	*HI <1*	*HI <1*
	1-1.3	*HI <1*	*HI <1*
	1.3-1.7	*HI <1*	*HI <1*
CFComp2	0-0.5	*HI <1*	*HI <1*
	0.5-1	*HI <1*	*HI <1*
	1-1.3	*HI <1*	*HI <1*
	1.3-1.7	*HI <1*	*HI <1*
CFComp3	0-0.5	*HI <1*	*HI <1*
	0.5-1	*HI <1*	*HI <1*
	1-1.3	*HI <1*	*HI <1*
	1.3-1.7	*HI <1*	*HI <1*
GFComp1	0-0.5	*HI <1*	*HI <1*
	0.5-1	*HI <1*	*HI <1*
	1-1.3	*HI <1*	*HI <1*
	1.3-1.7	*HI <1*	*HI <1*
MComp1		*HI <1*	*HI <1*

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Appendix B: Ecological Risk Assessment COI Screening Results

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Exposure Pathway: soil						
	Hazard Quotients and Cumulative Hazard Index By Assessment Endpoint					
	Sample: CFComp1 0-0.5					
Detected COI	HQ Plants	HQ Inverts	HQ Ground Feeding Birds (non T&E)	HQ Ground Feeding Mammals (non T&E)	HQ Top Consumer Birds (Non-T&E)	HQ Top Consumer Mammals (non-T&E)
4,4'-DDE	0.004	No RBC	0.037	0.063	0.013	0.152
Carbendazim	No RBC					
DCPMU						
Diuron						
Receptor Specific Total Hazard Index	**0.00**	**0.00**	**0.04**	**0.06**	**0.01**	**0.15**

Exposure Pathway: soil						
	Hazard Quotients and Cumulative Hazard Index By Assessment Endpoint					
	Sample: CFComp1 0.5-1					
Detected COI	HQ Plants	HQ Inverts	HQ Ground Feeding Birds (non T&E)	HQ Ground Feeding Mammals (non T&E)	HQ Top Consumer Birds (Non-T&E)	HQ Top Consumer Mammals (non-T&E)
4,4'-DDE	0.003	No RBC	0.027	0.046	0.009	0.111
Carbendazim	No RBC					
DCPMU						
Diuron						
Receptor Specific Total Hazard Index	**0.00**	**0.00**	**0.03**	**0.05**	**0.01**	**0.11**

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Exposure Pathway: soil						
	Hazard Quotients and Cumulative Hazard Index By Assessment Endpoint					
	Sample CFComp1 1-1.3					
Detected COI	HQ Plants	HQ Inverts	HQ Ground Feeding Birds (non T&E)	HQ Ground Feeding Mammals (non T&E)	HQ Top Consumer Birds (Non-T&E)	HQ Top Consumer Mammals (non-T&E)
4,4'-DDE	0.001	No RBC	0.009	0.016	0.003	0.038
Carbendazim	Not Measured; No RBC					
DCPMU						
Diuron						
Receptor Specific Total Hazard Index	**0.00**	**0.00**	**0.01**	**0.02**	**0.00**	**0.04**

Exposure Pathway: soil						
	Hazard Quotients and Cumulative Hazard Index By Assessment Endpoint					
	Sample: CFComp1 1.3-1.7					
Detected COI	HQ Plants	HQ Inverts	HQ Ground Feeding Birds (non T&E)	HQ Ground Feeding Mammals (non T&E)	HQ Top Consumer Birds (Non-T&E)	HQ Top Consumer Mammals (non-T&E)
4,4'-DDE	0.001	No RBC	0.008	0.013	0.003	0.032
Carbendazim	Not Measured; No RBC					
DCPMU						
Diuron						
Receptor Specific Total Hazard Index	**0.00**	**0.00**	**0.01**	**0.01**	**0.00**	**0.03**

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Exposure Pathway: soil						
	Hazard Quotients and Cumulative Hazard Index by Assessment Endpoint					
	Sample: CFComp2 0-0.5					
Detected COI	HQ Plants	HQ Inverts	HQ Ground Feeding Birds (non T&E)	HQ Ground Feeding Mammals (non T&E)	HQ Top Consumer Birds (Non-T&E)	HQ Top Consumer Mammals (non-T&E)
4,4'-DDE	0.003	No RBC	0.029	0.050	0.010	0.121
Carbendazim	No RBC					
DCPMU						
Diuron						
Receptor Specific Total Hazard Index	**0.00**	**0.00**	**0.03**	**0.05**	**0.01**	**0.12**

Exposure Pathway: soil						
	Hazard Quotients and Cumulative Hazard Index by Assessment Endpoint					
	Sample: CFComp2 0.5-1					
Detected COI	Plants	Inverts	Ground Feeding Birds (non T&E)	Ground Feeding Mammals (non T&E)	Top Consumer Birds (Non-T&E)	Top Consumer Mammals (non-T&E)
4,4'-DDE	0.003	No RBC	0.029	0.050	0.010	0.121
Carbendazim	No RBC					
DCPMU						
Diuron						
Receptor Specific Total Hazard Index	**0.00**	**0.00**	**0.03**	**0.05**	**0.01**	**0.12**

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Exposure Pathway: soil						
	Hazard Quotients and Cumulative Hazard Index by Assessment Endpoint					
	Sample: CFComp2 1-1.3					
Detected COI	HQ Plants	HQ Inverts	HQ Ground Feeding Birds (non T&E)	HQ Ground Feeding Mammals (non T&E)	HQ Top Consumer Birds (Non-T&E)	HQ Top Consumer Mammals (non-T&E)
Carbendazim	Not Measured; No RBC					
DCPMU						
Diuron						
Receptor Specific Total Hazard Index	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

Exposure Pathway: soil						
	Hazard Quotients and Cumulative Hazard Index by Assessment Endpoint					
	Sample: CFComp2 1.3-1.7					
Detected COI	HQ Plants	HQ Inverts	HQ Ground Feeding Birds (non T&E)	HQ Ground Feeding Mammals (non T&E)	HQ Top Consumer Birds (Non-T&E)	HQ Top Consumer Mammals (non-T&E)
Carbendazim	Not Measured; No RBC					
DCPMU						
Diuron						
Receptor Specific Total Hazard Index	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

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Exposure Pathway: soil						
	Hazard Quotients and Cumulative Hazard Index by Assessment Endpoint					
	Sample: CFComp3 0-0.5					
Detected COI+	HQ Plants	HQ Inverts	HQ Ground Feeding Birds (non T&E)	HQ Ground Feeding Mammals (non T&E)	HQ Top Consumer Birds (Non-T&E)	HQ Top Consumer Mammals (non-T&E)
4,4'-DDE	0.004	No RBC	0.041	0.071	0.014	0.172
Carbendazim	No RBC					
DCPMU						
Diuron						
Receptor Specific Total Hazard Index	**0.00**	**0.00**	**0.04**	**0.07**	**0.01**	**0.17**

Exposure Pathway: soil						
	Hazard Quotients and Cumulative Hazard Index by Assessment Endpoint					
	Sample: CFComp3 0.5-1					
Detected COI+	HQ Plants	HQ Inverts	HQ Ground Feeding Birds (non T&E)	HQ Ground Feeding Mammals (non T&E)	HQ Top Consumer Birds (Non-T&E)	HQ Top Consumer Mammals (non-T&E)
4,4'-DDE	0.004	No RBC	0.044	0.075	0.015	0.182
Carbendazim	No RBC					
DCPMU						
Diuron						
Receptor Specific Total Hazard Index	**0.00**	**0.00**	**0.04**	**0.08**	**0.02**	**0.18**

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Exposure Pathway: soil						
	Hazard Quotients and Cumulative Hazard Index by Assessment Endpoint					
	Sample: CFComp3 1-1.3					
Detected COI+	HQ Plants	HQ Inverts	HQ Ground Feeding Birds (non T&E)	HQ Ground Feeding Mammals (non T&E)	HQ Top Consumer Birds (Non-T&E)	HQ Top Consumer Mammals (non-T&E)
Carbendazim	Not Measured; No RBC					
DCPMU						
Diuron						
Receptor Specific Total Hazard Index	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

Exposure Pathway: soil						
	Hazard Quotients and Cumulative Hazard Index by Assessment Endpoint					
	Sample: CFComp3 1.3-1.7					
Detected COI+	HQ Plants	HQ Inverts	HQ Ground Feeding Birds (non T&E)	HQ Ground Feeding Mammals (non T&E)	HQ Top Consumer Birds (Non-T&E)	HQ Top Consumer Mammals (non-T&E)
4,4'-DDE	0.000	No RBC	0.003	0.004	0.001	0.011
Carbendazim	Not Measured; No RBC					
DCPMU						
Diuron						
Receptor Specific Total Hazard Index	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.01**

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Exposure Pathway: soil						
	Hazard Quotients and Cumulative Hazard Index by Assessment Endpoint					
	Sample: GFComp1 0-0.5					
Detected COI	HQ Plants	HQ Inverts	HQ Ground Feeding Birds (non T&E)	HQ Ground Feeding Mammals (non T&E)	HQ Top Consumer Birds (Non-T&E)	HQ Top Consumer Mammals (non-T&E)
4,4'-DDE	0.002	No RBC	0.022	0.038	0.008	0.091
Carbendazim	No RBC					
DCPMU						
Diuron						
Receptor Specific Total Hazard Index	**0.00**	**0.00**	**0.02**	**0.04**	**0.01**	**0.09**

Exposure Pathway: soil						
	Hazard Quotients and Cumulative Hazard Index by Assessment Endpoint					
	Sample: GFComp1 0.5-1.0					
Detected COI	HQ Plants	HQ Inverts	HQ Ground Feeding Birds (non T&E)	HQ Ground Feeding Mammals (non T&E)	HQ Top Consumer Birds (Non-T&E)	HQ Top Consumer Mammals (non-T&E)
4,4'-DDE	0.003	No RBC	0.034	0.058	0.012	0.141
Carbendazim	No RBC					
DCPMU						
Diuron						
Receptor Specific Total Hazard Index	**0.00**	**0.00**	**0.03**	**0.06**	**0.01**	**0.14**

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Exposure Pathway: soil						
	Hazard Quotients and Cumulative Hazard Index by Assessment Endpoint					
	Sample: GFComp1 1.0-1.3					
Detected COI	HQ Plants	HQ Inverts	HQ Ground Feeding Birds (non T&E)	HQ Ground Feeding Mammals (non T&E)	HQ Top Consumer Birds (Non-T&E)	HQ Top Consumer Mammals (non-T&E)
4,4'-DDE	0.002	No RBC	0.021	0.035	0.007	0.086
Carbendazim	Not Measured; No RBC					
DCPMU						
Diuron						
Receptor Specific Total Hazard Index	**0.00**	**0.00**	**0.02**	**0.04**	**0.01**	**0.09**

Exposure Pathway: soil						
	Hazard Quotients and Cumulative Hazard Index by Assessment Endpoint					
	Sample: GFComp1 1.3-1.7					
Detected COI	HQ Plants	HQ Inverts	HQ Ground Feeding Birds (non T&E)	HQ Ground Feeding Mammals (non T&E)	HQ Top Consumer Birds (Non-T&E)	HQ Top Consumer Mammals (non-T&E)
4,4'-DDE	0.001	No RBC	0.009	0.015	0.003	0.037
Carbendazim	Not Measured; No RBC					
DCPMU						
Diuron						
Receptor Specific Total Hazard Index	**0.00**	**0.00**	**0.01**	**0.02**	**0.00**	**0.04**

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Exposure Pathway: soil						
	Hazard Quotients and Cumulative Hazard Index by Assessment Endpoint					
	Sample: MComp1+MComp2					
Detected COI	Plants	Inverts	Ground Feeding Birds (non T&E)	Ground Feeding Mammals (non T&E)	Top Consumer Birds (Non-T&E)	Top Consumer Mammals (non-T&E)
4,4'-DDE	0.001	No RBC	0.006	0.010	0.002	0.024
Non-chlorinated Pesticides	Not Measured; Some without RBCs					
Oil Range Organics	0.80	0.80	0.03	0.03	0.03	0.03
Receptor Specific Total Hazard Index	**0.80**	**0.80**	**0.04**	**0.04**	**0.04**	**0.06**

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Appendix C: Human Health Risk Assessment COI Screening Results

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Exposure: soil			
	Hazard Quotients and Cumulative Hazard Index By Assessment Endpoint		
	Sample: CFComp1 0-0.5		
Detected COI	Residential Pathway	HQ Cancer	HQ Noncancer
4,4'-DDE	Soil Ingestion, Dermal Contact, and Inhalation	0.008333333	
	Volatilization to Outdoor Air	3.94737E-06	
	Leaching to Groundwater	0.009375	
DCPMU	Soil Ingestion, Dermal Contact, and Inhalation	No RBCs	
	Volatilization to Outdoor Air		
	Leaching to Groundwater		
Cumulative Hazard Index		**0.02**	**0**

Exposure: soil			
	Hazard Quotients and Cumulative Hazard Index By Assessment Endpoint		
	Sample: CFComp1 0.5-1		
Detected COI	Residential Pathway	HQ Cancer	HQ Noncancer
4,4'-DDE	Soil Ingestion, Dermal Contact, and Inhalation	0.006111111	
	Volatilization to Outdoor Air	2.89474E-06	
	Leaching to Groundwater	0.006875	
DCPMU	Soil Ingestion, Dermal Contact, and Inhalation	No RBCs	
	Volatilization to Outdoor Air		
	Leaching to Groundwater		
Cumulative Hazard Index		**0.01**	**0**

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Exposure: soil			
	Hazard Quotients and Cumulative Hazard Index By Assessment Endpoint		
	Sample: CFComp1 1-1.3		
Detected COI	Residential Pathway	HQ Cancer	HQ Noncancer
4,4'-DDE	Soil Ingestion, Dermal Contact, and Inhalation	0.002116667	
	Volatilization to Outdoor Air	1.00263E-06	
	Leaching to Groundwater	0.00238125	
Carbendazim	Soil Ingestion, Dermal Contact, and Inhalation	Not Measured; No RBCs	
	Volatilization to Outdoor Air		
	Leaching to Groundwater		
DCPMU	Soil Ingestion, Dermal Contact, and Inhalation	Not Measured; No RBCs	
	Volatilization to Outdoor Air		
	Leaching to Groundwater		
Diuron	Soil Ingestion, Dermal Contact, and Inhalation	Not Measured	
	Volatilization to Outdoor Air	Not Measured; No RBCs	
	Leaching to Groundwater	Not Measured	
Cumulative Hazard Index		**0.00**	**0**

Exposure: soil			
	Hazard Quotients and Cumulative Hazard Index By Assessment Endpoint		
	Sample: CFComp1 1.3-1.7		
Detected COI	Residential Pathway	HQ Cancer	HQ Noncancer
4,4'-DDE	Soil Ingestion, Dermal Contact, and Inhalation	0.00175	
	Volatilization to Outdoor Air	8.28947E-07	
	Leaching to Groundwater	0.00196875	
Carbendazim	Soil Ingestion, Dermal Contact, and Inhalation	Not Measured; No RBCs	
	Volatilization to Outdoor Air		
	Leaching to Groundwater		
DCPMU	Soil Ingestion, Dermal Contact, and Inhalation	Not Measured; No RBCs	
	Volatilization to Outdoor Air		
	Leaching to Groundwater		
Diuron	Soil Ingestion, Dermal Contact, and Inhalation	Not Measured	
	Volatilization to Outdoor Air	Not Measured; No RBCs	
	Leaching to Groundwater	Not Measured	
Cumulative Hazard Index		**0.00**	**0**

Memorandum

Exposure: soil			
	Hazard Quotients and Cumulative Hazard Index By Assessment Endpoint		
	Sample: CFComp2 0-0.5		
Detected COI	Residential Pathway	HQ Cancer	HQ Noncancer
4,4'-DDE	Soil Ingestion, Dermal Contact, and Inhalation	0.006666667	
	Volatilization to Outdoor Air	3.15789E-06	
	Leaching to Groundwater	0.0075	
DCPMU	Soil Ingestion, Dermal Contact, and Inhalation	No RBCs	
	Volatilization to Outdoor Air		
	Leaching to Groundwater		
Diuron	Soil Ingestion, Dermal Contact, and Inhalation		8.46154E-05
	Volatilization to Outdoor Air	No RBCs	
	Leaching to Groundwater		0.012222222
Cumulative Hazard Index		**0.01**	**0.01**

Exposure: soil			
	Hazard Quotients and Cumulative Hazard Index By Assessment Endpoint		
	Sample: CFComp2 0.5-1		
Detected COI	Residential Pathway	HQ Cancer	HQ Noncancer
4,4'-DDE	Soil Ingestion, Dermal Contact, and Inhalation	0.006666667	
	Volatilization to Outdoor Air	3.15789E-06	
	Leaching to Groundwater	0.0075	
DCPMU	Soil Ingestion, Dermal Contact, and Inhalation	No RBCs	
	Volatilization to Outdoor Air		
	Leaching to Groundwater		
Cumulative Hazard Index		**0.01**	**0.00**

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Exposure: soil			
	Hazard Quotients and Cumulative Hazard Index By Assessment Endpoint		
	Sample: CFComp2 1-1.3		
Detected COI	Residential Pathway	HQ Cancer	HQ Noncancer
Carbendazim	Soil Ingestion, Dermal Contact, and Inhalation	Not Measured; No RBCs	
	Volatilization to Outdoor Air		
	Leaching to Groundwater		
DCPMU	Soil Ingestion, Dermal Contact, and Inhalation	Not Measured; No RBCs	
	Volatilization to Outdoor Air		
	Leaching to Groundwater		
Diuron	Soil Ingestion, Dermal Contact, and Inhalation	Not Measured	
	Volatilization to Outdoor Air	Not Measured; No RBCs	
	Leaching to Groundwater	Not Measured	
Cumulative Hazard Index		**0**	**0**

Exposure: soil			
	Hazard Quotients and Cumulative Hazard Index By Assessment Endpoint		
	Sample: CFComp2 1.3-1.7		
Detected COI	Residential Pathway	HQ Cancer	HQ Noncancer
Carbendazim	Soil Ingestion, Dermal Contact, and Inhalation	Not Measured; No RBCs	
	Volatilization to Outdoor Air		
	Leaching to Groundwater		
DCPMU	Soil Ingestion, Dermal Contact, and Inhalation	Not Measured; No RBCs	
	Volatilization to Outdoor Air		
	Leaching to Groundwater		
Diuron	Soil Ingestion, Dermal Contact, and Inhalation	Not Measured	
	Volatilization to Outdoor Air	Not Measured; No RBCs	
	Leaching to Groundwater	Not Measured	
Cumulative Hazard Index		**0**	**0**

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Exposure: soil			
	Hazard Quotients and Cumulative Hazard Index By Assessment Endpoint		
	Sample: CFComp3 0-0.5		
Detected COI	Residential Pathway	HQ Cancer	HQ Noncancer
4,4'-DDE	Soil Ingestion, Dermal Contact, and Inhalation	0.009444444	
	Volatilization to Outdoor Air	4.47368E-06	
	Leaching to Groundwater	0.010625	
DCPMU	Soil Ingestion, Dermal Contact, and Inhalation	No RBCs	
	Volatilization to Outdoor Air		
	Leaching to Groundwater		
Diuron	Soil Ingestion, Dermal Contact, and Inhalation		0.000153846
	Volatilization to Outdoor Air	No RBCs	
	Leaching to Groundwater		0.022222222
Cumulative Hazard Index		**0.02**	**0.02**

Exposure: soil			
	Hazard Quotients and Cumulative Hazard Index By Assessment Endpoint		
	Sample: CFComp3 0.5-1		
Detected COI	Residential Pathway	HQ Cancer	HQ Noncancer
4,4'-DDE	Soil Ingestion, Dermal Contact, and Inhalation	0.01	
	Volatilization to Outdoor Air	4.73684E-06	
	Leaching to Groundwater	0.01125	
DCPMU	Soil Ingestion, Dermal Contact, and Inhalation	No RBCs	
	Volatilization to Outdoor Air		
	Leaching to Groundwater		
Cumulative Hazard Index		**0.02**	**0.00**

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Exposure: soil			
	Hazard Quotients and Cumulative Hazard Index By Assessment Endpoint		
	Sample: CFComp3 1-1.3		
Detected COI	Residential Pathway	HQ Cancer	HQ Noncancer
Carbendazim	Soil Ingestion, Dermal Contact, and Inhalation	Not Measured; No RBCs	
	Volatilization to Outdoor Air		
	Leaching to Groundwater		
DCPMU	Soil Ingestion, Dermal Contact, and Inhalation	Not Measured; No RBCs	
	Volatilization to Outdoor Air		
	Leaching to Groundwater		
Diuron	Soil Ingestion, Dermal Contact, and Inhalation	Not Measured	
	Volatilization to Outdoor Air	Not Measured; No RBCs	
	Leaching to Groundwater	Not Measured	
Cumulative Hazard Index		**0**	**0**

Exposure: soil			
	Hazard Quotients and Cumulative Hazard Index By Assessment Endpoint		
	Sample: CFComp3 1.3-1.7		
Detected COI	Residential Pathway	HQ Cancer	HQ Noncancer
4,4'-DDE	Soil Ingestion, Dermal Contact, and Inhalation	0.000588889	
	Volatilization to Outdoor Air	2.78947E-07	
	Leaching to Groundwater	0.0006625	
Carbendazim	Soil Ingestion, Dermal Contact, and Inhalation	Not Measured; No RBCs	
	Volatilization to Outdoor Air		
	Leaching to Groundwater		
DCPMU	Soil Ingestion, Dermal Contact, and Inhalation	Not Measured; No RBCs	
	Volatilization to Outdoor Air		
	Leaching to Groundwater		
Diuron	Soil Ingestion, Dermal Contact, and Inhalation	Not Measured	
	Volatilization to Outdoor Air	Not Measured; No RBCs	
	Leaching to Groundwater	Not Measured	
Cumulative Hazard Index		**0.00**	**0**

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Exposure: soil			
	Hazard Quotients and Cumulative Hazard Index By Assessment Endpoint		
	Sample: GFComp1 0-0.5		
Detected COI	Residential Pathway	HQ Cancer	HQ Noncancer
4,4'-DDE	Soil Ingestion, Dermal Contact, and Inhalation	0.005	
	Volatilization to Outdoor Air	2.36842E-06	
	Leaching to Groundwater	0.005625	
Carbendazim	Soil Ingestion, Dermal Contact, and Inhalation	No RBCs	
	Volatilization to Outdoor Air		
	Leaching to Groundwater		
DCPMU	Soil Ingestion, Dermal Contact, and Inhalation	No RBCs	
	Volatilization to Outdoor Air		
	Leaching to Groundwater		
Diuron	Soil Ingestion, Dermal Contact, and Inhalation		0.000107692
	Volatilization to Outdoor Air	No RBCs	
	Leaching to Groundwater		0.015555556
Cumulative Hazard Index		**0.01**	**0.02**

Exposure: soil			
	Hazard Quotients and Cumulative Hazard Index By Assessment Endpoint		
	Sample: GFComp1 0.5-1		
Detected COI	Residential Pathway	HQ Cancer	HQ Noncancer
4,4'-DDE	Soil Ingestion, Dermal Contact, and Inhalation	0.007777778	
	Volatilization to Outdoor Air	3.68421E-06	
	Leaching to Groundwater	0.00875	
DCPMU	Soil Ingestion, Dermal Contact, and Inhalation	No RBCs	
	Volatilization to Outdoor Air		
	Leaching to Groundwater		
Cumulative Hazard Index		**0.02**	**0**

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Exposure: soil			
	Hazard Quotients and Cumulative Hazard Index By Assessment Endpoint		
	Sample: GFComp3 1-1.3		
Detected COI	Residential Pathway	HQ Cancer	HQ Noncancer
4,4'-DDE	Soil Ingestion, Dermal Contact, and Inhalation	0.004711111	
	Volatilization to Outdoor Air	2.23158E-06	
	Leaching to Groundwater	0.0053	
Carbendazim	Soil Ingestion, Dermal Contact, and Inhalation	Not Measured; No RBCs	
	Volatilization to Outdoor Air		
	Leaching to Groundwater		
DCPMU	Soil Ingestion, Dermal Contact, and Inhalation	Not Measured; No RBCs	
	Volatilization to Outdoor Air		
	Leaching to Groundwater		
Diuron	Soil Ingestion, Dermal Contact, and Inhalation	Not Measured	
	Volatilization to Outdoor Air	Not Measured; No RBCs	
	Leaching to Groundwater	Not Measured	
Cumulative Hazard Index		**0.01**	**0**

Exposure: soil			
	Hazard Quotients and Cumulative Hazard Index By Assessment Endpoint		
	Sample: GFComp3 1.3-1.7		
Detected COI	Residential Pathway	HQ Cancer	HQ Noncancer
4,4'-DDE	Soil Ingestion, Dermal Contact, and Inhalation	0.002016667	
	Volatilization to Outdoor Air	9.55263E-07	
	Leaching to Groundwater	0.00226875	
Carbendazim	Soil Ingestion, Dermal Contact, and Inhalation	Not Measured; No RBCs	
	Volatilization to Outdoor Air		
	Leaching to Groundwater		
DCPMU	Soil Ingestion, Dermal Contact, and Inhalation	Not Measured; No RBCs	
	Volatilization to Outdoor Air		
	Leaching to Groundwater		
Diuron	Soil Ingestion, Dermal Contact, and Inhalation	Not Measured	
	Volatilization to Outdoor Air	Not Measured; No RBCs	
	Leaching to Groundwater	Not Measured	
Cumulative Hazard Index		**0.00**	**0**

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Exposure: soil			
Detected COI	Hazard Quotients and Cumulative Hazard Index By Assessment Endpoint **Sample: MComp1+ MComp2** Residential Pathway	HQ Cancer	HQ Noncancer
4,4'-DDE	Soil Ingestion, Dermal Contact, and Inhalation	0.001317	
	Volatilization to Outdoor Air	6.23684E-07	
	Leaching to Groundwater	0.00148125	
Oil-Range Organics	Soil Ingestion, Dermal Contact, and Inhalation		0.19
	Volatilization to Outdoor Air		~0
	Leaching to Groundwater		0.022
Non-Chlorinated Pesticides	Soil Ingestion, Dermal Contact, and Inhalation	Not Measured; (Some without RBCs)	
	Volatilization to Outdoor Air		
	Leaching to Groundwater		
Cumulative Hazard Index		**0.00**	**0.21**